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Venturetech pty ltd

VENTURE TECHNOLOGY AND CONSULTING

A.C.N. 009 230 617

CHARACTERISATION OF THE

'NO COMMERCIAL VALUE' SHEEPSKINS OPPORTUNITY

IN AUSTRALIA

A Study conducted for the

MEAT RESEARCH CORPORATION

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Revised Project Objectives

By 30 September 1996 to

(i) increase utilisation of collagenous co-products through the development of:

(a) new edible food coatings formulated from collagen;
(b) an isinglass import replacement and export product (made from bovine collagen);
(c) new collagen-derived functional food ingredients for the meat and processed food industries; and
(d) generic collagen value-adding technologies applicable to a range of collagenous materials;

(ii) investigate the economics of the hydrolysis of no commercial value (NCV) sheepskin material, headpieces or skins, to an animal feedstuff containing a balanced amino acid profile.

Revised Methodology

The Project has been divided into two modules:

Collagen Hydrolysates & Co-Polymers - Module A

Collagen Hydrolysis:
Collagen hydrolysates have a large variety of uses from gelatine and thickening agents to functional ingredients which lower a_w and act as salt substitutes in foods. Protease systems will be evaluated for the production of hydrolysates with suitable taste profiles for food ingredient use. Such technology could also be applicable to other areas of co-product processing such as the production and use of hydrolysed gelatine and/or bone soups. Published reports also indicate that collagen hydrolysates may act as anti-oxidants under some conditions. These claims will be investigated in the context of functionality in processed meat products. The modification of collagen hydrolysates via the action of food grade enzymes to promote the addition of lipophile side chains, will also be investigated.

Tasks will include:

(a) developing a hydrolysis protocol;
(b) determining the microbiological status of the hydrolysate;
(c) developing the protocols to produce a hydrolysate with a bland taste; and
(d) investigating the effects of hydrolysates on TBA values.

Complete Hydrolysis of Sheepskins:
There will always be a need for a cost effective method of disposal of skin headpieces, damaged skins and materials in local oversupply. Hydrolysis methods have been proposed to produce an animal feed with a balanced amino acid profile, and consequently a high value from NCV skins and wool-on face pieces. This process will be costed and the nutritional value of feeds produced will be evaluated.

Tasks will include:

(a) evaluating and selecting commercial enzyme;
(b) determining the efficiency of hydrolysis;
(c) determining the amino acid profile of hydrolysate;
(d) determining the cost of the process;
(e) evaluating strategies for stabilisation; and
(f) conducting feeding trials.

Formation of Co-Polymers:
The functionality of collagen molecules and hydrolysates can be markedly altered by the formation of co-polymers with hydrocolloids such as alginates, pectins and substituted starches. This gives the potential for the production of new food ingredients and the modification of existing ingredients. Some possibilities for new or altered products include:

(a) heat stable inclusions or gels for pet foods;
(b) import replacement/species substitution of bovine/ovine material for isinglass (fish collagen); and
(c) new emulsifying agents for emulsion products for human or pet foods.

Tasks will include:

(a) selecting suitable hydrocolloids;
(b) determining effects of co-polymer formation on viscosity;
(c) characterising charge properties of co-polymers; and
(d) determining heat stability of co-polymers.

Protocols will be developed based on the Research Organisation's knowledge of collagen crosslink structure and stability during various processing protocols. An emphasis will be placed on manipulation of collagen properties by either hydrolysis to yield peptides of higher functionality and value, or formation of co-polymers to add functionality to the collagen.

The success of this module will depend on whether the gelling properties of collagen can be retained and exploited as a texture modifier in canned pet food. By replacing crude collagen preparations, the use of collagen co-polymers as a food ingredient in meat based products will stabilise the emulsions, increase protein concentration, improve texture and consistency, enhance the product specific flavours, increase shelf-life and allow the reduction of salt content.

Edible Collagen Coatings - Module B

This module will examine the utilisation of collagen for the production of edible films, tapes and membranes for the food industry. Conventionally cast and directly applied collagen films will be considered. The ability to produce a wider range of edible tapes for the food industry will also be considered.

The direct application process will aim to seal or coat hot-boned or conventional primals prior to packing. The individual primals could then be multi-packed in vacuum or modified

MILESTONE REPORT

PROJECT NAME:

M218 Utilisation of Collagen

MILESTONE NUMBER:

7

MILESTONE DESCRIPTION:

Evaluation of the economics of complete hydrolysis of sheepskins for animal feeds (Module A).

STATUS:

Completed. 5 December 1995

CSIRO Division of Food Science and Technology
Meat Technology Program

CSIRO AUSTRALIA

The effects of various concentrations and reaction conditions on hydrolysis of wool-on sheep skins for animal feeds (chicken feed, in particular) has been investigated at a laboratory scale.

Sheep skins were hydrolysed with Alcalase® and Esperase® at various temperatures, pH and times, with the optimum pH and temperature of the particular enzymes chosen for evaluating the economics.

Table 1 summarises the conditions and costings for a set of hydrolysis experiments, using approximately 10 g of raw material in 200 mL 50mM phosphate buffer containing 1M urea, pH 9 (Alcalase); pH 11 (Esperase). The rate of hydrolysis of the raw material is displayed in Figure 1. This indicates the amount of solid material remaining at each time point, after being filtered through 1mm^2 mesh screen.

Enzyme	Amount (mL)	Density (g/mL)	Cost ($/kg)	Activity (Au/g)	Activity units (Au)	Total Cost
Alcalase	2.00	1.18	$ 27.20	2.4	5.664	**$ 0.06**
Esperase	0.64	1.18	$ 31.50	7.5	5.664	**$ 0.02**
Chemical	Cost ($/kg)	Conc. (g/L)	Volume (L)	Cost	Total Cost	
Urea	$ 0.51	60	0.2	$ 0.01	**$ 0.10**	
Na_2HPO_4	$ 43.96	7	0.2	$ 0.06		
NaH_2PO_4	$ 26.38	7	0.2	$ 0.04		

	Wet weight of skin Initial (g)	Final (g)	**Yield (% hydrol.)**	Cost ($/sample)	**Cost ($/kg skin)**
Alcalase	9.92	3.15	**68.2**	$ 0.17	**$ 17.01**
Esperase	9.92	2.15	**78.3**	$ 0.13	**$ 12.94**

Table 1 : Conditions and costings of enzyme processing of sheep skins.

As seen from the above table, buffer costs are the most expensive item; Esperase® is three times cheaper than Alcalase®. Esperase® hydrolysed the raw material to a greater degree than Alcalase (based on wet weight).

Although amino acid analyses have not been received from Deakin Research Limited, it is anticipated that there will be specific essential amino acid imbalances compared to published data for the composition and recommended levels of the diets of chickens. Therefore, supplementation with other proteins or complementation with several proteins will be necessary to correct this deficiency. It then follows that this will increase the cost of production.

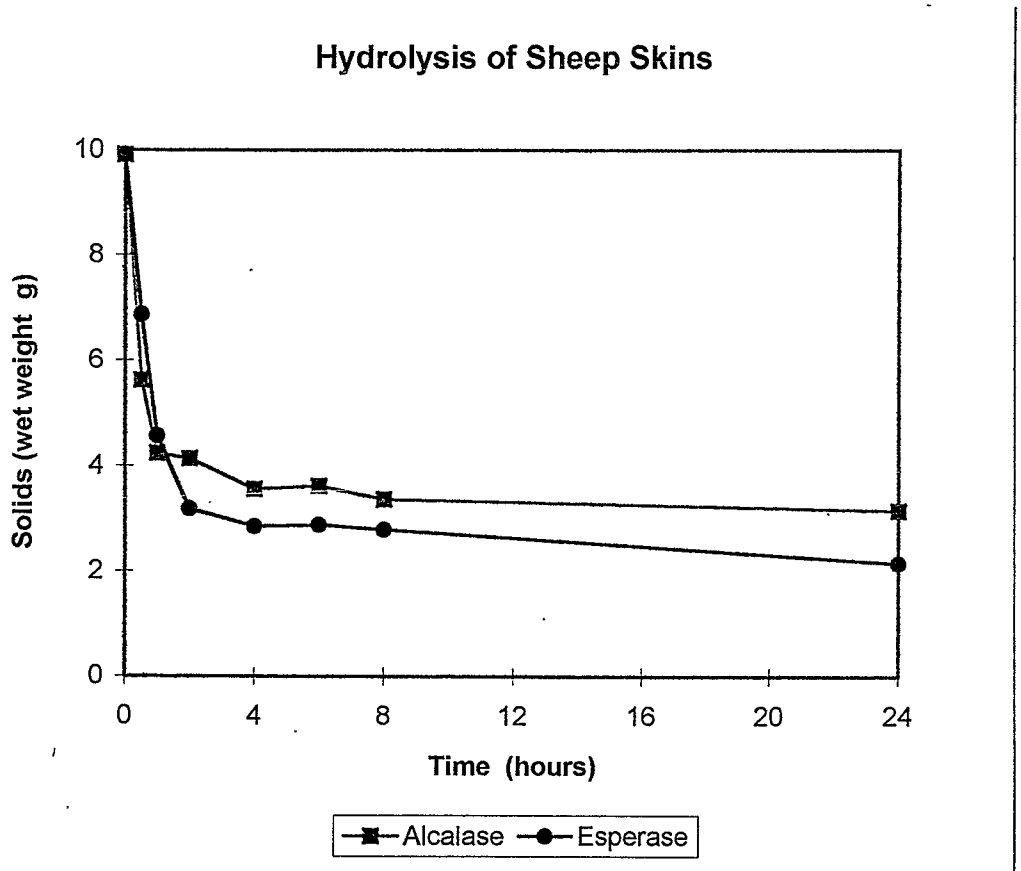

Figure 1 : Rate of hydrolysis of sheep skins with two proteases.

Further investigation into cheaper buffer systems is proposed. These alternatives include a calcium hydroxide (lime) buffering system for Esperase®, and to look at the feasibility of employing a low concentration sodium hydroxide buffer. These systems have the advantages of using low concentrations, cost, easy to use, and effluent problems are minimal.

Other aspects of the complete hydrolysis of sheep skins for the production of a protein supplement to the diet of chickens that can be investigated include : altering the combinations of enzyme concentration (i.e. activity) and time to give the desired degree of hydrolysis; and altering the present liquor to solids ratio (20:1) to 5:1.

THE VIEWS EXPRESSED IN THIS REPORT ARE THOSE OF D W ROBERTS AND NOT NECESSARILY THOSE OF THE MEAT RESEARCH CORPORATION.

DISCLAIMER

The information in this report is based on sources which are believed to be reliable and to have been provided in good faith. Some of the information has come directly from Denis W Roberts and the opinions expressed in the report are his except where otherwise stated. They are given in good faith.

No warranty is given on the accuracy or reliability of the information and data, nor on its interpretation. No responsibility will be accepted for any errors, damage or loss, suffered by any individual or body suffered as a result of this report, however it may have been caused.

Attention is drawn to lack of established practice and know-how in relation to sheepskin material of no commercial value and those using the report as a consideration in working or planning to work with such material are urged to exercise caution in applying general data and information in this report to specific situations. Circumstances and technology in connection with all aspects of sheepskins in Australia, are in a vigorous state of flux and information or technology which is applicable or accurate at one time can quickly become inaccurate or inappropriate. Anyone moving to the specific from the this report is advised to seek guidance from competent and reliable sources.

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1. SUMMARY

1.1. The report reviews the supply of NCV sheepskin material through an examination of sheep and lamb slaughterings, slaughter locations, seasonality of slaughter, annual, monthly and weekly variations in slaughter, the Merino and age composition of the slaughter and the export of sheep and lamb skins.

1.2. NCV sheepskin material is discussed in terms of skins of sheep slaughtered 'off shears' or with short wool; head pieces from sheep and lambs; brisket pieces; skin trimmings from legs of skins; and pelts and pelt pieces found to be NCV after fellmongering.

1.3. The characteristics of the different NCV skin materials are discussed within the limits of the information available on them.

1.4. Various proven and likely means of short to long term preservation of NCV skin materials and their likely suitability for the different materials are discussed .

1.5. Data is presented on transport costs relevant to NCV skin materials between capital cities and regionally.

1.6. Approaches to acquisition of NCV skin material at abattoirs, from fellmongeries and from skin packing sheds are presented.

1.7 It is concluded that the indicative quantities of sheepskin material currently available in Australia annually are 51.4 - 51.7 million m^2 if off-shears NCV skins are taken into account and 4.2 to 5.4 million m^2 if they are not. The indicative quantities of collagen in those areas are 25,290 to 25,400 tonnes and 2,380 and 2,490 tonnes respectively.

1.8. Although overlooking off-shears NCV skins reduces the supply of material by nearly 90%, it is recommended that prospective processors of NCV material base their operations on the regularly available supply on account of the extreme variability in the supply of off-shears NCVs and their probable disappearance with the development of the Australian fellmongering industry.

1.9. Processing operations located East on a Gunnedah-Bordertown axis could access 75% of the NCV skin material within hours of its production. More isolated and smaller production in Western Australia and Queensland could either be processed in small scale operations or freight material at relatively advantageous rates to processors East of the axis.

1.10. The sources of NCV material are abattoirs, fellmongers and skin packers.

1.11. A variety of short and long term preservation methods are available for the NCV material. Chilling and acetic acid show the most promise.

1.12. Meatworks are in a strong position to process NCV sheepskin material, especially into animal feed or fertiliser if they should choose to do so.

2. INTRODUCTION

Although it is estimated that 6 million sheepskins are currently dumped annually, it is anticipated that the growth and development of fellmongering in Australia will lead to the near disappearance of off-shears type NCV skins. Increased fellmongering and wool recovery from NCV skin pieces are likely to lead to increased quantities of high collagen and wool-free skin material available for processing into collagen or gelatine.

2.1. The NCV (no commercial value) sheepskin question is generally thought of in terms of whole sheepskins which get taken to rubbish tips, and are sometimes refused entry to rubbish tips, at irregular intervals.

2.2. Dramatic as this spectacle may be, and great as the numbers of whole skins dumped can be at times, estimated by some at 6 million in 1992 and 1993, the more significant aspect of the issue that it indicates an ongoing level of wastage that affects every skin and every sheep dressed in Australia in every year. The fact is that in some years the returns on sheepskins are so low that skins with less than 25 mm of wool on them are dumped because they have no commercial value. Generally the level is lower than that, but wherever the NCV point happens to be, it represents an amount which gets deducted from the returns of all skins at the time. It is more or less equivalent to the cost of drying or salting, sorting, packaging and freighting skins to foreign processors. Looked at differently, no return is earned on sheepskins below the NCV point.

2.3. In part NCV skin material represents failures in product development and marketing. In part it represents a failure in production or processing to produce or process sheep and lambs to their best advantage in market value terms.

2.4. Meat Research Corporation sheepskin research has dealt with the NCV sheepskins issue to date, from the perspectives of marketing, product development, production and processing systems to raise the value of the whole of all sheepskins, as well as from directly seeking uses for low value NCV material.

2.5. Improvement of the returns on sheepskins was one of the earliest aims of Meat Research Corporation commissioned research. Work towards it was intensified with the initiation of the Sheepskins Key Research Program in 1989. Successful research to support the development of fellmongering in Australia has begun to eliminate the need for drying and salting of skins, a saving of up to $3.50 per skin, or a reduction in NCV point by $3.50. Other apparently successful work awaiting industry evaluation is the recovery of wool from skin pieces. Corporation research is directed at reducing

NCV material produced in farm production and in dressing skins. It has demonstrated a role for the formerly despised Merino sheepskin in 'up market' nappa applications. In the final stages of its Sheepskins Key Program, the Corporation is working with CALM services to present the sheep and sheepskin industries with improved computer marketing systems which will give Australian and overseas buyers immediate access to sheepskins and sheepskin products in all their forms by the end of 1993.

2.6. In brief, the Meat Research Corporation has dealt with the NCV skin issue to date, by research and development aimed at increasing the value of skin pieces, reducing the amount of NCV material produced and improving access to sheepskins and sheepskin material.

2.7. Some of these developments can have indirect advantageous effects. For example processes to recover wool from skin pieces will yield significant quantities of high collagen skin material largely free of wool and well suited for processing into collagen or gelatine.

2.8. In the same way, whereas it may be uneconomic to burn the wool off off-shears NCV skins to use them for collagen or gelatine production, increased fellmongering will lead to increased quantities of wool-free, process-damaged NCV pelts being produced in the course of fellmongering.

2.9. It is logical that it should continue this approach since gains made through these channels are added to every sheepskin and reduce the numbers or amount of NCV material. Whereas research specifically directed at NCV sheepskin material would merely add minor value to that minor part of total sheepskin production.

2.10. It is believed in December 1993 that competition from the development of fellmongering in Australia has already increased skin prices by $1 to $2. Improvements in the quality of Australian fellmongered pelts and further development of fellmongering is likely to see further increases in skin prices and inducement to producers to send more culled sheep for slaughter in full or part wool rather than off-shears, thus substantially reducing or even elminating the off-shears type of NCV skin.

3. SHEEP AND LAMB SLAUGHTER - THE SUPPLY OF NCV SHEEPSKINS.

The overall trend of sheep and lamb slaughter has been a decline in annual slaughter from 53 million in 1971/72 to a low of 25 million in 1983/84 then remaining steady about 32 million from 1985/86 rising to about 34 million since 1990/91.

Victoria has confirmed its position as the dominant lamb producing state while New South Wales has become dominant in sheep slaughter.

Typically, 60% of sheep and 50% of lambs are slaughtered in the 6 months from October to March. There is greater variability about sheep than lamb kills in all respects. Monthly kills generally conform to the seasonal patterns with weekly and daily patterns following.

Slaughter for the domestic market is more consistent than for export. The data indicate that there is strong interaction in stock supply between New South Wales, Victoria and South Australia.

Merinos comprise around 85% of the ewes mated in Australia but purebred Merino lambs comprise only 16.4%, 7.8% and 30% of the lamb kills in New South Wales, Victoria and South Australia respectively.

Data is provided on the locations and capacities of abattoirs with capacities greater than 500 head per day.

3.1. Sheep and lamb slaughter and slaughter patterns

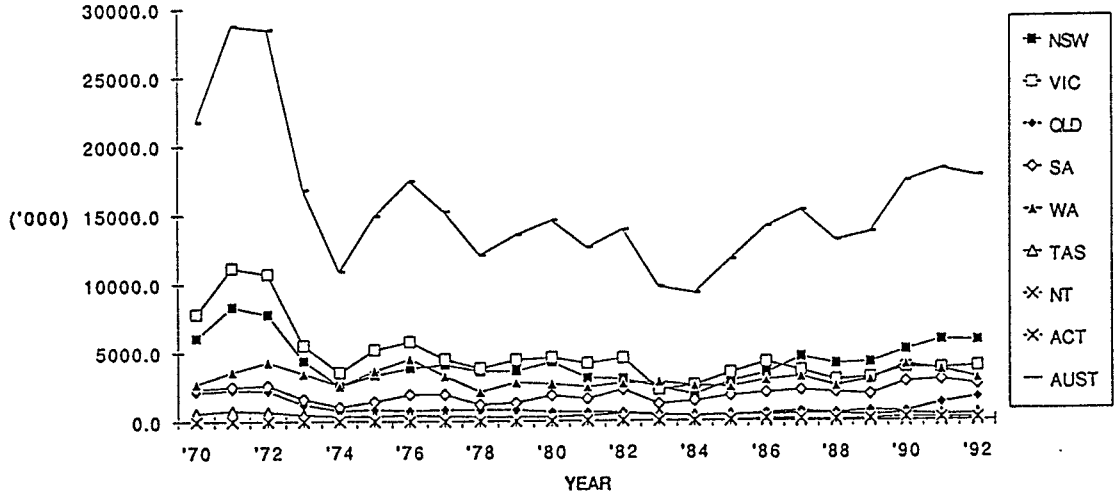
3.1.1. The supply of sheepskin material of no-commercial value (NCV) is related to the slaughter of sheep and lambs. Tables 1 and 2 show the figures (From AMLC) for sheep and lamb slaughter in Australia by month and state from 1970 to 1992. Tables 3, 4 and 5 derived from the same data, show respectively the annual slaughter of sheep, lambs and the combined total of sheep and lambs in Australia by state and year over the same period. There has been a steady decline in sheep and lamb slaughter over the period from a peak of 53 million in 1971/72 to 25 million in 1983/84, with a slight upturn of sheep slaughter since 1990/91 to a combined annual of around 34 million, after remaining relatively steady at about 32 million from 1985/86 to 1989/90.

3.1.2. Table 6, derived from the AMLC data, shows the average monthly slaughter figures for sheep and lambs over the 1970 to 1992 period, together with their standard deviations. (The significance of the standard deviation figure is that 68% of the numbers making up the averages, fall within ± 1 standard deviation of the average. 94% of the values are within ± 2 standard deviations.) The standard deviations of sheep kills form the highest proportion of the means in Queensland and Victoria and the lowest in Tasmania, and South Australia and Western Australia. The standard deviations amount to 87%

and 84% of the average kills for June and July low season in Victoria. Lamb kills have substantially lower standard deviations than sheep.

FIGURE 1: Annual sheep slaughterings by state and nationally from 1970 - 1992

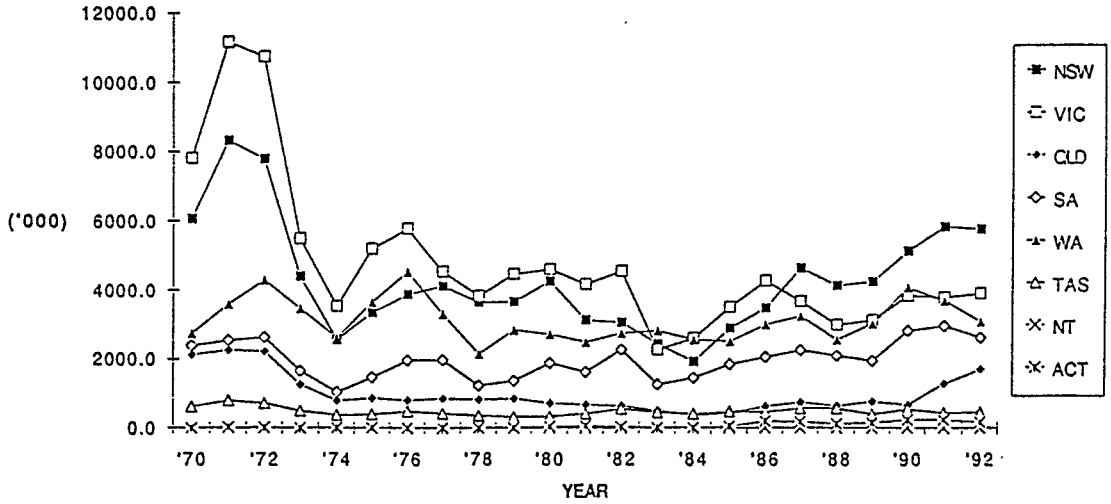
Data from Australian Meat and Livestock Corporation



3.1.3 Figure 1 shows graphically, the annual sheep slaughter nationally and by states from 1970 to 1992 and Figure 2 shows them by states alone. They show that Victoria was generally the dominant state for sheep slaughter, until New South Wales assumed the dominance from 1987.

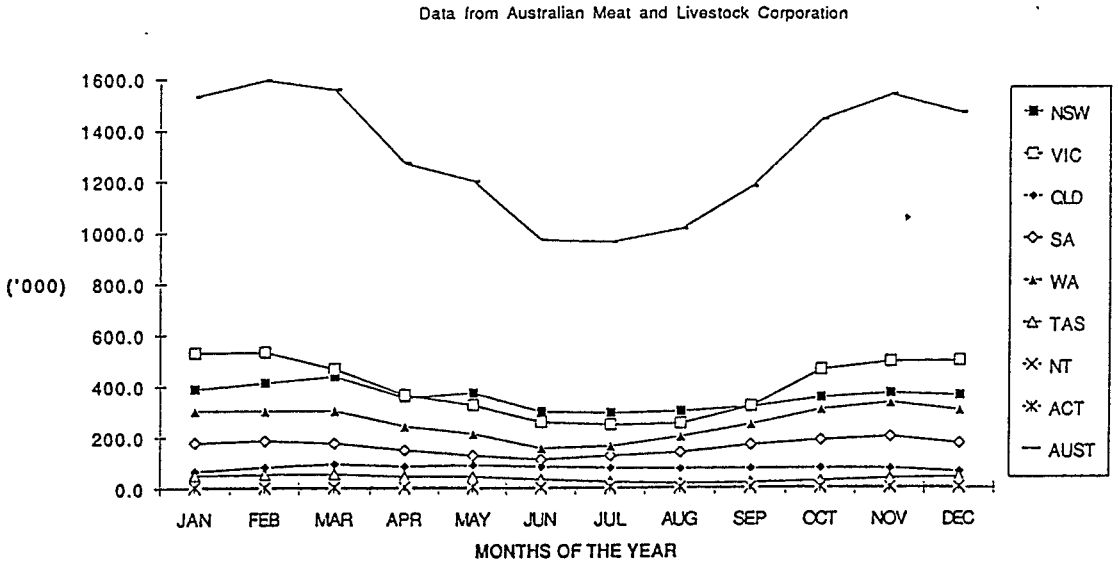
FIGURE 2: Annual slaughterings of sheep in Australian states between 1970 -1992

Data from Australian Meat and Livestock Corporation



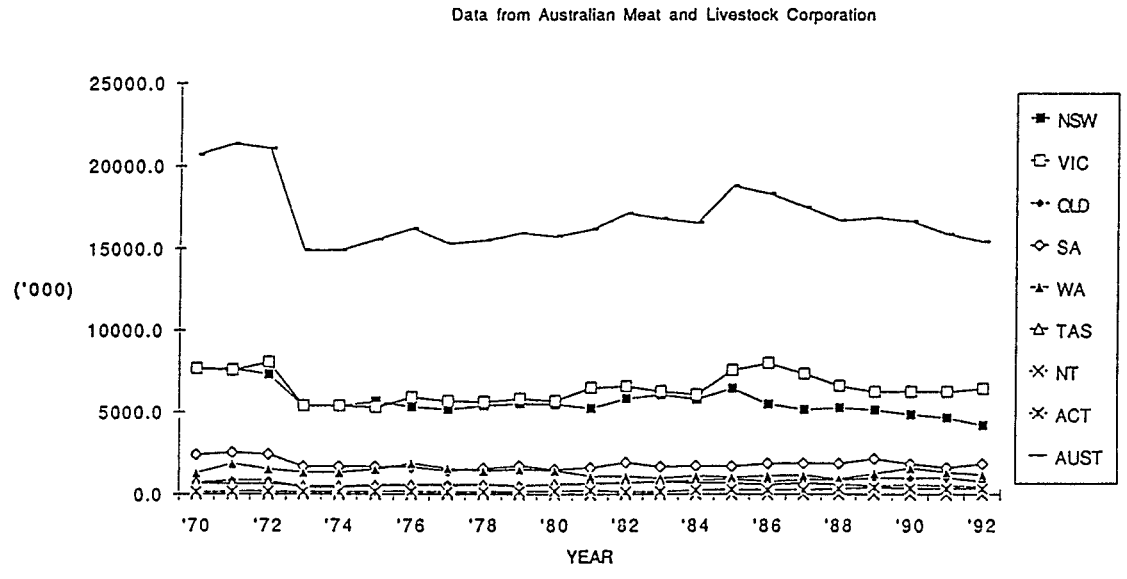
3.1.4. Numbers of sheep slaughtered in Australia roughly tend to show peak periods at around 5 yearly intervals (Figure 1). A massive peak occurred in 1971 in response to severe depressions in wool prices then. Subsequently peak periods have occurred in 1976, 1980-82, 1987 and 1991. **It is at such peak periods that the waste and disposal problems of NCV skins become magnified.** Generally the trends in all states follow similar lines which suggests that the general cause of trends are perceived market conditions.

FIGURE 3: Mean monthly sheep slaughterings by states and totals for Australia between 1970-1992



3.1.5. Figure 3 shows graphically the mean monthly sheep kills nationally and by states between 1970 and 1992 extracted from AMLC data. The low season for all states except Queensland falls between May and September.

