South Australian Agriculture

WOOL

DEPARTMENT OF AGRICULTURE
SOUTH AUSTRALIA

WOOL
COMMODITY PLAN

A Strategic Plan for the Development of the South Australian Sheep and Wool Industry

MISSION STATEMENT:

To facilitate change in the sheep and wool industry to improve efficiency of production and meet market needs.

FOREWORD

This strategic plan is one of a series which has been developed for the principal South Australian agricultural industries and the services provided by the Department of Agriculture.

Agriculture contributes a greater proportion of returns to the State's economy than that of virtually any other state in Australia. It is therefore important to review the potential for the further development of agriculture in South Australia. These plans have been prepared by the staff of the Department of Agriculture in association with representatives of the respective agricultural industries and farmer organisations. The aim has been to identify the production potential and the market potential for the respective commodities and to thereby evaluate the opportunity which the state has to further develop its agricultural industries. At the same time, consideration has been given to identifying the most important issues to be addressed in the coming years to enable the state to achieve its maximum economic potential from agriculture. These plans will be valuable for determining the future provision of services to the rural community.

I should like to acknowledge the hard work and creative thought which both departmental staff and participants from industry and the farming community have put into the preparation of these plans.

John C. Radcliffe

(John C Radcliffe)
DIRECTOR-GENERAL OF AGRICULTURE

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1. EXECUTIVE SUMMARY.

1.1 INDUSTRY STATUS.

South Australia's annual greasy wool production ranges from 100 to 130 million kg. The gross value of production in South Australia (including wool, Merino meat, live sheep exports and Merino genetic material exports) was approximately $701 million in 1989/90 (33% of total agricultural production). This will be down to about $509 million for the year 1990/91 due to:

* a reduction in the wool floor price from 870 to 700 c/kg clean, and the subsequent abandonment of the reserve price scheme resulting in the market indicator declining a further 40 per cent;
* disruption to the live sheep export trade;
* very low prices for surplus sheep.

High wool and sheep prices in 1988 and 1989 encouraged increased production, assisted by a favourable run of seasons in all areas except Eyre Peninsula. South Australia had an estimated 17.8 million sheep in March 1989, and 18.6m in March 1990. The wool clips for 1989 and 1990 were 115 and 129.6 mkg respectively. Wool production is not expected to fall in 1991, but the recent return to the free market and the marked drop in wool prices will reduce production in the 1991/92 year.

Wool represents only a small fraction (5%) of world fibre use and its production has grown at a slower rate than other fibres. The $A remained high against currencies of wool importing countries keeping world wool prices relatively high until October 1990. Production responses to price changes in the world wool market traditionally lag by about 18 months. Wool prices peaked in April 1988. However demand for wool has not yet recovered owing to the uncertainty caused by the Middle East crisis, warmer northern hemisphere winters, and depressed economies in China and what was formerly the USSR. A change in the world market's confidence in the stability of the floor price may also have adversely affected demand in the short term. With the suspension of the reserve price scheme for wool, buyers have returned to the market to take advantage of historically low prices. It is too early to interpret this as a turning point in wool prices.

1.2 POTENTIAL FOR IMPROVEMENT.

The main goals for improvement in the South Australian wool industry are:

1.2.1 For producers, increasing productivity and enhancing wool quality by:

a Increasing the understanding of production systems and their capacity to meet market needs through:

* improved efficiency of grazing management;
* improved production efficiency and sheep health;
* improving lamb marking percentages in the State;
* understanding of how to genetically improve wool quality.

1.2.2 For the industry as a whole, increasing the efficiency of production of wool and value of wool and wool products by:

b Improving policy advice to government and industry.

c   Improved understanding of market needs and market information through:

* improving the marketing of wool and Merino genetic material;
* encouraging development of "value-added" wool products (e.g. tops) for export;
* improved information systems and better quality of information from market to producer.

d   Improving the quality of raw wool presented to the market, through:

* genetically improving the quality of wool produced by the State's Merino flock;
* improved efficiency of grazing management;
* improved production efficiency and sheep health;
* improved wool harvesting.

e   Conducting research and development of national significance, with particular emphasis on the genetic improvement of sheep.

1.3   BARRIERS.

The main barriers to achievement of these improvements are:

* the current low prices for wool and surplus sheep;
* the lack of understanding within South Australia's wool industry of the factors limiting production efficiency and quality of the State's clip;
* a small number of influential Merino studs have a large effect on genetic progress in the industry;
* the poor adoption of improved animal and pasture management technology by the sheep industry;
* the lack of objective information related to genetic value of livestock and controls on the export of Merino genetic material;
* the substantial reductions in funding for production research due to a shift in industry funds towards textile research;
* the undeveloped state of market-based price stabilisation techniques such as wool futures and options.

1.4   OPERATIONAL PROGRAMS RELATED TO THE WOOL COMMODITY.

The following is a list of wool Operational Programs currently conducted or proposed in the Department. These programs have research, advisory and regulatory components and have been ranked in importance by industry (indicated by numbers in bold after the program name), and their associated goal from section 1.2 is indicated by the superscript.

1.4.1   Major Programs Currently Conducted.

1. Soil fertility, soil structure, plant nutrition and water use.(=3)[a]
2. Breeding and selection of pasture plants.(2)[a]
3. Management and utilisation of pastures and rangelands vegetation.(6)[a]
4. Genetic improvement of sheep.(1)[a,d,e]
5. Nutrition of sheep.(9)[a]
6. Reproductive efficiency of sheep.(10)[a]
7. Sheep pests, health and welfare.(7)[a,d]
8. Provision of policy advice on the sheep and wool industry.(12)[b,c]
9. Marketing and processing of sheep, wool, skins and other by-products.(8)[c]
10. Wool harvesting and handling systems.(13)[d]

11. Communication and training.$(5)^{a,b,c}$
12. Wool quality.$(=3)^{a,c,d,e}$
13. Sheep management.$(11)^{a,d}$

1.5 RESOURCES.

Figure 1 summarises the State and Trust fund resources allocated in 1990/91 to the 13 Wool Commodity Operational Programs.
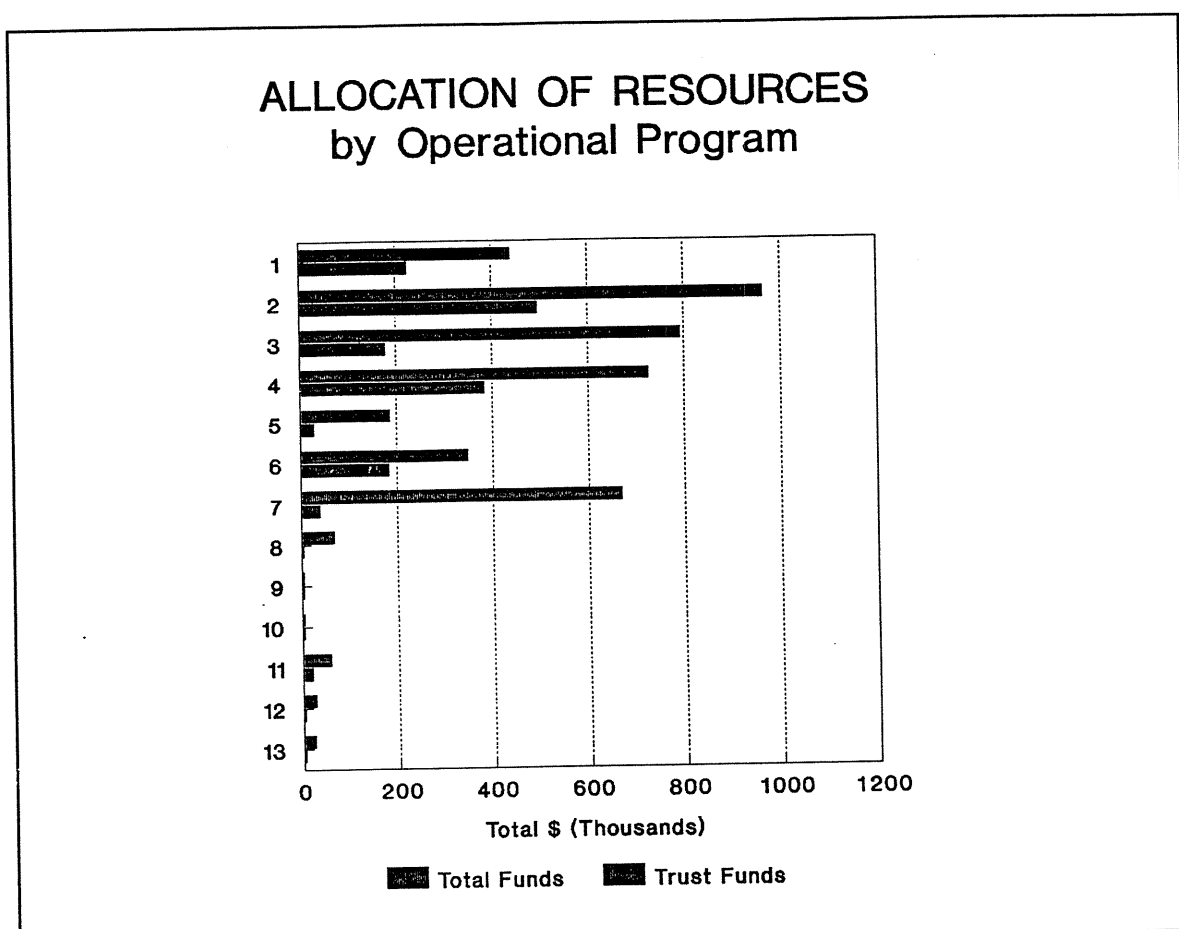
Figure 1

1.5.1 Research.

The Department of Agriculture's Turretfield Research Centre is the major facility for Merino sheep and wool research in South Australia. The principal features of Turretfield's research include genetic improvement of wool production and quality, artificial breeding procedures, improved nutrition and parasite control as well as pasture species evaluation and management. In addition, the Department of Agriculture conducts wool sheep research at the Animal Breeding Unit in Adelaide (theoretical and statistical aspects of sheep breeding), Central Veterinary Laboratories (disease and parasite control, trace element nutrition), Northfield Research Laboratory (plant nutrition, pasture plant breeding), Kybybolite and Flaxley Research Centres (high rainfall pasture species evaluation), and Minnipa and Wanbi Research Centres (sheep management and nutrition). Staff and resources involved in research servicing the sheep and wool industry are 61 Full Time equivalents (FTE's) with an annual expenditure of approximately $3.2 million (salaries and operating only).

1.5.2 Extension and Regulatory.

Generalist advisory staff are managed by Regions, and there is a lack of "specialist" sheep and wool officers. An estimated 22.7 FTE's provide extension and regulation related to the wool commodity. This represents approximately $1.1 million in salaries and operating (excluding other Departmental on-costs).

Thus a total of 84 FTE's are devoted to wool commodity activities compared to the total Department of 1,075 FTE's (7.8% of total FTE's for a commodity providing c. 33% of gross value of agricultural production). Figure 2 summarises the allocation of State and Trust fund resources to research, extension and regulatory functions of the Department of Agriculture in relation to the Wool Commodity in the 1990/91 financial year.
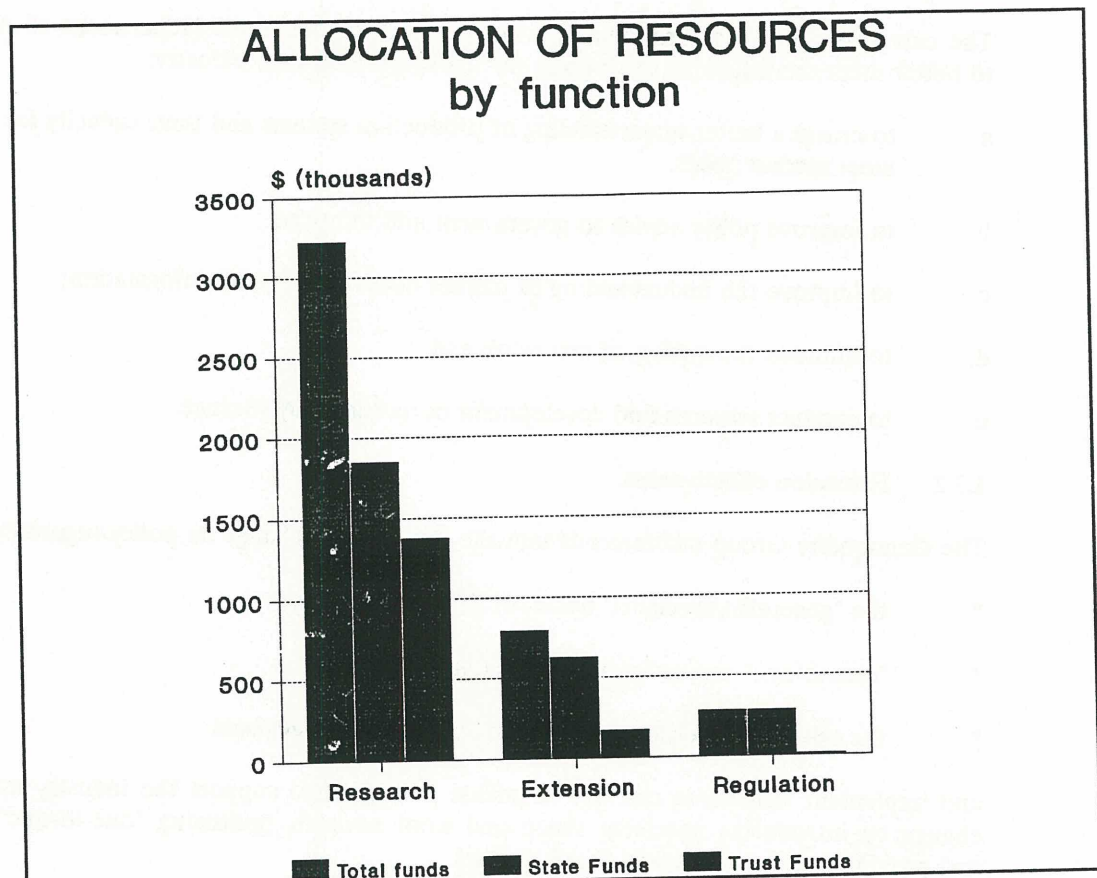
Figure 2

1.6 OUTCOMES.

1.6.1 If the South Australian wool and sheep industry fails to change to meet market needs it will rapidly decline in size and value, from $701 million in 1989/90 to half that figure or possibly less.