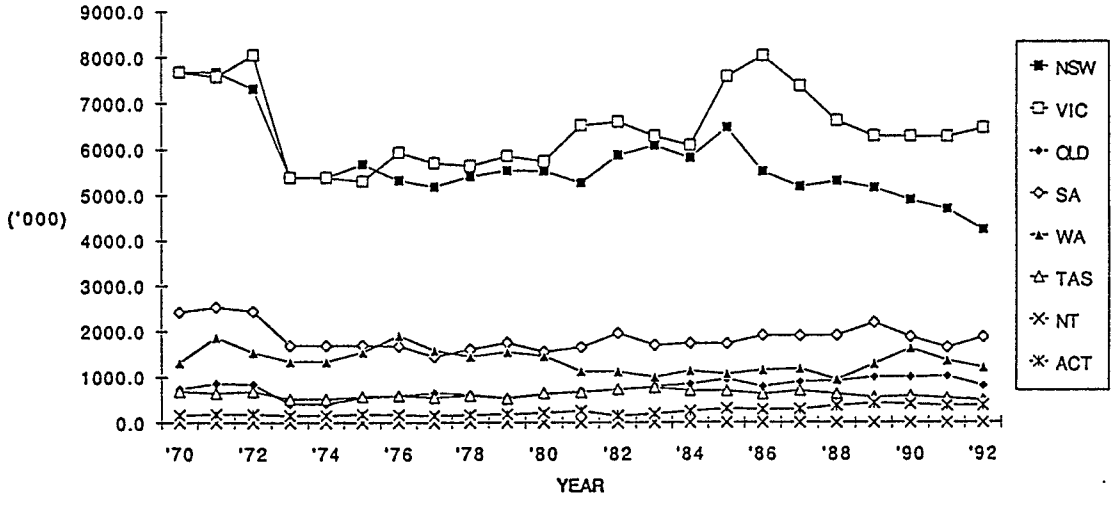
FIGURE 4: Annual slaughterings of lambs by state and nationally for Australia from 1970-1992



3.1.6. Figure 4 shows graphically, the annual lamb slaughter nationally by states from 1970 to 1992 and Figure 5 shows them by states alone. They illustrate that Victoria and New South Wales are the dominant states for lamb slaughter, although in contrast to sheep slaughter, Victoria has increased its dominance in lambs since 1985.

FIGURE 5: Annual lamb slaughterings by states in Australia from 1970-1992

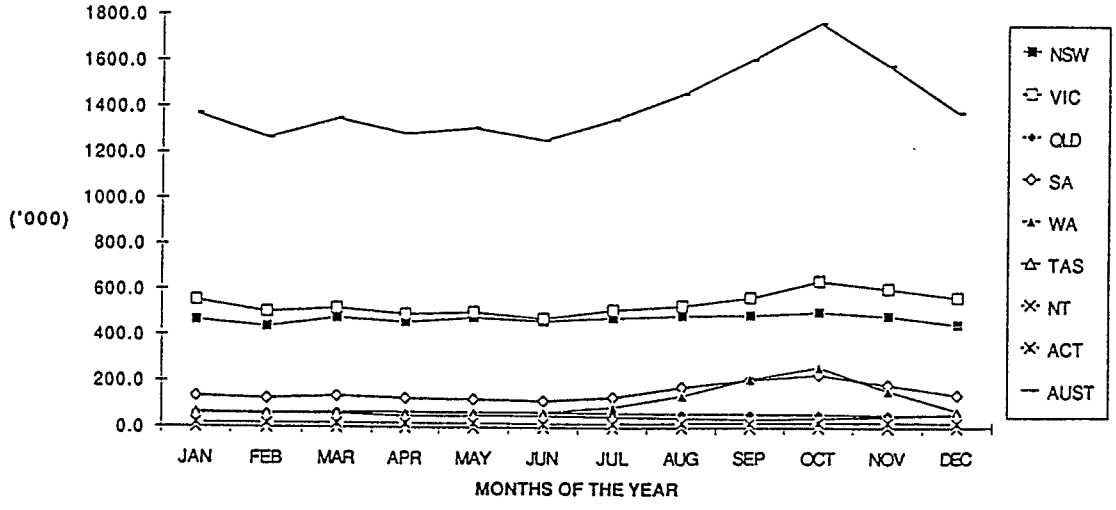
Data from Australian Meat and Livestock Corporation



3.1.7. Figure 6 shows graphically the mean monthly lamb kills nationally and by states between 1970 and 1992 extracted from AMLC data. The seasonality of lamb kill is less than that for sheep, with the seasonal peak being less pronounced than for sheep and extending from August to December instead of October to March.

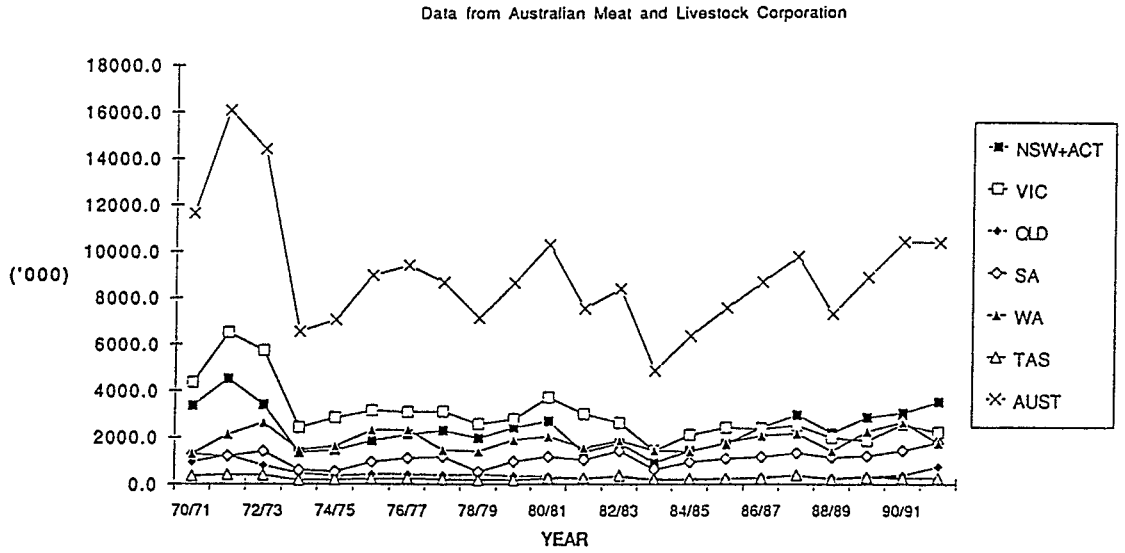
FIGURE 6: Mean monthly slaughterings of lambs by states and total for Australia between 1970 and 1992

Data from Australian Meat and Livestock Corporation



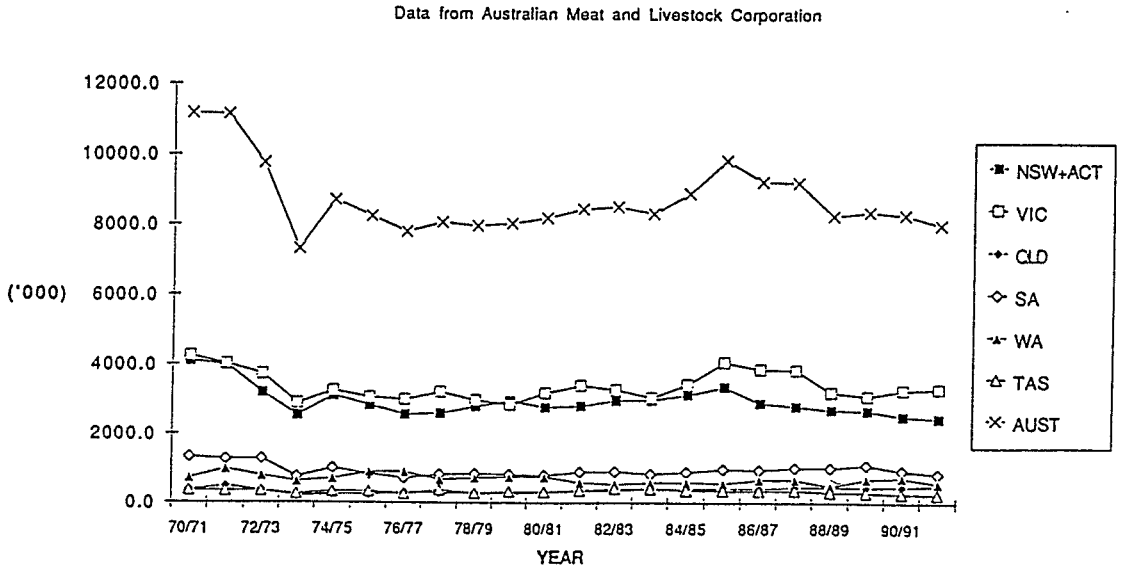
3.1.8. Table 7 shows the numbers of sheep slaughtered nationally and by states from October to March by state and nationally between 1970/71 and 1991/92. Figure 7 displays them graphically.

FIGURE 7: Annual numbers of sheep slaughtered by state and nationally in Australia between October to March from 1970/71-1991/92



3.1.9. Table 8 shows the numbers of lambs slaughtered nationally and by states from October to March between 1970/71 and 1991/92. Figure 8 shows the figures graphically. A comparison of figures 7 and 8 shows that lamb slaughter is substantially more consistent than sheep slaughter.

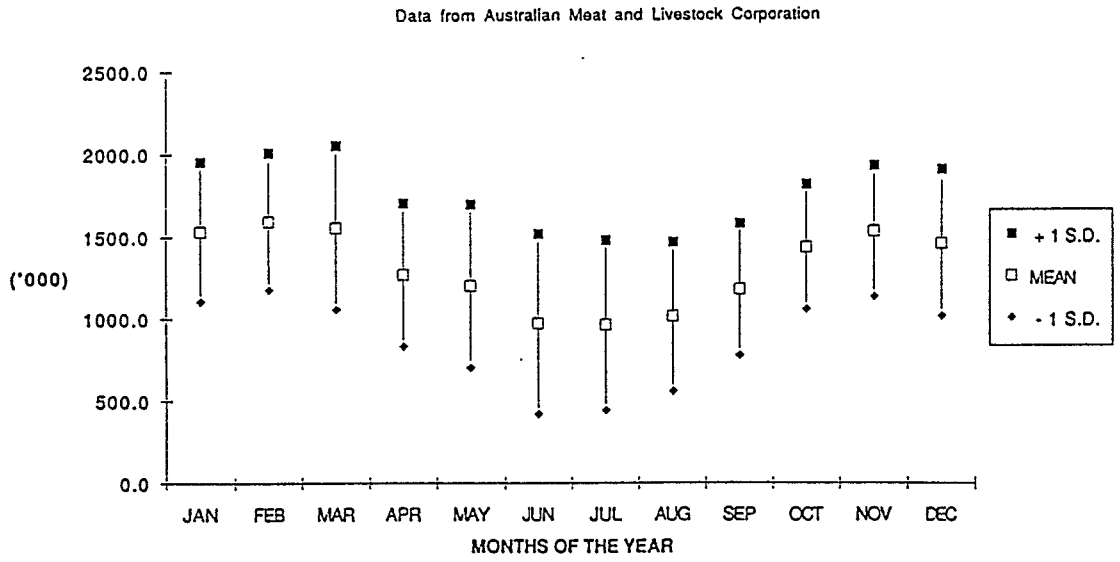
FIGURE 8: Annual numbers of lambs slaughtered in Australia between October and March inclusive from 1970/71-1991/92



3.1.10. Table 9 shows the combined numbers of sheep and lambs slaughtered nationally and by states from October to March by state and nationally between 1970/71 and 1991/92.

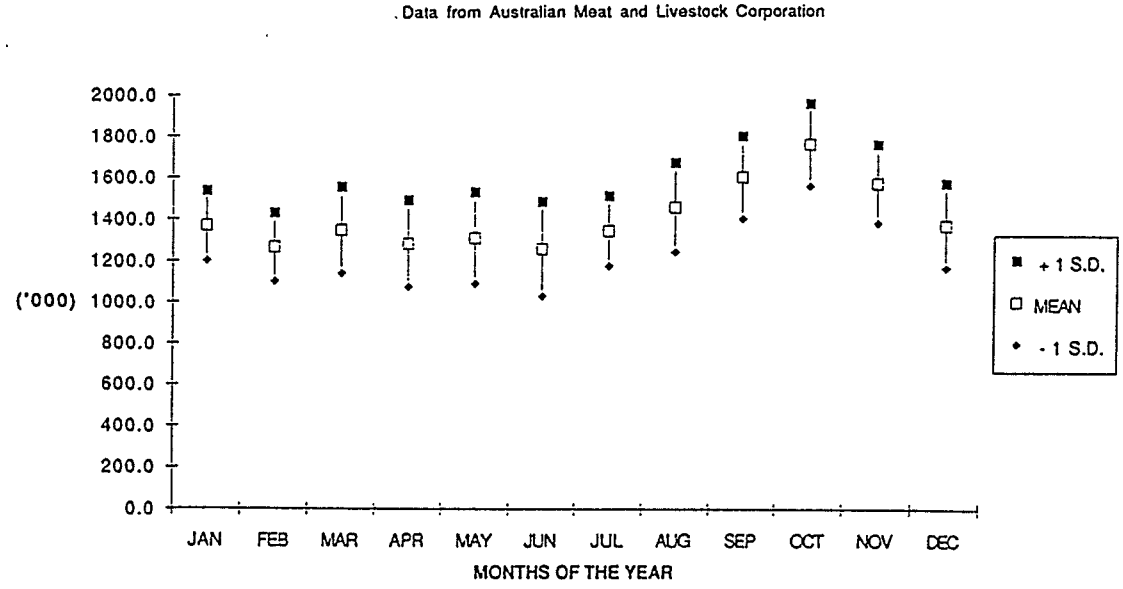
3.1.11. Figure 9 shows mean monthly, national sheep slaughter figures and their standard deviations. The standard deviations are greater during the period of lower kills.

FIGURE 9: Mean monthly slaughterings of sheep, with their standard deviations, in Australia from 1970-1992



3.1.12. Figure 10 shows mean monthly, national lamb slaughter figures and their standard deviations. Standard deviations for lambs are considerably less than for sheep

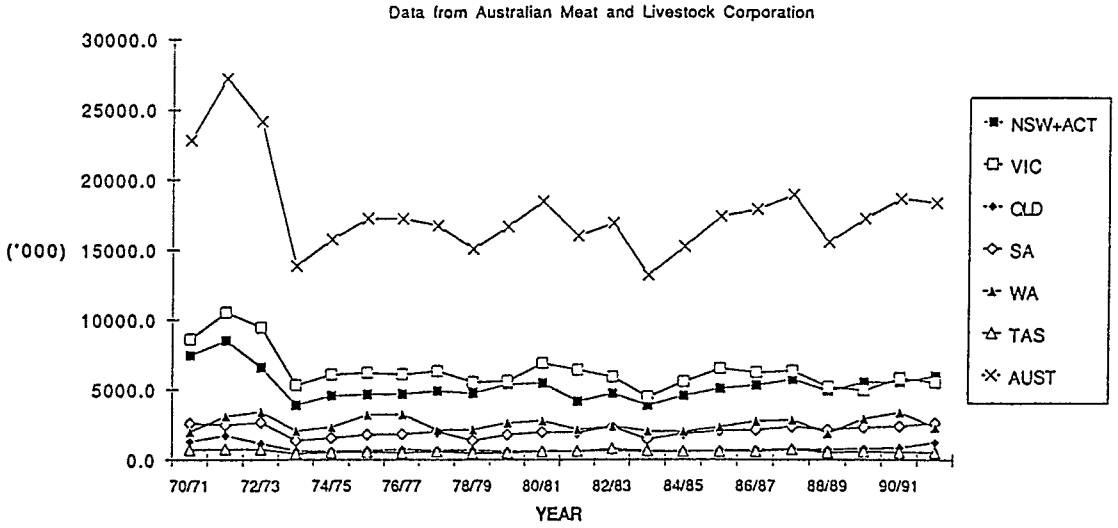
FIGURE 10: Mean monthly slaughterings of lambs with their standard deviations, in Australia from 1970-1992



3.2. Seasonality of slaughter

3.2.1. Figure 11 shows the combined sheep and lamb slaughter nationally and by states between October and March from 1970/71 to 1991/92.

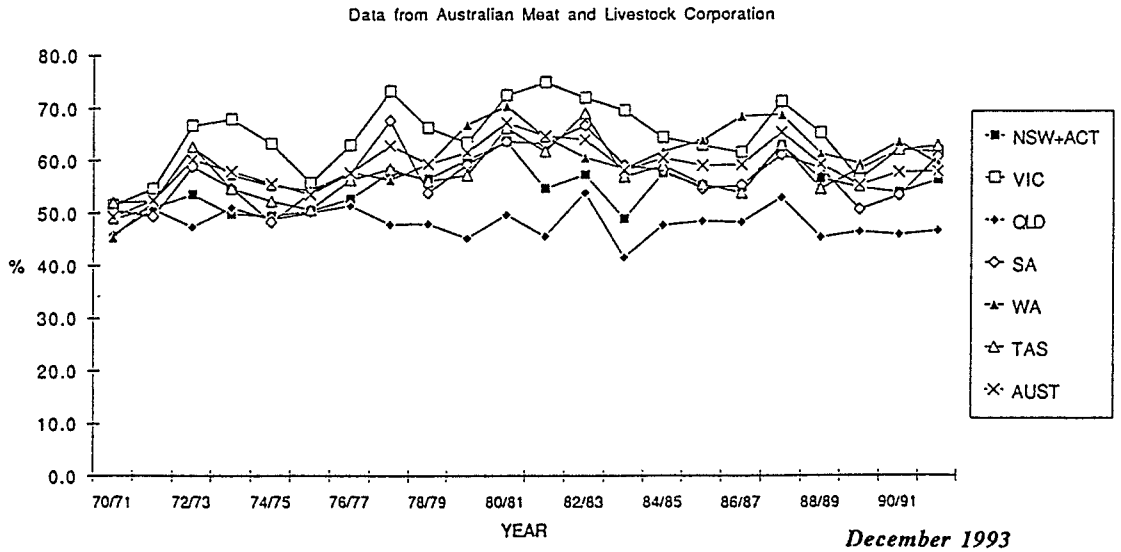
FIGURE 11: Combined slaughterings of sheep and lambs between October and March in Australia from 1970/71-1991/92



3.2.2. Table 10 shows the percentages of annual sheep slaughter occurring from October to March inclusive, nationally and by state in Australian from 1970/71 to 1991/92. Table 11 shows the corresponding data for lambs and Table 12 the combined figures for sheep and lambs. Typically about 60% of the sheep and 50% of the lambs are slaughtered during this period.

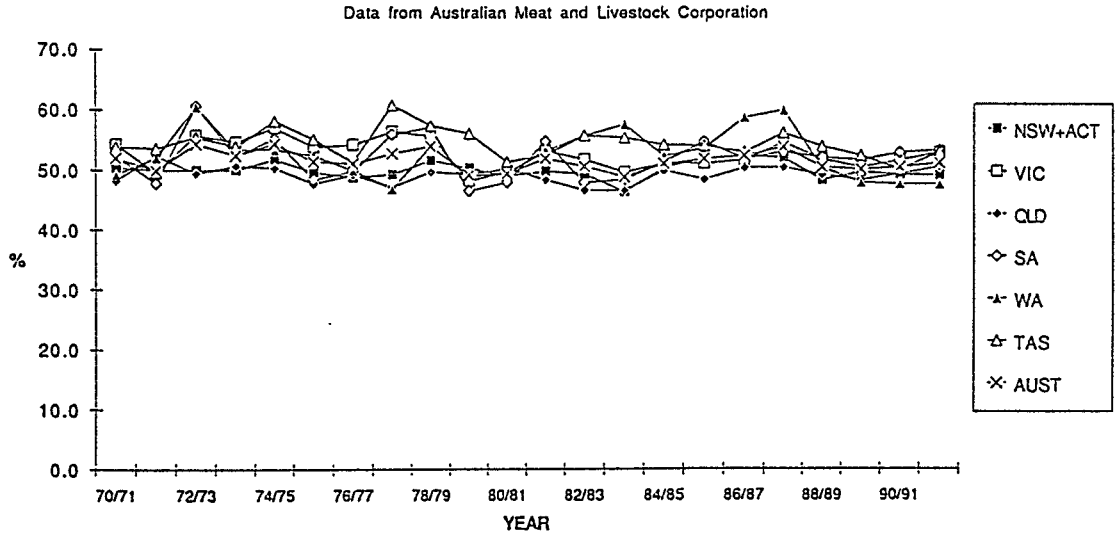
3.2.3. Figure 12 shows graphically, the percentages of the annual sheep kill, by state and nationally in Australia, occurring from October to March inclusive, from 1970/71 to 1991/92. It indicates the Victorian kill is the most seasonal and Queensland the least.

FIGURE 12: Percentages of the annual sheep kill by state and nationally in Australia occurring between October to March inclusive, from 1970/71-1991/92



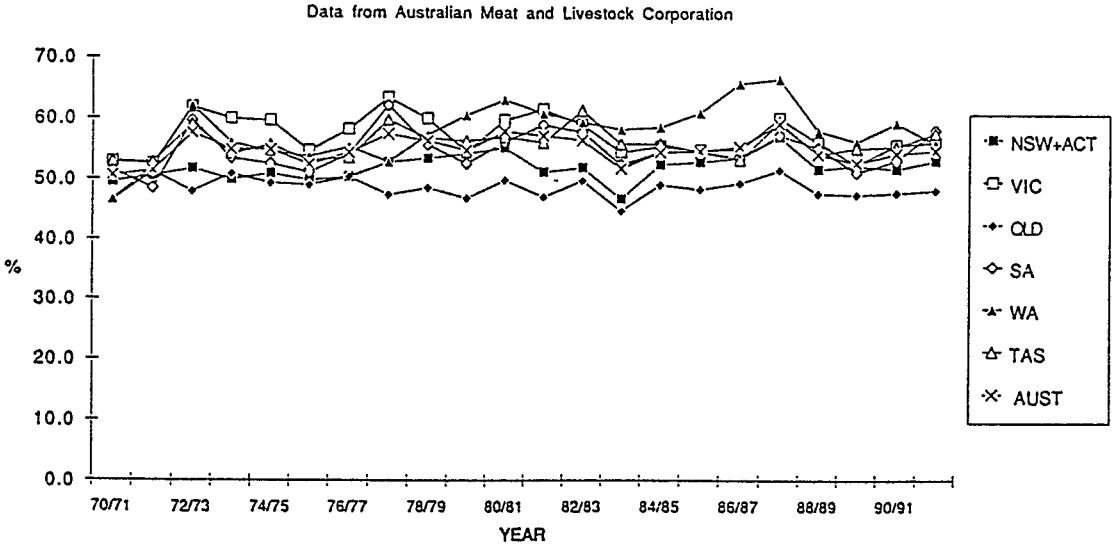
3.2.4. Figure 13 shows graphically, the percentages of the annual lamb kill, by state and nationally in Australia, occurring in the peak slaughter period, from October to March inclusive, from 1970/71 to 1991/92. The figures show less seasonality than those for sheep, and less variation from year to year.

FIGURE 13: Percentages of the annual lamb kill by state and nationally in Australia occurring between October to March inclusive, from 1970/71-1991/92



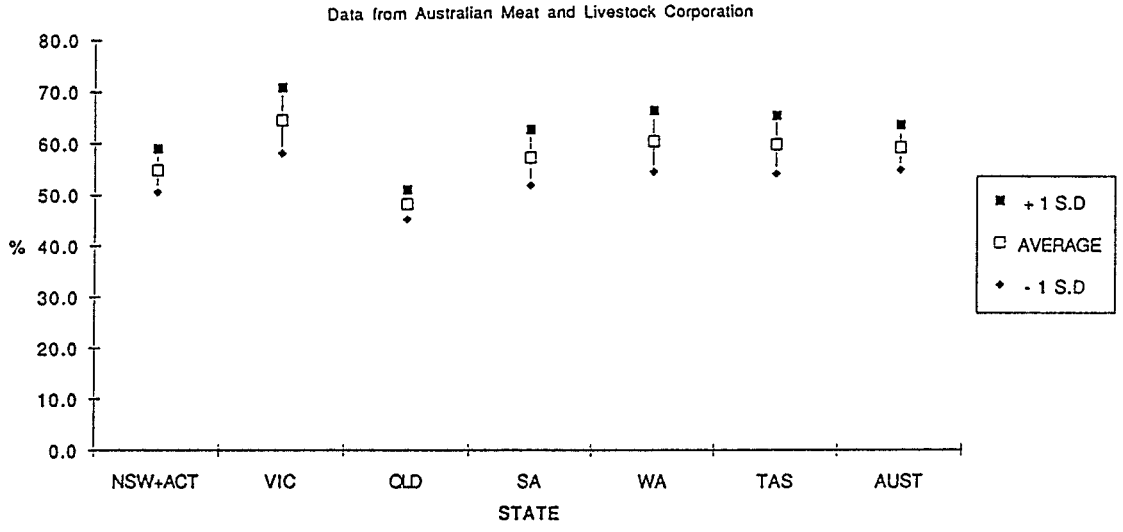
3.2.5. Figure 14 shows graphically, the percentages of the annual combined sheep and lamb kills, by state and nationally in Australia, occurring from October to March inclusive, from 1970/71 to 1991/92. The figure indicates that Western Australia has a high level of both variability and seasonality on these combined slaughter figures.

FIGURE 14: Percentages of combined annual sheep and lamb kill, by state and nationally in Australia occurring from October to March inclusive from 1970/71-1991/92



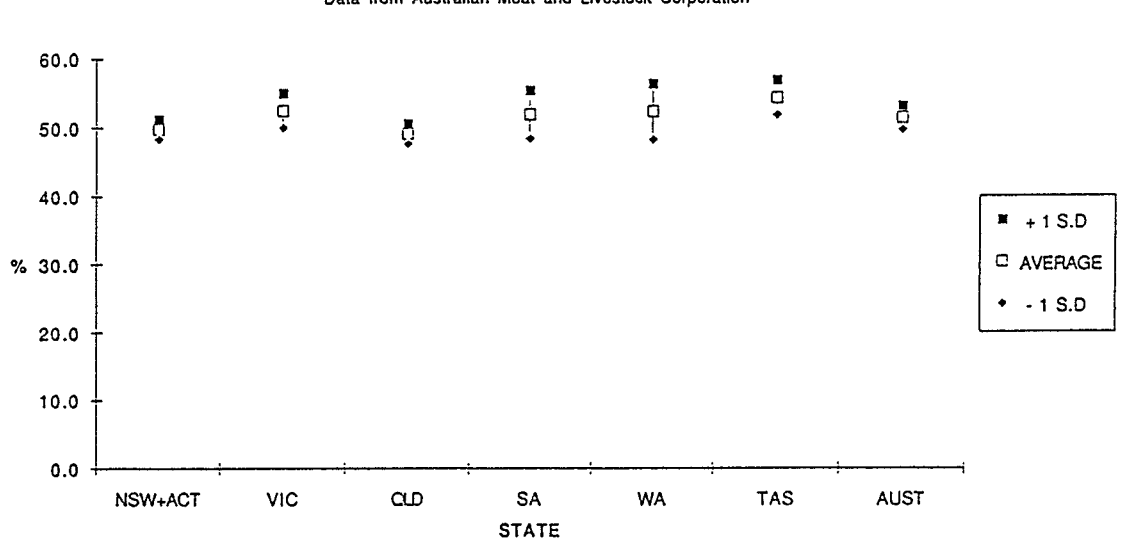
3.2.6. Figure 15 shows the mean percentages, with standard deviations, of annual sheep kills occurring between October and March inclusive from 1970/71 to 1991/92. It again illustrates the higher seasonality and variability of the Victorian sheep kill with Queensland and New South Wales having both the lowest seasonality and lowest variability.

FIGURE 15: Mean percentages, with standard deviations, of annual sheep kills occurring between October and March inclusive from 1970/71-1991/92 in Australia by state and nationally



3.2.7. Figure 16 shows the mean percentages, with standard deviations, of annual lamb kills occurring between October and March inclusive from 1970/71 to 1991/92. It shows generally less seasonality and variability than the sheep kill, significantly in the major lamb states of Victoria and New South Wales, but with the Western Australian lamb kill remaining both seasonal and variable.

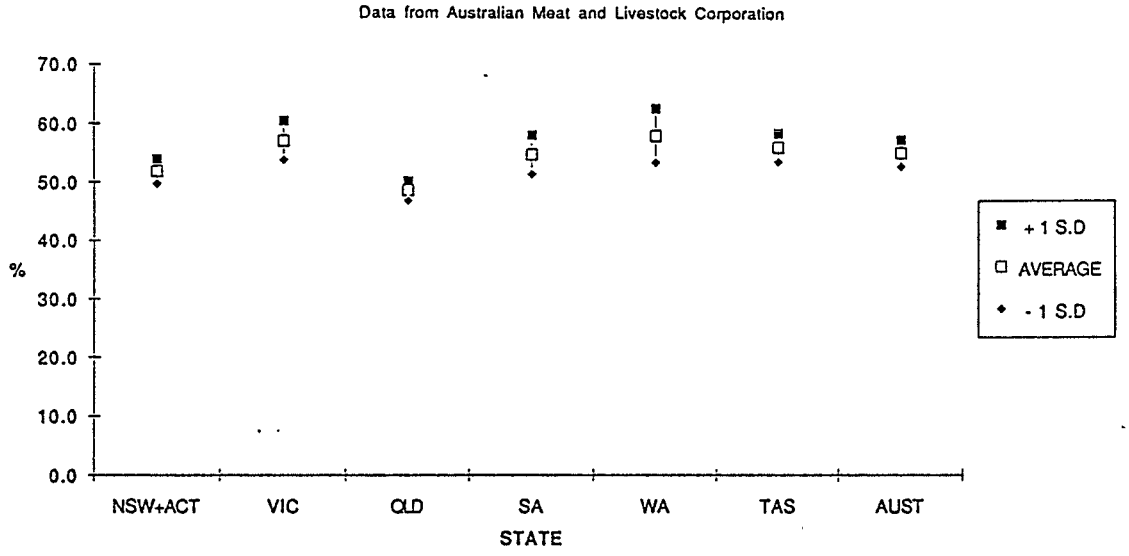
FIGURE 16: Mean percentages, with standard deviations of annual lamb kills occurring between October and March inclusive from 1970/71-1991/92 in Australia by state and nationally



3.3. Weekly and monthly slaughter variations

3.3.1. Figure 17 shows the mean percentages, with standard deviations, of annual combined sheep and lamb kills occurring between October and March inclusive from 1970/71 to 1991/92. The Queensland and New South Wales kills are notable for lower seasonality and variability with Victoria and Western Australia exhibiting similar greater seasonality, but with less variability in Victoria.

FIGURE 17: Mean percentages with standard deviations of combined sheep and lamb kills occurring in Australia between October and March inclusive from 1970/71-1991/91



3.3.2. Weekly kills reflect monthly figures. At times when they are low, export sheep chains may close altogether until sheep supplies increase. These are the abattoirs which will produce the bulk of this type of NCV skin. Domestic abattoirs tend to operate at much more consistent throughputs, but to concentrate on lambs rather than sheep.

3.3.3. Daily kills in turn reflect weekly kills except that abattoirs may elect to kill sheep at lower daily figure every day, or on only part of the week at a higher daily kill, either providing no work for slaughtermen on the remaining days or assigning them to kill other species.

3.4. Regional Effects

3.4.1. From Figures 2 and 4 showing annual slaughter data for sheep and lambs it can be inferred that there is a general interaction between New South Wales, Victoria, South Australia and to a lesser extent Queensland. Western Australian annual slaughter figures indicate little relationship with other states, reflecting its Mediterranean climate, although it would be reasonable to expect a general wet winter similarity between Western Australia and much of South Australia.

3.4.2. Regional differences in kills according to seasons, especially export kills, reflect the commercial drive and seasonal operating policy of individual meatworks rather than local conditions. Abattoirs supplying to the domestic market have a stronger onus to produce high quality sheepmeat consistently throughout the year and from year to year. Sheep are commonly drawn from hundreds of kilometres, and from interstate, for kill at the more enterprising meatworks when supplies are limited and buying is more competitive.

3.5. Merino component

3.5.1. The Merino component of kills is indicated by the AMLC's June 1993 Lamb Survey, Merino ewes comprised 87%, 81% and 91% of sheep matings in New South Wales, Victoria and South Australia respectively. Other states are not included in the survey, but Queensland and Western Australia would be likely to have even higher Merino ewe components. However, purebred Merino lambs are expected to comprise only 16.4%, 7.8% and 30% of the lamb kills in New South Wales, Victoria and South Australian respectively.

3.6. Slaughtering locations

3.6.1. Appendix 1 shows data on slaughter sites provided by AMLC. It lists abattoirs with kill capacity greater than 500 per day and direct line distances from the nearest capital cities. The abattoirs' locations are shown in Figure 18. **There are known to be errors in the AMLC data, which have not been verified with the companies concerned, and they should only be regarded as indicative potential kills.** The reliability of these data is further reduced by the growing trend in Australia towards abattoirs working multi shifts, which almost overnight, can more than double the throughput of abattoirs adopting them. Hence data accurate on one day can be misleading within weeks as abattoirs close or modify their operations.

FIGURE 18: Distribution of locations in Australia with capacities to slaughter 500 or more sheep and lambs per day. (Data from Australian Meat and Livestock Corporation)

WESTERN AUSTRALIA
1=BUNBURY
2=FREMANTLE
3=ALBANY
4=KATANNING
5=AUSTRALIND
6a=WOOROLOO
6b=LINLEY VALLEY
7=TAMMIN
8=PICTON

SOUTH AUSTRALIA
9=LOBETHAL
10=PORT PIRIE
11=MOUNT GAMBIER
12=MURRAY BRIDGE
13=OLD NOARLUNGA
14=GEPPS CROSS
15=BORDERTOWN
16=TWO WELLS
17=NORMANVILLE

QUEENSLAND
18=IPSWICH
19=KILCOY
20=MORNINGSIDE
21=WALLANGARRA
22=BULIMEA
23=CORINDA
24=KILLARNEY

NEW SOUTH WALES
25=YANCO
26=WAGGA WAGGA
27=CULCAIRN
28=YOUNG
29=COWRA
30=MUDGEE
31=DUBBO
32=ORANGE
33=GUYRA
34=DENILIQUIN
35=HARDEN
36=GOSFORD
37=WYONG
38=WOLLONGONG
39=TAMWORTH
40=COOTAMUNDRA
41=SCONE
42=GUNNEDAH
43=BLANEY
44=CENTRAL TILBA

VICTORIA
45=SWAN HILL
46=PORTLAND
47=BARNAWARTHA
48=CASTERTON
49=DANDENONG
50=COBRAM
51=HAMILTON
52=ECHUCA
53=SEYMOUR
54=STAWAELL
55=KYNETON
56=DAYLESFORD
57=BAIRNSDALE
58=MYRTLEFORD
59=WARRAGUL
60=NATHALIA
61=MILDURA
62=TALLANGATTA
63=WANGARATTA
64=TATURA
65=CRANBOURNE
66=WARRAMBOOL
67=COLAC
68=WONDONGA
69=WOORAK VIA NHILL
70=CARISBROOK
71a=CHELSEA
71b=CHELSEA
72=BROOKLYN
73a=ALTONA NORTH
73b=ALTONA NORTH

TASMANIA
74=LAUNCESTON
75=BRIDGEWATER
76=LONGFORD

4. "NO-COMMERCIAL-VALUE" (NCV) SHEEPSKIN MATERIAL COMPRISES:

1. Skins of sheep slaughtered off-shears or with short wool.
2. Head pieces from all sheep and lambs slaughtered.
3. Brisket pieces.
4. Skin trimmings from legs.
5. Pelts and pelt pieces found to be NCV after fellmongering.

4.1 Off-shears and short stapled NCV skins.

Australian fellmongers consider that over recent years, annual production of NCV skins has been 6 million. The number fluctuates, and not always in accordance with average wool prices. Off-shears and short stapled NCV skins are mainly from aged Merino ewes. They are likely to disappear as the Australian fellmongering industry develops.

4.1.1. The Australian fellmongers estimate (November 1993) that the skins from a typical 32 million annual Australian sheep kill are dispersed as follows:

3 million	tanned wool-on in Australia.
4 million	fellmongered in Australia.
14 million	fellmongered overseas principally in France and New
5 million	tanned wool-on overseas.
6 million	**dumped as NCV (no-commercial-value) in Australia.**

4.1.2. The skins from sheep so recently off-shears that shearing cuts have not healed (less than 6 to 8 weeks), are unsuitable for processing into leather of any kind, because shearing wounds open up during processing. They have insufficient wool for profitable fellmongering. So they are NCV in both these applications. Their possible end uses are in stock feeds, fertilisers, restructured collagen products and gelatine production.

4.1.3. Growers sell culled sheep off-shears because they do not perceive they receive worthwhile returns for wool or pelt when sheep are sold 'in-the-wool'. Besides, it is often convenient to dispose of low-value culls off-shears. In times of drought or low prices, growers tend to cull more deeply at shearing, and so numbers of off-shears NCV skins are further increased in those circumstances. In some instances growers will shear sheep prematurely in preference to selling them in part-wool. Many growers

have nearly zero awareness of skins. There have been informal estimates that around 6 million skins annually are NCV and dumped.

4.1.4. Western Australia has a reputation for sending a high proportion of its culled sheep for slaughter off-shears and observations support this.

4.1.5. The development of fellmongering in Australia will increasingly provide a fuller return to growers of the value of wool on their skins. From this and with fellmongering costs being competitive with shearing costs, it can be predicted that the off-shears component of NCV skins will progressively disappear. Growers will opt to sell culled sheep in-the-wool at a time compatible with overall farm operations and pasture conditions, rather than being tied to turn-off at shearing.

4.1.6. Sheep ages

4.1.4.1. These NCV skins are generally derived from culled sheep which are mature or aged. Between 1988 and 1992, ewes comprised between 61% and 66% of the sheep kill with a mean of 63% (from AMLC data). Reports are often heard of extreme fragility in old ewe skins, especially in poor feed conditions.

4.1.7. Dumping of skins

4.1.7.1. NCV skins are perceived to be a problem when abattoir operators incur costs up to $0.30 per skin for rubbish tip disposal, or the outright refusal of refuse authorities to accept them at rubbish sites.

4.1.8. Numbers of NCV skins

4.1.8.1. The numbers of NCV skins coming forward are variable. They tend to be presented in greater numbers at times of industry crisis, in response to poor outlooks for wool or sheepmeat or to drought. Routinely culled sheep are disposed of in the farm cycle, mainly in the late spring, early summer or following autumn shearing.

4.1.8.2. On occasions when there is inadequate capacity to slaughter all sheep and lambs presented for slaughter, lamb slaughter takes precedence over sheep slaughter.

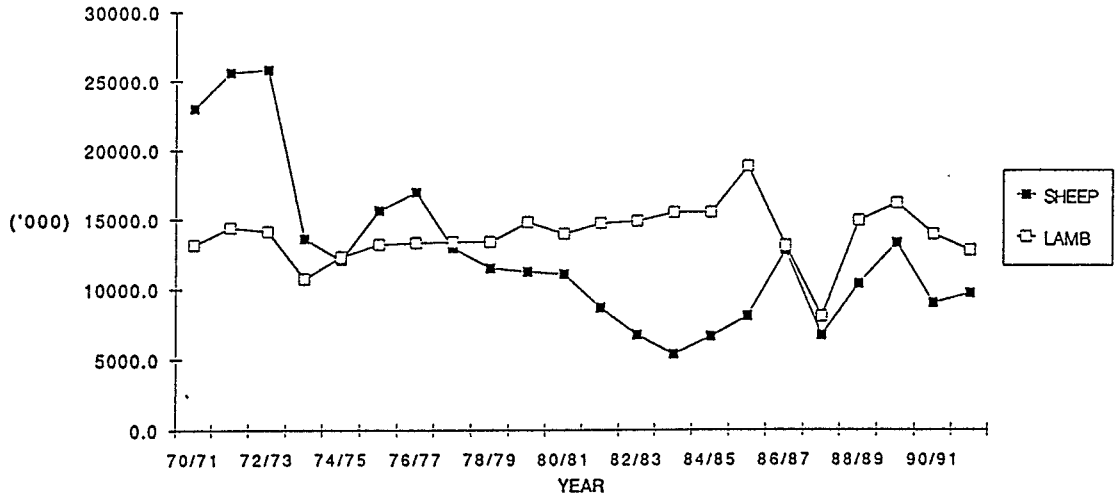
4.1.8.3. Table 13 Shows annual sheep and lamb slaughter figures, the numbers of skins exported, the differences between the two, the differences as percentages of the kill and average wool prices from 1970/71 to 1991/92. It can be seen that the differences, which indicate NCV levels, do not always respond to wool prices.

4.1.8.4. The differences between kill figures and skin export numbers, or domestic disappearance of skins, are made up of NCV skins that disappear from the system to rubbish tips, skins that are tanned domestically as wool skins and skins that are domestically fellmongered. In the occasional years when the differences are negative it is evident that there has been a carryover of preserved skins in stock which were exported in subsequent years.

4.1.8.5. Figure 19 shows exports of lamb skins to be relatively consistent, except for 1987/88, especially in comparison with the highly variable figures for sheep skins.

FIGURE 19: Annual exports of sheep and lamb skins from Australia from 1970/71-1991/92

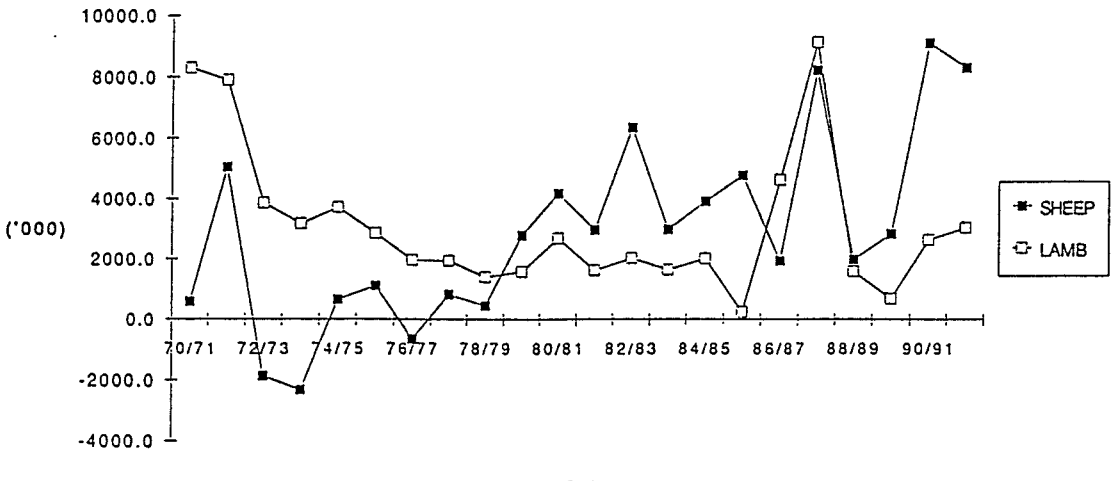
Data from Australian Bureau of Census and Statistics



4.1.8.6. However, Figure 20 which shows the differences between annual totals of sheep and lambs slaughtered and exported annually in Australian between 1970/71 and 1990/91 shows very large variations for lambs as well as for sheep.

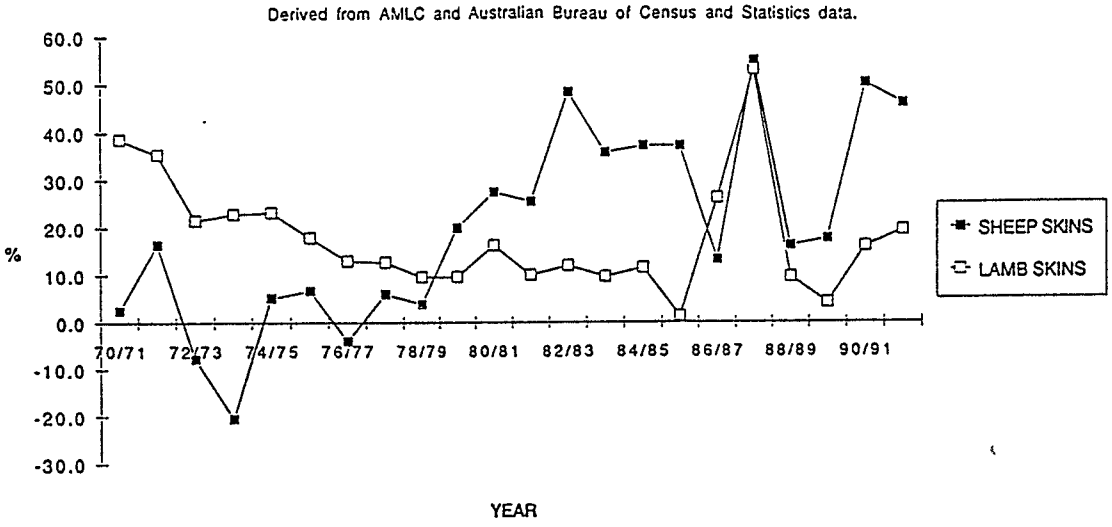
FIGURE 20: Differences between sheep and lambs slaughtered annually in Australia and exports of sheep and lamb skins from 1970/71-1991/92

Slaughter data from AMLC and skins data from Australian Bureau of Census and Statistics



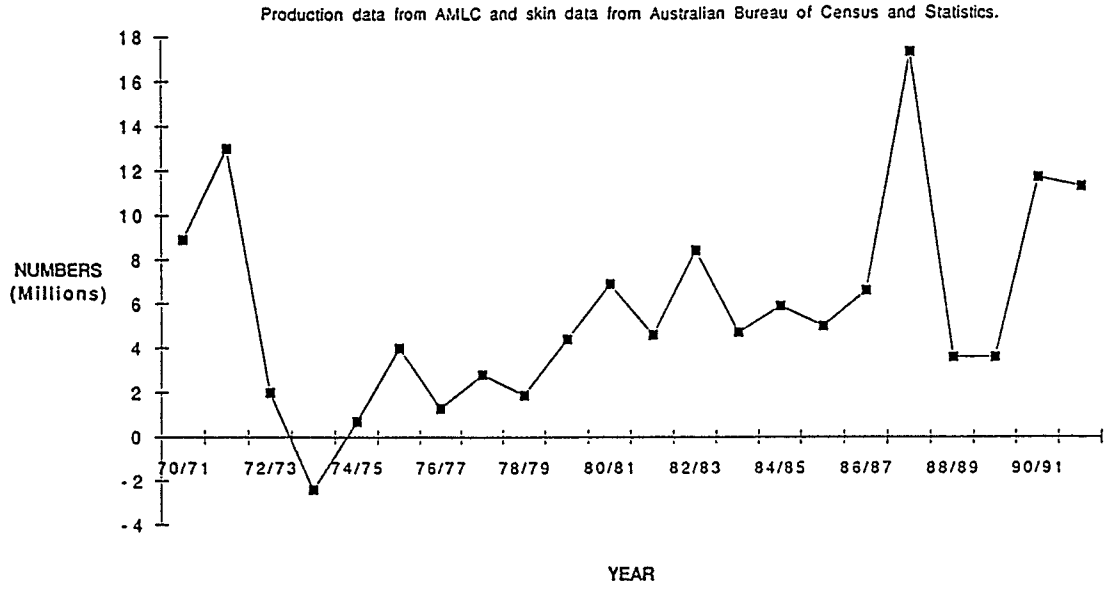
4.1.8.7. Figure 21 shows the differences between annual slaughterings of sheep and lambs and exports of their skins as percentages of animals slaughtered.

FIGURE 21: Differences between annual slaughterings of sheep and lambs in Australia and sheep and lamb skin exports as percentages of annual slaughterings



4.1.8.8. Figure 22 shows the differences between combined annual totals of sheep and lambs slaughtered and combined sheepskin and lambskin exports from 1970/71 to 1991/92.

FIGURE 22: Differences between combined annual totals of sheep and lambs slaughtered in Australia and combined exports of sheep and lamb skins from 1970/71-1991/92



4.1.8.9. It can be roughly presumed that the more or less steady minimum base levels of domestic disappearance of lamb and sheep skins were accounted for by woolskin tanning and

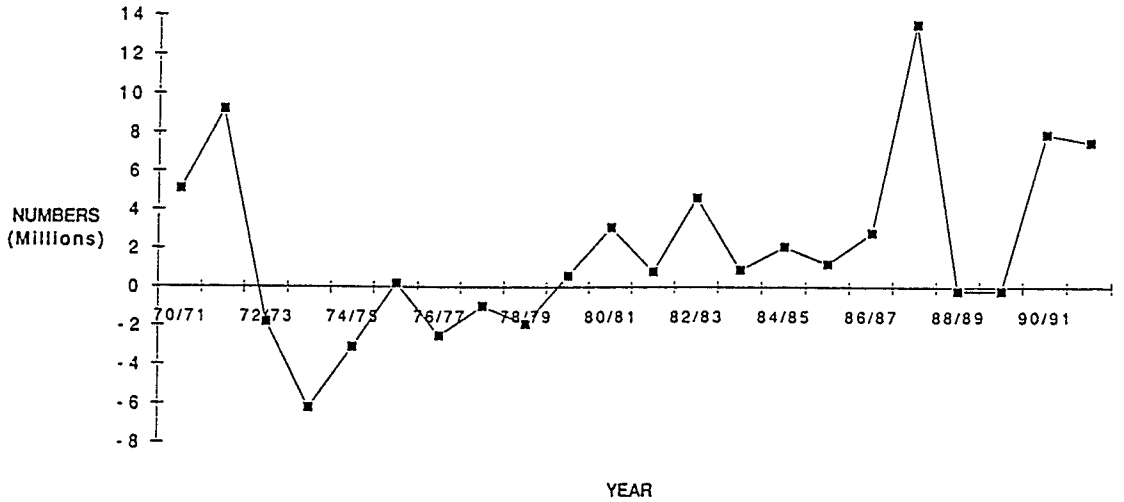
fellmongering. The variations outside of those levels have been NCV skins. From Figure 20, typical annual domestic base consumption for fellmongering or tanning of approximately 1.8 million and 2 million for lambs and sheep respectively, a total of 3.8 million, seem realistic estimates, given that the impact of new fellmongering operations will not have become manifest before 1991. A figure of this order is supported by examination of Figure 22 showing the differences between the combined annual totals of sheep and lambs slaughtered in and combined exports of sheep and lamb skins between 1970/71 and 1991/92

4.1.8.10. Figure 23 indicates NCV skin production by year by showing the total of the differences between combined sheep and lamb kills and sheep and lamb skins exported minus the allowance of 3.8 million for domestic processing in every year. It can reasonably be assumed that few unshorn lambskins would be NCV on account of demand for them for tanning into dressing skins and for nappa leather.

4.1.8.11. On those assumptions of annual 3.8 million domestic consumption of skins per annum, Figure 22 indicates that NCV skin production was approximately a net 3 million in the 1970/71 to 75/76 period taking into account the carryover evident in the negative difference figures from 1972/73 to 74/75. The NCV surpluses on the same assumptions were 3 million in 1980/81, 5 million in 1982/83, and 14 million in 1987/88 with smaller numbers in 1984/85 and 1986/87. The assumptions would not be valid from 1990/91 on account of the fellmongering operations which commenced about then at Wongan Hills, Laverton, Dubbo and Wagga Wagga. There have been claims that 5 million skins were dumped in 1992, but that is likely to be an underestimate because it would not have taken full account of the widespread practice of hand shearing dressed skins which would then have been NCV as freshly shorn pelts. Australian fellmongers estimate that 6 million skins have been NCV and dumped annually over very recent years.

FIGURE 23: Differences, less 3.8 million, of combined annual totals of sheep and lambs slaughtered in Australia and numbers of skins exported, to indicate NCV levels between 1970/71 and 1991/92

Derived from AMLC and Australian Bureau of Census and Statistics data.



4.1.9. Merino component

4.1.9.1. When wool prices are very low, pelts from Merino sheep more than 6 to 8 weeks off-shears drift into the NCV category because although they may have as much as 1.5 kg or more greasy wool, its value is still too low to be attractive to fellmongers. If the wool from those skins was removed the pelts would be suitable for normal tanning, or alternatively the skins would be suitable for tanning into short-woolled wool skins. However, woolskin tanners are reluctant to process Merino skins because of perceived problems with fleshing them on account of their ribbiness, a propensity to felt and their high grease content.

4.1.9.2. The proportions of Merino sheep in the kills will reflect the sheep populations, but when high kills are precipitated by low wool prices the Merino proportion would naturally be higher. They are highest in Western Australia and Queensland and lowest in Victoria. Taking into account the AMLC's June 1993 Lamb Survey, in which Merino ewes comprised 87%, 81% and 91% of matings in the 'low Merino' states of New South Wales, Victoria and South Australia respectively, the Merino proportions of adult sheep kills should be at least that high.

4.2. Head and face pieces.

Indicatively, 1.156 million m^2 of sheep and 0.952 million m^2 of lamb headpieces are produced annually from the approximately 16 million sheep and 16 million lambs slaughtered. Additionally, perhaps 0.74 million m^2 or face pieces may be available.
Face and some headpieces become available at slaughter, or headpieces can be recovered downstream from the abattoir. Headpieces have wool in proportion to that of the overall skin. The amount of wool on headpieces will increase as more sheep are slaughtered in-the-wool. There are 3 known processes for the recovery of wool from headpieces. Headpiece production will be permanent.

4.2.1. Headpieces and increasingly, face pieces are both be removed from sheep during dressing. Headpieces comprise the 'topknot' and ears and face pieces the remainder of the skin on the head. In export abattoirs all heads are skinned and face pieces are generally separated from the skins on the slaughter floor. Procedures for removal of face pieces and headpieces vary, but it is now common for skins to be delivered from abattoirs without headpieces as well. The author is unaware of instances where face pieces are left on skins, in some instances they are removed on the slaughterfloor with headpieces.

4.2.2. Where skins are to be fellmongered, headpieces are likely to be removed to facilitate fleshing. They are generally removed before salting too. Because they tend to curl round and become breeding places for maggots and they can be difficult to dry to low moisture levels, they are frequently removed before drying too.

4.2.3. Headpieces, according to Mr Ray Vinton of Castricum Brothers (Phone 03 794 0200) may comprise 8.5% of the total surface area of a skin. Apart from wool, they contain hair. Face pieces are likely to comprise about half the area of headpieces and contain more hair.

4.2.4. In the past, headpieces have been fellmongered by pieing in which all but hair and wool are rotted away. This practice has disappeared from Australia on account of environmental problems associated with it and the poor returns on the wool produced from it.

4.2.5. One company in Victoria is said to have recovered such wool by acid hydrolysis, which like pieing, leaves nothing behind but wool and effluent.

4.2.6. There have been sporadic attempts in Australia to recover wool from skin pieces by means of the Slipemaster machine, but the results have been variable and most do not appear to have persisted. One Slipemaster operation which is reported to have persisted for many years, was at the Angliss plant at Riverstone in New South Wales. The CSIRO Leather Research Centre at Clayton in Victoria, in Meat Research Corporation project (CS.090), has developed an machine to recover the wool from fresh skin pieces to the prototype stage. Both of these techniques leave the skin material behind.

4.2.7. This NCV material is produced in association with every sheep and lamb slaughtered.

4.2.8. Head pieces are potential feedstock for stock feeds, fertilisers, collagen products and gelatine production.

4.2.9. On the assumption that the average lamb in Australia has a skin area of 0.7 m^2, and the average sheep 0.85 m^2, The area of headpieces annually produced from 16 million sheep and 16 million lambs is indicatively:

Sheep:	$0.085 \times 0.85 \times 16 \times 10^6$	=	1.156 million m^2
Lambs:	$0.085 \times 0.7 \times 16 \times 10^6$	=	0.952 million m^2.

4.2.10. On the assumption that face pieces comprise about half the area of headpieces and that they might be recoverable from 70% of the sheep and lambs slaughtered, the area of faces pieces available annually is approximately 0.74 million m^2.

4.3. Brisket pieces.

Something less than 1.5 million m^2 from 32 million brisket pieces (strips) are produced annually. However, their production is likely to disappear as abattoirs become aware of the loss of pelt value arising from removal of brisket strips from the narrowest part of a sheep's skin.

4.3.1. It has been common for abattoirs in Australia to simplify their dressing procedures by removing a strip of skin from the brisket of sheep and lambs. The practice has been justified on the grounds of increased ease of dressing and allowed on the grounds that the briskets of sheep have insignificant quantities of wool. However, the brisket is the narrowest part of the skin, so the practice significantly reduces the useable area of the skin when used for nappa, suede or chamois production. As fellmongering increases in Australia and more pelts are used for nappa production the practice may be curtailed, or at least steps may be taken to minimise the area lost in this dressing procedure. Its effect is minimal when skins are tanned as wool skins because there is little wool on the brisket and the area is generally trimmed anyway.