1.6.2 Along with this situation of declining value and importance, changes within the industry which improve productivity, efficiency and meeting market requirements should increase gross returns by 4% or $14 million per annum.

1.6.3 The implementation of the Department of Agriculture's programs are required to successfully achieve these improvements in returns and other outcomes as detailed in Table 3, page 100.

1.7 RECOMMENDATIONS FOR FUTURE DEVELOPMENT.

1.7.1 Sheep & Wool Advisory Group review of projects.

The overall goals and priorities (section 1.2) should be the main guide for resource allocation, provided they are regularly reviewed by both the Commodity Group and industry. The industry priorities allocated to individual projects should only be used as a guide for allocation of resources within Operational Programs.

The current Operational Programs will be reviewed to enable the Department of Agriculture to better meet the following main goals for the sheep and wool industry:

a   to create a better understanding of production systems and their capacity for change to meet market needs;

b   to improve policy advice to government and industry;

c   to improve the understanding of market needs and market information;

d   to improve the quality of raw wool; and

e   to conduct research and development of national significance.

1.7.2 Extension effectiveness.

The Commodity Group recommends that the Department change its policy regarding:

*   the "generalist/specialist" duties of livestock advisers;

*   "one-to-one" versus "group" extension;

*   the training, experience and expertise of livestock advisers.

and implement immediate changes to enable personnel to support the industry and facilitate change by introducing specialist sheep and wool advisers, increasing "one-to-one" extension, and providing training to assist these changes.

1.7.3 The under-resourcing of the following areas should be redressed by increasing funding in the following areas:

*   gathering and application of pasture production data;

*   demonstration of management strategies to cope with the summer/autumn feed shortage;

*   programs to alert farmers and industry to pesticide residue risks;

*   interpretation and distribution of wool market information; and

*   the adoption of the Code of Practice for clip preparation and management of sheep to produce a high quality product.

1.7.4   Priority should be given to the operational program "genetic improvement of sheep" by the development of the Turretfield Fleece Measurement Service and its integration into a statewide program as recommended in the document "Technology Transfer Program for: Genetic Improvement of Wool Quality in South Australia" (Rogan, Maxwell & Gray, 1990).

1.7.5   The Department should direct resources towards the development of programs addressing the improvement of wool quality and the facilitation of communication and training both within the Department and in the wool industry.

1.7.6   Staff and resources allocated to extension should be increased (particularly information collection, strategic planning and communication to industry).

1.7.7   The reallocation of resources in the following ways should be considered:

With the exception of industry funded research projects, Operational Programs 6., ("Reproductive efficiency of sheep") and 9., ("Marketing and processing of sheep, wool, skins and other by-products") could be discontinued creating a potential saving of $100,000 of State funds. These funds should be considered as partial savings, and partial re-allocations to higher priority Operational Programs (such as "Genetic improvement of sheep"). Operational Programs on "Management and utilisation of pasture and rangelands vegetation", "Nutrition of sheep", "Sheep pests, health and welfare", and "Sheep management" should be carefully assessed with a view to:

*   streamlining and coordinating higher priority projects across the state;

*   reducing regulatory activity where possible.

1.7.8 The best approach to reducing resources in the wool commodity is *rationalisation of low priority projects* within Operational Programs, and a *statewide coordination* of all Operational Programs (see Table 3, page 100).

2.   INTRODUCTION.

2.1   THE COMMODITY PLANNING PROCESS.

A Commodity Group has been established within the South Australian Department of Agriculture for each of the main agricultural commodities. These groups have been asked to prepare an industry statement and strategic plan for their commodity.

The Wool Commodity industry statement encompasses the farming characteristics of the commodity, its production in Australia and South Australia, details of special regional aspects, market outlets both domestically and internationally, the extent of regulations governing the commodity, their purpose and structures, and the extent of domestic processing.

The Wool Commodity Group sought to identify the potential for the industry, both in terms of the production potential within South Australia and its market opportunities. Constraints to the achievement of industry potential were considered, through an identification of what research, extension, changes in regulation, and provision of services might be necessary to further enhance the sustainable development of the industry.

2.2   OBJECTIVES OF THE WOOL COMMODITY GROUP.

The Wool Commodity planning process aims to define the achievable outcomes that the Department of Agriculture is seeking as a result of services provided to the wool industry over the next 5-10 years. This in turn will identify specific new programs of work which need to be initiated, and how they might be funded. This could involve combinations of state funds, industry funds and in some cases charges for Departmental services. Resources will be shifted towards the higher priority programs. Ultimately, the extent of services provided will be dependent on the resources which are obtainable. A major objective of the Wool Commodity Group will be to review and evaluate programs as they proceed. This will involve strategic planning of research, extension and regulatory programs within the Department of Agriculture.

2.3   INDUSTRY CONSULTATION WITH THE WOOL COMMODITY GROUP.

Formal requests have been made to the Advisory Board of Agriculture and the United Farmers and Stockowners to nominate representatives to assist with the planning process. In the case of the Wool Commodity, the majority of industry consultation has been done through the Sheep and Wool Advisory Group (SWAG), which was established in 1986 by the Sheep and Wool Section to assist with program planning and policy development within the Department of Agriculture. Industry consultation in relation to the Wool Commodity Plan has included assistance with identification of problems, issues or opportunities confronting the wool industry and periodic review and up-dating of commodity programs.

See also section 8 (Review of Operational Programs).

2.4   MEMBERS OF THE WOOL COMMODITY GROUP.

Dr Chis Maxwell, Sheep and Wool Section [Chairman]

Dr B. Wilson, Director of Animal Industries and Analytical Services (Overview Director)

Dr Geoff Judson, Vet Lab

Mr Kym Jervois, Economics Group

Dr Ron Newlands, Animal Health Branch

Mr Ken Watchman, Meat Section [Executive Officer]

Mr Peter James, Turretfield Research Centre

Mr Harry Nash, Sheep and Wool Section

Mr Ian Rogan, Turretfield Research Centre

Dr Dennis Gifford, Turretfield Research Centre

Mr Matt Benson, Agricultural Development and Marketing Group

Dr Ivars Dainis, State Chemical Laboratories

Mr Jim Walkley, Commodity Planning Group

Mr Don Blesing, wool producer consultant to the commodity group and member of Sheep and Wool Advisory Group

Mr Chris Bretag, wool industry representative nominated by the UF &S

Mr Michael McBride, wool industry representative nominated by the UF&S

Mr Ian Rowett, wool industry representative nominated by the UF&S

3. INDUSTRY STATEMENT.

3.1 PRODUCTION.

The sheep and wool industry in South Australia is one of the State's largest agricultural industries. South Australia's wool production ranges from 100 to 130 million kg of greasy wool annually. Using recent price ranges, this wool has a gross value of $600 to $800 million. For 1989/90 the gross value of wool was $602 million. Besides wool production, the Merino based flock also produces meat ($30 million), live sheep for export ($66 million) and genetic material for export ($3 million). Thus the gross value of production in 1988/89 was approximately $701 million. This is 33% of total agricultural production in South Australia. The gross value of production is expected to be down to $509 million for the year 1990/91 due to:

* a reduction in the wool floor price from 870 to 700 c/kg clean, and the subsequent abandonment of the reserve price scheme resulting in the market indicator declining a further 40 per cent;
* disruption to the live sheep export trade;
* very low prices for surplus sheep.

Wool characteristics: 90% of sheep in South Australia are Merinos producing an average of 5.4 kg of wool per year with a fibre diameter between 22 and 24 microns (cf. Australian average of 4.75 kg and 21-22 microns for fleece weight and fibre diameter respectively). SA Merinos are heavy cutting, high in body weight and fecund, and top sires and semen have a national and international demand.

Sheep numbers tend to fluctuate [particularly in the medium rainfall cereal-sheep zone] according to drought incidence, and to a lesser extent according to wool prices and relative prices of other commodities eg. beef and/or cereal/legume prices.

3.2 REGIONAL FEATURES.

Wool production is carried out throughout the State's rural areas. The cereal-sheep zone has an annual rainfall of 300 to 500 mm and sheep in these areas produce 55% of the Merino wool. The dry pastoral zone, [grazing on native vegetation, fencing and watering facilities often minimal, very large paddock size], produces 15%. The remaining 30% comes from the high rainfall grazing country of the South East, Kangaroo Island and the Adelaide Hills. In these areas, holdings tend to be smaller and disease incidence higher.

Stocking rates vary according to rainfall [ie. higher rainfall, higher stocking rates & higher average wool production per hectare] and soil type. Stock numbers depend on other farm activities, eg. in some regions cereal cropping complements or can dominate sheep production. Disease incidence, such as internal parasites and footrot, are influenced by climate. Half of the State's sheep flocks are in declared footrot protected areas because they are at risk from footrot infection.

3.3 GENERAL MARKET ACTIVITY.

High wool and sheep prices in 1988 and 1989 encouraged increased production, assisted by a favourable run of seasons in all areas except the Eyre Peninsula. Australia had an estimated 175 million sheep in March 1989, 11.1 million more than the previous year [17.8m in SA and 19.1m in March 1990]. The wool clip was a record 882m kg, up 41 mkg [115 mkg in SA and 129.6 mkg in March 1990]. Availability of Australian wool was down 2.6% because of reduced AWC carryover stocks. AWC stocks are at record levels [4.8 million bales in February 1991].

A large proportion of the wool producing land in Australia is suitable for the cultivation of grain legumes and cereal grains. It is common for grain and wool production to complement one another,

but the proportion of each product in the mix is determined by the relative price. When wool prices are unfavourable, the producer will switch to the higher priced commodities, and even if wool prices become subsequently attractive due to market demand there will be a significant production lag while sheep numbers increase. By the time production has responded it may well be that prices have fallen.

These fluctuations in prices and supply are likely to encourage manufacturers to use synthetic fibres and cotton rather than wool. As synthetic fibres and cotton require different equipment from wool, there is the danger that if manufacturers shift to synthetics they would be reluctant to revert to wool. **It is therefore in the interests of the industry to maintain the world supply of wool within a stable and competitive price band.**

3.4   EXPORT ORIENTATION.

Ninety five percent of SA wool is exported, largely in the raw (unprocessed) state. However, an increasing proportion is being exported in a "value-added" form, mainly as tops. G.H. Michell & Sons [Aust] Pty Ltd, Salisbury, South Australia, is the largest producer of wool tops in the Southern Hemisphere. They produce 200,000 kg of tops per week at an average price of $10 per kg. The value of wool tops exported from SA in 1989 was $104m [all by G.H.Michell]. Processing includes scouring and/or carbonising, and top-making.

3.5   INDUSTRY REGULATION.

The Australian Wool Corporation (AWC) - a Commonwealth statutory authority operating under the Wool Marketing Act 1987, regulated the marketing of wool until 30 June 1991 by:

*   organising the marketing and promoting the Australian wool clip;

*   until February 1991, acting to reduce sharp price fluctuation to growers through the Reserve Price Scheme (RPS suspended 25 Feb. to 30 June 1991, with a supplementary payments scheme to cover differences between the market and old reserve price); and

*   funding research (through State Departments of Agriculture, CSIRO and Universities in Australia, and the International Wool Secretariat [IWS] overseas) and promotion (mainly through the IWS).

On 30 April 1991 the Minister for Primary Industries and Energy announced a restructuring of the old AWC and amendments to the Wool Marketing Act (1987), as follows:

*   The RPS was removed permanently;

*   The AWC was replaced by three new statutory bodies:

    -    the Wool Realisation Commission (WRC), responsible for managing the AWC's debt and stockpile of wool;

    -    the Australian Wool Corporation, responsible for wool promotion and facilitation of marketing, including wool quality control; and

    -    the Wool Research and Development Corporation (WRDC).

*   A permanent Australian Wool Industry Council was established to provide coordination and advice to the Minister on strategic directions for the industry;

*   The AWC's debt will be repaid over a maximum period of seven years, with minimum annual debt reduction targets to be met by the WRC;

* The wool tax was to be reduced from 25% to 15% from the start of the new selling season on 1 July 1991. However, action by industry and the Federal opposition has reduced this to 12% for the 1991/92 selling season.