4.3.2. The area of skin removed in brisket pieces varies widely, but may average out at 0.5 of a square foot, or about 6% of the total skin area. Over 32 million sheep and lambs slaughtered the total area annually would be around 16 million square feet or 1.5 million m^2.

4.3.3. This material is available at the slaughter floor.

4.3.4. It has the same potential uses as head pieces and the wool may contain less hair and be of higher value.

4.4. Skin trimmings from legs.

Leg trimmings, like headpieces, will be a permanent production from every one of the annual 32 million sheep killed annually. They have similar potential use to headpieces. They may amount in area to 0.5 million m^2 and 0.61 million m^2 annually of lamb and sheep leg trimmings.

4.4.1. These trimmings comprise skin which if tanned would produce little useable leather. The wool included has a high kemp content and the appendages they form are an inconvenience in fleshing and other tanning processes.

4.4.2. The most appropriate place to trim them should be at the skin chute, but they are frequently not removed until immediately before or after drying or salting or fellmongering.

4.4.3. They have identical potential uses to head and brisket skin pieces except for differences which might arise from the absence of ears and lips on leg pieces.

4.4.4. Observations made by Allan Hopkins and Ian Campbell of the Department of Agriculture and Rural Affairs of Victoria (personal communication 1993) indicate they comprise around 4.5% of the total skin area. If the average sheep and lambskin respectively are assumed to be 0.7 m^2 and 0.85 m^2, the area of sheep and lamb leg pieces can be calculated to be indicatively:

Sheep:	$0.045 \times 0.85 \times 16 \times 10^6$	=	0.612 million m^2
Lambs:	$0.045 \times 0.7 \times 16 \times 10^6$	=	0.504 million m^2.

4.5. NCV fellmongered pelts and skin pieces

Fellmongered NCV pelts comprise those affected by grass seeds and those severely damaged in processing. The percentages in both categories can be expected to decline, but seem likely to remain at 20% to 25% of fellmongered pelt production. Those pelts suffering only grain damage would generally be suitable for chamois or suede production, indicatively leaving 0.2 -0.3 m^2 of NCV sheepskin and 0.17 - 0.26m^2 of NCV lambskin per annum distributed over 7 fellmongeries with a combined annual capacity of approximately 5 million skins. The most severely damaged pelts can be detected at the wool puller, but others may only be progressively detectable in downstream processing.

4.5.1. This material comprises skins which have been cut during dressing, torn in fleshing or wool-pulling and pelts with severe grass seed damage. Damage during fleshing may arise from high levels of burr

4.5.2. Figures of 40% NCV pelts from fellmongering Merino type pelts in Central New South Wales have been quoted. That figure is very high in comparison with indications from Victoria of around 10% or less in this category. The 10 to 15% may be a more realistic ongoing figure. However seed can be an enormous problem in Northern Victoria and New South Wales in particular, in some seasons.

4.5.4. Grass seeds

4.5.4.1. Grass seeds can be a severe problem at times in any state. When the seeds are still lodged in the skin their presence and the resultant loss of value are obvious. The following refers to skins from which the seeds themselves have mainly disappeared.

4.5.4.2. The extent to which seed affected skins can be used in embossed sheepskins to alleviate the effect, has yet to be demonstrated. There are further possibilities to make these skins more acceptable for tanning by innovative design and marketing.

4.5.4.4. Claims have been made, usually by people without farming experience, that growers could do a great deal to reduce seed damage to skins. However, the scope for doing so is limited by the nature and suddenness of grass seed production itself. Significant changes are unlikely, unless growers perceive dramatic increases in skin returns from whatever control measures may be feasible.

4.5.4.5. Severe, recent grass seed damage may be detectable in the raw skin and most heavily grass seed damaged skins can readily be detected and recovered at the wool puller immediately fellmongering has taken place. However, Dr Roger Hegarty of the NSW Department of Agriculture's Elizabeth Macarthur Agricultural Institute (Phone 046 293 445) working on Meat Research Corporation Project DAN.049 found that light grass seed damage could not be seen until the finished leather stage. Such damage is likely to be readily covered by embossing techniques. It leads to uneven dye uptake in suede production.

4.5.4.6. On many occasions grass seeds can be readily seen embedded in raw and in dried or salted skins.

4.5.4.7. The numbers of pelts rendered NCV on account of grass seeds are too variable according to seasons and regions, for either reliable estimation or reliable feedstock into downstream processing.

4.5.5. Grain strain

4.5.5.1. From a nappa point of view, skins with excessive grain strain, may also be classed as unsuitable for further processing, but be fine for suede or chamois production. Work in Australia by David Macfarlane of CSIRO Meat Research Laboratory in the Meat Research Corporation Project CS.138 showed severe grain damage on more than 60% of pelts examined. This is supported by an anecdotal report from industry that it is about 75%. It is realistic to expect that when abattoirs become aware of the cost of this damage as domestic fellmongering develops, it will fall promptly to around 25%, then gradually to a lower figure.

4.5.6. Reject rates

4.5.6.1. An ultimate likely "reject" percentage for a well-run fellmongery working in conjunction with abattoirs operating to effective total quality management principles, in Australia, producing pelts for nappa leather production, is 20 to 25%. It would mainly comprise skins knife damaged on the slaughter floor or cut and broken by machinery in the fellmongery. However some, perhaps 50% of those would be rejected on account of grain damage and still be suitable for production of chamois or suede. So, only a proportion of them, perhaps half, are likely to prove NCV in the longer run.

4.5.6.2. It seems reasonable to assume that the 20 to 25% of reject skins might comprise around half that would be suitable for chamois production. Then 10% to 15% of the present annual fellmongering capacity of 5 million sheep lambs would be NCV and amount to approximately

2.5 x 0.10 (or x 0.15) x 0.85	=	0.2 to 0.3 million m^2 of sheep skins
2.5 x 0.10 (or x 0.15) x 0.7	=	0.17 to 0.26 million m^2 of lamb skins

4.5.6.3. The severest grain damage may be detectable after wool pulling, more becomes apparent after pickling, still more at the wet blue stage and some may become apparent after that. It may be said that the more severe and coarse the grain strain, the earlier it can be detected. Severe grain damage excludes a pelt from nappa but not necessarily from suede or chamois production.

4.5.7. Fellmongering damage

4.5.7.1. A further cause of damage in fellmongering is poor temperature control. Affected skins can be predicted to be NCV from temperature records if they are kept, but if not the effects may not be detected until after the wet blue stage. This damage should only be accidental and occasional. Affected skins could still be suitable for suede or chamois production, but would be more realistically used for collagen or gelatine production.

4.5.7.2. Damage from fellmongering machinery and misuse of chemicals are further sources of damage in fellmongering.

4.5.7.3. Cut, torn or seed damaged pelts, detectable at the wool puller are the overwhelming source of this class of NCV skin material.

4.5.7.4. To a degree, seedy pelts are seasonal. However, grass seeds can remain through the skin and penetrating into underlying tissue for long periods and while they do, the seed holes cannot heal. Hence it is not uncommon for them to carry through from one season to the next and maybe longer.

4.5.8. Australian fellmongers

4.5.8.1. The fellmongers known to be operating at present in Australia are:

\# Winrose Skins (Export) Pty Ltd

Present capacity: 400 pelts per day.

Present method: Acetate.

Phone/fax: 07 890 1722/07 390 8281.

\# Fletcher Sheepskins Australia at Dubbo, New South Wales.

Estimated likely capacity: 6,000 pelts per day.
Present method: Acetate
Phone/fax: 068 84 5833/068 84 2965.

Narcorp Pty Ltd at Forbes, New South Wales.
Present capacity: Small
Present method: Sweating
Phone/fax: 068 52 2766/068 52 1633.

Riverina Sheepskins Pty Ltd at Wagga Wagga, New South Wales.
Estimated likely capacity: 3,000 pelts per day.
Present method: Sulphide
Phone/fax: 069 21 8522/069 21 8615.

Castricum Brothers (FTG) Pty Ltd, Dandenong, Victoria.
Present capacity: 2,000 pelts per day.
Present method: Sulphide.
Phone/fax: 03 794 0200/03 794 0281.

PMK (Australia) Pty Ltd, Laverton, Victoria.
Present capacity: 5,000 pelts per day.
Present method: Sulphide.
Phone/fax: 03 360 0088/03 360 0185.

WA Pelt Processors, Wongan Hills, Western Australia.
Present capacity: 1,600 pelts per day.
Present method: Acetate.
Phone/fax: 096 711 020/096 711 214.

4.5.8.2. *The capacities quoted have been given to D W Roberts by the fellmongers for the purpose of this study. Individual companies should be referred to directly for accurate figures for use in planning. The plants in Brisbane, Dubbo, Forbes and Wongan Hills could be expected to be predominantly processing Merino skins and the others predominantly crossbred skins.*

4.5.8.3. Those predominantly processing Merino skins are the ones predominantly using the acetate method.

4.5.8.4. Dr John Snowden is currently working with success to develop other depilatories in a Meat Research Corporation Project DAW.052. All of those he has identified would require alkaline conditions.

4.5.8.5. Australian fellmongering is in a state of flux and D W Roberts is aware of a further 5 fellmongeries at present either in advanced planning or feasibility study stages. All of them could be operating for the 1994 season.

5. NCV SKIN CHARACTERISTICS

It seems that the collagen content of a sheepskin is approximately 35% of its water content and that the water content of a skin is approximately 30% of its green, wool-free weight. This equates to approximately 486 grams of collagen per m^2 of skin. It is indicatively estimated that 51.4 to 51.7 m^2 of NCV skin material produced annually in Australia contains 25,290 to 25,400 tonnes of collagen. The yield of gelatine from a skin is expected to be 90% of its collagen content. Skin thickness is related to time since shearing, plane of nutrition and breed. Skin weight (without wool) is 7% of liveweight off-shears and 5% at 6 to 8 weeks off-shears. On a 70% moisture content basis fat content on Merino skins has ranged from the equivalent of 5.2% to 9.69%

5.1. Collagen content

5.1.1. Dr John Snowden of the Western Australian Department of Agriculture has a long experience of innovation with sheepskins and sheepskin products, especially Merino sheepskins. He considers typical fresh weights of bare Western Australian sheep pelts (mainly Merino) to be approximately 2kg, or more conservatively, in the range 1.2 to 1.5 kg and their dry weight to be approximately 30% of their green fleshed weight. He further believes their collagen content to be approximately 35% of their water content. Further, the yield of gelatin when a fleshed skin is processed for that application should be around 90% of the collagen.

5.1.2. On this basis a fresh bare Merino skin of 1.5 kg at 70% water content should contain approximately

$$1.5 \times 0.7 \times 0.35 = 367\text{g of collagen}$$

5.1.3. This is equivalent to approximately 24% of fresh, wool-free weight or approximately 30% of air-dry weight of fleshed pelts.

5.1.4. The 367g of collagen in a skin should be capable of yielding 330g of gelatin or approximately 365g of commercial gelatin of 10% water content. If one assumes the surface area of the 1.5kg pelt to be 8 square feet, the collagen content is thus approximately 45 grams per square foot (486 grams per m^2). Dr Snowden is of the opinion that collagen content is likely to be constant per unit of surface area in a defatted pelt.

5.1.5. On the other hand Dr Lyndon Kurth of the CSIRO Meat Research Laboratory (Phone 07 399 3122), quotes the CSIRO Leather Group as reporting a collagen content in skins they examined, of 150 to 200g of collagen. If these figures were applied to Dr Snowden's skins of 390g dry weight, including fat content, the figure seems low.

5.1.6. Dr Roger Hegarty has reported the skins of the mainly crossbreed sheep he has worked with, to have a bare weights of around 2kg. Dr Hegarty's data indicate that tensile strength (ie force per unit of cross sectional area) tends to remain constant with varying thickness of skins. Assuming that skin strength is a function of collagen content, this would indicate that collagen content is better estimated as function of weight than of surface area. This would concur with Dr Snowden's preference to relate the amount of collagen to the water content of skins.

5.1.7. While it is clear that data on the collagen content, and indeed most characteristics of sheepskins, is imprecise and calculations about them should be regarded as correspondingly crude and imprecise, Table 14 below uses the 45 grams per square foot (486 grams per m^2) figure to calculate the collagen content in the indicative areas of NCV skin material already quoted.

TABLE 14: Indicative areas of NCV skin materials available annually and the quantities of collagen contained in them based on calculating that there are 486 grams of collagen per m^2 of sheepskin material.

NCV material	Indicative area per annum (million m^2)	collagen content per annum (,000 tonnes)
6 million off-shears NCV sheepskins (less leg trimmings) based on 0.85m^2 per skin less 4.5% for leg trimmings and 8.5% for headpieces, giving 0.77m^2 per skin.	46.2	22.45
Headpieces:		
16 million sheep	1.156	0.56
16 million lambs	0.952	0.46
Face pieces 32 million	0.74	0.36
Brisket pieces	<0.952	<0.46
Leg trimmings		
16 million sheep	0.612	0.59
16 million lambs	0.504	0.24
Fellmongery damage		
2.5 million sheep	0.2 to 0.3	0.09 to 0.15
2.5 million lambs	0.17 to 0.26	0.08 to 0.13
TOTAL	51.486 to 51.676	25.29 to 25.4

5.2. Skin thickness

5.2.1. Dr Hegarty has found that skin thickness is related over a restricted range, to time from shearing, plane of nutrition and breed. In his observations crossbred skins have been thicker than the smaller number of Merinos he examined. He points out that estimation of skin thickness of Merinos is problematical on account of the presence of ribs. He considers, while pointing out that it is based on limited data, bare, wet, skin weight comprises approximately 5% of body weight in animals 6 weeks or more off-shears and around 7% of body weight at 5 days off-shears. Skins thicken almost immediately after shearing and progressively return to their original thickness by around 12 weeks.

5.3. Relation to liveweight

5.3.1. Using Dr Hegarty's approximations, one may then calculate that liveweight (without wool) is approximately double the carcass weight and then skin weight will be 7% of that if the animals are early off-shears and 5% if wool is longer than 15 to 20 mm or the animals are more than 6 to 8 weeks off-shears. For example the 21kg average Australian carcass weight sheep for 1992 (AMLC) would have a liveweight of 42kg and a skin weight of 2.94kg immediately off-shears and 2.1kg after 6 to 8 weeks.

5.4. Off-shears effects

5.4.1. Applying Dr Snowden's rough approximation of collagen content to be 35% of water content and using his 70% water content, the collagen content of the 6 to 8 weeks off-shears, 2.1 kg skin, of the average Australian sheep, would be 514g. It would be unrealistic to apply Snowden's approximations to fresh off-shears skins since he has not examined them or the effect of the rapid changes they undergo immediately after shearing, on collagen content.

5.5. Animal age effects

5.5.1. While Dr Snowden does not have direct experience with crossbreed sheepskins, he believes that they could have higher collagen contents per unit of surface area than Merino skins on account of their higher collagen fibre densities and greater thickness.

5.5.2. Lamb skins would be likely to have higher water and lower collagen contents than mature sheep, according to Dr Snowden.

5.6. Fat content

5.6.1. Fat may be regarded as a nuisance if processing an NCV skin for suede, chamois or collagen because it has an affinity for collagen and in any event is a constituent which needs to be removed. It is a useful component when using skin for a feed or fertiliser on account of its energy value in feed and surfactant effects in fertiliser. In any event fat is a significant component of Australian sheepskins. Mr

John Beilby of the Western Australian Department of Agriculture working on Meat Research Corporation Project DAW.050 has found the mean fat content of unfleshed skins from two different lines of Merino sheep to be 32.3% and 17.38% on a dry weight basis, with the standard deviations 4.75 and 5.77 respectively. This is equivalent to 9.69% and 5.2% fat content on a green skin weight of 70% moisture content. In the same work Mr Beilby has developed effective procedures for the defatting of skin material to levels of 5% to 10% on dry weight.

5.6.2. Clean wool is generally around 70% of greasy wool and woolgrease or lanolin comprises the majority of the 30%. Other components of the 30% are dirt from soil, seeds and burr, moisture, salts, excretions and organic matter from the animal. Lanolin is a wax and is a complex mixture of aliphatic alcohols, steroid alcohols and triterpenoid alcohols as esters with saturated nonhydroxylated acids, unsaturated nonhydroxylated acids and hydroxylated acids. When present in normal tallow it devalues it.

5.7. Wool and hair

5.7.1. Wool and hair can be assets if producing for feed or fertiliser, especially if they are hydrolysed. Hydrolysed wool and hair should be comparable in composition with feather meal except for the fats, waxes and components of suint they contain. They are nuisances in the production of suede, chamois, collagen or gelatin. The length and quantity of wool present depend upon the period from shearing and the nutritional status of the animal immediately before and during the period, although wool grows more slowly on the legs and face than on the trunk of sheep. Hair presumably reaches a maximum length and then falls out.

6. PREPARATION, PRESERVATION AND PACKAGING OF NCV SKIN MATERIAL

The methods available to preserve NCV sheepskins comprise 7 principal approaches: drying, salting, organic acids, other chemical preservatives, pickling, chilling and freezing. All have their particular applications and important criteria for selection of a method include the period of preservation required and the capacity of the downstream processor to cope with chemicals. The costs of the methods ranges from around $4 per skin for drying and packing to $0.0762 per chilling under full capacity conditions.

6.1. Drying

Drying is a simple and uses few chemicals. However it requires labour, a drying facility and considerable time. Its indicative full costs are $3 to $3.50 per skin and up to $4 per skin. It would be a difficult technique to apply to skin pieces.

6.1.1. Drying is an old simple technique. It requires the use of insecticides to control weevils and flies but is otherwise chemical free. It seems to be falling into disuse in most production countries and for most markets.

6.1.2. It is slow because the rate at which the water mass in the skin can diffuse to the surface to evaporate is limiting when evaporation rates are high. On the other hand, in some parts of Australia it can take up to 8 weeks or longer at some times of the year because evaporation rates are limiting. However with the use of artificial driers for the completion of drying the drying period can be reduced to about 4 weeks in such cases.

6.1.3. Drying demands high labour inputs because skins have to be hung and then pulled down, and where necessary hung again in the artificial driers.

6.1.4. Stowage of dried skins can be labour intensive as well, on account of their nature. If the skins are to be used for chamois or suede, cracking from over drying, too severe pressing or incorrect stacking needs to be avoided. Stowage rates of dried skins depend partly on the amount of wool they contain but are of the order of 9 tonnes per container or 3.5 m^3 per tonne, according to Mr Ray Vinton of Castricum Bros Pty Ltd, when correctly pressed.

6.1.5. Mr Vinton reports claims of full skin drying costs greater than $4 each. True costs are extremely difficult to gauge, but are probably in the range $3 to $3.50 in most cases, with some country based operations operating at lower figures.

6.1.6. The costs for drying skin pieces would be substantially higher - if it was practicable to dry them.

6.2. Salting

Preservation by salting is simple, quick and requires a modest capital investment. The indicative costs for salting alone are $0.56 per skin. Salting adds approximately one third extra weight of salt to skin material and salted skins generally stow at 1.5m^3 per tonne.

6.2.1. Preservation of normal skins by both hand and drum salting is common now throughout Australia. Preservatives are necessary in the salt to preserve against bacteria and moulds. They include naphthalene, borate and fluoride.

6.2.2. Hand salting is preferred by many woolskin tanners because they find it produces a better raw material for their purposes. Although machines are available for flat salting it is still rated as more expensive than drum salting.

6.2.3. Drum salting can be either done in specially constructed drums costing around $22,000 each new and with a capacity of about 200 short woolled skins. Alternatively, used concrete mixers are frequently purchased for around $5,000, then reconditioned and coated for the purpose.

6.2.4. Normal skins to be salted require, according to Mr Vinton around one third of their weight of salt costing typically $0.40 per skin in Melbourne.

6.2.5. The period required in the drum is approximately 1.5 hours. Hence a single worker with a single drum, could process up to 800 pelts and maybe more, off-shears pelts per day, in a single shift. The period between loading and unloading of the drums, should be sufficient for packaging and stowing. On gross costs of $130 per day for the worker and $0.40 per skin for salt, the direct operating costs, aside from sorting, stacking, services and packaging materials, is up to $0.56 per skin. Overall costs for salted skins intended for tanning are generally quoted as being up to $2.50 per skin, including sorting etc.

6.2.6. The costs for salting of skin pieces should be pro rata those of whole skins, on the basis that according to Ray Vinton, the area and presumably therefore the weight, of headpieces comprise approximately 8.5% of trimmed skins. Messrs Alan Hopkins (Phone 060 556 202) and Ian Campbell (Phone 052 335 512) of the Department of Agriculture and Rural Affairs of Victoria have found skin trimmings to be approximately 4% to 4.5% of trimmed skin area, although they would have a substantially lesser proportion of the total wool on a skin.

6.2.7. Less care needs to be taken in the baling of salted skins and particularly skin pieces than is the case with dried skins. Salted skins are normally 'moulded' free standing and strapped onto a pallet. Salted skin pieces would need to be baled or otherwise contained.

6.2.8. Salting of skins increases their weight by the amount of salt added, notionally by one third according to Mr Vinton. Stowage rates of 20 pallets equivalent to 20 tonnes per container or approximately 1.5 m^3 per tonne apply. Salted skin pieces should stow similarly.

6.2.9. Salted skins are normally packed as free standing pallet loads after being moulded during stacking. Salted skin pieces are likely to require greater containment than that.

6.3. Organic acids

Organic acids have considerable potential to be manipulated for preservation effects in their properties as preservatives in their own rights, on account of their pH effects and their potential to synergise with some other preservatives. Acetic acid has a potential side effect of wool loosening which could be countered by the use of sulphur dioxide. Acetic acid (Glacial), the cheapest of the organic acids can cost less than $2 per kilogram.

6.3.1. A number of readily available organic acids such as acetic, propionic and sorbic have anti microbial properties in addition to their pH effects and they can be used in preservation procedures, if necessary in conjunction with other substances having preservative effects, such as salt, sulphur dioxide, phenols or zinc.

6.3.2. The possible combinations are numerous and a variety of application methods could be developed to economically target different shelf life periods. In the case of whole skins, it is likely to be feasible to spray liquids onto the flesh side with or without pre-fleshing and stow. Skin pieces could either be soaked in a solution, wetted in a trommel or sprayed on a belt before being drained through squeeze rollers or by spin drying. These solutions will be corrosive and the sulphur dioxide produced from metabisulphites is evolved from acid solutions and diffuses freely through plastics.

6.3.3. Sulphur dioxide from metabisulphites is an effective preservative against microbial growth under acid conditions and an enzyme inactivator as well. This is important in sheepskins in which there is high early enzymic activity that raises skin temperatures, which in turn facilitates the growth of spoilage bacteria.

6.3.4. A useful side effect of organic acids, if buffered correctly and used without enzyme inhibitors or inactivators, could be to facilitate the loosening of wool by the same pH lowering mechanism used to activate proteolytic enzymes in normal acetate fellmongering of sheepskins. Thus, skins or skin pieces destined for production of suede or chamois leather, collagen or gelatin, could have their wool loosened and then recovered at the time of processing, while the pieces were preserved for the required shelf life.

6.3.5. The adoption of procedures of this nature should be done after consultation and probably development work in conjunction with a scientist familiar with the material, because numerous combinations of chemicals, shelf lives and side-effects are feasible. Dr John Snowden and Mr John

Beilby of the Western Australian Department of Agriculture have worked on short term sheepskin preservation on Meat Research Corporation Project DAW.039. The CSIRO Leather Research Group at Clayton in Victoria has a long experience in short and long term preservation of sheepskins and hides.

6.3.6. It is not realistic to estimate accurate costs of these types of treatments until a procedure is selected. Sorbate is probably the most expensive substance at approximately $12 per kg for the food grade of the potassium salt in 50 kg quantities. However it is likely to be used at less than 500 part per million. Acetic acid can cost less than $2 per kilogram in large volumes. Other chemicals would generally be in between those in cost but closer to acetic acid.

6.3.7. Alkalis present other preservation possibilities if there is no interest in recovery of wool. In particular this approach could prove compatible with gelatin extraction. Hydroxides have the disadvantage of being inactivated by carbon dioxide which is likely to be absorbed over time. This would be a particular problem if lime was neutralised to insoluble calcium carbonate.

6.3.8. Stowage rates for skin material treated with organic acids should be similar to those of salted skin material, although considerably less than one third their weight of solution should be necessary. Allowance would need to be made in storage for the potential corrosive effects of the acids.

6.4. Other chemical preservatives

Various other chemical preservatives are available, each with its own characteristics of conditions for effectiveness, toxicity and side effects.

6.4.1. There are various preservatives available which could have application to different preservation techniques according to the requirements specified by the intended user and provided that they can be satisfactorily handled in the effluent. It is noteworthy however that the activity of many preservative substances is deactivated by large amounts of organic matter. In general these include common sanitising substances. One would generally use techniques such as salt or pH manipulation to strengthen the effect of preservatives.

6.4.2. Toxicity issues limit the application of some preservative substances. Perhaps the most outstanding of them is formaldehyde, now regarded as a carcinogenic substance.

6.4.3. The simplicity, safety and relatively low cost, of tried and proven basic preservation techniques such as pickling with salt and simple acids like formic, hydrochloric or sulphuric acids and with anti-mould support makes them. Nonetheless the potential for adverse effects upon pelts and collagen of extremely low pHs should be noted when pickling is being considered.

6.5. Wool removal as a prior step

Where wool on NCV skin material needed to be de-woolled downstream in its processing, it is logical to consider the use of dewoolling procedures which would knit into subsequent preservation systems, especially pickling. The two simplest of the procedures would be burning off with alkali and sulphide at around $1.30 to $1.40, and acetate wool loosening which could be significantly cheaper, depending upon the context in which it was used.

6.5.1. "Burning off" of wool from sheepskins with alkaline sulphide procedures, has been done frequently, particularly where pelts have been directed towards chamois tanning. Costs for the procedure through to pickled pelts, suggested by Mr Neil Panton of WA Pelt Processors of Wongan Hills, Western Australia (Phone 096 711 020 and Fax 096 711 214) in September 1993 were $1.00 per skin for crossbred and $1.30 to $1.40 for Merino skins. Mr Ray Vinton of Castricum Brothers offered identical estimates. These costs would not include transport.

6.5.2. A variation to "burning off" would be to apply acetate buffer which in time would cause wool loosening and at the same time preservation, for probably 1 week or more under adjusted conditions. Subsequently, the wool would need to be removed physically or 'burned off' in an alkaline process.

6.6. Chilling

Chilling has the advantages of not generating effluent, not using chemical preservatives, of being nearly instantaneous, of not interfering with subsequent processing and of being cheap, costing as little as 7.62 cents per skin. The limits of shelf life with the technique have not yet been determined, but are indicatively 7 days.

6.6.1. Dry ice has been used to chill and even to freeze sheepskins in New Zealand for some time. All reports on its efficacy seem to have been positive, apart from the reported usage rate of approximately 1.0 kg of dry ice per skin likely to be used and reported to be from around $0.25 per skin. That could obviously increase significantly in remoter locations and particular calculations should only be made after reference to potential suppliers of dry ice and the plant and machinery required. A dry ice system on a belt conveyor is an industrially convenient and labour efficient approach.

6.6.2. Working on Meat Research Corporation Project DAW.039, Dr John Snowden and Mr Simon Skevington to the WA Department of Agriculture have developed a plate chilling system for which a patent application has been made. This system was designed for chilling skins, but can be used for freezing. A single plate, 5 kilowatt unit chilling 3 skins per minute, would consume around $0.01 worth of electricity per minute @ $0.129 per kilowatt hour to chill the 3 skins or 0.33 cents per skin. If trimming was done in the seconds the skin was on the plate instead of on a table there would be no additional labour costs. However, if extra (1 person) labour was used, the cost would be around $130 per 8 hour day or 9 cents per skin for one labourer. The capital cost of the unit would be around $15,000 and with $1,000 of maintenance per annum should have a useable life of around 20 years - an operating overhead of $35 per week or 0.486 cents per skin on a throughput of 1440 skins per day over 50 weeks of 5 days. The total of these costs amounts to $0.09816 per skin.

6.6.3. Chilling has not yet been adapted to skin pieces.

6.6.4. Experience in the handling of chilled skins is still limited. At present the researchers have confidence about 7 days of storage under chilled conditions. However, chilled cattle hides are reported to store for 21 days so the 7 day period may be extended with the benefit of experience, particularly where wool loosening is not a disadvantage.

6.6.5. Preservation by chilling has the attraction that it has no impact on the environment and does not generate effluent either in the course of the preservation, or in undoing it for further processing.

Furthermore, chilling is not known to adversely affect the suitability of the skin for any form of subsequent processing, including acetate fellmongering. It does not require the use of expensive and polluting procedures like 'wetting back' or washing out salt.

6.6.6. The maximum shelf life of chilled skins has not yet been determined.

6.7. Freezing

Freezing is an extension of chilling, but has not been developed industrially, nor has its impact on the subsequent properties of thawed skins been evaluated. There are at least three ways in which freezing could be approached. The costs of freezing using a plate are likely to be as low as 9.472 cents per skin for full freezing. It could require around 4 kg of dry ice. Frozen storage costs for frozen skins are likely to be $4.20 to $4.30 per pallet per week.

6.7.1. The process of freezing is an extension of chilling.

6.7.2. There are three evident possibilities. The first is to increase the application of dry ice where that method of chilling is used, so as to freeze, instead of only chilling the skins.

6.7.3. The use of dry ice to freeze could be costly given the 70% water content in say 1.5 kg of bare green skin amounting to 1.05 kg and above. Indicatively it would be likely to require around 4 times the dry ice, or refrigeration, needed to merely chill the skins.

6.7.4. If the plate chiller was used, the skins could be left on it for a longer time to freeze. This would be likely to quadruple the time required on the chiller plate and increase the electricity and capital costs by a factor of about 4, but not necessarily increase the labour costs at all, assuming that the operator would either feed skins on and off 4 chillers instead of only 1 or otherwise engage in productive activity. The operating overhead cost would increase to approximately 1.472 cents per skin on 475 per day, and the electricity cost to 1 cent per skin, yielding a total cost, including labour, in the vicinity of 9.472 cents per skin.

6.7.5. A third procedure could be to chill and then add dry ice as the skins were stacked on pallets to be stored.

6.7.6. A fourth approach might be to store thoroughly chilled skins on pallets in a freezer or freezer store to be frozen slowly. The practicality of this system would depend on the unknown length of time required for the centre of the pallet of skins to freeze. If that occurred within one week the system could be practicable. A cold storage depot might demand higher charges to take in unfrozen product.

6.7.7. P&O Cold Storage, Mr Richard Cross, Perth (Phone 09 418 3300), quotes a rate of $4.20 to $4.30 per pallet of 6.64 m^3 per week for cold storage of frozen material.

6.7.8. The author is unaware of industrial experience with freezing of sheepskins and recommends that small scale pilot studies be undertaken before any detailed planning is done in connection with freezing. Apart from any effects which freezing might have in denaturing protein, account should be taken as well, of effects it could have on wool loosening from modified enzyme activity.

7. TRANSPORT

Scheduled inter-capital city freight rates are quoted. They show that back loading rates towards the largest capital cities, especially from Perth and Adelaide can be orders of magnitude less than freight rates out. They clearly indicate a freight pressure towards moving raw material towards, rather than away from major the major capitals. Regional scheduled freight rates into Sydney are quoted at 12.66 per tonne kilometre and regional freight rates in Western Australia ranging from 33.3 to 22.2 cents per kilometre. Regional freight rates in New South Wales of 50 cents per tonne kilometre have been quoted in another study.

7.1. Inter-capital city freight costs

7.1.1. Mr Keith Agar of Refrigerated Roadways (Phone 09 418 3300) has provided the following information on general cargo rates between capital cities for shipping 20 pallets with a gross weight of 21 tonnes:

Adelaide to Brisbane	$2450
Adelaide to Sydney	$1750
Adelaide to Melbourne	$750
Adelaide to Perth	$5000
Brisbane to Sydney	$1150
Brisbane to Melbourne	$1850
Brisbane to Adelaide	$2650
Brisbane to Perth	$7500
Melbourne to Brisbane	$2700
Melbourne to Sydney	$1600
Melbourne to Adelaide	$1350
Melbourne to Perth	$6200
Perth to Brisbane	$3400
Perth to Sydney	$2400
Perth to Melbourne	$2200
Perth to Adelaide	$1600

Sydney to Brisbane	$1650
Sydney to Melbourne	$950
Sydney to Adelaide	$2500
Sydney to Perth	$6500

7.1.1. Where part loads have to be delivered to outer metropolitan areas, a further charge may be made for consolidation amounting to $50 to $65 per pallet for distances up to 50 kilometres from a central depot.

7.2. Regional freight costs

7.2.1. Freight rates in Western Australia for regular transport of fresh skins of $0.20 per skin for 200 kilometres and $0.30 per skin for 400 kilometres equivalent to $0.40 per skin for 600 kilometres have been paid. Assuming green weights of 3 kg per skin, this is equivalent to $0.333, $0.25 and $0.222 per tonne per kilometre over 200, 400 and 600 kilometres respectively.

7.2.2. Haulage from depot at Coffs Harbour to depot Sydney by Lindsay's Transport, 553 kilometres, has been quoted at $70 per tonne or pallet, equivalent to $0.1266 cents per tonne per kilometre.

7.2.3. Regional transport rates in New South Wales, of $0.50 per tonne kilometre were quoted to Mr Peter Firth of Gibson Associates, in a study he undertook on sheepskin supply for gelatine production, for the Meat Research Corporation in August 1993.

7.2.4. It is evident that for mainland states, the variation between states is minor and differences are likely to be greater between carriers than between states. The lowest freight rates prevail where underutilised backloading space is used, as between Perth and other capitals; and where transport is a regular operation, or links into regular operations, such as through freight depots.

8. SECURING SUPPLIES OF NCV SKINS

The potential sources of NCV material are abattoirs, fellmongeries and skin packing sheds. Spoilage of skin material begins immediately after dressing and businesses using the material should act to process or preserve it as close to dressing as possible and preferably under their own control. The CALM Services skin selling systems being developed for sheepskins should be particularly useful for acquisition of NCV skins from abattoirs. Abattoirs are the collection points for off-shears NCV skins, face pieces and sometime headpieces. Fellmongeries are sources of dewoolled skin material in competition with chamois and suede end-uses, but busy fellmongeries are unlikely to engage in any processing which is less profitable than fellmongering. Skin packing premises are potential collection sites for leg and sometimes headpieces and have good potential to engage in salting. Meatworks themselves are potential users of NCV material themselves for rendering or fertiliser production.

8.1. Potential sources of NCV material

8.1.1. Depending to some extent on the type of NCV skin under consideration, the potential sources of NCV sheepskins are:

At abattoirs.
At fellmongeries.
At skin packing sheds.

8.2. Indicative slaughter sites

8.2.1. Figure 18 shows on a map of Australia, the approximate locations and distribution of abattoirs, which according to data from AMLC, known to be imperfect, have the capacity to slaughter more than 500 sheep per day. Appendix 1 lists the same data in more detail.

8.2.2. It is evident from figure 18 and Appendix 1 that the overwhelming bulk of Australian sheep abattoirs are located East and South of a line from Gunnedah to Bordertown. Processing sites in Central to Southern New South Wales and Central Victoria would all be within a few hours by road of their NCV skin sources and be capable of drawing comfortably on all NCV skin sources in New South Wales, Victoria and most of South Australia. Thus they could access the NCV material from 75% of the total Australian sheep kill. In the cases of Western Australia with approximately 12.5% of the national kill, and Queensland with 5% of the kill, smaller scale operations using NCV material could operate locally

drawing on their limited regional productions. In the case of Western Australia, larger operations East of the Gunnedah - Bordertown axis could exploit the low back-loading transport costs to draw in material appropriately preserved for a longer term.

8.3. Principle of early control of NCV material

8.3. Animal processors tend to concentrate on their core activity and not on co-products, especially NCV co-products, which are liable to be the most neglected and abused. Hence, as a principle, NCV co-products should always be brought under the NCV skin processor's control as early in the system as possible.

8.4. Aspects of early control

8.4.1. The disadvantage of the principle of early control is that the earliest stages in the system are the ones where the skins are most dispersed. However, it has the advantage too, that where NCV skins are to be used for chamois or suede, allowance can be made for the known rates of knife damage for particular abattoirs. Further, skins may be sorted at source from the beginning and where it is likely that those of no use may profitably be rendered into stockfeed or fertiliser on site, or dumped more simply and cheaply.

8.5. Lag phases before damage

8.5.1. The lag phase before damage begins from breakdown or decay of a fresh skin is variable according to the extent that skins are permitted to heat up after dressing. Ideally, one would aim to have control begin within minutes of removal, especially in the case of lambskins with fragile collagen, but 1 hour would be realistic in the case of sheepskins to be used for chamois or nappa. If NCV type skins were to be used wool-on, the likely period before damage might extend to 2 hours.

8.5.2. The best general principle is that damage to skins begins immediately after dressing and any delay in processing or preservation should be avoided.

8.6. Abattoir collection

8.6.1. The common existing practice about selling of sheepskins which are not intended for use by the abattoir owner, is to call tenders and allocate contracts on the afternoon before slaughter of the animals. The logical point for allocation to NCV use is the same. An NCV skin user could either participate in the tender, even quoting a disposal cost, or offer a positive price according to the skins, or be advised by the owner of unsold NCV skins that they will need to be collected for disposal at the particular time assigned for their slaughter.

8.6.2. Whatever arrangement was reached it would need to be as reliable, more convenient or cheaper for the abattoir than rubbish tip disposal, and more profitable than rendering for stockfeed or fertiliser.

8.6.3. Abattoir collection would be likely to work best when done in conjunction with collection for normal fellmongering because in the first place, all procedures, including buying procedures, equipment and workers would be in place routinely, and fellmongers could use their normal preservation systems.

8.6.4. The methods of treatment likely to be applicable to abattoir collection are:

i. Collection for immediate 'burning off' or salting.
ii. Chilling, effective for up to 1 week and maybe more, or freezing, effective indefinitely.
iii. Application of buffered acetate, effective for up to 1 week or more.
iv. Preservation with acids and/or chemicals, including sulphur dioxide, effective for varying periods according to method.

8.6.5. Whatever the approach, it is probable that any acquirer of NCV skins at abattoirs, or their agent, would need to take control of them at the skin chute or as near as physically possible to it.

8.6.6. The Meat Research Corporation is presently working with CALM Services developing computer selling of sheepskins. In the proposed arrangement, skins would be assessed either when the live animal is assessed for sale, or in the abattoir lairage for skin sale by tender or auction. In either event, prospective buyers would be able to bid for skins with confidence, relying on CALM Services accredited assessors, without having to engage skin buyers of their own.

8.6.7. The routine collection of head pieces or brisket strips from abattoirs, on account of their more regular production, could be a more attractive proposition than irregular collection of whole NCV skins.

8.7. Fellmongery collection

8.7.1. Fellmongers are not likely to be in the best position to secure and cope with raw NCV skins, unless they are to be 'burned off'. But, NCV skins from their wool pullers, or out of their pickle drums are likely to be the most suitable for processing into suede, chamois, collagen or gelatine on

account of being free of wool at those points. They can be readily preserved, or if pickled, are already preserved.

8.7.2. Fellmongeries already have in place the equipment, procedures, and probably the chemicals and technical expertise, for initial processing and storage of NCV skins, even raw ones.

8.7.3. Fellmongeries are the logical sites to collect leg trimmings and in some cases headpieces, from skins which are to be fellmongered.

8.7.4. The methods of treatment likely to be applicable to fellmongery collection are:

i. Collection of pickled pelts or pieces for immediate shipment or use.
ii. Salting, effective indefinitely.
iii. Application of buffered acetate, effective for up to 1 week or more.
iv. Preservation with acids and/or chemicals, including sulphur dioxide, effective for varying periods according to method.

8.7.5. The greatest likely limitation to the involvement of fellmongeries in taking in raw NCV skins, as distinct from producing pelts found to be NCV after wool recovery, is that skins that are NCV on account of being off-shears are likely to be produced mainly when fellmongeries are at maximum seasonal production levels when they can more profitably fellmonger woolly skins. It should always be remembered that skins are NCV because their processing is unprofitable for normal fellmongering or tanning. NCV skins would only be processed in fellmongeries to utilise idle capacity.

8.8. Skin packer collection

8.8.1. Skin packers share many of the advantages of fellmongers in connection with NCV skins, except that in processing they would generally be limited to either drying, which is unlikely to be viable or to salting.

8.8.2. A small proportion of skins with minimum wool lengths for economic fellmongering which are found to have knife damage will be found to be NCV during skin packing.

8.8.3. Winrose Skins, Fletcher Sheepskins Australia, Narcorp and Castricum Bros have incorporated fellmongering into existing skin packing operations. This trend is a logical one and likely to continue.

8.8.4. Combined fellmongeries and skin packing operations offer the best of all circumstances for the collection, processing (where appropriate) and preservation of NCV skins. This is especially the case considering that much of the NCV skin supply is likely to be irregular and organisations dealing only in NCV skins would find it extraordinarily difficult to deal with intermittent supply of this low value material.

8.8.5. Skin packers operations are the logical places to collect leg trimmings and in some cases headpieces, from skins to be dried or salted.

8.8.6. The methods of treatment likely to be applicable to skin packing plant collection are:

i. Collection of salted or dried pelts or pieces for immediate shipment or use.
ii. Application of buffered acetate, effective for up to 1 week or more.
iii. Preservation with acids and/or chemicals, including sulphur dioxide, effective for varying periods according to method.

8.9. Meatworks utilisation of NCV skin material

8.9.1. Meatworks themselves are ideally positioned to enter into better utilisation of their NCV skins. However, they have shown little interest or aptitude to improve their returns from sheepskins in the past and there is no reason to expect that to alter in the future. Again however, should a meatworks decide to work for further returns on sheepskins, it would be logical for it to first concentrate on those which were of commercial value and address the NCV skins last.

8.9.2. The logical meatworks approach to the use of NCV skin material would be as feedstock for fertilisers or in rendering. Wool recovery should be included in meatworks processing where practicable.

9. OTHER STUDIES RELATED TO NCV SHEEPSKIN MATERIAL

9.1 Sheepskins for Gelatine

Dr Lyndon Kurth of the CSIRO Meat Research Laboratory (Phone 07 214 2000 Fax 07 214 20620, prepared a discussion paper on "Sheepskins for Gelatine" for the Meat Research Corporation in 1993. The paper explores some technological aspects of the processing of sheepskin into gelatine.

9.2. Sheepskin supply for gelatine manufacture

Mr Peter Firth of Gibson Associates, (Phone 07 839 8888 Fax 07 839 9888) produced a report for the Meat Research Corporation, "Economic Analysis of Sheepskin Supply to a Proposed Gelatine Manufacturing Plant" in August 1993.

10. CONCLUSIONS

10.1 The quantities

10.1.1. The area of NCV sheepskin material currently produced in Australia is indicatively estimated to be between 51.4 and 51.7 million m^2 annually and it is indicatively calculated to contain 25,290 to 25,400 tonnes of collagen.

10.1.2. It is predicted that with the continued development of fellmongering in Australia, production of off-shears NCV skins and brisket pieces will cease.

10.1.3. The annual quantity of NCV material available if off-shears NCV skins and brisket pieces are excluded is 4.2 to 5.4 million m^2 calculated to contain 2,380 to 2,490 tonnes of collagen.

10.1.4. Although the elimination of off-shears NCV skins and brisket pieces would reduce NCV skin material by nearly 90%, this is also the most unstable and inconsistent source of NCV material. In any event, a business planning to process NCV skin material would be faced with either heavy capitalisation in aiming to operate on NCV material only sporadically available in unpredictable quantities, or to bear the heavier costs of long term preservation by drying or salting - or both.

10.1.5. It is clear that a business planning to base itself on NCV sheepskin feedstock would therefore need to base its scale on the steadily available NCV sources of headpieces, face pieces, leg trimmings and pelts damaged in fellmongering.

10.2 Sources and locations

10.2.1. Processing plants located East of a Gunnedah-Bordertown axis could access 75% of the national NCV skin material production within hours of its production.

10.2.2. Western Australia with 12.5% of the national production would be excluded from such processing where it depended upon very short term preservation. However it could be feasible either to use it in small scale processing or to exploit favourable freight rates from Perth to Eastern Australia, in conjunction with appropriate preservation, for processing in establishments East of the Gunnedah-Bordertown axis.

10.2.3. Queensland sources with around 5% of national production would be similarly situated to Western Australian ones, but should enjoy lower freight rates to Eastern processing establishments than Western Australian sources.

10.3 Preservation Methods

10.3.1. A variety of effective preservation methods with individual peculiarities in shelf lives, effects on the NCV material and costs are available to processors of NCV skin material.

10.3.2. The likely most attractive preservation methods are likely to be chilling and preservation with organic acids, especially acetic.

10.4 Acquisition of NCV material

10.4.1. Abattoirs, fellmongers and skin packers are identified as the sources of NCV skin material. It is recommended that users of the material should arrange to take control over its preservation as early in the processing stream as possible.

10.4.2. Meatworks are ideally situated to engage in the processing of NCV skin material on account of having possession of much of it at dressing and on account of the equipment and expertise that meatworks generally have on hand in connection with rendering in particular.

10.4.3. The use of NCV skin material in rendering and fertiliser production should be appropriate to meatworks processing.

TABLE 1

NUMBERS OF LAMBS SLAUGHTERED THROUGHOUT AUSTRALIA BETWEEN 1970-1992

('000 head)

MTH YR	NSW	VIC	QLD	SA	WA	TAS	NT	ACT	AUST
JAN 70	608.2	610.3	54.4	133.9	104.2	59.9	0.0	12.4	1583.3
FEB 70	589.7	553.3	56.4	123.2	83.2	53.8	0.0	13.2	1472.7
MAR 70	536.3	593.5	59.2	139.2	74.9	54.6	0.0	14.8	1472.4
APR 70	625.0	562.5	68.7	144.7	83.5	56.1	0.0	15.0	1555.4
MAY 70	620.2	517.7	60.9	116.8	91.0	57.6	0.0	14.1	1478.3
JUN 70	647.9	524.3	61.0	145.4	79.9	58.1	0.0	13.0	1529.5
JUL 70	667.1	537.9	64.0	167.7	93.7	57.9	0.0	13.4	1601.6
AUG 70	636.7	571.6	60.7	251.6	111.9	43.8	0.0	12.9	1689.1
SEP 70	692.7	723.4	67.7	328.9	181.3	45.9	0.0	14.8	2054.7
OCT 70	698.7	843.8	60.4	374.3	242.5	58.9	0.0	15.1	2293.8
NOV 70	679.8	844.1	65.8	312.7	67.4	67.8	0.0	16.3	2054.0
DEC 70	687.1	796.7	60.6	187.8	107.5	71.2	0.0	14.7	1925.6
TOTAL	7689.4	7679.1	739.8	2426.2	1321.0	685.6	0.0	169.7	20710.4
JAN 71	649.8	583.6	59.5	159.0	104.8	59.7	0.0	14.6	1630.9
FEB 71	588.7	557.5	60.8	148.6	98.5	52.7	0.0	15.3	1522.1
MAR 71	713.9	636.1	70.7	158.6	101.1	56.4	0.0	17.2	1754.1
APR 71	614.0	568.3	63.1	170.7	108.4	57.6	0.0	15.8	1597.9
MAY 71	642.9	555.3	67.9	144.0	114.7	53.4	0.0	15.0	1593.2
JUN 71	697.0	626.8	81.2	158.7	131.9	55.7	0.0	17.2	1768.6
JUL 71	632.8	599.4	67.3	199.2	134.2	53.6	0.0	14.9	1701.4
AUG 71	583.2	658.3	61.7	282.8	182.5	41.5	0.0	14.7	1824.9
SEP 71	644.6	730.6	78.8	346.0	239.9	43.7	0.0	16.5	2100.2
OCT 71	612.6	661.8	78.1	358.7	300.0	49.6	0.0	15.7	2076.3
NOV 71	661.4	692.9	84.6	214.8	228.2	55.9	0.0	17.6	1955.4
DEC 71	633.8	706.3	81.7	200.7	134.3	67.1	0.0	15.3	1839.2
TOTAL	7674.7	7576.9	855.4	2541.8	1878.5	646.9	0.0	189.8	21364.2
JAN 72	591.0	636.8	77.6	183.6	113.5	57.6	0.0	16.6	1676.8
FEB 72	668.8	617.0	80.2	156.4	100.5	59.1	0.0	17.7	1699.7
MAR 72	739.5	716.8	90.1	169.7	109.6	65.3	0.0	17.2	1908.3
APR 72	627.5	621.9	74.2	196.8	112.9	49.0	0.0	15.6	1697.7
MAY 72	723.7	762.8	91.7	183.3	120.3	59.2	0.0	17.9	1958.7
JUN 72	702.3	724.7	73.0	192.5	118.6	60.5	0.0	16.1	1887.6
JUL 72	587.6	598.8	69.5	173.6	99.0	49.5	0.0	14.7	1592.7
AUG 72	553.7	634.2	76.3	160.4	114.7	47.3	0.0	13.4	1600.0
SEP 72	494.9	585.2	54.8	216.6	127.0	43.3	0.0	12.8	1534.5
OCT 72	533.5	694.8	49.9	321.7	236.4	51.5	0.0	15.8	1903.5
NOV 72	574.3	766.9	55.9	287.1	184.3	69.5	0.0	17.4	1955.5
DEC 72	517.5	688.1	50.1	210.4	109.2	70.4	0.0	14.8	1660.4
TOTAL	7314.3	8048.0	843.3	2452.1	1546.0	682.2	0.0	190.0	21075.4

Data from AMLC

TABLE 1

MTH YR	NSW	VIC	QLD	SA	WA	TAS	NT	ACT	AUST
JAN 73	562.6	670.0	76.7	197.5	103.6	73.0	0.0	20.4	1703.6
FEB 73	426.9	475.5	68.3	145.1	80.4	46.2	0.0	12.1	1254.4
MAR 73	496.3	446.7	64.8	134.8	83.3	45.3	0.0	14.5	1285.8
APR 73	496.0	314.1	54.1	78.7	67.7	43.3	0.0	14.8	1068.7
MAY 73	519.8	445.1	69.4	107.9	60.5	54.4	0.0	14.2	1271.3
JUN 73	477.8	397.8	49.7	107.8	52.7	48.1	0.0	12.1	1145.9
JUL 73	414.0	419.6	39.1	127.7	94.1	43.0	0.0	10.8	1148.3
AUG 73	427.3	461.8	34.3	132.3	115.1	38.2	0.0	10.6	1219.5
SEP 73	405.0	484.0	26.3	146.1	155.1	33.8	0.0	10.4	1260.7
OCT 73	433.4	644.4	32.4	208.0	253.2	46.5	0.0	12.3	1630.1
NOV 73	440.7	639.8	27.5	139.4	172.3	44.7	0.0	11.9	1476.3
DEC 73	398.3	428.2	30.6	122.6	54.6	44.4	0.0	10.0	1088.7
TOTAL	5498.1	5827.0	573.2	1647.9	1292.6	560.9	0.0	154.1	15553.3
JAN 74	439.7	438.2	43.2	107.5	54.1	46.4	0.0	15.1	1144.2
FEB 74	370.3	367.5	33.2	93.2	46.7	40.5	0.0	10.9	962.3
MAR 74	395.8	383.5	36.2	90.9	51.0	41.5	0.0	11.6	1010.6
APR 74	396.8	360.4	28.3	108.6	59.8	36.3	0.0	10.9	1001.0
MAY 74	422.4	362.6	36.3	89.7	65.5	37.2	0.0	12.5	1026.0
JUN 74	416.9	327.2	33.5	90.5	63.8	37.3	0.0	11.3	980.4
JUL 74	483.0	380.4	26.7	109.2	85.7	37.4	0.0	13.1	1135.6
AUG 74	374.7	445.5	25.8	137.2	142.3	39.4	0.0	13.5	1178.4
SEP 74	514.4	467.7	35.7	209.3	214.3	37.4	0.0	14.9	1493.7
OCT 74	552.9	684.9	39.9	269.4	291.7	43.7	0.0	15.9	1898.5
NOV 74	527.3	603.3	35.3	233.1	196.4	52.6	0.0	15.7	1663.6
DEC 74	498.6	570.9	36.8	150.7	65.3	65.6	0.0	13.2	1401.1
TOTAL	5392.8	5392.1	410.9	1689.3	1336.6	515.3	0.0	158.6	14895.4
JAN 75	515.3	535.4	60.0	124.9	53.9	67.3	0.0	16.1	1372.9
FEB 75	475.8	430.4	48.2	113.4	46.6	56.2	0.0	16.2	1186.8
MAR 75	455.0	439.1	38.3	128.6	55.3	49.4	0.0	13.9	1179.6
APR 75	480.8	398.7	58.0	135.2	55.5	43.2	0.0	13.7	1185.1
MAY 75	481.2	407.2	60.2	117.1	56.2	46.5	0.0	13.1	1181.5
JUN 75	491.6	376.5	49.2	122.2	66.3	38.2	0.0	13.4	1157.4
JUL 75	489.7	443.4	47.1	112.3	107.4	44.3	0.0	15.1	1259.4
AUG 75	426.4	346.1	36.6	188.2	166.4	37.7	0.0	14.3	1215.7
SEP 75	457.8	421.2	42.5	183.9	269.5	37.4	0.0	17.0	1429.3
OCT 75	487.4	556.7	40.3	184.4	332.7	41.6	0.0	18.0	1661.0
NOV 75	444.0	436.2	39.6	152.3	254.3	46.8	0.0	15.5	1388.7
DEC 75	472.3	515.4	40.7	141.1	91.4	69.4	0.0	16.5	1346.8
TOTAL	5677.3	5306.3	560.7	1703.6	1555.5	578.0	0.0	182.8	15564.2
JAN 76	437.3	520.3	42.0	121.6	73.1	58.9	0.0	17.2	1270.4

Data from AMLC

TABLE 1

MTH YR	NSW	VIC	QLD	SA	WA	TAS	NT	ACT	AUST
FEB 76	403.8	493.6	43.4	111.6	67.7	55.5	0.0	17.0	1192.7
MAR 76	485.3	538.5	49.6	139.0	93.4	65.2	0.0	18.1	1389.1
APR 76	458.2	490.3	41.1	160.9	90.2	54.5	0.0	15.6	1310.9
MAY 76	462.3	479.1	49.4	133.4	92.4	50.2	0.0	15.6	1282.4
JUN 76	491.4	455.2	64.0	128.8	105.5	52.0	0.0	15.1	1312.1
JUL 76	481.9	478.6	57.1	127.9	167.6	51.1	0.0	13.0	1377.1
AUG 76	434.2	420.6	52.7	154.7	249.6	43.3	0.0	13.6	1368.6
SEP 76	434.9	452.6	50.1	181.2	315.5	28.8	0.0	11.8	1474.9
OCT 76	394.5	523.7	47.8	157.4	285.7	35.1	0.0	11.4	1455.5
NOV 76	415.8	572.7	47.8	158.6	285.3	44.5	0.0	13.8	1538.5
DEC 76	426.1	510.6	49.1	109.5	88.7	51.5	0.0	13.2	1248.7
TOTAL	5325.7	5935.8	594.1	1684.6	1914.7	590.6	0.0	175.4	16220.9
JAN 77	417.6	439.4	58.2	92.8	72.5	42.3	0.0	12.3	1135.0
FEB 77	403.0	491.5	57.5	93.9	84.8	45.0	0.0	12.6	1188.3
MAR 77	439.7	462.9	57.4	112.3	96.4	49.7	0.0	13.2	1231.4
APR 77	408.7	376.1	51.5	98.3	78.3	44.0	0.0	13.1	1070.1
MAY 77	406.8	406.7	57.5	94.7	54.3	40.2	0.0	16.5	1076.6
JUN 77	456.8	414.4	61.1	75.8	52.2	48.0	0.0	13.5	1121.8
JUL 77	418.0	402.9	59.0	75.6	113.9	45.5	0.0	12.0	1126.9
AUG 77	481.5	423.5	60.4	130.4	191.4	35.6	0.0	14.0	1336.8
SEP 77	413.7	551.5	49.3	202.4	293.7	31.9	0.0	13.0	1555.5
OCT 77	441.4	608.6	43.2	194.7	333.8	35.1	0.0	13.2	1670.0
NOV 77	490.4	606.6	57.6	165.8	156.9	53.9	0.0	13.6	1544.8
DEC 77	406.5	522.3	46.2	109.9	60.5	83.1	0.0	12.1	1240.5
TOTAL	5184.1	5706.4	658.9	1446.6	1588.7	554.3	0.0	159.1	15297.7
JAN 78	385.0	588.4	52.3	123.8	47.3	76.7	0.0	11.7	1285.3
FEB 78	352.8	446.2	46.2	125.2	38.9	72.0	0.0	11.5	1092.8
MAR 78	458.2	447.5	60.6	119.8	56.8	72.6	0.0	14.5	1229.9
APR 78	416.2	433.2	56.9	67.9	52.8	55.5	0.0	12.4	1094.9
MAY 78	477.2	380.1	65.4	112.2	77.0	46.8	0.0	14.1	1172.7
JUN 78	416.3	320.2	53.2	77.5	62.2	41.2	0.0	12.9	983.5
JUL 78	422.6	363.0	48.9	70.5	53.4	33.4	0.0	13.6	1005.5
AUG 78	517.9	449.5	58.8	146.1	160.1	32.5	0.0	15.0	1379.8
SEP 78	502.4	488.4	47.7	206.2	309.2	35.4	0.0	14.0	1603.3
OCT 78	512.2	661.1	42.1	254.9	378.4	38.3	0.0	16.1	1903.2
NOV 78	532.3	587.0	50.5	174.6	158.5	42.4	0.0	14.8	1560.2
DEC 78	416.5	475.9	38.3	126.1	55.0	48.7	0.0	12.8	1173.4
TOTAL	5409.6	5640.5	620.9	1604.8	1449.6	595.5	0.0	163.4	15484.5
JAN 79	451.1	444.7	54.0	111.7	52.4	54.8	0.0	12.8	1181.6
FEB 79	401.9	413.3	53.4	96.7	47.3	46.2	0.0	13.9	1072.7