The Animal Health Branch of the S.A. Department of Agriculture also has statutory authority relevant to the wool industry. The objectives of the Animal Health Branch are:

* to prevent introduction of animal diseases and pests and facilitate export of animals and their products;

* to promote sound management practices for the production and marketing of healthy animals and their products;

* to minimise the impact of animal diseases, pests and disasters on production, human health and trade; and

* to promote responsible livestock welfare.

The following State Acts support the objectives of the Branch:

* **Stock Act, 1990** - provides for regulatory action against the introduction or spread of contagious disease and chemical residues. Eleven endemic and 19 exotic diseases of sheep are scheduled under this Act. Control is maintained by diagnosis, prescribed treatment, property quarantine, market inspection, and the control of stock movement and artificial breeding.

* **Brands Act, 1933** - provides for the registration of brands and earmarks for the identification of stock ownership. It is not compulsory to own a registered brand or mark but the use of an unregistered brand or mark, other than for numbering animals, is not permitted unless registered.

* **Foot and Mouth Disease Eradication Fund Act, 1958** - provides a mechanism for paying compensation to owners for loss of stock or for the destruction of stock or property in the event of foot and mouth disease and scheduled foreign diseases. The Act is also the legal basis for cost sharing between States and Commonwealth in the event of such a disease.

3.6   RESEARCH AND DEVELOPMENT.

The Department of Agriculture's Turretfield Research Centre is the major facility for Merino sheep and wool research in South Australia. The principal features of Turretfield's research include genetic improvement of wool production and quality, reproduction, improved nutrition and parasite control as well as pasture species evaluation and management. In addition, the Department of Agriculture conducts wool sheep research at the Animal Breeding Unit in Adelaide (theoretical and statistical aspects of sheep breeding), Central Veterinary Laboratories (disease and parasite control, trace element nutrition), Northfield Research Laboratory (plant nutrition, pasture plant breeding), the Field Crops Improvement Centre at the Waite Agricultural Research Institute (pasture plant breeding), Kybybolite and Flaxley Research Centres (high rainfall pasture species evaluation), Struan (footrot), and Minnipa and Wanbi Research Centres (sheep management and nutrition).

4. INDUSTRY POTENTIAL.

4.1 MARKET & EXPORT DEVELOPMENT.

Table 1 shows that ten countries produce nearly 80% of the world's wool. Australia is the leading country in terms of both sheep numbers and size of the wool clip, followed by the USSR. The first five countries listed are the main exporters of wool in the world. Together they have 27.1% of the sheep, produce 50.9% of the world's wool, and are all in the southern hemisphere. This contrasts with the pattern observed for virgin wool consumption at the spinning stage, where the five major exporting countries consume only 4.6% of the wool, Japan and the EEC consume 30%, and China and the USSR consume 34.8%. Thus, in broad terms, major wool producing and exporting countries are in the southern hemisphere, whereas major wool processing and consuming countries are in the northern hemisphere.

Table 1. World sheep and wool statistics (1988/89)

Country	No. of sheep Millions	%	Greasy wool production Million kg	%
Australia	166	14.5	961	29.7
New Zealand	65	5.7	335	10.3
Argentina	29	2.5	167	5.2
Uruguay	26	2.3	87	2.7
South Africa	25	2.1	98	3.0
USSR	141	12.3	484	14.9
China	103	9.0	209	6.5
Turkey	49	4.3	85	2.6
UK	41	3.6	65	2.0
India	40	3.5	27	0.8
Other	463	40.2	721	22.3
TOTAL	1,148	100.0	3,239	100.0

Source: Aust. Wool Compendium (1990). Australian Wool Corporation, Melbourne.

4.2 WORLD WOOL PRODUCTION & ECONOMICS.

The total amount of fibre produced annually in the world (approximately 35,000 million kg) is made up of approximately equal proportions of natural and man-made fibres. Wool represents 5.0 and 9.5% of the total and natural fibre produced, respectively. During the last decade, world wool production increased by 10%, whereas the production of cotton and of synthetics increased by 17 and 19%, respectively. Thus, although wool is very important for some national economies, it is only a small fraction of all the fibres produced, and its production has grown at a slower rate than other fibres.

The $A increased against the currencies of wool importing countries by 24% during 1988, and has not yet declined to early 1988 levels. Along with other factors this has kept world wool prices relatively high. Wool textile and apparel production has remained high, and increased in certain sectors. However, the current record level of wool production in Australia, the continuing high $A (until November 1991) and lack of some major buyers in the market (particularly China and the former USSR) have substantially lowered demand for Australian wool during 1990 and early 1991. Demand improved substantially after the abandonment of the RPS, but there is still uncertainty regarding the

first half of the 1991/92 selling season as major buyers fill their stocks depleted during speculation against the dropping of the reserve price.

On the textile side, general economic conditions have been favourable. Economic growth remained firm in the major industrialised countries in 1989, and this continued at a satisfactory but slower rate in 1990. Wool has experienced difficult trading conditions at the retail level in autumn/winter 1989/90, reflecting lower overall apparel sales, and increased competition from blends and other fibres, coupled with a mild northern winter. Consumer demand was expected to grow strongly in industrialised countries in 1990 and 1991, however, the Middle East crisis dampened expectations during late 1990. Current reduced funding of wool promotion and the lowering of the IWS budget, together with the reticence of the IWS to promote wool in the lucrative blend market, make the future of the wool textile market uncertain, particularly for wool stronger than 21 microns.

4.3 CURRENT WOOL PRICE.

The market indicator, [the weighted average price across the 13 wool categories], was about 894 cents per kg clean in March 1990 after peaking at 1269 cents in April 1988. Thus the market indicator had declined 30% from that peak.

After the disruptions in China during 1989, China (the second largest purchaser of Australian wool) left the market. Japan (the biggest purchaser) was fully stocked at the beginning of the season, and early in the second half of the 1989-90 sales, the former USSR's foreign currency shortages resulted in an inability to pay for wool purchases during the season.

The resultant build-up of AWC stocks of wool generated considerable media and government/industry debate over the level of the wool price leading up to the May Wool Council meeting in Roma. This caused major wool buyers to withdraw from the market until the wool price debate was finalised, and consequently the AWC bought between 85 and 90% of wool catalogued for sale up until the end of May.

On 31st May 1990, the Federal Minister for Primary Industries and Energy, Mr John Kerin, announced a reduction in the floor price from 870 to 700c/kg clean, with a maximum level of the wool tax of 20% to be introduced on 1 July, 1990. On the 8th October Federal Cabinet approved a new maximum level for the wool tax of 30%, with the operative rate set at 25% and a provision to add surcharges of up to 20% on top of this. Wool sale controls were also introduced limiting number of bales on offer at weekly sales to 140,000. On 9 November, proposals were also introduced to facilitate the humane disposal of some 20 million sheep, and introduce marketing quotas of 65-75% for wool sold after 1 July 1991. For the week ended 9 November, the market indicator was at 704c/kg clean, and the AWC was required to buy 65.5% of the offering.

AWC presented its Strategic Plan for 1991/94 to the Federal Minister for Primary Industries and Energy on 1 February 1991. With AWC debt approaching $3 billion and the stockpile at 4.8 million bales, the Minister decided to suspend the RPS (8 February) and amend the Wool Marketing Act (1987). The amendments suspended the RPS permanently and restructured the marketing system for wool as described on page 14. In an unregulated market, the market indicator stood at 570 c/kg clean at the close of the 1990/91 selling season on 28 June 1991.

4.4 MARKET OUTLOOK.

AWC stocks are at record high levels [4.8 million bales in February 1991] but will not continue to increase due to the suspension of the RPS. Some wool was released for sale from the stockpile before the close of the 1990/91 season because of increased demand. The build-up in AWC stocks was due to increased production and reduced demand. The limited statistical information available suggests that the flock size would have peaked in 1991 without the recent wool price adjustment, followed by a decline over a period of years under the influence of the declining real price. From the peak in wool cut this year, production should commence to decline in 1991/92, while apparel wool production in

other wool exporting countries will continue to grow for several years.

Production responses to price changes in the world wool market traditionally lag by about 18 months. Wool prices peaked in April 1988. However demand has not yet recovered owing to uncertainty caused by the Middle East crisis, the strength of the A$, and depressed economies in China and the former USSR. A change in the world market's confidence in the stability of the floor price was also adversely affected in the period up to the suspension of the RPS in February 1991. The downturn in the value of the $A in early 1991 in terms of the currencies of wool-importing countries should improve demand during 1991.

4.5   POTENTIAL FOR IMPROVEMENT.

The main goals for improvement in the South Australian wool industry are:

1.2.1 for producers, increasing productivity and enhancing wool quality by:

a   increasing the understanding of production systems and their capacity to meet market needs through:

*   improved efficiency of grazing management;
*   improved production efficiency and sheep health;
*   improving lamb marking percentages in the State;
*   understanding of how to genetically improve wool quality.

1.2.2 for the industry as a whole, increasing the output of and value of wool and wool products by:

b   improving policy advice to government and industry;

c   improved understanding of market needs and market information through:

*   improving the marketing of wool and Merino genetic material;
*   encouraging development of "value-added" wool products (e.g. tops) for export;
*   improved information systems and better quality of information from market to producer.

d   improving the quality of raw wool presented to the market, through:

*   genetically improving the quality of wool produced by the State's Merino flock;
*   improved efficiency of grazing management;
*   improved production efficiency and sheep health;
*   improved wool harvesting.

e   conducting research and development of national significance, with particular emphasis on genetic improvement of sheep.

5. CONSTRAINTS TO SUSTAINABLE PRODUCTION AND MARKET DEVELOPMENT.

Thirteen Operational Programs have been developed by the Wool Commodity Group from the potential for improvement outlined in section 4.5. The constraints to sustainable production and market development under these Operational Programs are detailed below. The constraints listed were developed during a "brainstorming" session conducted by members of the Wool Commodity Group, and these were refined following consultation with industry.

The following is a summary of constraints outlined in detail on pages 22-43:

5.1   SOIL FERTILITY, SOIL STRUCTURE, PLANT NUTRITION AND WATER USE.

       5.1.1 Importance of this to wool industry.

       5.1.2 Major constraints to wool industry development.
             5.1.2.1 Soil fertility
             5.1.2.2 Soil structure
             5.1.2.3 Land degradation

5.2   BREEDING AND SELECTION OF PASTURE PLANTS.

       5.2.1 Importance of pasture plants to the wool industry.

       5.2.2 Major constraints to wool industry development.

             5.2.2.1 Pastures in the marginal agricultural zone (300mm).
             5.2.2.2 Pastures in the sheep wheat zone (300 mm - 500 mm).
             5.2.2.3 Pastures in the high rainfall zone (450 mm - 800 mm).

5.3   MANAGEMENT AND UTILISATION OF PASTURES AND RANGELAND VEGETATION.

       5.3.1 Importance of pasture management to the wool industry.

       5.3.2 Major constraints to wool industry development.

             5.3.2.1 Pasture quality.
             5.3.2.2 Pasture assessment data required.
             5.3.2.3 Rangelands vegetation.

5.4   GENETIC IMPROVEMENT OF SHEEP.

       5.4.1 Poor adoption of knowledge and technology.

       5.4.2 The need to reduce fibre diameter in the State's flocks.

       5.4.3 Limited choice of Merino strains.

       5.4.4 The need for accurately determined breeding objectives and breeding values.

       5.4.5 The efficient adoption of artificial breeding technology as a tool for genetic improvement.

5.9 MARKETING AND PROCESSING OF SHEEP, WOOL, SKINS AND OTHER BY-PRODUCTS.

5.9.1 The current over supply of wool.

5.9.2 Wool market feedback.

5.9.3 World demand for wool.

5.9.4 International freight charges.

5.9.5 The greenhouse effect.

5.9.6 Wool processing and by-product development.

5.9.7 The use of sheep in the biotechnology industry.

5.9.8 A national property, paddock, flock and sheep identification system.

5.9.9 An inadequate wool futures market.

5.9.10 Lack of risk capital availability.

5.10 WOOL HARVESTING AND HANDLING SYSTEMS.

5.10.1 Inefficient use of farm labour.

5.11 COMMUNICATION AND TRAINING.

5.11.1 Industry liaison, communication and training.

5.11.2 Farm management support.

5.11.3 Adoption of existing technology.

5.11.4 Targetting of extension effort.

5.11.5 Staff skills, recruitment and training.

5.12 WOOL QUALITY.

5.12.1 Objective measurement.

5.12.2 Sale by description.

5.12.3 Wool contamination and trace-back.

5.13 SHEEP MANAGEMENT.

5.13.1 The relationship between stocking rate and efficiency of sustainable production.

5.13.2 Knowledge about pasture productivity.

5.13.2 Knowledge about additional measurements.

5.13.4 Management in relation to fibre diameter.

5.13.5 Management in relation to wool contamination.

5.1 SOIL FERTILITY, SOIL STRUCTURE, PLANT NUTRITION AND WATER USE.

5.1.1 Key pillars to sustainable farming systems are soil structure and moisture, plant nutrients and soil physical stability. However the cumulative effects of farming practices and their complex interactions can lead to a decline in soil fertility, structure and stability unless carefully managed.

Such a decline mitigates against the productivity and profitability of the grazing industries. Fundamental, therefore, to the long-term viability of these industries is the development and adoption of modern nutrition and soil management strategies to foster a sustainable pasture production system.