Data from AMLC

TABLE 1

MTH YR	NSW	VIC	QLD	SA	WA	TAS	NT	ACT	AUST
MAR 79	408.0	408.7	48.5	90.1	51.6	57.1	0.0	12.6	1076.5
APR 79	331.7	378.9	42.6	73.4	44.4	37.9	0.0	9.7	918.7
MAY 79	399.5	385.4	50.8	78.7	38.2	36.9	0.0	17.9	1007.4
JUN 79	387.0	343.0	43.1	71.8	33.7	39.2	0.0	10.5	928.4
JUL 79	493.1	480.8	42.7	163.9	69.4	35.0	0.0	14.4	1299.4
AUG 79	604.9	706.8	51.4	264.8	236.1	39.6	0.0	15.9	1919.5
SEP 79	534.7	612.2	40.4	270.5	358.5	37.9	0.0	20.5	1874.7
OCT 79	598.3	627.2	41.5	257.0	408.4	34.3	0.0	21.9	1988.5
NOV 79	501.8	558.4	38.2	173.7	163.7	44.5	0.0	19.5	1499.8
DEC 79	425.6	491.2	35.7	103.4	48.4	64.4	0.0	13.6	1182.3
TOTAL	5537.6	5850.6	542.3	1755.7	1552.1	527.8	0.0	183.2	15949.5
JAN 80	449.4	507.9	57.3	86.3	51.5	71.8	0.0	18.4	1242.7
FEB 80	403.9	398.9	53.8	91.1	39.8	73.7	0.0	14.9	1076.2
MAR 80	480.5	272.5	58.4	117.7	47.9	53.7	0.0	17.5	1048.2
APR 80	483.2	470.3	75.7	86.7	51.8	50.3	0.0	11.6	1229.6
MAY 80	405.4	423.4	50.3	76.7	39.7	53.6	0.0	14.3	1063.3
JUN 80	335.9	395.4	34.5	93.1	40.2	54.3	0.0	14.9	968.2
JUL 80	445.2	587.2	43.9	131.2	100.5	55.6	0.0	17.5	1381.1
AUG 80	480.3	527.3	43.8	196.0	218.7	47.3	0.0	19.1	1532.7
SEP 80	543.1	566.1	50.2	208.7	298.5	36.4	0.0	24.6	1727.5
OCT 80	569.7	570.7	54.5	191.4	351.9	41.4	0.0	24.4	1804.0
NOV 80	455.7	486.8	40.0	153.8	150.7	45.7	0.0	25.0	1357.7
DEC 80	467.8	523.5	48.9	119.0	68.8	60.6	0.0	16.1	1304.7
TOTAL	5520.1	5730.0	611.3	1551.7	1460.0	644.4	0.0	218.3	15735.9
JAN 81	405.4	522.7	54.7	124.6	68.8	64.2	0.0	21.3	1261.6
FEB 81	360.3	510.1	55.2	109.9	64.7	57.5	0.0	18.6	1176.3
MAR 81	401.9	579.0	60.4	107.6	61.2	61.7	0.0	19.8	1291.6
APR 81	462.3	572.1	61.3	105.8	67.3	52.5	0.0	22.6	1343.9
MAY 81	451.0	505.1	61.6	126.3	54.5	58.0	0.0	27.3	1283.8
JUN 81	396.5	485.4	51.8	110.8	49.8	65.9	0.0	21.2	1181.3
JUL 81	489.2	504.5	61.7	118.6	61.2	62.8	0.0	16.4	1314.4
AUG 81	431.0	435.4	57.5	139.9	93.7	45.7	0.0	19.0	1222.2
SEP 81	502.0	589.8	64.9	177.0	198.0	41.3	0.0	27.4	1600.4
OCT 81	449.0	666.4	66.8	225.8	210.1	43.5	0.0	31.5	1693.1
NOV 81	469.4	536.7	49.8	170.1	114.9	46.5	0.0	18.8	1406.3
DEC 81	445.5	603.2	51.5	141.1	79.3	66.8	0.0	17.0	1404.5
TOTAL	5263.5	6510.4	697.2	1657.5	1123.5	666.4	0.0	260.9	16179.4
JAN 82	438.9	517.7	62.2	129.7	80.4	72.6	0.0	19.7	1321.1
FEB 82	413.9	507.5	54.4	116.4	64.7	59.7	0.0	17.4	1234.0
MAR 82	481.8	578.6	63.8	125.8	56.9	72.3	0.0	17.1	1396.3

Data from AMLC

TABLE 1

MTH YR	NSW	VIC	QLD	SA	WA	TAS	NT	ACT	AUST
APR 82	426.8	510.5	58.6	111.6	61.5	47.2	0.0	9.8	1226.0
MAY 82	422.8	462.2	60.6	100.2	60.0	59.8	0.0	13.8	1179.3
JUN 82	493.2	517.6	70.2	108.8	63.4	72.4	0.0	9.0	1334.5
JUL 82	515.0	577.0	71.0	178.9	55.8	59.4	0.0	18.6	1475.6
AUG 82	579.9	564.0	54.8	259.5	94.0	47.9	0.0	5.6	1605.8
SEP 82	588.0	709.4	62.6	274.1	158.2	49.3	0.0	0.0	1841.6
OCT 82	515.2	549.1	54.0	212.3	218.7	53.0	0.0	0.0	1602.2
NOV 82	500.1	520.0	54.2	181.9	144.2	60.9	0.0	21.4	1482.7
DEC 82	480.7	570.5	57.6	157.0	62.8	81.2	0.0	18.7	1428.5
TOTAL	5856.3	6584.1	724.0	1956.2	1120.6	735.7	0.0	151.1	17127.6
JAN 83	427.8	526.6	50.1	121.0	40.5	68.5	0.0	15.6	1250.0
FEB 83	424.5	583.7	55.8	127.5	40.6	74.1	0.0	13.4	1319.7
MAR 83	549.2	544.4	75.8	124.0	41.7	86.7	0.0	8.9	1430.7
APR 83	432.7	393.6	69.1	103.4	40.9	59.0	0.0	7.2	1105.9
MAY 83	412.7	378.7	66.8	90.2	47.3	57.8	0.0	10.6	1064.2
JUN 83	493.2	473.1	75.6	104.4	44.1	66.6	0.0	13.0	1269.9
JUL 83	535.3	501.3	69.9	136.9	57.1	57.0	0.0	14.3	1371.8
AUG 83	676.1	629.6	79.0	211.8	76.9	51.7	0.0	24.2	1749.3
SEP 83	650.6	577.2	80.4	189.5	149.7	54.1	0.0	23.9	1725.5
OCT 83	539.6	610.7	58.2	209.9	233.1	48.8	0.0	22.1	1722.3
NOV 83	513.4	551.9	54.4	146.3	146.1	66.2	0.0	23.9	1502.2
DEC 83	415.8	506.9	63.1	133.4	77.0	77.9	0.0	18.5	1292.7
TOTAL	6070.9	6277.7	798.2	1698.3	995.0	768.4	0.0	195.6	16804.2
JAN 84	452.6	461.2	84.9	118.6	50.2	86.6	0.0	17.7	1271.8
FEB 84	479.7	474.7	73.0	113.6	44.8	67.3	0.0	17.0	1269.1
MAR 84	472.9	464.7	75.8	124.6	44.9	70.7	0.0	14.3	1267.9
APR 84	429.3	450.9	81.5	114.7	53.0	50.5	0.0	22.2	1201.9
MAY 84	556.2	509.5	80.8	122.9	64.2	60.7	0.0	21.8	1416.0
JUN 84	509.9	469.2	81.1	132.0	42.7	65.5	0.0	16.4	1316.7
JUL 84	494.1	516.6	69.7	128.6	75.1	44.6	0.0	16.2	1345.0
AUG 84	502.6	547.0	57.9	148.0	135.4	42.1	0.0	21.6	1454.6
SEP 84	444.9	473.8	58.9	218.4	172.8	38.8	0.0	18.7	1426.2
OCT 84	545.6	605.2	58.6	202.5	212.5	40.2	0.0	31.1	1695.7
NOV 84	491.4	548.7	59.7	181.2	159.9	60.3	0.0	34.5	1535.7
DEC 84	422.3	548.4	66.0	135.6	77.1	72.6	0.0	19.5	1341.4
TOTAL	5801.5	6069.9	847.9	1740.7	1132.6	699.9	0.0	251.0	16542.0
JAN 85	543.6	607.0	88.2	133.1	61.5	59.7	0.0	26.6	1519.7
FEB 85	487.4	568.2	66.1	128.4	45.0	67.6	0.0	24.5	1387.1
MAR 85	496.0	571.8	83.6	123.7	44.5	68.6	0.0	22.7	1410.9
APR 85	512.4	580.6	82.6	125.3	56.3	51.6	0.0	22.4	1431.0

Data from AMLC

TABLE 1

MTH YR	NSW	VIC	QLD	SA	WA	TAS	NT	ACT	AUST
MAY 85	552.4	638.0	78.6	118.8	54.6	70.3	0.0	21.4	1534.0
JUN 85	471.5	571.4	78.8	124.2	57.5	67.6	0.0	26.0	1396.8
JUL 85	578.9	657.5	90.5	137.7	66.2	52.4	0.0	28.0	1611.3
AUG 85	589.2	602.8	84.4	146.2	92.5	42.1	0.0	17.0	1574.1
SEP 85	529.7	614.8	88.7	167.7	164.7	44.7	0.0	22.8	1633.2
OCT 85	634.8	784.5	72.5	200.7	231.7	44.8	0.0	37.5	2006.6
NOV 85	544.9	709.1	72.8	189.1	141.3	62.1	0.0	28.1	1747.3
DEC 85	514.9	656.0	62.0	131.5	44.9	67.5	0.0	29.8	1506.7
TOTAL	6455.7	7561.7	948.8	1726.4	1060.7	699.0	0.0	306.8	18758.7
JAN 86	521.9	699.2	78.0	176.7	51.8	60.2	0.0	26.1	1613.9
FEB 86	479.0	608.2	71.2	141.8	53.8	62.1	0.0	24.7	1440.9
MAR 86	512.6	633.2	71.7	155.7	56.8	63.1	0.0	21.0	1514.1
APR 86	519.2	762.1	75.8	162.4	66.8	53.3	0.0	27.3	1667.0
MAY 86	433.6	699.7	60.1	110.2	58.7	60.3	0.0	19.2	1441.7
JUN 86	372.0	620.2	59.8	110.2	59.1	56.0	0.0	15.6	1292.9
JUL 86	403.8	622.3	63.1	143.9	76.1	53.2	0.0	21.5	1383.9
AUG 86	373.4	598.2	57.6	164.5	87.3	42.4	0.0	18.4	1341.8
SEP 86	435.7	639.4	58.3	188.6	148.9	36.8	0.0	30.8	1538.5
OCT 86	496.5	728.8	70.9	227.6	245.9	44.0	0.0	26.3	1840.1
NOV 86	458.8	697.7	63.1	181.8	171.6	48.4	0.0	25.4	1646.7
DEC 86	497.8	703.8	62.8	147.4	79.4	51.2	0.0	30.9	1575.2
TOTAL	5504.3	8012.8	792.4	1910.8	1156.2	631.0	0.0	287.2	18296.7
JAN 87	452.4	595.5	76.6	134.9	54.0	63.3	0.0	24.8	1401.5
FEB 87	410.7	540.0	72.2	128.4	57.6	66.2	0.0	21.5	1296.6
MAR 87	445.9	611.8	76.5	153.8	73.4	80.0	0.0	19.7	1461.1
APR 87	460.2	645.7	79.3	136.0	73.7	70.1	0.0	28.3	1493.2
MAY 87	436.5	600.2	80.0	155.8	45.3	58.0	0.0	22.6	1398.4
JUN 87	424.5	557.4	80.8	124.4	54.8	57.1	0.0	20.9	1320.0
JUL 87	444.6	599.7	90.7	130.0	75.8	67.2	0.0	27.5	1435.4
AUG 87	360.2	536.8	66.5	174.0	97.8	45.1	0.0	22.3	1302.6
SEP 87	412.4	647.1	55.9	215.3	177.1	33.4	0.0	29.2	1570.4
OCT 87	452.9	696.2	79.9	213.3	273.4	51.6	0.0	24.9	1792.1
NOV 87	437.7	670.4	69.6	185.9	145.4	48.7	0.0	25.3	1582.9
DEC 87	439.6	653.9	68.3	147.3	57.3	65.6	0.0	29.8	1461.9
TOTAL	5177.6	7354.7	896.3	1899.1	1185.6	706.3	0.0	296.8	17516.1
JAN 88	378.4	608.3	82.5	145.1	54.3	53.5	0.0	26.4	1348.5
FEB 88	422.9	603.8	77.5	157.7	66.0	72.3	0.0	25.9	1426.1
MAR 88	513.1	628.2	81.5	173.4	83.1	74.6	0.0	30.8	1584.7
APR 88	401.4	506.9	93.0	150.0	51.1	55.6	0.0	20.0	1278.0
MAY 88	443.1	511.3	68.6	157.9	31.9	37.5	0.0	24.0	1274.2

Data from AMLC

TABLE 1

MTH YR	NSW	VIC	QLD	SA	WA	TAS	NT	ACT	AUST
JUN 88	406.1	448.4	80.2	89.8	28.2	51.0	0.0	27.2	1130.9
JUL 88	404.1	465.7	80.9	111.6	58.1	47.6	0.0	26.9	1195.1
AUG 88	503.7	522.0	78.7	178.0	111.3	47.4	0.0	42.2	1484.3
SEP 88	486.8	594.5	76.8	202.9	152.0	45.0	0.0	37.1	1595.2
OCT 88	445.1	579.8	64.0	205.4	146.9	41.7	0.0	34.7	1517.6
NOV 88	477.5	632.7	68.6	191.8	92.7	51.4	0.0	46.6	1562.2
DEC 88	412.1	503.7	65.5	151.9	65.3	51.7	0.0	30.7	1281.0
TOTAL	5294.3	6605.3	917.8	1915.5	940.9	629.3	0.0	372.5	16677.8
JAN 89	407.0	508.0	72.0	151.0	71.5	62.7	0.0	30.4	1302.6
FEB 89	424.4	500.4	81.2	154.8	62.5	58.0	0.0	31.7	1313.0
MAR 89	342.2	499.9	118.1	171.0	61.1	53.5	0.0	38.9	1284.4
APR 89	394.9	471.8	83.7	161.0	63.1	41.5	0.0	30.1	1246.0
MAY 89	483.4	527.8	82.6	154.9	60.2	44.0	0.0	38.4	1391.3
JUN 89	454.2	457.6	86.8	148.0	52.8	50.8	0.0	30.3	1280.4
JUL 89	437.4	487.5	82.3	166.3	87.1	41.1	0.0	32.5	1331.2
AUG 89	506.2	602.9	92.1	203.2	131.6	42.4	0.0	43.1	1621.5
SEP 89	452.2	528.5	82.0	229.0	201.6	29.8	0.0	35.9	1558.9
OCT 89	436.8	600.4	75.2	251.0	221.1	35.2	0.0	38.2	1657.9
NOV 89	434.5	578.3	70.4	226.7	173.4	49.1	0.0	46.2	1578.6
DEC 89	374.7	507.9	67.6	167.3	100.3	44.1	0.0	32.3	1294.2
TOTAL	5147.9	6271.0	994.0	2184.2	1286.3	552.2	0.0	428.0	16860.0
JAN 90	414.7	547.0	73.5	150.1	77.0	57.0	0.0	40.0	1359.3
FEB 90	404.2	440.6	82.0	150.3	71.3	58.2	0.0	31.4	1238.0
MAR 90	393.3	439.7	87.0	166.2	58.2	63.2	0.0	38.5	1246.1
APR 90	356.8	454.9	80.0	162.1	79.0	51.1	0.0	32.4	1216.3
MAY 90	408.3	537.9	77.1	160.5	94.1	65.3	0.0	36.3	1379.5
JUN 90	370.4	474.3	78.5	130.2	175.5	52.3	0.0	31.7	1312.8
JUL 90	404.8	515.0	81.7	121.2	175.4	47.2	0.0	33.2	1378.4
AUG 90	443.0	537.3	93.6	154.3	150.5	40.9	0.0	35.2	1454.7
SEP 90	416.3	530.1	90.4	170.6	229.4	31.1	0.0	23.6	1491.6
OCT 90	468.8	647.3	90.4	201.3	241.9	35.9	0.0	36.4	1721.9
NOV 90	457.2	614.4	79.8	184.8	186.9	42.5	0.0	37.2	1602.7
DEC 90	347.7	525.9	87.1	122.5	85.9	38.7	0.0	29.5	1237.4
TOTAL	4885.5	6264.4	1001.1	1874.1	1625.1	583.4	0.0	405.4	16638.7
JAN 91	386.2	551.4	77.2	146.0	75.7	56.1	0.0	31.5	1324.1
FEB 91	328.4	473.5	65.8	141.5	70.0	49.6	0.0	28.3	1157.1
MAR 91	353.0	477.9	85.5	155.8	91.6	56.0	0.0	26.8	1246.7
APR 91	388.7	509.5	78.1	141.5	98.3	54.7	0.0	29.7	1300.5
MAY 91	440.4	573.0	75.1	161.1	100.2	66.1	0.0	31.7	1447.6
JUN 91	355.5	451.8	83.0	109.9	77.4	40.0	0.0	26.6	1144.2

Data from AMLC

TABLE 1

MTH YR	NSW	VIC	QLD	SA	WA	TAS	NT	ACT	AUST
JUL 91	414.8	518.8	90.6	118.4	71.8	39.1	0.0	32.0	1285.4
AUG 91	410.4	481.4	88.0	94.7	118.6	41.4	0.0	29.5	1264.2
SEP 91	421.8	492.7	105.4	148.3	230.9	26.7	0.0	33.5	1459.3
OCT 91	446.1	619.6	110.5	163.5	228.6	41.4	0.0	41.0	1650.7
NOV 91	386.0	563.0	91.8	137.9	122.6	33.4	0.0	33.9	1368.6
DEC 91	344.3	544.8	69.8	129.1	70.9	35.3	0.0	28.0	1222.2
TOTAL	4675.6	6257.4	1020.8	1647.7	1356.6	539.8	0.0	372.5	15870.6
JAN 92	371.9	568.4	80.4	131.2	53.6	50.6	0.0	36.0	1292.1
FEB 92	344.2	489.0	77.6	137.3	52.2	50.5	0.0	30.2	1181.1
MAR 92	389.3	544.8	80.7	158.0	59.4	46.1	0.0	28.8	1306.9
APR 92	392.6	520.9	82.1	126.7	82.7	53.6	0.0	38.1	1296.7
MAY 92	381.4	486.4	68.4	138.2	81.4	36.5	0.0	29.8	1222.2
JUN 92	380.7	489.1	69.9	131.7	65.7	33.8	0.0	26.3	1197.2
JUL 92	348.9	542.9	79.1	114.9	90.2	39.0	0.0	31.4	1246.6
AUG 92	308.3	509.6	59.1	162.0	157.5	30.4	0.0	25.5	1252.3
SEP 92	319.7	617.4	57.4	172.6	182.8	34.8	0.0	35.0	1419.6
OCT 92	333.6	572.7	50.9	217.0	205.9	37.0	0.0	27.8	1445.0
NOV 92	324.7	565.9	48.1	200.4	111.7	36.9	0.0	30.3	1318.1
DEC 92	325.9	535.5	51.1	179.0	61.4	43.2	0.0	32.3	1228.5
TOTAL	4221.2	6442.6	804.8	1869.0	1204.5	492.4	0.0	371.5	15406.3

Data from AMLC

TABLE 2

NUMBERS OF SHEEP SLAUGHTERED THROUGHOUT AUSTRALIA
BETWEEN 1970-1992
('000 HEAD)

MTH YR	NSW	VIC	QLD	SA	WA	TAS	NT	ACT	AUST
JAN 70	468.0	727.2	142.7	194.3	291.8	60.3	0.4	0.6	1885.0
FEB 70	520.8	759.2	178.6	219.1	280.2	61.9	0.0	0.5	2020.3
MAR 70	450.2	755.9	179.3	219.0	250.8	54.9	0.0	0.6	1910.6
APR 70	596.9	855.0	215.0	249.1	272.8	63.8	0.0	0.7	2253.2
MAY 70	567.7	649.7	197.9	191.3	266.7	53.7	0.0	0.9	1928.0
JUN 70	520.3	606.6	189.5	175.1	212.4	36.8	0.0	1.0	1741.8
JUL 70	517.6	449.0	196.8	208.1	196.1	42.4	0.0	1.1	1611.1
AUG 70	504.5	444.0	180.6	200.2	253.6	43.0	0.0	0.9	1626.9
SEP 70	471.5	560.3	182.1	186.0	216.1	43.1	0.0	1.2	1660.3
OCT 70	458.3	595.9	155.0	193.2	219.6	53.1	0.0	1.0	1676.0
NOV 70	473.2	612.9	168.4	162.3	87.7	52.6	0.0	0.5	1557.5
DEC 70	522.3	793.4	147.2	189.1	195.6	52.4	0.0	0.4	1900.5
TOTAL	6071.3	7809.1	2133.1	2386.8	2743.4	618.0	0.4	9.4	21771.2
JAN 71	581.2	717.3	136.7	246.4	270.4	71.8	0.0	0.4	2024.3
FEB 71	567.4	719.5	154.2	237.1	264.3	67.5	0.8	0.6	2011.4
MAR 71	754.7	915.5	207.2	256.3	271.6	73.9	0.6	1.5	2481.4
APR 71	596.3	806.9	167.0	228.9	304.9	72.4	0.4	1.4	2178.3
MAY 71	702.5	886.5	183.3	202.7	320.4	73.8	0.5	2.1	2371.8
JUN 71	746.3	949.2	231.0	229.9	284.0	67.5	0.0	2.6	2510.6
JUL 71	764.9	956.6	211.8	250.0	315.8	68.7	0.3	2.8	2570.9
AUG 71	647.0	934.6	177.3	188.5	298.7	55.9	0.5	2.7	2305.1
SEP 71	688.0	1044.6	182.7	172.1	293.4	59.9	0.6	2.1	2443.5
OCT 71	684.8	1070.9	193.2	168.7	278.9	63.6	0.5	2.4	2463.9
NOV 71	793.7	1082.4	218.9	183.8	311.4	65.7	0.4	2.1	2658.4
DEC 71	807.4	1081.5	207.1	177.9	399.1	69.0	0.3	1.1	2743.5
TOTAL	8334.2	11165.5	2270.4	2542.3	3612.9	809.7	4.9	21.8	28763.1
JAN 72	684.2	983.2	177.9	230.8	368.3	69.3	0.0	1.2	2515.0
FEB 72	746.3	1126.8	219.4	233.7	370.7	79.6	0.0	1.5	2778.2
MAR 72	791.6	1174.9	241.3	218.4	412.4	77.3	0.0	1.2	2917.2
APR 72	632.6	794.3	200.9	208.4	359.9	70.1	0.5	1.4	2268.4
MAY 72	775.7	877.4	237.3	209.1	406.3	73.6	0.5	1.5	2581.3
JUN 72	804.1	826.1	211.5	217.4	291.0	60.3	0.0	1.5	2411.9
JUL 72	669.4	757.5	183.6	199.2	261.8	43.3	0.0	1.9	2116.7
AUG 72	581.1	685.3	195.7	205.6	310.2	36.4	0.0	2.5	2016.9
SEP 72	468.1	639.7	162.2	186.7	317.1	38.4	0.0	1.5	1813.7
OCT 72	515.3	876.1	152.5	268.0	356.4	43.2	0.0	1.4	2212.9
NOV 72	564.5	1047.9	140.3	238.6	430.8	57.2	0.0	1.1	2480.4
DEC 72	565.4	962.9	103.7	221.5	423.3	67.6	0.0	0.6	2345.1
TOTAL	7798.3	10752.1	2226.3	2637.4	4308.2	716.3	1.0	17.3	28457.7

Data from AMLC

TABLE 2

MTH YR	NSW	VIC	QLD	SA	WA	TAS	NT	ACT	AUST
MAR 73	594.5	919.8	153.7	234.3	524.6	75.6	0.0	0.3	2502.7
APR 73	443.0	240.3	119.9	182.2	316.8	48.3	0.0	0.4	1350.9
MAY 73	459.2	365.0	139.7	108.9	240.6	43.4	0.0	0.9	1357.7
JUN 73	337.1	184.4	100.3	105.7	139.7	28.3	0.0	0.8	896.2
JUL 73	258.4	203.7	76.0	104.2	181.6	24.8	0.0	0.4	849.1
AUG 73	245.5	201.3	80.6	82.1	188.7	20.8	0.0	0.5	819.4
SEP 73	227.8	230.3	75.5	80.6	205.9	25.2	0.0	0.3	845.4
OCT 73	239.6	333.9	100.3	97.8	222.8	28.5	0.0	0.3	1023.1
NOV 73	247.4	500.5	83.7	113.8	308.5	28.7	0.0	0.2	1282.8
DEC 73	194.1	384.2	63.2	94.1	239.1	23.2	0.0	0.3	998.2
TOTAL	4405.8	5496.9	1253.9	1650.0	3476.3	501.6	0.0	6.2	16790.3
JAN 74	214.3	452.5	65.3	115.3	223.1	28.6	0.0	0.4	1099.5
FEB 74	218.6	406.5	71.8	105.6	228.4	30.7	0.0	0.9	1062.7
MAR 74	252.9	356.1	84.4	96.4	248.0	43.4	0.0	1.1	1082.2
APR 74	210.1	222.9	68.5	97.2	177.9	28.6	0.0	1.2	806.4
MAY 74	235.0	153.9	79.8	79.7	185.8	27.7	0.0	0.9	762.8
JUN 74	204.3	141.9	70.7	71.7	161.1	25.5	0.0	0.6	675.8
JUL 74	192.2	129.7	46.9	62.6	164.2	32.9	0.0	1.0	629.5
AUG 74	163.1	170.7	48.0	72.5	217.2	27.0	0.0	0.7	699.4
SEP 74	210.5	257.7	60.7	84.4	226.4	30.6	0.0	1.0	871.4
OCT 74	227.5	445.6	72.3	80.8	238.3	38.5	0.0	0.5	1103.5
NOV 74	226.4	376.8	66.8	88.1	270.8	28.9	0.0	0.0	1057.7
DEC 74	201.3	418.6	49.9	83.5	262.9	28.3	0.0	0.3	1044.7
TOTAL	2556.2	3532.9	785.1	1037.8	2604.1	370.7	0.0	8.6	10895.6
JAN 75	230.2	532.6	52.1	89.0	277.3	38.4	0.0	0.2	1219.7
FEB 75	266.3	536.1	63.7	103.3	275.2	38.0	0.0	0.4	1283.1
MAR 75	301.7	529.0	67.9	102.5	317.0	38.0	0.0	0.3	1356.4
APR 75	352.1	468.2	81.1	106.6	305.3	36.9	0.0	0.2	1350.4
MAY 75	304.3	346.7	77.6	132.6	202.1	36.6	0.0	0.3	1100.1
JUN 75	268.7	283.9	78.1	128.1	221.6	28.7	0.0	0.4	1009.5
JUL 75	273.8	341.1	77.1	138.4	299.2	31.3	0.0	0.0	1161.0
AUG 75	235.6	262.6	70.4	107.9	312.6	17.8	0.0	0.0	1007.1
SEP 75	249.0	364.3	70.5	114.3	322.0	22.4	0.2	0.0	1142.6
OCT 75	292.5	513.7	81.5	124.7	366.5	35.9	0.0	0.0	1414.9
NOV 75	291.9	494.5	73.3	154.8	356.2	36.9	0.0	0.0	1407.8
DEC 75	285.3	534.3	66.6	159.5	406.5	30.3	0.0	0.0	1482.6
TOTAL	3351.4	5207.0	859.9	1461.7	3661.5	391.2	0.2	1.8	14935.2
JAN 76	285.4	494.0	61.0	160.8	405.9	37.1	0.0	0.0	1444.2
FEB 76	327.4	542.8	67.7	185.8	358.6	42.8	0.0	0.2	1525.3
MAR 76	377.8	579.9	81.4	185.0	431.0	47.1	0.0	0.5	1702.9
APR 76	348.2	540.1	70.2	163.1	387.0	50.2	0.0	0.5	1559.3
MAY 76	385.9	581.1	72.3	150.8	337.6	50.3	0.0	0.4	1578.4
JUN 76	342.3	428.5	71.7	158.7	300.6	52.9	0.0	0.5	1355.2

Data from AMLC

TABLE 2

MTH YR	NSW	VIC	QLD	SA	WA	TAS	NT	ACT	AUST
JUL 76	307.8	333.8	71.0	146.1	355.7	38.2	0.0	0.3	1253.0
AUG 76	287.4	299.5	65.9	170.0	384.6	23.0	0.0	0.4	1230.9
SEP 76	299.6	413.6	68.5	145.1	388.0	30.1	0.0	0.3	1345.3
OCT 76	256.5	475.6	58.9	149.6	368.9	33.6	0.0	0.2	1343.5
NOV 76	296.2	535.5	58.5	178.9	410.4	41.3	0.0	0.0	1520.8
DEC 76	364.6	560.5	60.9	169.1	414.3	38.7	0.0	0.4	1608.4
TOTAL	3879.1	5784.9	808.0	1963.0	4542.6	485.3	0.0	3.7	17467.2
JAN 77	363.0	553.2	66.3	186.9	350.2	37.4	0.0	0.3	1557.2
FEB 77	412.9	576.9	99.4	227.6	391.6	56.1	0.0	0.0	1764.5
MAR 77	444.3	394.2	97.3	219.7	402.1	56.7	0.0	0.0	1614.3
APR 77	366.8	317.7	72.7	160.1	244.6	40.4	0.0	0.0	1202.4
MAY 77	370.9	279.3	73.2	121.9	194.7	40.7	0.0	0.0	1080.7
JUN 77	287.9	182.4	66.1	94.6	141.5	32.9	0.0	0.0	805.5
JUL 77	252.0	147.1	67.3	102.7	183.0	21.1	0.0	0.3	773.5
AUG 77	264.7	153.6	65.6	104.1	282.3	16.1	0.0	0.0	886.4
SEP 77	272.2	284.1	61.5	144.1	280.3	22.8	0.0	0.0	1065.1
OCT 77	309.3	475.4	72.8	198.5	294.2	19.4	0.0	0.0	1369.8
NOV 77	379.8	615.5	59.7	212.4	288.8	35.4	0.0	0.3	1591.8
DEC 77	406.8	558.1	54.3	200.8	264.1	42.2	0.0	0.3	1526.5
TOTAL	4130.6	4537.5	856.2	1973.4	3317.4	421.2	0.0	1.2	15237.7
JAN 78	420.1	566.1	54.4	203.9	220.7	40.9	0.0	0.3	1506.4
FEB 78	358.4	506.5	70.5	202.1	210.5	39.1	0.0	0.6	1387.7
MAR 78	420.0	388.1	85.2	156.6	185.7	49.0	0.0	0.3	1284.8
APR 78	291.4	234.2	81.1	71.6	129.8	45.5	0.0	0.3	853.9
MAY 78	399.7	222.7	94.0	80.6	147.0	36.2	0.0	0.5	980.5
JUN 78	197.8	95.9	63.0	57.6	111.3	19.1	0.0	0.4	545.1
JUL 78	160.8	110.9	50.7	74.1	120.7	15.9	0.0	0.2	533.3
AUG 78	243.0	153.4	68.2	64.2	144.9	18.0	0.0	0.0	691.5
SEP 78	223.2	252.0	60.5	67.9	184.3	17.3	0.0	0.2	805.3
OCT 78	303.9	463.6	71.4	70.1	208.6	25.8	0.0	0.0	1143.4
NOV 78	362.7	471.3	74.8	105.3	257.9	27.3	0.0	0.2	1299.5
DEC 78	270.2	380.4	56.1	85.7	233.3	21.6	0.0	0.0	1047.3
TOTAL	3651.2	3845.1	829.9	1239.7	2154.7	355.7	0.0	3.0	12078.7
JAN 79	274.6	400.0	65.4	98.2	255.9	26.3	0.0	0.0	1120.5
FEB 79	341.1	474.6	70.6	89.1	229.9	40.0	0.0	0.5	1245.7
MAR 79	412.9	381.7	76.1	102.5	235.9	52.9	0.0	0.5	1262.4
APR 79	281.5	296.1	73.1	72.5	218.6	29.2	0.0	0.7	971.8
MAY 79	361.8	309.0	109.5	96.2	194.1	42.1	0.0	1.2	1113.7
JUN 79	234.2	185.6	87.1	96.3	110.5	29.0	0.0	2.2	744.9
JUL 79	205.1	193.2	74.4	121.2	92.1	17.7	0.0	0.5	704.2
AUG 79	303.7	295.2	77.2	120.0	231.0	11.2	0.0	0.7	1039.0
SEP 79	247.0	328.8	73.1	111.9	257.4	13.4	0.0	0.6	1032.3
OCT 79	333.3	565.0	52.5	120.3	307.6	12.2	0.0	0.5	1391.5
NOV 79	363.5	529.3	50.1	170.8	440.1	15.9	0.0	0.3	1570.0

Data from AMLC

TABLE 2

MTH YR	NSW	VIC	QLD	SA	WA	TAS	NT	ACT	AUST
DEC 79	314.5	516.6	41.4	170.9	274.5	35.6	0.0	0.3	1353.8
TOTAL	3673.2	4475.1	850.5	1369.9	2847.6	325.5	0.0	8.0	13549.8
JAN 80	456.1	523.2	55.5	186.1	359.5	37.8	0.0	1.1	1619.3
FEB 80	456.8	441.0	74.1	177.7	283.7	38.3	0.0	1.4	1473.0
MAR 80	493.6	208.2	87.9	160.8	246.0	41.5	0.0	2.1	1240.1
APR 80	373.8	463.8	88.2	150.5	163.2	33.4	0.0	1.1	1274.0
MAY 80	326.3	221.1	71.4	93.6	120.2	35.9	0.0	0.8	870.2
JUN 80	144.1	100.0	52.6	82.2	81.8	23.8	0.0	1.1	485.5
JUL 80	159.6	142.5	53.8	105.0	107.9	14.3	0.0	3.2	586.2
AUG 80	192.7	211.5	39.4	116.7	105.1	10.3	0.0	2.6	678.2
SEP 80	297.4	392.4	49.1	167.1	192.4	15.8	0.0	4.7	1118.9
OCT 80	434.1	710.0	56.2	200.3	368.7	17.8	0.0	6.6	1793.8
NOV 80	441.7	546.8	47.2	241.1	363.2	27.4	0.0	4.4	1671.7
DEC 80	491.8	660.2	39.5	201.7	330.7	41.2	0.0	13.8	1778.9
TOTAL	4268.0	4620.7	714.9	1882.8	2722.4	337.5	0.0	42.9	14589.8
JAN 81	425.6	680.1	53.7	216.3	350.6	50.2	0.0	5.6	1781.9
FEB 81	467.5	661.0	71.8	181.0	346.9	63.1	0.0	6.6	1797.8
MAR 81	397.7	454.3	82.5	148.1	293.3	67.7	0.0	7.7	1451.3
APR 81	372.5	320.1	86.3	119.8	232.8	37.7	0.0	10.0	1179.2
MAY 81	351.8	245.6	80.5	91.6	123.2	27.9	0.0	7.6	928.2
JUN 81	131.7	98.9	45.6	75.1	97.1	30.0	0.0	5.3	483.6
JUL 81	127.8	76.1	41.7	73.1	107.2	15.9	0.0	3.7	445.6
AUG 81	126.8	75.6	38.1	73.9	72.9	10.3	0.0	3.6	401.2
SEP 81	198.4	186.6	54.2	143.5	123.2	17.5	0.0	1.9	725.4
OCT 81	205.8	452.6	56.2	165.0	252.0	20.0	0.0	3.1	1154.7
NOV 81	141.3	390.6	38.5	167.9	234.4	26.3	0.0	2.9	1001.9
DEC 81	198.0	539.8	32.0	176.7	265.9	52.8	0.0	4.6	1269.8
TOTAL	3144.9	4181.3	681.1	1632.0	2499.5	419.4	0.0	62.6	12620.6
JAN 82	232.7	604.2	35.4	204.4	286.2	58.2	0.0	3.7	1424.7
FEB 82	271.0	572.1	47.2	171.7	231.5	59.0	0.0	5.0	1357.5
MAR 82	310.2	442.1	54.5	174.2	286.4	63.0	0.0	6.2	1336.6
APR 82	217.6	294.8	47.0	146.7	240.5	51.2	0.0	5.9	1003.6
MAY 82	242.1	201.1	62.6	82.5	198.2	42.1	0.0	9.8	838.3
JUN 82	203.5	169.7	70.5	94.5	113.6	35.6	0.0	4.8	692.2
JUL 82	206.6	135.5	57.3	128.8	116.3	27.6	0.0	4.5	676.5
AUG 82	192.2	177.8	43.0	133.8	144.6	15.2	0.0	0.2	706.7
SEP 82	280.1	425.1	57.4	272.3	186.2	23.6	0.0	0.0	1244.7
OCT 82	263.1	438.0	47.6	273.0	354.7	40.2	0.0	0.0	1416.6
NOV 82	357.1	499.2	70.5	319.8	325.1	66.7	0.0	0.0	1638.3
DEC 82	283.7	608.2	54.7	281.5	269.6	76.4	0.0	0.2	1574.2
TOTAL	3059.9	4567.8	647.7	2283.2	2752.9	558.8	0.0	40.3	13909.9

Data from AMLC

TABLE 2

MTH YR	NSW	VIC	QLD	SA	WA	TAS	NT	ACT	AUST
JAN 83	257.6	445.7	27.9	207.2	282.8	62.8	0.0	0.3	1284.3
FEB 83	288.9	385.4	57.2	208.6	317.3	67.6	0.0	0.4	1325.5
MAR 83	297.6	249.9	71.7	137.2	320.0	75.4	0.0	1.1	1152.9
APR 83	254.1	162.4	52.9	69.8	302.5	36.7	0.0	0.8	879.1
MAY 83	202.9	80.5	39.8	57.0	278.9	37.6	0.0	1.7	698.3
JUN 83	160.7	43.0	31.8	49.0	188.7	33.6	0.0	1.8	508.5
JUL 83	167.4	58.7	35.9	83.6	89.0	25.5	0.0	2.0	462.1
AUG 83	204.6	81.6	40.1	48.1	97.3	18.6	0.0	0.6	491.0
SEP 83	140.3	91.6	43.6	49.9	168.8	20.5	0.0	0.3	515.1
OCT 83	175.8	167.7	37.4	110.5	234.0	20.1	0.0	0.5	746.0
NOV 83	178.4	259.4	32.6	123.0	310.4	23.3	0.0	0.4	927.4
DEC 83	104.8	234.7	25.3	109.2	229.5	25.8	0.0	0.0	729.4
TOTAL	2433.1	2260.6	496.2	1253.1	2819.2	447.5	0.0	9.9	**9719.6**
JAN 84	97.1	313.3	20.8	89.6	185.5	38.1	0.0	0.0	744.6
FEB 84	169.6	271.9	27.9	106.0	257.7	63.0	0.0	0.5	896.5
MAR 84	195.1	185.1	33.8	106.2	235.6	67.9	0.0	0.0	823.8
APR 84	142.5	140.0	42.4	84.5	312.7	42.2	0.0	1.2	765.5
MAY 84	152.8	131.2	50.3	74.8	249.8	42.5	0.0	1.1	702.5
JUN 84	152.0	125.7	37.8	105.6	115.0	31.3	0.0	0.2	567.6
JUL 84	111.9	141.3	21.0	88.7	83.6	14.8	0.0	0.0	461.4
AUG 84	102.6	153.4	22.7	116.3	124.3	9.6	0.0	0.2	529.0
SEP 84	132.5	179.0	28.5	150.9	215.1	8.7	0.0	0.2	714.8
OCT 84	241.4	332.6	29.1	203.6	260.4	20.1	0.0	0.2	1087.5
NOV 84	239.9	343.2	33.9	200.5	315.8	31.2	0.0	0.2	1164.7
DEC 84	180.6	279.8	22.3	131.0	199.8	34.7	0.0	0.0	848.3
TOTAL	1918.0	2596.5	370.5	1457.7	2555.3	404.1	0.0	3.8	**9306.2**
JAN 85	219.3	402.2	27.5	130.3	225.9	52.1	0.0	0.2	1057.6
FEB 85	259.8	414.5	28.6	145.7	223.6	60.5	0.0	0.4	1133.0
MAR 85	288.1	353.0	38.0	153.6	190.4	53.5	0.0	0.4	1076.9
APR 85	231.8	281.3	40.7	129.2	154.8	43.7	0.0	0.6	882.1
MAY 85	280.5	250.4	53.0	125.1	176.7	56.3	0.0	0.9	942.8
JUN 85	193.6	170.1	31.1	85.1	122.5	42.3	0.0	0.0	644.7
JUL 85	207.9	163.8	28.8	154.3	115.1	29.7	0.0	2.0	701.6
AUG 85	179.2	141.8	29.7	161.2	166.9	14.3	0.0	11.3	704.4
SEP 85	230.2	218.0	47.0	175.8	219.1	21.5	0.0	9.1	920.7
OCT 85	280.7	320.4	37.2	205.6	276.5	28.1	0.0	10.9	1159.3
NOV 85	268.7	411.4	36.8	214.4	374.0	36.9	0.0	9.3	1351.5
DEC 85	257.2	388.6	33.9	167.5	263.7	48.2	0.0	8.3	1169.3
TOTAL	2897.0	3515.5	432.3	1847.8	2509.2	487.1	0.0	53.4	**11743.9**
JAN 86	273.9	424.4	32.9	128.0	308.4	45.6	0.0	10.6	1223.8
FEB 86	299.1	485.9	58.1	206.6	326.2	49.3	0.0	14.4	1439.5
MAR 86	294.2	396.0	57.5	181.8	241.9	53.8	0.0	8.8	1233.9
APR 86	278.8	374.8	59.7	180.6	205.5	57.8	0.0	17.1	1174.3
MAY 86	233.7	270.0	51.0	125.5	184.0	55.0	0.0	19.5	938.8

Data from AMLC

TABLE 2

MTH YR	NSW	VIC	QLD	SA	WA	TAS	NT	ACT	AUST
JUN 86	209.1	264.6	57.6	125.2	125.7	32.8	0.0	19.4	834.4
JUL 86	257.8	257.2	52.4	170.6	117.5	20.8	0.0	27.6	903.8
AUG 86	264.5	297.1	57.5	197.5	160.1	21.1	0.0	22.2	1019.9
SEP 86	334.5	312.8	44.4	192.9	253.8	16.2	0.0	19.9	1174.6
OCT 86	365.1	408.8	56.8	220.0	391.7	25.8	0.0	12.6	1480.8
NOV 86	301.4	390.4	62.5	181.4	354.2	35.1	0.0	11.9	1337.0
DEC 86	377.8	400.5	41.2	146.1	332.8	46.5	0.0	14.3	1359.1
TOTAL	3489.9	4282.5	631.6	2056.2	3001.8	459.8	0.0	198.3	**14119.9**
JAN 87	392.3	392.4	45.4	206.7	356.1	53.5	0.0	13.3	1459.6
FEB 87	451.1	422.7	60.8	223.4	353.2	56.1	0.0	14.3	1581.7
MAR 87	474.3	357.3	71.4	195.4	293.6	57.3	0.0	15.5	1464.9
APR 87	384.5	265.5	78.5	156.6	188.5	64.2	0.0	18.7	1156.6
MAY 87	355.7	190.2	73.0	128	128.9	73.9	0.0	17.7	967.6
JUN 87	288.6	162.1	56.9	103.2	112.6	39.3	0.0	14.1	776.8
JUL 87	330.3	173.5	54.5	139.8	138.0	27.1	0.0	17.0	880.2
AUG 87	296.1	151.2	46.7	176.6	191.2	15.6	0.0	12.9	890.2
SEP 87	377.1	249.5	56.7	229.1	286.2	25.0	0.0	15.3	1238.9
OCT 87	417.6	427.2	83.0	239.4	447.8	44.2	0.0	12.6	1671.7
NOV 87	429.9	445.5	62.1	249.4	405.2	50.8	0.0	11.2	1654.1
DEC 87	450.2	445.2	49.8	204.8	342.8	65.6	0.0	13.3	1571.7
TOTAL	4647.7	3682.3	738.8	2252.4	3244.1	572.6	0.0	175.9	**15314.0**
JAN 88	474.3	380.3	45.8	229.0	329.9	66.6	0.0	10.7	1536.5
FEB 88	558.5	441.4	63.0	227.7	340.3	80.8	0.0	13.4	1725.9
MAR 88	556.9	372.6	64.6	201.0	311.0	88.5	0.0	14.5	1609.0
APR 88	249.8	210.2	67.1	117.6	177.2	70.3	0.0	10.7	902.9
MAY 88	236.2	137.0	52.3	129.3	101.7	51.9	0.0	8.2	716.6
JUN 88	188.0	95.9	50.3	70.5	96.1	43.7	0.0	8.6	553.0
JUL 88	187.5	116.2	49.6	102.0	92.6	28.3	0.0	8.5	584.8
AUG 88	306.0	156.4	51.4	128.6	111.8	16.3	0.0	10.3	781.0
SEP 88	337.5	140.1	59.0	251.2	192.1	31.8	0.0	9.7	1021.5
OCT 88	344.1	239.9	48.4	226.9	235.0	21.4	0.0	9.5	1125.2
NOV 88	393.3	381.2	46.3	226.4	308.4	32.3	0.0	14.6	1405.6
DEC 88	319.0	317.5	39.9	181.8	265.6	38.0	0.0	10.7	1172.3
TOTAL	4151.1	2988.7	637.7	2092.0	2561.7	569.9	0.0	129.4	**13134.3**
JAN 89	376.0	366.8	33.8	171.0	178.8	40.1	0.0	12.0	1178.5
FEB 89	450.7	388.9	51.1	181.7	191.8	46.0	0.0	12.9	1323.1
MAR 89	266.2	292.1	68.8	167.9	256.5	46.9	0.0	8.6	1107.0
APR 89	281.8	249.0	48.4	124.4	201.6	43.3	0.0	13.3	961.9
MAY 89	300.1	221.8	58.8	120.8	180.2	36.1	0.0	14.0	931.8
JUN 89	232.5	182.9	80.0	95.8	133.4	31.8	0.0	12.6	769.1
JUL 89	305.9	140.6	82.2	145.7	162.5	21.5	0.0	10.8	869.1
AUG 89	416.8	228.2	85.7	174.3	270.9	15.4	0.0	15.6	1206.9
SEP 89	395.6	235.7	83.1	213.7	383.1	15.3	0.0	13.1	1339.5
OCT 89	397.1	251.3	78.4	160.0	359.3	21.0	0.0	12.3	1279.4

Data from AMLC

TABLE 2

MTH YR	NSW	VIC	QLD	SA	WA	TAS	NT	ACT	AUST
NOV 89	450.1	305.8	59.6	199.6	383.9	39.4	0.0	17.2	1455.6
DEC 89	388.2	269.0	37.3	196.8	330.3	42.9	0.0	12.8	1277.2
TOTAL	4261.0	3132.1	767.2	1951.7	3032.3	399.7	0.0	155.2	13699.1
JAN 90	485.7	354.4	40.4	206.9	371.3	65.3	0.0	18.7	1542.7
FEB 90	462.5	351.8	63.8	233.5	414.9	70.3	0.0	19.3	1616.1
MAR 90	574.0	341.9	75.9	226.3	401.8	71.3	0.0	25.9	1717.2
APR 90	345.5	284.5	45.1	206.8	276.2	56.1	0.0	20.0	1234.3
MAY 90	442.0	329.0	48.8	243.6	256.6	70.6	0.0	22.6	1413.2
JUN 90	357.8	233.9	66.4	210.2	204.0	43.3	0.0	19.6	1135.2
JUL 90	359.9	253.3	57.9	185.0	189.5	18.1	0.0	22.0	1085.7
AUG 90	409.2	260.1	53.0	231.6	270.5	18.9	0.0	21.5	1264.8
SEP 90	416.7	255.0	57.0	260.9	357.3	18.2	0.0	17.2	1382.2
OCT 90	481.6	375.4	50.1	290.2	444.1	27.8	0.0	19.6	1688.7
NOV 90	413.1	398.3	59.8	306.9	464.4	48.8	0.0	19.1	1710.5
DEC 90	396.0	402.2	51.2	218.9	435.7	41.5	0.0	17.2	1562.8
TOTAL	5144.0	3839.8	669.4	2820.8	4086.3	550.2	0.0	242.7	17353.4
JAN 91	542.0	496.9	60.2	216.6	424.1	52.9	0.0	20.0	1812.6
FEB 91	551.2	525.0	81.4	221.7	451.2	56.6	0.0	23.4	1910.5
MAR 91	548.4	373.2	97.0	203.6	437.8	47.4	0.0	22.4	1729.9
APR 91	479.5	315.7	95.2	255.3	292.6	30.7	0.0	23.6	1492.6
MAY 91	492.4	293.3	98.3	219.3	264.9	50.3	0.0	25.8	1444.3
JUN 91	336.5	208.1	111.6	131.7	155.8	33.3	0.0	23.3	1000.4
JUL 91	391.1	220.1	158.0	144.3	202.8	15.4	0.0	17.5	1149.2
AUG 91	419.9	146.7	137.8	184.6	194.4	13.3	0.0	15.5	1112.1
SEP 91	460.0	152.2	98.7	321.1	247.3	15.6	0.0	15.1	1310.1
OCT 91	522.6	363.9	111.0	371.4	305.1	26.6	0.0	17.2	1717.7
NOV 91	586.4	360.4	130.1	388.4	374.5	55.1	0.0	14.3	1909.1
DEC 91	515.2	340.7	106.1	295.1	339.0	42.3	0.0	14.6	1653.1
TOTAL	5845.2	3796.2	1285.4	2953.1	3689.5	439.5	0.0	232.7	18241.6
JAN 92	591.3	391.1	126.7	209.2	244.8	56.6	0.0	20.0	1639.7
FEB 92	591.5	401.3	137.4	256.4	247.1	53.7	0.0	16.9	1704.3
MAR 92	624.9	378.3	146.9	274.2	273.5	45.8	0.0	13.0	1756.6
APR 92	509.9	322.6	165.4	230.6	213.8	55.3	0.0	18.8	1516.4
MAY 92	453.9	305.3	154.1	180.5	212.8	37.5	0.0	15.3	1359.4
JUN 92	423.3	254.7	155.7	105.1	156.9	29.6	0.0	14.1	1139.4
JUL 92	418.2	259.8	148.8	81.2	169.3	27.9	0.0	15.2	1120.4
AUG 92	389.4	206.7	129.9	246.9	191.2	19.3	0.0	13.0	1196.5
SEP 92	457.3	215.1	125.0	255.5	290.0	20.4	0.0	15.9	1379.4
OCT 92	454.9	364.1	144.3	258.1	362.9	29.5	0.0	11.9	1625.7
NOV 92	376.3	414.6	136.9	276.6	383.7	38.2	0.0	11.2	1637.4
DEC 92	486.4	381.4	133.9	236.2	330.2	41.9	0.0	14.5	1624.5
TOTAL	5777.3	3895.0	1705.0	2610.5	3076.2	455.7	0.0	179.8	17699.7

Data from AMLC

TABLE 3: Annual slaughterings of sheep in Australia and by states from 1970/71 - 1991/92 ('000)

YEAR	NSW+ACT	VIC	QLD	SA	WA	TAS	AUST
70/71	6909.5	8450.4	2109.5	2540.2	2884.3	713.5	23610.1
71/72	8841.8	11953.3	2479.3	2458.8	4105.9	813.0	30657.3
72/73	6370.0	8612.4	1712.6	2397.0	4229.3	636.5	23958.0
73/74	2755.1	3587.7	919.8	1138.5	2570.9	335.7	11307.4
74/75	2949.6	4495.6	765.1	1134.0	2978.3	402.8	12725.4
75/76	3697.2	5676.9	863.7	1803.8	4283.7	455.0	16781.3
76/77	4059.8	4922.2	858.7	1969.6	4046.6	469.1	16326.5
77/78	3975.5	4247.3	829.4	1735.0	2597.7	386.8	13771.5
78/79	3475.6	3878.6	863.5	1022.1	2394.6	345.4	11979.3
79/80	4028.3	4385.4	798.4	1666.0	2857.1	316.7	14052.9
80/81	4242.2	5123.5	705.6	1863.8	2911.9	403.4	15249.7
81/82	2530.4	4005.3	577.9	1674.1	2412.0	451.9	11651.5
82/83	3055.6	3650.7	611.8	2138.0	3086.7	563.4	13105.6
83/84	1887.2	2060.9	427.9	1091.0	2485.3	418.8	8371.5
84/85	2485.3	3300.8	376.4	1660.0	2292.9	427.5	10542.8
85/86	3153.4	3859.7	530.2	2026.5	2807.0	473.0	12851.5
86/87	4449.7	3857.0	700.8	2121.8	3043.0	509.8	14682.4
87/88	4713.3	3529.5	695.9	2214.2	3167.4	630.0	14950.7
88/89	3931.4	3052.8	635.5	1978.5	2347.8	412.3	12361.8
89/90	5229.1	3326.1	766.7	2417.4	3814.8	532.4	16086.4
90/91	5681.6	4156.5	872.7	2741.7	4187.9	444.5	18085.0
91/92	6282.3	3637.3	1627.9	2960.9	3012.0	446.8	17967.1

TABLE 4: Annual slaughterings of lambs in Australia and by states from 1970/71 - 1991/92 ('000)

YEAR	NSW+ACT	VIC	QLD	SA	WA	TAS	AUST
70/71	8150.7	7845.1	782.4	2562.6	1463.7	681.0	21485.6
71/72	8017.0	8129.3	939.0	2684.5	1894.5	662.1	22326.2
72/73	6417.9	6717.2	739.5	2141.6	1318.8	641.8	17976.3
73/74	5098.9	5317.2	400.9	1456.5	1185.3	489.8	13948.1
74/75	6023.3	5740.0	514.1	1850.3	1329.5	576.9	16034.2
75/76	5710.9	5696.0	536.3	1757.5	1744.0	613.5	16058.5
76/77	5278.0	5549.8	647.8	1457.1	1830.9	523.5	15286.5
77/78	5312.2	5731.0	650.3	1505.2	1485.2	649.9	15333.6
78/79	5446.8	5398.9	578.7	1500.8	1382.2	502.8	14810.7
79/80	5914.1	5945.0	579.9	1784.9	1555.4	613.1	16392.4
80/81	5696.7	6436.0	626.3	1685.1	1555.4	646.8	16646.2
81/82	5680.4	6430.1	722.0	1665.0	1144.1	690.6	16332.1
82/83	6052.0	6390.1	747.4	1934.2	988.8	764.4	16876.8
83/84	6467.7	6207.8	882.1	1754.2	1039.7	757.0	17107.2
84/85	6249.4	6776.7	848.7	1767.8	1152.2	684.0	17478.1
85/86	6527.8	8047.3	887.5	1829.9	1088.3	668.6	19049.7
86/87	5587.3	7540.8	841.2	1887.1	1168.0	670.7	17697.0
87/88	5425.7	7111.0	914.2	1939.7	1141.4	656.1	17187.7
88/89	5653.4	6263.9	958.9	1982.3	997.5	595.3	16453.1
89/90	5428.0	6199.9	947.7	2162.9	1470.2	588.8	16794.3
90/91	5159.7	6407.1	987.7	1810.5	1583.2	558.8	16506.9
91/92	5070.6	6318.9	1015.2	1615.0	1238.4	488.4	15746.6