5.1.2 Major constraints to wool industry development.

5.1.2.1 Soil Fertility.

Much of the area used for grazing sheep exists on a diverse array of shallow, highly weathered, fragile soils low in natural fertility. The continued success of the sheep-grazing industry relies heavily on the capacity of these soils to support vigorous pasture growth of stable and nutritious botanical composition. The extent of acquisition of nutrients and water determines pasture growth rate, which in turn determines potential stocking rate and hence financial return to graziers.

5.1.2.2 Soil Structure.

There is currently high public concern over the nature and stability of Australia's soil resources. A fundamental determinant of soil health and stability is soil structure. This provides for ready water infiltration, development of pasture roots for sound nutrition and efficient water use, the encouragement of beneficial soil organisms and resistance to erosive factors impinging on soil and land systems.

5.1.2.3 Land degradation.

Land degradation is one of the most important environmental issues in Australia. Large areas of farm and wool producing land have already been affected by water and wind erosion, dryland salinity, soil acidification and a decline in the chemical, physical and biological status of soil. Land degradation represents a serious constraint to wool production in the future, both directly and indirectly from an increasingly environmentally conscious public.

5.2 BREEDING AND SELECTION OF PASTURE PLANTS.

5.2.1 Importance of pasture plants to the wool industry.

Improved pastures comprise the basis for much of South Australia's sheep and wool industry. The majority of sheep in the high rainfall and wheat-sheep zone (producing 85% of the State's wool) are grown on planted and fertilised pastures. The improvement of pastures through the identification and development of more productive and persistent pasture species is fundamental to improving returns to Australia's wool producers. The control of seed and burr contamination of wool is an important component of pasture management.

5.2.2 Major constraints to wool industry development.

5.2.2.1 Arid and semi-arid rangelands of the pastoral zone (<250mm).

The arid and semi-arid rangelands of South Australia are typified by an unpredictable annual rainfall pattern which produces highly variable annual pasture in both quantity and quality. This variability means the native perennial bushes form the basis of the grazing enterprises in the rangelands. Careful management is essential to maintain the viability of the perennial native bush resource. Further research and extension is needed into the management and rehabilitation of this resource.

5.2.2.2 Pastures in the marginal agricultural zone (300mm).

The marginal areas of the State (about 300mm rainfall) would benefit from the development of an annual legume which would persist and increase wool and cereal incomes. It should possess two important characteristics: drought resistance and persistence without the need for resowing.

5.2.2.3 Pastures in the sheep wheat zone (300 mm - 500 mm).

Pasture productivity is largely determined by persistence. Poor legume persistence in pastures is a major limitation. More productive and persistent legumes are required to increase the efficiency of wool production through higher stocking rates, less supplementary feeding and reduced pasture renovation costs.

5.2.2.4 Pastures in the high rainfall zone (450 mm - 800 mm).

Most pastures in this area are based on four commercial legume species viz. subterranean clover, white clover, strawberry clover and lucerne. In many instances these species are grown on soils totally outside of their adaptive range and this occurs as a direct consequence of a lack of suitable alternatives. New varieties are needed with improved production and persistence, particularly on soil types for which a suitable range of legumes is lacking.

5.3 MANAGEMENT AND UTILISATION OF PASTURES AND RANGELAND VEGETATION.

5.3.1 Importance of pasture management to the wool industry.

Careful management of pastures is an important contributor to maintaining high levels of wool production. South Australia has a Mediterranean climate which usually leads to an abundance of green pasture growth in the winter time, with surplus spring dry feed which is depleted by late summer when sheep need supplementary feeding to maintain production.

The skill of the good manager is to carry maximum sheep numbers during the winter/spring period and reduce numbers over the summer/autumn period. Failing this, the next best strategy is to provide supplements when feed is short and of poor quality. Careful management during the late winter/spring period will encourage maximum seed set of legume pastures. This strategy ensures the carry-over of sufficient seed for the establishment of productive pastures in the next growing season. It is therefore imperative that the best quality pastures are allowed to regenerate, the poorer pasture paddock can be grazed hard and cropped next year or re-sown depending on circumstances. Hay making depletes seed reserves as does over grazing during summer.

Lambing down in May, June and July helps relieve grazing pressure on summer dry pastures and thinning stubbles as well as reducing the amount of supplementation needed.

While some of the principles mentioned are relevant to the arid and semi-arid environment, such as managing the feed supply to meet the production status of the livestock, the rangelands possess unique problems, such as poor water supplies, large paddock size, past history of inappropriate land management, unreliable rainfall and the added grazing pressure of feral animals. The best potential for improved production efficiency is in the higher rainfall environment.

5.3.2   Major constraints to wool industry development.

5.3.2.1   Pasture quality. See also Operational programs 1 and 2.

*   Poor pasture quality can result from poor management; and this refers mainly to grass pastures with a resulting low stocking rate.

*   If it is assumed that adequate varieties are available to produce sufficient feed in the cereal sheep zone of the State, then the causes of poor pastures may be:

   o   the financial benefits of pasture are hard to assess, leading to an inadequate supply of inputs such as fertiliser and chemicals;

   o   the risk of failure in sowing pastures is perceived to be higher than for crops, leading some farmers to avoid sowing pastures and the resulting predominance of volunteer pastures;

   o   poor grazing and conservation management of pastures leading to a decline in their legume content; and

   o   the lack of relevant pasture skills.

*   Assessments by the WA Department of Agriculture using MIDAS indicate that late autumn/early winter pasture growth is limiting stocking rate and thus profitability. Obviously poor pastures will be even more limiting. From the whole farm point of view, it appears to be most profitable for pasture to be sown on non-cropping soils.

5.3.2.2   Pasture assessment.

*   The development of computer simulation models and pasture budgeting advice to farmers requires the generation of data on the performance of pasture and livestock under set stocking over a range of environments; this information is not available for South Australia.

*   Training programs have been initiated to improve the skills of advisory officers and managers in assessment of those pasture characteristics critical to animal production.

*   Gross margins per hectare from livestock on improved pasture need to be increased by improving the efficiency of grazing management.

* The development of a Pasture and Animal Assessment Programme (PAAP) has been supported by the South East livestock and agronomy advisers. A Sheep and Wool Refresher Course on PAAP was run by the Sheep & Wool Section in 1989 and led by Mr. Alan Bell the special livestock officer (Sheep Nutrition) Tamworth in New South Wales. Livestock advisers in South Australia learnt how to assess the grazing potential and quality of green growing legume pastures.

Since then some extension programmes have been run in the South East, Eyre and Central Regions to give growers an understanding of the method for assessing pasture production and develop livestock management systems to get best pasture/animal productivity.

Sheep and beef industry benefits from a 10% increase in the feed available each quarter have been estimated as a 17% increase in net value of production across Australia (Love et al., 1982, "Some potential economic effects of technology and production changes in Australian beef and sheep industries", B.A.E. Occasional Paper No. 73). The financial benefit to the sheep industry would be about 6.5%. Extension effectiveness in SA is about 8% of the population annually. Therefore, financial benefits to SA sheep industries could be about 0.52% gross value of production per annum.

5.3.2.3 Decline in rangeland vegetation.

Since the Northern Pastoral Region of South Australia was settled in the 1860's, the vegetation has undergone a marked change due to prevailing management. Careful management of the vegetation is necessary to maintain sheep production without damaging the perennial plant populations which regenerate infrequently (once every 5-50 years depending on seasonal conditions and plant species). Loss of perennial plant cover leads to soil erosion and invasion by undesirable plant species. This causes lowered and more unstable wool production.

Previously careful management has involved continuous stocking at conservative rates (5 - 14 ha/sheep depending on rangeland type), low numbers of sheep per watering point and subdivision of properties into small paddocks. However recent evidence suggests that continuous stocking even at these low rates accelerates perennial plant mortality and inhibits the establishment of new plants. Considerable damage has already occurred to the vegetation, leading to reduced carrying capacity and lower production per animal. Much of this occurred soon after settlement due to high stocking rates, inappropriate range management and the introduction of rabbits and other feral animals. Stocking rates are now considerably lower than they were in the early days, however degredation of the vegetation still continues.

The major constraints to wool industry development in the rangelands are:

* lack of appropriate range management practices to prevent the loss of desirable perennial plants;
* invasion by undesirable plant species
* competition from other herbivores, particularly rabbits; and
* lack of cost-effective range restoration practices.

5.4   GENETIC IMPROVEMENT OF SHEEP.

5.4.1   Poor adoption of knowledge and technology.

The responsibility for genetic change in Australian Merino flocks has always rested with a small number of elite studs. This has led to a poor understanding amongst breeders and woolgrowers of the potential to genetically improve the nation's flocks. The adoption of breeding technology by the industry has been very slow. The industry needs to understand that the adoption of improved breeding systems across the industry will have significant benefits, and individual producers need to be made aware of these opportunities.

5.4.2   The need to reduce fibre diameter in the State's flocks. See also Operational Programs 5 and 12.

More than 60% of wool produced in South Australia is in the range 22 to 24 microns. Current and predicted wool prices favour wools of finer fibre diameter than 22 microns. One option is for South Australia's wool producers to reduce the fibre diameter of their flocks by at least one micron; this is feasible within 7 to 9 years, hence the program needs to start immediately.

5.4.3   Limited choice of Merino strains. See also Operational programs 7 and 13.

In a wool-sheep enterprise the two most important traits affecting profitability are fleece weight and fibre diameter. Genetic improvement in a flock is best directed at improving these two traits, and can be achieved either by selection within the flock or introducing superior bloodlines. Selection within the flock might aim at reducing fibre diameter by one micron and/or increase fleece weight by 1 kg. This would lead to an increase in gross margin per sheep, but may require up to 10 years of selective breeding to achieve either objective.

An alternative and much quicker way to achieve genetic improvement is to introduce a more productive bloodline or strain. The strains of Merino available in South Australia are limited mainly to the South Australian Merino strain. Comparative information relating the performance of bloodlines and strains under similar conditions is limited. Available data suggest that some bloodlines are capable of producing similar fleece weights but much finer fibre diameters, resulting in significantly higher fleece values. By replacing less productive bloodlines with these more profitable types, substantial genetic improvement can be achieved in a relatively short period; depending on whether rams only are introduced, or the whole flock is replaced.

Comparative information on new sources of genetic material is needed. This can be obtained from strain comparisons (usually run on government research stations), sire referencing schemes, and properly designed and conducted wether trials.

5.4.4   The need for accurately determined breeding objectives and breeding values. See also Operational programs 11.

Genetic improvement programs in Merino breeding flocks, generally Merino studs or group breeding schemes, is achieved by selection of superior stock, aided by the implementation of performance recording and objective measurement. Accurate genetic parameters (e.g. heritabilities of traits and the genetic correlations [relationships] between traits) are required for the most efficient operation of performance recording schemes such as WOOLPLAN. These are available for some strains/bloodlines of Merinos, but not all. In addition, many parameter estimates have been made at ages which do not reflect current breeding industry practice.

Additional measurements such as staple length, staple strength and colour are now being provided with many clips for sale. In the future measurements such as coefficient of variation of fibre diameter, coefficient of variation of length, resistance to compression and style may also be provided. Accurate specification of these traits may enable economic weights to be assigned to these, as well as to traits such as disease resistance, and open the way for their rational incorporation in breeding objectives.

There is urgent need to estimate genetic parameters for production traits at ages which reflect industry practice.

5.4.5 The efficient adoption of artificial breeding technology as a tool for genetic improvement. See also Operational program 8.

Considerable research has been done in the areas of artificial insemination (AI) and embryo transfer (ET) technology in sheep. AI technology has been effectively adopted by the sheep industry. However, little of the embryo transfer technology has been developed to the practical stage. No encouragement has been given to raise the standards and application of new technology on a national basis to improve the efficiency of wool production in Merino woolgrowing flocks.

The practical goal of reproductive technology is permanent genetic improvement of livestock. The increased application of artificial breeding technology has the potential to both increase genetic gain and reduce costs by increasing efficiency of production.

Assistance to the sheep artificial breeding industry is required to:

*   provide for acceptable health and production standards for semen and other genetic material,

*   provide a focus for the commercial application of artificial breeding technology on a national basis, and to standardise national marketing and sales of artificial breeding products and services,

*   the development of export markets and the marketing of Australian artificial breeding technology and services in export markets,

*   research and development to bring research findings to the level of large-scale commercial application.

5.4.6 Breeding sheep resistant to fly strike. See also Operational Programs 7 and 13.

Flystrike costs the South Australian Merino industry $30m per annum and is a major barrier to improved efficiency of production. The two main forms of fly strike are breech strike and body strike. At present control of strike relies mainly on surgical and insecticidal methods. These methods are receiving increasing opposition because of animal welfare considerations and concerns about the use of pesticides. The South Australian Merino is the most susceptible to body strike of the Australian Merino strains and this is a significant barrier to its more widespread use in the high rainfall areas. Breeding sheep with increased resistance could reduce reliance on chemical and surgical methods and increase the range of environments suitable for SA Merinos.

5.4.6.1 Breech strike.

A novel approach would be to attempt to breed sheep without wool in the breech area. There are two possible approaches to this problem:

* identify breeds of sheep with little or no wool growing in the breech area and attempt to introduce this characteristic to Merinos by crossbreeding and selection, or

* increasing the area of bare skin in the breech area by selection within the SA Merino.

5.4.6.2   Body Strike.

Resistance has been shown to be a heritable character but efficient selection strategies are required.   Some Merino strains may have greater resistance than current South Australian bloodlines.

5.4.7   The introduction of exotic breeds of sheep.

The potential for introduction of new sheep breeds or Merino bloodlines into Australia should be investigated to:

* diversify the wool industry (e.g. dual-purpose breeds, ultra-fine wool breeds), and

* improve existing Merinos.

Despite anecdotal views expressed as to the genetic superiority of the Australian Merino, there is almost no objective information available comparing the genetic merit of Australian Merinos with those in other countries.

5.5   NUTRITION OF SHEEP.

5.5.1   Summer/autumn feed shortage.

South Australia suffers from a shortage of quality feed during the summer/autumn period each year. Most farmers conserve fodder in the form of hay and grain to feed back to sheep at this time. Too many increase the stress on sheep by lambing during March, April and May. Ewes in the last 6-8 weeks of pregnancy require up to twice the amount of good quality feed when compared with empty ewes or wethers at the same time. Opportunities to offset these constraints include the following:

* A Statewide shift from Autumn to late winter lambing would improve the efficient use of paddock feed and relieve the need for conserving large quantities of feed.

* Some farmers have adopted a lot feeding strategy. The objective is to remove sheep from paddocks after the opening rains, and feed them in a confined area for 3 or 4 weeks during which time pastures can get established. This management system has been shown by some growers to encourage rapid pasture establishment which provides good grazing during the winter. The cost of doing this needs to be carefully assessed to be sure the benefits are worthwhile.

* Around 55% of South Australia's annual wool production is grown in the cereal-sheep zone. Cereal crop residues make a considerable contribution to sheep production in this zone as well as to the Australian wool industry. Based on predictions of the MIDAS model of cereal-pasture-sheep farming for mediterranean environments, the value of stubbles to the wool industry is over $250 million in Australia. The ability of sheep to readily recover this material in stubbles may be greatly influenced by residue handling during harvest. In particular, straw handling methods to facilitate minimum tillage farming may not be compatible with getting the best value for sheep out of stubbles. There is only limited information on the residual grazing value of residues

remaining after straw baling and removal. In addition, crop residues have an important function in soil conservation which also requires investigation.

5.5.2 Prevention of nutritional deficiencies. See also Operational Program 13.

Identification, correction and prevention of nutrient deficiencies which affect the quantity and quality of wool produced. It is generally assumed that the main limiting nutrients are the sulphur amino acids, but in the more productive areas this may not be the case, but rather other essential amino acids, minerals and/or trace elements that limit wool production.

5.6 REPRODUCTIVE EFFICIENCY OF SHEEP.
See also section 5.4.5.

Reproductive performance of the Australian Merino remains poor despite a large investment of money into research. A major reason for the failure of research to improve the national lamb marking percentage "is undoubtedly the fact that much of the research which has been carried out in the past 20 years has not been directed towards solving problems associated with ordinary sheep flocks" (Lindsay 1985). Further, he states that "improvement of specific aspects of poor lambing percentages in commercial flocks or the cheap manipulation of the management of these flocks to reduce costs should receive strong encouragement".

The South Australian sheep industry recognises poor lamb marking percentages as a major problem, and have identified research on reproductive loss in the Merino to be of high priority. Information on the levels of reproductive wastage found in Merino flocks in South Australia is limited. Most of the available information relates to research centres, the environments of which may be atypical of the commercial scene, and which often makes it difficult to extrapolate to commercial management situations. The South Australian Department needs to define the sources of reproductive wastage in commercial woolgrowing flocks, and to study the effects of year, season of mating, age of ewe, body weight and temperature on the major components of the reproductive process (breeding soundness of the ram, oestrus, ovulation rate, embryo mortality, ewes lambing, lambs born, and lamb survival to marking). This will identify problems important to industry and, through extension of appropriate management strategies, help improve flock productivity.

5.7 SHEEP PESTS, HEALTH AND WELFARE.

5.7.1 Internal parasites in sheep.

A major disease factor limiting production in the high rainfall and cereal zones of South Australia is internal parasite infestations. It is estimated that these infestations cost the South Australian sheep industry some $80 million per annum. Much of this cost can be attributed to incorrect use of drenches and a lack of understanding by graziers of worms in the sheep and on pastures. There is a need for programs which encourage sheep producers to use anthelmintics efficiently and reduce the threat of resistance of helminths to anthelmintics.

5.7.2 External parasites in sheep.

5.7.2.1 Fly strike.

Fly strike currently costs the South Australian sheep industry $30 million, is responsible for an estimated 300,000 sheep deaths annually and is a major barrier to improved efficiency of production (Beck *et al.* 1985).

Control of fly strike is achieved by an integrated program which relies heavily on surgical and insecticidal methods. Animal welfare considerations have stimulated increased pressure for alternatives to surgical methods while there are increasing concerns about residues of pesticides in wool and wool by-products.

In addition there are concerns about operator exposure to pesticides and environmental contamination as well as the development of resistance to pesticides in both sheep blowfly and louse populations.

5.7.2.2   Lice.

Sheep lice cost the SA industry an estimated $10 million annually (Wise 1987). Moderate lice infestations cause a significant reduction in the wool value of affected sheep. Control of lice depends mainly on insecticidal and cultural methods. Despite many years of regulatory control and a legal requirement for annual dipping a survey of SA sheep found 16% of sheep flocks where lice could be detected. Interstate experience suggests that the figure would approach 25% if all flocks examined had been in full wool. Such flocks, if not treated for lice, could be expected to develop significant infestations.

A larger extension component in the existing lice control program has been agreed to by this Department, Advisory Board of Agriculture and the United Farmers and Stockowners. This removes the requirement to dip all sheep annually and places greater onus on producers to maintain clean flocks. It is a combination of an extension program and normal regulatory surveillance.

5.7.2.3   Control programs:

*   Give more efficient control of blowfly strike and lice and thus reduce the costs of these parasites to the wool industry;

*   Improve the efficiency of use of pesticides and thus avoid the problems and potential barriers to marketing of wool and its by-products noted above;

*   Reduce dependency on surgical methods of flystrike control.

5.7.3   Pesticide resistance. See also Operational program 13.

Pesticides still form the main basis for control programs of pests of the sheep industry including helminths, insect pests (of animals, pastures and stored foodstuffs), weeds and vertebrate pests. The development of resistance is seen by many as a major threat to the future effectiveness of control. Significant current problems of resistance to the sheep industry include helminths, lice, blowflies, stored product pests and weeds. When resistance develops, higher concentrations of pesticides are required to achieve control and the chance of residues is increased.

Extension is needed to create an awareness of the likelihood of resistance development and to promote optimal pest management practices and resistance management strategies. Research is needed to develop alternatives to chemical control and application strategies which maximise the effective life of those pesticides presently available.

5.7.4 Pesticide residues. See also Operational Programs 8 and 11.

Regardless of whether fears expressed by consumers are real or imagined, pesticide residues can severely affect the marketability of produce. With wool, concerns fall into three main areas:

* Residues in lanolin: Manufacturers of pharmaceuticals and cosmetics have a zero tolerance for residues. Detection of any level of pesticide residues in their products can have devastating effects on markets.

* Residues in wool scouring effluent: There is increasing concern in Europe and particularly in the UK about the presence of pesticide residues in wool scouring effluent.

* Occupational exposure: Fears have been expressed of toxic hazards from exposure of shearers and other wool and sheep handlers to pesticides.

Other residues which are of concern are from chemicals used in moth-proofing processes and toxic heavy metals used in wool dyeing.

5.7.5 Regulation and management of footrot.

Thirty percent of SA Merino sheep are located in the high rainfall areas and are at risk to the introduction of footrot. Prevalence is kept low but at a cost of market restriction for the owner and the cost of regulation and extension by the Department. The South East Regional Research/Extension Liaison Committee identifies footrot as one of two major concerns. Footrot experts within the Department have identified the following areas where activity is required:

5.7.5.1. Research.

* Improved methods of laboratory diagnosis
* Production effects of strains of intermediate virulence
* Epidemiology of footrot under SA conditions
* Alternative forms of treatment
* Evaluation of software packages, such as FOOTFIX (a computer program to aid decision making about foorot treatment), suitable for measuring economic impact of various treatment strategies

5.7.5.2 Extension.

* Training sessions for departmental staff
* Training sessions for private practitioners
* Field demonstrations for producers
* Written extension material and fact sheets
* Field adoption of positive research findings
* Field application of software programs such as FOOTFIX.

5.7.5.3 Regulation.

* In line with the recommendations of the South Australian Footrot Working Party (1984-87) which involved the South Australian Department of Agriculture, the Advisory Board of Agriculture and United Farmers & Stockowners, support and assistance is required for development through to adoption of a national footrot control program. South Australia, Victoria and NSW have already agreed to a coordinated approach. Tasmania dropped footrot control five years ago; footrot is on the increase and action is being requested by industry.

5.7.5.4 Benefits to SA.

* Immediate benefits in terms of livestock movements. Geographically the footrot control areas are a small part of the state but they hold about 50% of the sheep. [Saleyards do present an opportunity for spread of disease but also present a more cost effective way of inspecting sheep moving between properties than making multiple property checks. However, saleyard inspections are a "quality assurance" service, and a "user-pay" system might be appropriate].

* Regulation of footrot is a value-added service which will give down stream benefit in future years as well as short term advantages.

5.7.5.5 Barriers to Success.

* Lack of a definitive diagnostic test for footrot.

* Eradication in individual flocks together with statewide control is a more realistic option than total eradication. Eradication may never be achieved for footrot, where the spectrum of pathogenicity extends from highly virulent to no observable effects.

* Lack of a statewide/national sheep identification system. A property and individual sheep identification system funded by industry would provide better disease control and be more responsive to industry needs.

5.7.6 Disease control and diagnosis.

Presence of disease in a flock affects both productivity and marketing. Export markets are particularly vulnerable to the presence of endemic diseases and reduced prices or markets for either lamb or mutton will eventually effect the viability of the wool enterprise. Australian mutton exports to the United Kingdom ceased in the 1920's because of the high level of cheesy gland in Australian sheep. Temporary halts have occurred with US lamb exports because of the presence of C. ovis (sheep measles) cysts. Disease control has a welfare as well as an economic component.

The absence of disease implies a risk of introduction to the flock, state or country. The cost of prevention must be balanced against the risk of introduction and the likely cost of such introduction.

The needs for disease control can be considered under three headings;

5.7.7 Animal welfare.

Issues of animal welfare can have a detrimental effect on the marketing of animal products as shown from the experience of intensive poultry farmers, fur farmers and intensive pig producers. Many issues of animal welfare also have production components.

The Senate Select Committee on Animal Welfare has identified major issues of interest to the animal welfare movement and to industry:

* improvement of lamb survival;
* reduction in losses of twin bearing ewes and their lambs;
* ensuring producers correctly dock tails;
* immunocastration;
* alternatives to mulesing;
* easy care, strike resistant sheep;

* parameters for the transport of burnt stock; and
* landcare initiatives ("sheep and environment").

5.7.8 Disease monitoring and assurance.

In many cases adequate information is not available either for the owner to appreciate the economics of disease prevention and control within his flock or for government authorities to issue certificates of health. Basic statistical information is not available. The opportunities for improvement are:

* Promotion of cost effective disease control methods which take into account disease aspects as well as market forces, insurance options and tax calculations.

* Improvement of the resistance of animals to disease by breeding, management and vaccination.

* Diagnostic methods and clinical and laboratory aids to diagnosing disease with increase in sensitivity, specificity, speed and economy.

* The industry remains at risk from the introduction of foreign diseases. The presence of disease in Australia has adverse affects on exports to certain countries. While in general the wool market is not seriously affected directly by sheep disease, there are serious indirect effects due to decreased value of surplus sheep, which can be considered a by-product of the wool industry.

* Under new developments related to international trade agreements for livestock and animal products any country establishing restrictions on information on the grounds of the risk of disease introduction will have to provide evidence that it is in fact free of the disease in question or is taking active steps to control it. A national working party is presently examining the uses involved.

  It is proposed that Australia develop a national animal health information system to provide more and better quality intelligence of animal health in Australia.

* Animal health monitoring includes active surveillance of on-farm conditions as well as collection of abattoir data. A sheep identification system would contribute greatly to its effectiveness. Monitoring aims to collect production information for improvement of husbandry programs, welfare statistics as a yardstick for refuting allegations, and economic data for analysis of industry trends; disease assurance information is used to free up marketing.

5.8 PROVISION OF POLICY ADVICE ON THE SHEEP AND WOOL INDUSTRY.

5.8.1 Government funding and provision of support resources for the wool industry. See also Operational Program 9.

There is a lack of Departmental extension and regulatory resources devoted to the wool sheep industry in South Australia, being some 22.7 full time equivalents (FTE's). The Department currently comprises some 1,075 FTE's, which includes 556 FTE's allocated to research and advisory activities. Some major divisions in the latter figure are 303 scientists, 165 technical officers, 43 horticultural officers and 25 veterinary officers. Therefore, only 7.8% of our FTE's are allocated to wool, the most important agricultural industry in the State (Source of figures: Department of Agriculture South Australia, Annual Report, 1988/89).

Government funding and the provision of support resources for the wool industry has been reviewed during the period 1988 - 1990. Two surveys of livestock staffing of the Department

have shown that in 1988 fourteen district and head office staff contributed six full time equivalents (FTE's) supporting sheep and wool management extension programmes. The second survey in 1990 showed 19 people provide 9 FTE's. Of these 9 FTE's 5.8 (1% of total research & advisory FTE's) support the four major across regions extension programmes (WOOLPLAN, LAMBS-UP, TAKEAWAY AND WORMCHECK).