Data from AMLC

TABLE 5: Combined annual slaughterings of sheep and lambs in Australia and by states from 1970/71 - 1991/92 ('000)

YEAR	NSW+ACT	VIC	QLD	SA	WA	TAS	AUST
70/71	15060.2	16295.5	2891.9	5102.8	4348.0	1394.5	45095.7
71/72	16858.8	20082.6	3418.3	5143.3	6000.4	1475.1	52983.5
72/73	12787.9	15329.6	2452.1	4538.6	5548.1	1278.3	41934.3
73/74	7854.0	8904.9	1320.7	2595.0	3756.2	825.5	25255.5
74/75	8972.9	10235.6	1279.2	2984.3	4307.8	979.7	28759.6
75/76	9408.1	11372.9	1400.0	3561.3	6027.7	1068.5	32839.8
76/77	9337.8	10472.0	1506.5	3426.7	5877.5	992.6	31613.0
77/78	9287.7	9978.3	1479.7	3240.2	4082.9	1036.7	29105.1
78/79	8922.4	9277.5	1442.2	2522.9	3776.8	848.2	26790.0
79/80	9942.4	10330.4	1378.3	3450.9	4412.5	929.8	30445.3
80/81	9938.9	11559.5	1331.9	3548.9	4467.3	1050.2	31895.9
81/82	8210.8	10435.4	1299.9	3339.1	3556.1	1142.5	27983.6
82/83	9107.6	10040.8	1359.2	4072.2	4075.5	1327.8	29982.4
83/84	8354.9	8268.7	1310.0	2845.2	3525.0	1175.8	25478.7
84/85	8734.7	10077.5	1225.1	3427.8	3445.1	1111.5	28020.9
85/86	9681.2	11907.0	1417.7	3856.4	3895.3	1141.6	31901.2
86/87	10037.0	11397.8	1542.0	4008.9	4211.0	1180.5	32379.4
87/88	10139.0	10640.5	1610.1	4153.9	4308.8	1286.1	32138.4
88/89	9584.8	9316.7	1594.4	3960.8	3345.3	1007.6	28814.9
89/90	10657.1	9526.0	1714.4	4580.3	5285.0	1121.2	32880.7
90/91	10841.3	10563.6	1860.4	4552.2	5771.1	1003.3	34591.9
91/92	11352.9	9956.2	2643.1	4575.9	4250.4	935.2	33713.7

Data from AMLC

TABLE 9: Combined totals of sheep and lambs slaughtered by state and nationally in Australia during October to March from 1970/71-1991/92 ('000)

YEAR	NSW+ACT	VIC	QLD	SA	WA	TAS	AUST
70/71	7472.7	8616.3	1346.5	2625.4	2031.0	738.0	22831.6
71/72	8524.7	10551.3	1750.1	2497.2	3126.9	779.1	27231.9
72/73	6610.2	9482.2	1176.9	2705.3	3440.3	754.3	24169.1
73/74	3920.1	5335.3	671.8	1384.6	2101.8	447.1	13860.7
74/75	4571.0	6102.7	631.2	1567.3	2350.7	544.9	15767.6
75/76	4693.4	6219.9	687.1	1820.6	3237.3	567.5	17226.4
76/77	4711.6	6096.7	759.1	1856.3	3250.9	531.9	17206.1
77/78	4907.1	6329.3	703.0	2013.5	2158.2	619.4	16730.3
78/79	4771.6	5562.3	701.2	1405.0	2164.7	481.4	15086.4
79/80	5388.8	5639.4	646.4	1815.8	2671.1	523.7	16685.4
80/81	5489.1	6905.2	664.6	1994.8	2819.5	598.5	18471.3
81/82	4204.5	6411.5	612.3	1968.8	2162.7	640.7	16000.5
82/83	4725.5	5920.7	677.1	2351.0	2418.0	813.5	16905.6
83/84	3909.7	4502.2	587.2	1490.9	2048.8	655.7	13193.7
84/85	4575.7	5574.6	601.6	1869.2	2016.4	621.1	15258.5
85/86	5111.4	6516.9	684.6	2099.4	2371.0	621.7	17406.8
86/87	5354.6	6249.7	760.2	2146.9	2763.5	627.4	17904.3
87/88	5770.8	6373.0	827.6	2374.0	2856.5	762.8	18965.1
88/89	4938.9	5210.9	757.7	2181.6	1936.1	543.7	15572.5
89/90	5548.6	4988.1	811.1	2334.7	2962.8	617.0	17262.3
90/91	5585.0	5861.4	885.5	2409.8	3409.3	553.8	18704.9
91/92	6007.6	5565.3	1269.0	2651.7	2371.3	537.4	18402.1

Data from AMLC

TABLE 10: Percentages of annual sheep slaughterings occurring from October to March inclusive, by state and nationally in Australia from 1970/71-1991/92

YEAR	NSW+ACT	VIC	QLD	SA	WA	TAS	AUST
70/71	48.7	51.5	45.9	50.6	45.4	52.0	49.3
71/72	51.1	54.5	50.7	49.3	52.1	52.2	52.4
72/73	53.4	66.7	47.4	58.8	62.5	62.6	60.1
73/74	49.7	67.8	51.0	54.7	57.2	54.5	57.9
74/75	49.3	63.1	48.7	48.3	55.1	52.2	55.5
75/76	50.3	55.7	50.0	53.8	54.3	50.6	53.5
76/77	52.7	62.9	51.4	57.5	57.8	56.2	57.6
77/78	57.8	73.2	47.9	67.7	56.4	58.4	62.9
78/79	56.6	66.3	48.0	53.9	59.4	56.1	59.4
79/80	60.2	63.5	45.3	59.2	66.9	57.2	61.5
80/81	63.7	72.5	49.7	63.8	70.5	66.3	67.4
81/82	54.7	74.9	45.6	63.3	64.5	61.8	64.8
82/83	57.3	71.9	53.9	66.8	60.6	69.1	64.0
83/84	48.9	69.5	41.6	59.1	58.5	56.9	58.1
84/85	57.6	64.4	47.7	58.1	61.8	59.0	60.4
85/86	55.1	62.9	48.4	54.5	63.8	55.4	59.0
86/87	54.9	61.5	48.2	55.3	68.4	53.8	59.1
87/88	62.9	71.2	52.9	61.0	68.7	62.9	65.3
88/89	56.4	65.1	45.4	58.4	61.2	54.5	59.1
89/90	54.8	56.3	46.4	50.6	59.3	58.3	55.3
90/91	53.8	61.9	45.8	53.2	63.5	61.9	57.6
91/92	56.2	61.5	46.6	60.6	59.2	62.7	57.8

TABLE 11: Percentages of annual lamb slaughterings occurring from October to March inclusive, by state and nationally in Australia from 1970/71-1991/92

YEAR	NSW+ACT	VIC	QLD	SA	WA	TAS	AUST
70/71	50.4	54.3	48.3	52.3	49.3	53.8	52.0
71/72	50.0	49.6	52.4	47.8	52.1	53.6	50.0
72/73	50.0	55.7	49.5	60.5	60.4	55.5	54.3
73/74	50.0	54.6	50.7	52.3	53.3	53.9	52.4
74/75	51.7	56.9	50.3	55.1	53.3	58.0	54.3
75/76	49.6	53.7	47.7	48.4	52.3	55.0	51.4
76/77	48.8	54.1	49.1	49.7	49.9	51.2	51.0
77/78	49.1	56.2	47.1	55.8	46.7	60.5	52.6
78/79	51.5	55.4	49.6	56.9	53.8	57.2	53.8
79/80	50.1	48.0	49.1	46.5	48.8	55.8	49.0
80/81	48.9	49.6	50.1	47.8	49.3	51.2	49.2
81/82	49.6	53.0	48.3	54.6	53.0	52.3	51.8
82/83	49.2	51.6	46.5	47.8	55.5	55.5	50.4
83/84	46.2	49.5	46.4	48.2	57.3	55.2	48.7
84/85	50.3	50.9	49.7	51.2	52.1	53.9	50.9
85/86	51.7	50.8	48.2	54.4	53.3	53.8	51.6
86/87	52.1	51.4	50.2	51.6	58.4	52.6	52.1
87/88	51.7	54.3	50.2	52.7	59.5	55.8	53.5
88/89	48.1	51.5	49.0	51.8	50.1	53.6	50.2
89/90	49.5	50.2	48.1	51.4	47.7	52.1	49.9
90/91	49.1	51.4	49.2	52.6	47.5	49.9	50.2
91/92	48.9	52.7	50.3	53.1	47.4	52.7	50.9

Data from AMLC

TABLE 6: Mean monthly slaughterings of sheep and lambs by states and total for Australia (with standard deviations) between 1970 and 1992 ('000)

SHEEP	NSW		VIC		QLD		SA		WA		TAS		NT		ACT		AUST	
MONTH	MEAN	ST.DEV	MEAN	ST.DEV	MEAN	ST.DEV	MEAN	ST.DEV	MEAN	ST.DEV	MEAN	ST.DEV	MEAN	ST.DEV	MEAN	ST.DEV	MEAN	ST.DEV
JAN	390.2	151.2	531.6	184.1	67.0	41.4	181.3	48.2	305.7	74.5	50.8	14.0	0.0	0.1	5.2	7.0	1531.9	424.6
FEB	415.9	139.6	535.7	189.5	85.5	47.6	189.1	47.4	306.0	74.5	56.4	13.8	0.0	0.2	5.9	7.4	1594.5	414.8
MAR	440.1	156.2	469.5	240.9	96.7	51.9	179.2	48.8	307.3	85.5	58.6	13.3	0.0	0.1	5.8	7.5	1557.2	497.0
APR	358.3	129.3	367.8	197.2	89.8	49.0	152.7	56.3	246.9	67.0	48.2	13.3	0.0	0.1	6.5	7.9	1270.3	435.7
MAY	375.4	149.7	328.2	212.6	93.8	52.0	132.4	50.7	216.1	73.3	47.6	13.9	0.0	0.1	6.7	8.1	1200.3	497.3
JUN	302.8	173.2	260.6	226.6	87.7	54.8	116.0	49.3	159.9	62.9	36.1	11.2	0.0	0.0	5.9	7.3	969.0	547.9
JUL	297.1	162.2	250.5	209.5	82.5	54.5	130.8	47.3	167.9	75.0	27.1	12.2	0.0	0.1	6.2	7.9	962.1	518.0
AUG	303.3	137.8	256.0	191.9	78.5	49.3	143.7	54.9	205.4	80.0	20.3	10.8	0.0	0.1	6.0	7.3	1013.2	454.6
SEP	322.4	127.3	320.0	199.8	78.3	42.4	172.9	69.4	252.4	68.3	24.1	11.0	0.0	0.1	5.6	6.8	1178.7	402.8
OCT	356.7	121.7	463.8	197.9	80.3	42.5	191.1	72.1	311.0	70.4	30.3	12.1	0.0	0.1	5.4	6.3	1438.7	381.0
NOV	372.9	141.5	496.2	196.9	78.8	46.7	204.5	70.6	337.4	79.0	39.2	13.3	0.0	0.1	5.3	6.4	1534.4	397.6
DEC	364.4	154.4	498.2	208.5	66.0	44.0	178.2	53.9	306.4	71.0	43.8	14.5	0.0	0.1	5.6	6.4	1462.7	446.0

LAMBS	NSW		VIC		QLD		SA		WA		TAS		NT		ACT		AUST	
MONTH	MEAN	ST.DEV	MEAN	ST.DEV	MEAN	ST.DEV	MEAN	ST.DEV	MEAN	ST.DEV	MEAN	ST.DEV	MEAN	ST.DEV	MEAN	ST.DEV	MEAN	ST.DEV
JAN	465.6	77.5	551.7	69.4	65.9	13.9	135.0	26.3	68.3	21.3	61.9	9.9	0.0	0.0	21.0	7.8	1369.3	167.1
FEB	437.6	81.6	501.9	69.5	62.3	13.1	126.3	20.8	62.1	18.3	58.4	10.1	0.0	0.0	19.1	6.7	1267.8	164.0
MAR	476.5	95.8	518.3	99.3	69.3	18.1	136.5	24.3	67.6	20.4	61.2	12.6	0.0	0.0	19.7	8.2	1349.0	207.0
APR	457.2	79.0	493.7	104.5	66.9	15.8	127.1	33.8	69.5	20.1	50.8	7.6	0.0	0.0	19.1	8.6	1284.2	207.9
MAY	477.5	86.9	502.4	105.0	66.1	12.5	124.0	29.4	67.9	24.1	52.6	10.0	0.0	0.0	20.1	7.9	1310.6	220.6
JUN	463.0	98.6	474.8	97.4	65.2	15.8	116.9	28.0	68.6	34.0	52.7	11.0	0.0	0.0	18.0	6.7	1259.2	228.0
JUL	478.5	78.6	513.1	77.3	65.1	17.3	133.3	30.4	89.9	32.9	48.6	9.0	0.0	0.0	19.6	7.5	1348.0	167.9
AUG	487.2	101.5	531.0	89.4	62.2	18.1	177.4	48.1	140.7	49.3	42.0	5.3	0.0	0.0	20.0	9.4	1460.5	214.0
SEP	491.2	93.6	569.5	85.0	62.0	19.4	211.0	50.0	214.3	64.8	38.2	7.5	0.0	0.0	21.2	9.4	1607.4	199.4
OCT	504.3	82.4	640.8	74.6	60.1	18.3	230.5	54.7	264.5	61.4	43.2	6.6	0.0	0.0	23.1	10.3	1766.5	199.2
NOV	487.8	77.4	608.0	90.3	57.6	16.0	188.9	43.2	162.1	47.8	51.1	10.0	0.0	0.0	24.0	9.8	1579.5	188.9
DEC	450.9	82.2	569.1	87.5	56.1	14.3	144.5	28.0	75.9	20.4	60.5	13.9	0.0	0.0	20.4	7.8	1377.6	202.9

TABLE 7: Numbers of sheep slaughtered from October to March by state and nationally from 1970/71 to 1991/92 ('000)

YEAR	NSW+ACT	VIC	QLD	SA	WA	TAS	AUST
70/71	3361.5	4354.5	968.7	1284.4	1309.2	371.3	11651.1
71/72	4517.5	6519.7	1257.8	1213.3	2140.8	424.5	16076.2
72/73	3404.1	5740.2	811.2	1408.7	2643.1	398.4	14405.9
73/74	1370.1	2433.7	468.7	623.0	1469.9	183.1	6548.5
74/75	1455.1	2838.7	372.7	547.2	1641.5	210.1	7065.1
75/76	1861.0	3159.2	431.5	970.6	2324.7	230.1	8977.7
76/77	2138.4	3095.9	441.3	1131.8	2337.5	263.8	9408.7
77/78	2296.2	3109.7	396.9	1174.3	1464.0	226.0	8667.0
78/79	1966.6	2571.6	414.4	550.9	1421.5	193.9	7118.8
79/80	2423.5	2783.3	361.5	986.6	1911.4	181.3	8647.7
80/81	2703.1	3712.4	350.9	1188.5	2053.4	267.4	10275.4
81/82	1384.5	3001.4	263.8	1059.9	1556.4	279.3	7545.2
82/83	1750.0	2626.4	329.6	1427.3	1869.5	389.1	8391.8
83/84	922.2	1432.1	177.8	644.5	1452.7	238.2	4867.7
84/85	1430.5	2125.3	179.4	964.7	1415.9	252.1	6368.0
85/86	1736.1	2426.7	256.4	1103.9	1790.7	261.9	7577.3
86/87	2443.9	2372.1	338.1	1173.0	2081.6	274.3	8683.1
87/88	2963.1	2512.2	368.3	1351.3	2177.0	396.5	9768.9
88/89	2217.6	1986.4	288.3	1155.7	1436.1	224.7	7311.7
89/90	2863.8	1874.2	355.4	1223.1	2261.5	310.2	8888.2
90/91	3054.0	2571.0	399.7	1457.9	2657.3	275.0	10415.0
91/92	3527.9	2235.7	758.2	1794.7	1784.0	280.1	10380.5

TABLE 8: Numbers of lambs slaughtered from October to March by state and nationally between 1970/71-1991/92 ('000)

YEAR	NSW+ACT	VIC	QLD	SA	WA	TAS	AUST
70/71	4111.2	4261.8	377.8	1341.0	721.8	366.7	11180.5
71/72	4007.2	4031.6	492.3	1283.9	986.1	354.6	11155.7
72/73	3206.1	3742.0	365.7	1296.6	797.2	355.9	9763.2
73/74	2550.0	2901.6	203.1	761.6	631.9	264.0	7312.2
74/75	3115.9	3264.0	258.5	1020.1	709.2	334.8	8702.5
75/76	2832.4	3060.7	255.6	850.0	912.6	337.4	8248.7
76/77	2573.2	3000.8	317.8	724.5	913.4	268.1	7797.4
77/78	2610.9	3219.6	306.1	839.2	694.2	393.4	8063.3
78/79	2805.0	2990.7	286.8	854.1	743.2	287.5	7967.6
79/80	2965.3	2856.1	284.9	829.2	759.7	342.4	8037.7
80/81	2786.0	3192.8	313.7	806.3	766.1	331.1	8195.9
81/82	2820.0	3410.1	348.5	908.9	606.3	361.4	8455.3
82/83	2975.5	3294.3	347.5	923.7	548.5	424.4	8513.8
83/84	2987.5	3070.1	409.4	846.4	596.1	417.5	8326.0
84/85	3145.2	3449.3	422.2	904.5	600.5	369.0	8890.5
85/86	3375.3	4090.2	428.2	995.5	580.3	359.8	9829.5
86/87	2910.7	3877.6	422.1	973.9	681.9	353.1	9221.2
87/88	2807.7	3860.8	459.3	1022.7	679.5	366.3	9196.2
88/89	2721.3	3224.5	469.4	1025.9	500.0	319.0	8260.8
89/90	2684.8	3113.9	455.7	1111.6	701.3	306.8	8374.1
90/91	2531.0	3290.4	485.8	951.9	752.0	278.8	8289.9
91/92	2479.7	3329.6	510.8	857.0	587.3	257.3	8021.6

Data from AMLC

TABLE 12: Percentages of combined annual sheep and lamb slaughterings occurring from October to March inclusive from 1970/71-1991/92

YEAR	NSW+ACT	VIC	QLD	SA	WA	TAS	AUST
70/71	49.6	52.9	46.6	51.5	46.7	52.9	50.6
71/72	50.6	52.5	51.2	48.6	52.1	52.8	51.4
72/73	51.7	61.9	48.0	59.6	62.0	59.0	57.6
73/74	49.9	59.9	50.9	53.4	56.0	54.2	54.9
74/75	50.9	59.6	49.3	52.5	54.6	55.6	54.8
75/76	49.9	54.7	49.1	51.1	53.7	53.1	52.5
76/77	50.5	58.2	50.4	54.2	55.3	53.6	54.4
77/78	52.8	63.4	47.5	62.1	52.9	59.7	57.5
78/79	53.5	60.0	48.6	55.7	57.3	56.8	56.3
79/80	54.2	54.6	46.9	52.6	60.5	56.3	54.8
80/81	55.2	59.7	49.9	56.2	63.1	57.0	57.9
81/82	51.2	61.4	47.1	59.0	60.8	56.1	57.2
82/83	51.9	59.0	49.8	57.7	59.3	61.3	56.4
83/84	46.8	54.4	44.8	52.4	58.1	55.8	51.8
84/85	52.4	55.3	49.1	54.5	58.5	55.9	54.5
85/86	52.8	54.7	48.3	54.4	60.9	54.5	54.6
86/87	53.3	54.8	49.3	53.6	65.6	53.1	55.3
87/88	56.9	59.9	51.4	57.2	66.3	59.3	59.0
88/89	51.5	55.9	47.5	55.1	57.9	54.0	54.0
89/90	52.1	52.4	47.3	51.0	56.1	55.0	52.5
90/91	51.5	55.5	47.6	52.9	59.1	55.2	54.1
91/92	52.9	55.9	48.0	57.9	55.8	57.5	54.6

Data from AMLC

TABLE 13: Annual slaughterings of sheep and lambs, annual exports of sheep and lamb skins, differences between the two and the difference as a percentage of the animals slaughtered

YEAR	SHEEP SLAUGHTERED	SHEEP SKINS	SLAUGHTERED -SKINS	% NCV	LAMBS SLAUGHTERED	LAMB SKINS	SLAUGHTERED -SKINS	% NCV	WOOL PRICES(c/Kg)
70/71	23610.1	23007.4	602.7	2.6	21485.6	13173.0	8312.6	38.7	383
71/72	30657.3	25604.3	5053.0	16.5	22326.2	14411.1	7915.1	35.5	421
72/73	23958.0	25813.9	-1855.9	-7.7	17976.3	14117.1	3859.2	21.5	939
73/74	11307.4	13619.5	-2312.1	-20.4	13948.1	10761.1	3187.0	22.8	805
74/75	12725.4	12060.0	665.4	5.2	16034.2	12314.6	3719.6	23.2	490
75/76	16781.3	15653.1	1128.2	6.7	16058.5	13194.5	2864.0	17.8	487
76/77	16326.5	16966.5	-640.0	-3.9	15286.5	13301.9	1984.6	13.0	553
77/78	13771.5	12945.0	826.5	6.0	15333.6	13378.8	1954.8	12.7	524
78/79	11979.3	11512.6	466.7	3.9	14810.7	13391.4	1419.3	9.6	527
79/80	14052.9	11251.5	2801.4	19.9	16392.4	14798.2	1594.2	9.7	568
80/81	15249.7	11069.9	4179.8	27.4	16646.2	13944.7	2701.5	16.2	544
81/82	11651.5	8683.7	2967.8	25.5	16332.1	14689.7	1642.4	10.1	507
82/83	13105.6	6759.9	6345.7	48.4	16876.8	14843.5	2033.3	12.0	469
83/84	8371.5	5380.8	2990.7	35.7	17107.2	15457.5	1649.7	9.6	491
84/85	10542.8	6632.1	3910.7	37.1	17478.1	15455.8	2022.3	11.6	499
85/86	12851.5	8085.1	4766.4	37.1	19049.7	18790.1	259.6	1.4	491
86/87	14682.4	12737.1	1945.3	13.2	17697.0	13075.0	4622.0	26.1	523
87/88	14950.7	6738.3	8212.4	54.9	17187.7	8061.4	9126.3	53.1	778
88/89	12361.8	10365.8	1996.0	16.1	16453.1	14867.4	1585.7	9.6	743
89/90	16086.4	13249.2	2837.2	17.6	16794.3	16097.4	696.9	4.1	596
90/91	18085.0	8997.5	9087.5	50.2	16506.9	13866.9	2640.0	16.0	429
91/92	17967.1	9686.3	8280.8	46.1	15746.6	12697.7	3048.9	19.4	365

Sheep slaughter data from AMLC, skin data from Australian Bureau of Census and Statistics, wool prices from Australian Wool Corporation.

Capacities and locations of abattoirs in Australia with capacities greater than 500 or more sheep and lambs per day. (Data from Australian Meat and Livestock Corporation.)

Company Name	Town	Daily Sheep Slaughtered
State: NSW		
Beer's Abattoirs	Culcairn	1300
Blayney Abattoirs Pty Ltd	Blayney	2500
Burrangong Abattoir	Young	950
Cargill Foods Australia	Wagga Wagga	800
Cowra Abattoir	Cowra	2059
Codgegong County Council	Mudgee	3000
Famicorp Pty Ltd	Deniliquin	1600
Fletcher International Exports P/L	Dubbo	7200
Gunnedah Shire Abattoir	Gunnedah	3000
Guyra Meat Packing Pty Ltd	Guyra	1800
Harden Abattoir Pty Ltd	Harden	2000
Meat Exports Sydney Pty Ltd	Central Tilba	500
Metro Meat Limited	Gosford	3944
Metro Meat Ltd	Orange	944
Metro Meat Ltd	Wyong	1318
Parrish Meat Supplies	Wollongong	2000
Scone Abattoir Pty Ltd	Scone	2000
Scott G.M Pty Ltd	Cootamundra	2000
Tamworth City Council Abattoirs	Tamworth	500
State: ACT		
P.D. Mulligan Pty Ltd	Kingston	2300
State: QLD		
Hutton JC Pty Ltd	Corinda	600
Ipswich Regional Abattoir	Ipswich	600
Kilcoy Pastoral Company Pty Ltd	Kilcoy	500
Killarney Abattoir Pty Ltd	Killarney	500
Metropolitan Regional Abattoir	Morningside	1000
Ron Jones Exports (Aust) Pty Ltd	Wallangarra	2000
St. George Meat & Livestock Pty Ltd	Bulimea	1500
State: SA		
Abdilla Meats Pty Ltd	Two Wells	600
Lobethal Abattoir Pty Ltd	Lobethal	2000
Metro Meat Ltd	Old Noarlunga	2800
Metro Meat Ltd (Murray Bridge)	Murrary Bridge	3600
Mount Gambier Meat Processing P/L	Mount Gambier	2000
Normanville Abattoirs	Normanville	600
Northern Butchers Nominees Pty Ltd	Port Pirie	1800
South Australian Meat Corporation	Gepps Cross	2900
Tatiara Meat Company Pty Ltd	Bordertown	5000
State: TAS		
Blue Ribbon Meat Products Pty Ltd	Launceston	1500
Bridgewater Abattoirs Pty Ltd	Bridgewater	800
Hawkridge Meat Company Pty Ltd	Quoiba	1100
Longford Meat Company Pty Ltd	Longford	900

Company Name	Town	Daily Sheep Slaughtered	
State: VIC			
Ashton Pty Ltd	Swan Hill	5000	
Australia Meat Holdings	Portland	4698	*
Barnawartha Abattoirs	Barnawartha	5000	
Carrum Meatworks	Chelsea	1360	
Castricum Abattoirs Pty Ltd	Casterton	600	
Castricum Brothers Pty Ltd	Dandenong	1000	*
Castricum Brothers Pty Ltd	Dandenong	1300	
Cobram Abattoirs Pty Ltd	Cobram	9000	
D & S Meats	Hamilton	1800	
East Gippsland Quality Meats	Bairnsdale	500	
Echuca Abattoirs	Echuca	800	
Elinora Properties Pty Ltd	Seymour	900	
Frewstal Pty Ltd	Stawell	1600	
G.F. & V.C. Hardwick	Kyneton	1800	
Gathercole G & B Pty Ltd	Chelsea	900	
Gilbertson Greenham Pty Ltd	Altona North	3500	
Gumby Pty Ltd	Daylesford	1200	
Kerbrook Pty Ltd	Brooklyn	2300	
Louis Dreyfus Services Pty Ltd	Altona North	3600	
Myrtleford Abattoirs Pty Ltd	Myrtleford	600	
Penney & Lang Pty Ltd	Carisbrook	1300	
Radford R & Son Pty Ltd	Warragul	600	
Ryan W Abattoir Pty Ltd	Nathalia	800	
Sunraysia Abattoirs	Mildura	1500	
Tallangatta Abattoirs Pty Ltd	Tallangatta	5200	
Tatura Pty Ltd	Tatura	900	
Wagstaff Cranbourne Pty Ltd	Cranbourne	800	
Wang Meat Company	Wangaratta	500	
Warrnambool Bayside Meatworks P/L	Warrnambool	1900	
Western District Meat Packing Co	Colac	1400	
Wimmera Meat Exporters	Woorak Via Nhill	1270	
Wodonga Meats Pty Ltd	Wodonga	5000	
State: WA			
Dardanup Butchering Company	Picton	500	
Derby Industries Pty Ltd	Bunbury	1400	
Goodchilds Abattoir	Australind	500	
Metro Meat Geraldton Division	Fremantle	2106	
Metro Meat Ltd	Albany	4000	
Metro Meat Pty Ltd (Katanning)	Katanning	4162	
Metro Meat Pty Ltd (Linley Valley)	Wooroloo	4000	
Reg Russel & Sons Pty Ltd	Tammin	574	
Tip Top Abattoirs	Wooroloo	2007	
W.A. Meat Commission	Fremantle	7930	

* Closed