The implementation of priority Departmental programs to meet new industry goals (see 1.4.1) can only be partially achieved with current resources, leading to a slower rate of change in the industry. This will result in lower raw wool quality and an increasing number of non-profitable woolgrowers.

5.8.2 Funding and support for new technology.

The level of funding to support new technology development needs reviewing. These may not be high priority areas for the Department, but need consideration by government. Three major research and development areas are languishing for the want of funds:-

*   Wool harvesting - robotic and chemical shearing are two practical ways of reducing costs to the industry.

*   Artificial breeding technology requires further development and information disseminated to industry to incorporate cost reductions in reproduction practices on properties.

*   Biotechnology research has developed a number of techniques which improve production efficiencies and require support to ensure the transfer of technology to the producer.

Investigations on wool harvesting technology and means for reducing the costs of shearing have resulted in the introduction of a number of new features in shearing sheds, changes in shearing shed design and increases in the efficiency of labour in handling wool. Robotic shearing has been investigated at two locations (University of Western Australia and by Merino Wool Harvesting Pty Ltd in South Australia). The mobile wool harvesting system developed by Merino Wool Harvesting Pty Ltd which includes robotic technology has reached the prototype stage, but is currently short of funding due to a downturn in the rural industries. This major advance in technology, with considerable cost savings to the industry, urgently requires only minor funding to reach the commercially operative stage. The abandonment of this system would be a major constraint to the development of the wool industry in Australia.

Chemical defleecing research is also showing promise of commercial application. It is essential that investigations continue to find methods of removing wool from sheep and handling wool which are less costly than those currently employed.

5.8.3 Encouragement and funding for development of value-added products.

The industry has recognised the need for Australia to spend time and money encouraging manufacturers to process wool as a means of adding value to the greasy product. Scouring and top-making, spinning and weaving, and encouragement of vertical integration from farm to end product to consumer all require stimulation to relieve the industry of the pressures being applied from the downturn in the market.

Attention needs to be given to the development of wool products, including the replacement of some manufactured and synthetic goods with wool products which are natural, clean, pollution-free, environmentally sound and high quality.

5.8.4 Control of flock size and wool production in Australia. See also Operational Program 9.

Considering the current wool industry situation where a costly reserve price scheme (suspended 25 Feb. 1991), a wool stockpiling program, an industry-funded flock reduction scheme (concluded 31 March 1991) and wool marketing quotas have been suggested (abandoned with RPS 25 Feb. 1991), it is clear that there are grave difficulties with regulated marketing and controlled production. Alternative mechanisms such as a free market system with good information flows should be researched, and considered for medium-term implementation. The effects on current industry structures and programs needs consideration.

5.8.5 Funding priorities of the Wool Research and Development Corporation (WRDC). See also Operational Program 9.

There has been a change in emphasis away from production research to wool processing research. This will be a barrier if these priorities are inappropriate for the Australian wool industry. The South Australian Department of Agriculture receives funding through the production research component. This component is going to decrease relative to the rapidly increasing textile research funding. Given the downturn in some State Departments of Agriculture funding, competition for the limited production research funds will increase. This will probably result in this Department tailoring projects more to suit the WRDC priorities.

Initial evidence indicates a greater return from a successful production research project than a textile project (Mullen and Alston 1989). However, there is no information about the amount of investment needed to achieve these successful benefits. To justify a switch in grower funded research and development resources from the traditional area of production research, there must be strong grounds to believe that research and development in processing and textile production will result in cost savings significantly larger than the cost savings available from an equal investment in production research and development.

The structured strategic planning and considerable industry input to wool commodity planning provides the opportunity to influence the WRDC in the setting of its priorities for research. Thus in areas where there is some conflict between the aims and priorities of the WRDC and those of the SA Dept. of Agriculture, industry should be alerted, and where possible evidence should be developed to support the priorities specifically relating to the South Australian industry.

5.8.6 Regulation of the export of Merino genetic material.

The export of Merino genetic material is currently restricted to a limited quota of rams per year (currently 900), sold for export through a licensed export auction, and/or semen from those rams. Export of Merino semen (other than from rams sold for export), ewes, embryos, or other Merino genetic material is prohibited. This regulation will be reviewed in 1992, and there is some potential for change, although this is a very emotive industry issue.

The rationale for the current restrictions is that exporting genetic material will endanger our future wool exports by making other wool producer countries more competitive. There is no genetic evidence to support any superiority of Australian Merino genetic material, rather the evidence suggests that other countries produce less wool of lower quality due to their environmental conditions.

If it is decided to continue regulations on genetic material exports, the economically optimum regulation would be an export tax, not quantity restrictions. In order to calculate the optimal tax, more information is necessary about the value of genetic material, and associated economic parameters.

The restrictive nature of the current regulations may be raising the domestic price of genetic material, and thus slowing the adoption of new developments. Additionally, these restrictions could be slowing the development of genetic improvements by the stud industry by limiting their market. Overall the current restrictions are probably a barrier to industry potential.

The export of Merino genetic material is currently worth some $3 million gross per annum. There is some potential to expand this market, particularly in the USA (with the development of new wool sheep industries due to pressure on beef cattle from land care groups), China and Eastern Europe/USSR (for the upgrading of existing wool sheep). The latter two are probably of finite duration, as the limited information available suggests there are only small genetic differences between Merinos from Australian and Chinese/USSR sources.

5.8.7 Low land prices in Australia. See also Operational Program 9.

Farming land is relatively cheap in Australia, both in relative terms ($/ha) and output ($ produced/$ value), compared to many other countries. This is an opportunity for out-competing foreign countries in the world wool market. Thus, production is more efficient in Australia in terms of return on land capital.

Industrial land is similarly inexpensive in Australia. This provides opportunities for wool processing efficiencies in this country, which are added to those obtained from automation because of our relatively high labour costs compared to developing countries.

5.9 MARKETING AND PROCESSING OF SHEEP, WOOL, SKINS AND OTHER BY-PRODUCTS.

5.9.1 The current over supply of wool. See also Operational Programs 4 and 8.

The over supply of wool is a major current issue in the wool industry. The oversupply of wool coupled with low demand has been addressed by the AWC and IWS in more aggressive marketing and marketing arrangements. Other solutions which have been considered for dealing with this problem include:

* reducing the level of the stockpile by destroying a part of it (preferably the lowest quality and prices segment) or finding alternative uses for it;

* reducing the production of wool at the lower demand/price/quality end of the market by imposing quotas selectively on production of wool at and below a "set standard" (unlikely since the idea of quotas was abandoned);

* removing the reserve price scheme and allowing market forces to adjust the industry [now implemented].

5.9.2 Wool market feedback.

Despite the efforts of the AWC to provide annual presentations from the IWS to woolgrowers, little information from the international wool market is consistently and aggressively passed back to growers on what the consumer is seeking. For example, no information is available on the average wool quality requirements (e.g. AWC type and fibre diameter) of our major international customers. The current wool market situation has stimulated a greater flow of information than normal, but this needs to be maintained and woolgrowers need a constant,

consistent flow of market signals. The reserve price scheme has provided a price buffer which has led to grower security. However this has created inertia in the wool industry with growers seeing no need to change. The poor market signals from the floor price buffer have resulted in a static quality of the Australian raw wool product.

Grower education is also required on how to market the clip. Woolgrowers have a low level of knowledge on the factors important to international wool buyers and on how to present a wool clip to receive an optimum return. Growers have been slow to take up the information which has been provided on processing requirements e.g. contamination/coloured fibres, consistency of colouring in carding wools, consistency of length in fleece wools, optimum lot size, presentation of bales and bale fastening.

The majority of the problems relating to woolgrower uptake of market signals may relate to the level of grower education (secondary and tertiary), and their inability to react to the market unless there is a crisis situation. Australia has the lowest level of farmer education of the developed nations. This leads to poor adoption of both research and marketing information.

5.9.3 World demand for wool.

A major objective for the Australian wool industry should be to increase the world demand for wool. Many of the difficulties discussed elsewhere relate to this. Wool currently occupies less than 5% of the total world fibre market. Increasing this proportion by just 1 or 2 percent would have an enormous effect on our sheep and wool industries. For example, new end-uses need to be developed, or an increased market share gained for alternate end-uses; the fibre diameter of the Australian clip needs to be reduced; processing performance of Australian wool needs to be improved; wool's natural properties and advantages need to be promoted and marketed; new properties and performance attributes need to be developed; and wool needs to be promoted not only as the fashion fibre in the luxury market, but also into alternative markets.

Opportunities for alternative end uses for wool include:

*   Increased use of wool in car seat upholstery. To assess this, a study needs to be done by manufacturers comparing the costs of wool with current materials. Even if wool blends can be introduced competitively, the market should be large. There should also be increased promotion of new weave design light weight blankets, and current quilt fillings could be replaced with wool fibre mixes, bearing in mind the need for allergy-free products.

*   Consideration may be given to the use of wool as a sound and temperature insulation material in buildings. Wool is naturally fire-resistant and could replace fibreglass and wood fibre insulation. This would require additional treatment to enhance fire resistance and provide insect resistance. The large stockpile of wool could be utilised to replace other materials currently used on the domestic market.

*   Alternative uses for consideration with low quality wool are:

    o   as a replacement for or addition to cellulose in some applications;

    o   as a fibre to be used for geotextiles (stabilising earth faces and as a binding agent for retention slopes, dams and ponds);

    o   as a fibre to be used in plastic composite materials, particularly with cross-linking agents;

o   as a soundproofing material in association with plaster (gypsum) or with foamed plastics as a mouldable plastic extension; and

o   as a reformed protein material for disposable biodegradable items of everyday use.

5.9.4   International freight charges. See also Operational Program 8.

Problems on the waterfront and the high cost of international freight are Australian problems which impose barriers to most industries with an export perspective. Micro-economic reform is required to make our export businesses more competitive. In order to increase efficiency under high freight charges, increased export of value-added product is essential e.g. for every three shiploads of greasy wool leaving Australia, one is carrying dirt, seed, woolgrease and other contaminants. This could be overcome by scouring wool in Australia prior to export.

5.9.5   The greenhouse effect.

It is difficult to assess the relevance of the greenhouse effect on the future of the Australian wool industry. Scientific experts have conflicting views on its effects and time frame. The northern hemisphere has experienced four warmer than average winters consecutively, which has significantly affected sales of woollen garments, most noticeably in the coarser micron categories. There is some indication that the IWS believes the greenhouse effect is worth consideration in planning, and that the "Cool Wool" campaign should be maintained.

5.9.6   Wool processing and by-product development.

The development initially of an expanded early-stage wool processing industry in this country could add considerably to export revenue. At present less than 20% of the wool clip is processed in Australia, but industry studies have shown there is scope to increase this based on new technology. This includes improved techniques for measuring and specifying wool to enhance its processing performance, cleaner methods for scouring wool with a reduction of effluent problems; high-speed carding to cut production costs, strategies to reduce the "prickle" feel of wool by lowering wool fibre diameter, improved spinning techniques, including the production of better worsted and wool-blend yarns, and efforts to add greater value to carding wools for woollen yarn production.

A study by Werner Associates Inc. estimated that if the whole clip were processed into yarn it would add an extra $3.5 billion and if it were converted to wool fabric it would be worth an extra $15 billion in export revenue. There are, however, significant international trade obstacles to exporting such a volume of wool in processed form. A more practical option, based on markets for wool now available, would be to process 65,000 tonnes, mostly into wool tops, with a similar proportion into yarn or fabric. This would add an extra $1 billion in value to exports.

It should be noted that the scouring of wool in Australia using cheap industrial land has the potential to produce an effluent problem. Effective waste disposal may be a critical factor in deciding whether or not additional wool processing works should be established in Australia. The problem is compounded for SA by a shortage of water and hence the possible need to recycle water from waste rather than evaporation.

Greater emphasis is required on developing markets for associated sheep products. e.g. skins and lanolin. However, this is an area where the Department of Agriculture will have minimal involvement apart from the provision of marketing information, and, possibly in cooperation with the Department of Industry, Trade and Technology, encourage new market development.

An area which has been identified for export expansion is the tanning of sheep hides into more sophisticated sheep-skin goods. The Australian Meat and Livestock Industry Policy Council has estimated that Australia could more than double the number of sheepskins produced annually to 6 million without any expansion of existing plant. In its 1990 state of the industry report, the Textile Clothing Footwear Development Authority clearly identifies textile production and tanning as potential growth areas provided Australia can establish better marketing links with Asia.

5.9.7 The use of sheep in the biotechnology industry.

Increasing use is being made of animals for the production of vaccines, antisera, and antibody preparations. The Rotavirus project is an example of such a process, using cow's colostrum to prepare oral vaccines against diarrhoeal rotavirus infections, especially in children. Currently, there is extensive application of biotechnology to produce certain biochemicals and rare hormones. The suggested requirements to investigate the use of sheep for this opportunity are:

* a literature search, and
* a market research investigation on potential biotechnology applications using sheep as biochemical "factories".

5.9.8 A national property, paddock, flock and sheep identification system. See also Operational Programs 7 and 13.

There is no national rural identification system operating in Australia. Implementation of such a system on a national basis would lead to rapid and certain identification of geographical and property production and marketing problems, aid in disease and residue traceback and facilitate the provision of market intelligence. In many cases simple remedies already exist for problems that are not recognised by the producer.

An identification system would also aid sale yard operation, direct selling, CALM, abattoir monitoring, application of wool testing results, and the interpretation of surveys. Such a system could be implemented by a joint working group, possibly initiated by SCA, involving the AMLC and state Department of Agriculture "brands" sections.

5.9.9 An inadequate wool futures market.

The wool futures market has only a few contracts traded on its floor. This makes it difficult to use as a hedge against falling prices. The AWC reserve price scheme (RPS) was the reason for the low level of trading in wool futures. However, with the withdrawal of the RPS, prices may become more volatile, and demand may increase for wool futures contracts. At this point growers and processors will be seeking a fully operational futures market. The Department will need to be prepared to provide advice and education on the risks and rewards of using the futures market.

5.9.10 Lack of risk capital availability.

Australia tends to develop most innovations in the wool industry because of the importance of the Australian component of the world wool market. However, as illustrated by many technical innovations in Australia (e.g. the Sarich engine), the Australian equity market is highly conservative and unlikely to fund innovative technologies. Australia contributes about 65% of global wool textile research. This comes largely from CSIRO and WRDC and not the private equity (i.e. share) market. Current tax incentives mean that the effective cost of spending $1.00 on R&D is 26 cents for a business paying 48% tax. Even with this incentive, the current economic climate is not conducive to the entry of risk capital into the wool industry, and a change in business culture is necessary to increase its availability. Thus, the

wool industry needs to become more responsive to market signals, such as the permanent trend towards light weight wool textiles, and hence finer wool.

5.10 WOOL HARVESTING AND HANDLING SYSTEMS.

5.10.1 Inefficient use of farm labour.

According to the study by Love *et al.* (1982), a 10% decline in labour input resulted in an increase in net income for Australian higher rainfall wool properties of 10%. Labour productivity could be increased through management methods which reduce the double handling of stock, improve the wool harvesting process, and through the breeding of sheep with easy-care characteristics such as resistance to blowfly strike.

Shearing shed design and shearing equipment has changed markedly in the past 20 years. Harvesting and handling costs (prior to delivery to a wool store) are high, and the Department of Agriculture should actively promote the most cost-effective systems available.

5.11 COMMUNICATION AND TRAINING.

5.11.1 Industry liaison, communication and training.

Industry liaison and close communication with Department of Agriculture staff are essential to provide direction to research and extension, and may improve the effectiveness of wool production. Training programs to meet the needs of all sections of the wool industry and market pipeline are needed to assist industry change.

5.11.2 Farm management support. See also Operational Program 13.

Lack of timely information inhibits forward planning by producers.

As distinct from the Department's industry liaison role, individual woolgrowers require access to accurate, timely and validated business information on which to make farm and flock management decisions. Guidance on basic management skills needs to be given in order to correctly apply the information. The role of the Department is to ensure that such information is available, not to provide the advice in isolation to the growers understanding of the process or his/her knowledge of the basic information.

The role of the Department of Agriculture is to ensure the production sector matches market needs so that woolgrowing becomes more efficient and profitable.

5.11.3 Adoption of existing technology.

There is considerable concern about farmers' attitude to change, their innate conservatism and their low level of education. Are advisers adopting the most effective means of communication, and are they providing what clients *want* rather than what they *need*?

* These considerations place the onus on research officers to generate "user friendly" information, and to lock advisers into the dissemination of this information.

* Advisory staff need to participate in regional and statewide extension programs and to assess the effectiveness of such programs.

*   Farmers tend to be conservative in the adoption of new technology, and changing production practices to meet market requirements. This is a function of low participation in secondary and tertiary education, but also possibly because many producers are more comfortable/secure with their way of life, and do not perceive a need or benefit to change until a crisis occurs.

The education standard of farmers is seen as a major constraint to the appreciation of the benefits of new technology.

5.11.4 Targetting of extension effort.

The question of audience definition when extension programmes are developed has always been difficult to answer. The most certain and satisfying solution to audience definition is to identify the people who :

a.   believe they need information to help take advantage of a situation or overcome an identified problem; and

b.   have the time and inclination to seek out a source of information which will meet needs.

This audience identification process is most easily achieved by working closely with groups of farmers. The introduction of fee for service, cost recovery and revenue raising activities will be most successful when accurate identification of audience needs occurs.

Program managers (usually district advisers) are in the best position to decide the relevant audience and the extension methodology to achieve the agreed objective.

5.11.5 Staff skills, recruitment and training. See also Operational Program 8.

Over the last decade, Department of Agriculture staff have been asked to take on a more "generalist" role covering more livestock industries than sheep and wool, and more activities than extension (e.g. regulation). Such a policy requires training back-up and funds to keep staff up to date with the technical requirements of the three functions.

The absence of "specialist" sheep and wool officers in this State highlights the difficulty in supplying high quality advice to South Australian woolgrowers. As George Bernard Shaw said, our advisers will end up "knowing less and less about more and more until they know nothing about everything."

There have been few new state funded sheep and wool staff employed by the Department in the last ten years, which means there is a succession problem. Consideration should be given to an "extension officer in training scheme" as proposed by the Turretfield Working Party Report.

It may also be appropriate for the Department to develop a "skills profile" for potential recruits and discuss this with educational institutions from which our staff are recruited (e.g. Universities and Agricultural Colleges).

Specialist staff in Head Office have a responsibility to ensure the latest technology is made available to all district staff to ensure the rural community is given every opportunity to take advantage of opportunities as they arise.

5.12   WOOL QUALITY.

5.12.1   Objective measurement. See also Operational Programs 4 and 12.

The AWTA continues to receive criticism from wool processors regarding the accuracy and consistency of their objective measurement techniques. Objective measurement still has not obtained full credibility throughout the wool industry, and this is particularly apparent in the Merino breeding sector. Woolgrowers need a better understanding of the implications of 'sale by description' on the marketing of their clips, sheep management and breeding. In relation to staple strength, for example, there are wool processors who will not purchase wool under 30 Newtons/Ktx, or with certain break characteristics, regardless of recommendations from the AWTA or AWC.

5.12.2   Sale by description. See also Operational Program 9.

The downturn in the wool industry should encourage accelerated work on the accurate description of wool's properties to encourage rapid introduction of sale by description. The sooner this happens, the sooner marketing and handling economies can be passed to producers and reduce costs, resulting in increased returns.

5.12.3   Wool contamination and trace-back.

Wool producers need to be made more aware of quality parameters relating to contamination, including "junk" in bales, black baling twine, discoloured wool, and also chemical contamination. If woolgrowers do not respond to the market demand for increased quality, then the whole industry will be disadvantaged by a discount applied to the Australian product relative to other woolgrowing countries, or to manufacturers of alternative fibres. The wool industry should apply trace-back technology on a flock basis and penalise individual growers who do not comply with basic requirements.

Wool producers are expected to more closely follow the code of practice for clip preparation. The incidence of contamination is causing concern throughout the market and processing part of the system. Careful sheep and shed preparation before shearing, proper in-shed sheep and wool handling and careful attention to clip preparation is needed to eliminate the contamination problem. The Australian Wool Corporation has a national program running which is supported by Department staff and aims to improve clip preparation standards to ensure best prices for the wool at market. In addition, a trace back system involving penalties is being introduced in an attempt to minimise contamination.

5.13   SHEEP MANAGEMENT.

5.13.1   The relationship between stocking rate and efficiency of sustainable production.

There is a need for investigation of the consequences of reducing or increasing stocking rate on wool production efficiency and sustainability. This should be related to management strategies, costs and returns, lambing percentages and the State's wool production. A consequence of reducing stocking rate would be increased fleece weight but also increased fibre diameter.

5.13.2   Knowledge about pasture productivity.

Producers should be encouraged to learn more about the productivity of their pastures. With this knowledge and an understanding of the nutrient requirements of sheep according to their physiological state, stocking rates can be accurately determined. The proposed Pasture and Animal Assessment Program (PAAP) aims to help farmers do this. The South East, Central and Eyre Regions staff are running limited pilot PAAPs with a number of producers.

Widespread adoption of this program would permit collection of production data which will help validate some of the assumptions used in grazing management models.

5.13.2 Knowledge about additional measurements.

Livestock advisers will be encouraged to give farmers and graziers information which will help reduce the incidence of weak fibres with low newtons per kilotex (N/Ktx) readings. South Australia has recorded the second lowest figures when compared with all other states. Market prices are reduced when wools record less than 30 N/Ktx. South Australia's climate leads to poor quality dry paddock feed in the late summer/autumn period. Most producers plan their lambing to occur in autumn. The stress of pregnancy at a time when feed is short leads to weak fibres if management is not adjusted to provide improved nutrition for pregnant ewes.

5.13.4 Management in relation to fibre diameter.

There is particular concern with strong wool Merinos about fibre diameter variation, and increase in fibre diameter with age which may be affected by nutrition. However, it is believed that some sheep maintain constant fibre diameter despite marked seasonal variations in feed quantity and quality.

5.13.5 Management in relation to wool contamination.

See 5.12.3.

6.   OPERATIONAL PROGRAMS FOR THE SHEEP & WOOL INDUSTRY.

The following is a list of current Departmental Operational Programs and Projects within Programs which address the constraints to sustainable production and market development in the wool industry. Each project is accompanied by an expected outcome [in square brackets] and the aims of the project. These Operational Programs are carried out in both Regionally and Divisionally managed parts of the Department of Agriculture. The structure of the Department relevant to these programs is shown in Figure 3 on Page 45. The resources allocated by the Department to these Operational programs are summarised on the summary page for each Program. These resources are given in detail for each Project and program in Appendix II.

Figure 3: *South Australian Department of Agriculture organisation structure.*
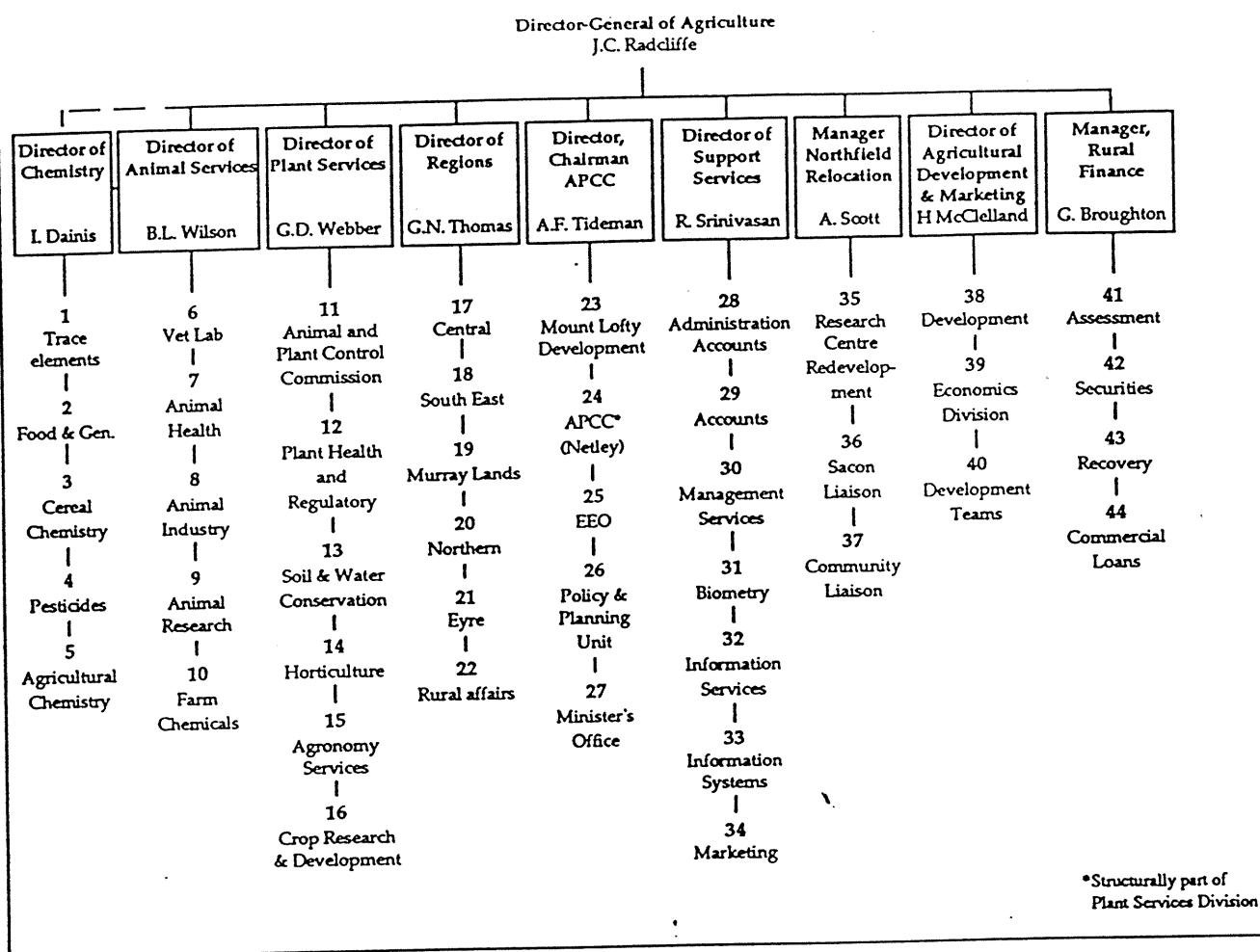
Location of Operational Programs indicated by superscript:

1. Soil fertility, soil structure, plant nutrition and water use[1,3,5,13,15,17-21].

2. Breeding and selection of pasture plants[15,16,17-21].

3. Management and utilisation of pasture and rangeland vegetation[8,11,12,15,17-21].

4. Genetic improvement of sheep[8,9,17-21].

5. Nutrition of sheep[6,8,15,17-,21].

6. Reproductive efficiency of sheep[6,7,8,17-21].

7. Sheep pests, health and welfare[6,7,8,11,17-21].

8. Provision of policy advice on the sheep and wool industry[8,26,27,39].

9. Marketing and processing of sheep, wool, skins and other byproducts[8,38,39].

10. Wool harvesting and handling systems[8,17-21].

11. Communications and training[7,8].

12. Wool quality[7,8,9,17-21].

13. Sheep management[7,8,17-21].

6.1 SOIL FERTILITY, SOIL STRUCTURE, PLANT NUTRITION AND WATER USE.

6.1.1 Soil fertility.

6.1.2 Soil acidity.

6.1.3 Soil salinity.

6.1.4 Soil conservation.

6.1.5 Monitoring soil pH and nutrient status.

RESOURCES: $439,777; 7.22 FTE's.

6.1 SOIL FERTILITY, SOIL STRUCTURE, PLANT NUTRITION AND WATER USE.

6.1.1 Soil fertility.

Research

6.1.1.1 Residual benefits of fertiliser zinc applied to S.A. soils. [Will provide tests and criteria for diagnosing zinc deficiency in annual pasture legumes (and crops)].

> 6.1.1.1.1 To define the residual effects of fertiliser zinc in soils of the Murray Mallee and Eyre Peninsula.

> 6.1.1.1.2 To calibrate plant and soil tests diagnostic of zinc deficiency in pasture and crop plants.

6.1.1.2 Phosphorous fertilisation in wheat-pasture rotations. [The most efficient strategy for applying P fertiliser to a medic-wheat rotation will be provided by this research.]

> To examine efficient strategies for applying P fertilisers to annual medic-wheat rotations (long-term trial at Mallala).

6.1.1.3 Field calibration of plant tests for diagnosing sulphur deficiencies in sub-clovers and annual medic pastures. [Incorporate tests and their criteria into existing commercial plant testing services as an aid to graziers].

> 6.1.1.3.1 To develop reliable analytical procedures for determining sulphur and SO_4 in plant materials.

> 6.1.1.3.2 To develop and calibrate sensitive plant tests for diagnosing S deficiencies in sub-clovers and annual medics.

6.1.2 Soil acidity.

Research

6.1.2.1 Development of an expert system for the prediction of optimum and safe liming practices on S.A. acidic pasture soils. [Provide safe liming application rates to S.A. graziers via an expert system].

> 6.1.2.1.1 Evaluate effects of lime on boron nutrition of pasture.

> 6.1.2.1.2 Evaluate effects of lime on sub-clover nodulation, effectiveness and efficiency.

> 6.1.2.1.3 Develop expert system for liming advice to graziers.

Extension

6.1.2.2 Soil Acidity - Kangaroo Island.

> To demonstrate and increase the adoption of effective soil acidity correction practices.

6.1.3 Soil salinity.

Extension

6.1.3.1 Soil Salinity - Kangaroo Island.

To define the causes of soil salinity increases on KI and assess remedial strategies.

6.1.4 Soil conservation.

Extension

6.1.4.1 Soil Conservation - Kangaroo Island.

Soil fertility, soil structure, plant nutrition and water use.

To encourage a community land-care ethic through the KI Soil Board and local land care groups.

6.1.5 Monitoring soil pH and nutrient status.

Extension

6.1.5.1 Soil pH/nutrient monitoring - Kangaroo Island.

To increase awareness of acid soils/soil fertility and to conduct long-term fertiliser trials comparing various fertilisers.

6.1.5.2 Monitoring soil pH and nutrient status - Central Hills.

To monitor the fertility status of soils and extend corrective measures based on analysis, land use, economics, environmental and social factors.

6.2 BREEDING AND SELECTION OF PASTURE PLANTS.

6.2.1   National sub-clover improvement program - SA.

6.2.2   Low phosphorus tolerant pasture legumes.

6.2.3   Pasture legumes for the low rainfall areas.

6.2.4   Breeding ARGT resistant ryegrass.

6.2.5   Selection for salt tolerance and resistance to Stagonospora.

6.2.6   Annual medic genetic resource.

6.2.7   Pastures for saline soils.

6.2.8   Pastures for deep sands.

RESOURCES: $962,786;   17.07 FTE's.

6.2 BREEDING AND SELECTION OF PASTURE PLANTS.

6.2.1 National sub-clover improvement program - SA.

Research

6.2.1.1 National Subterranean clover improvement program - S.A. component.

To develop, in a nationally coordinated breeding program, new cultivars of Trifolium brachycalycinum with the widest possible adaption to environments and farming systems in S.A.

6.2.2 Low phosphorus tolerant legumes.

Research

6.2.2.1 Selection of low phosphorous tolerant pasture legumes.

To select, through natural selection, annual pasture legumes adapted to low levels of soil phosphorous.

6.2.3 Pasture legumes for low rainfall areas.

Research

6.2.3.1 Pasture legumes for low rainfall agricultural areas.

To select and evaluate improved pasture legumes for low rainfall northern agricultural areas of South Australia.

6.2.4 Breeding ARGT resistant ryegrass.

Research

6.2.4.1 Breeding ARGT resistant ryegrass. [ARGT resistant cultivars developed by this project will be the only pasture grasses recommended for use in the wheat/sheep belt of Southern Australia].

6.2.4.1.1 Develop cultivars of annual ryegrass resistant to the nematode associated with annual ryegrass toxicity.

6.2.4.1.2 Develop DNA probes or identify proteins that can be used to identify resistant plants and seeds.

6.2.5 Selection for salt tolerance and resistance to Stagonospora.

Research

6.2.5.1 Selection for salt tolerance and resistance to Stagonospora. [1.Depending on level of salt tolerance development of experimental cultivars; and 2. Release of Stagonospora resistant improvements of current experimental varieties].

6.2.5.1.1 Solution for salt tolerance in lucerne.

6.2.5.1.2   Incorporation of resistance to <u>Stagonospora</u> into lucerne selections.

6.2.6   Annual medic genetic resources.

Research

6.2.6.1   The evaluation and seed production of annual medic genetic resources. [This project has been responsible for the initial introduction and evaluation of many important pasture cultivars. These include medics such as Paraggio, Parabinga, Sephi, Paragesa, Kelson and Rivoli and clovers such as Paradana and Kyambro. In addition the programme has provided sources of resistance to various aphids, which have been utilised in breeding. The project will continue to provide the main source of germplasm for pasture research programs in Southern Australia and this will provide a basis for the development of many new cultivars which will continue to have an impact on the industry].

6.2.6.1.1   To evaluate and increase seed of priority pasture legume lines for rapid advancement into breeding and regional evaluation programmes.

6.2.6.1.2   To conserve seed of these lines in the genetic resources collection as a basis for future research.

6.2.7   Pastures for saline soils.

Extension

6.2.7.1   Dryland Salinity in the Murray Mallee.

To evaluate better pasture species for the lighter and salt affected soils.

6.2.8   Pastures for deep sands.

Extension

6.2.8.1   Pasture Species for the Deep Sands.

To improve pasture production on deep sands in the Meningie area.

6.3   MANAGEMENT AND UTILISATION OF PASTURES AND RANGELAND VEGETATION.

6.3.1   Pasture establishment.

6.3.1   Grazing management.

6.3.3   Evaluation of grazing system models.

6.3.4   Extension of existing pasture technology.

6.3.5   Weed control in pastures.

6.3.6   Pest control in pastures.

6.3.7   Pathogens of annual medics.

6.3.8   Legume variety testing.

RESOURCES: $791,469;   18.04 FTE's.

6.3 MANAGEMENT AND UTILISATION OF PASTURES AND RANGELAND VEGETATION.

6.3.1 Pasture establishment.

Research

6.3.1.1 Pasture establishment on red-brown earth soils.

> To assess the influence of sowing method on pasture establishment and production.

Extension

6.3.1.2 Pasture establishment, renovation and management.

> To assess pasture establishment, renovation and management problems and techniques, and to maximise pasture productivity.

6.3.1.3 Cover crop x medic rate.

> To develop cultural practices for establishment of high quality legume pastures in the Murraylands Region.

6.3.1.4 Cover crop x lucerne rate.

> To develop cultural practices for establishment of lucerne in the Murraylands Region.

6.3.2 Grazing management.

Research

6.3.2.1 Grazing management of sheep on saltbush pastures. [Major changes in management strategies will prevent the gradual deterioration of pastures and hence maintain production in the long term. Also reduced need for panic selling of stock in drought].

> To establish the impact of sheep grazing on the population dynamics of saltbush, to allow the development of management strategies which will prevent pasture damage.

6.3.2.2 Herbage production, animal production and rabbit grazing in the degraded grasslands of semi-arid South Australia. [Livestock production will be optimised under current levels of knowledge and aspects requiring further research will be highlighted].

> To gather basic information on production levels in relation to rainfall, competition from pests and under livestock grazing and to assess current management strategies.

6.3.3 Evaluation of grazing system models.

Research

6.3.3.1 Evaluation of grazing systems models.

6.3.3.1.1   To evaluate the suitability of models of various aspects of cereal/animal farming systems for use as extension aids in S.A.

6.3.3.1.2   To develop a simulation model of the stubble-pasture-sheep system as practised in the cereal/animal zone of S.A.

6.3.4   Extension of existing pasture technology.

Research

6.3.4.1 Pastures in cropping systems.

> To improve the utilisation of existing pasture technology to benefit farmers and the community by accelerating the adoption of profitable and sustainable farm practices.

Extension

6.3.4.2 Increasing pasture production and utilisation

> To improve pasture quality on dryland properties by identifying and extending methods of increasing clover content.

6.3.4.3 Increasing pasture production - Central Region.

> To identify factors limiting pasture production, investigate methods of addressing these factors and achieve cost effective increases in pasture production.

6.3.5   Weed control in pasture.

Research

6.3.5.1 Biology and control of perennial weeds. [Reduce competition from perennial weeds to allow increased growth of desirable pastures species, allowing increased wool production through better nutrition].

> Improve understanding and control of perennial weeds so as to reduce their impact on crops and pastures.

6.3.5.2 Biology and control of golden dodder. [Reduce the threat to lucerne production and pasture legume seed production and export markets].

> To improve detection and control methods for golden dodder.

6.3.5.3 Barley grass control in sub-clover pastures. [1. In the year before sowing a crop, application of Fusilade® can be delayed, eg. until mid-August, so that barley grass can be utilised for early feed yet still be controlled early enough to avoid problems with the seed heads and impart benefits to the following cereal crop; and 2. removal of barley grass from pastures can lower pasture production and allow invasion of other broadleaf weeds; grazing management on legume dominant pastures needs to be modified, eg. deferred grazing at break of season to allow clovers to become established and light grazing only over summer to retain sufficient pasture residues to protect the soils].

6.3.5.3.1   To investigate different rates and times of Fusilade® application (a selective grass herbicide) for barley grass control in a sub-clover pasture.

6.3.5.3.2   To investigate the effects of this barley grass control on pasture and crop production.

6.3.5.4   Silver grass (Vulpia) control in legume pastures. [Silver grass seeds cause serious wool contamination and sheep health problems. Losses are in the order of $40 million p.a. Interstate research and S.A. trials in 1989 indicated that relatively cheap, selective treatments for silver grass control, based on Simazine® ± Gramoxone®, are possible and require further evaluation. Control of silver grass needs to be integrated in a pasture management programme].

6.3.5.4.1   To investigate herbicides for silver grass control in legume pastures

6.3.5.4.2   To investigate effects of silver grass control on pasture production and composition.

6.3.5.4.3   To investigate replacement species to compete with silver grass in legume pastures.

Extension

6.3.5.5   Grass control in pasture.

To extend the principle of grass control as a means to reducing cereal root diseases.

6.3.5.6   Grass seed survey.

To carry out a survey on grass seeds in sheep and use the current methods of control.

6.3.6   Pest control in pastures.

Research

6.3.6.1   Cost effective control of invertebrate pests in annual medic pasture. [New technology to make rational decisions on the cost-effectiveness of controlling red legged earthmite, bluegreen aphid and lucerne flea in medic pastures, thus reducing the estimated $238 million annual loss to the wool industry attributed to these pests of pasture by up to 30 to 40%, commensurate to the proportion of the number of sheep in southern Australia grazing medic pastures].

6.3.6.1.1   To assist woolgrowers with decisions on the cost effective control of major invertebrate pests in medic pastures by:
- determining treatment thresholds for the pests.
- developing practical sampling methods of the pests.

6.3.6.1.2   To develop procedures which can be used by woolgrowers/extension officers/consultants to implement the cost-effective control of pests.

6.3.7   Pathogens of annual medics.

Research

6.3.7.1   Survey of annual medic seed for fungal, nematode and viral pathogens. [1. An increase of $11 million in wool production; 2. more reliable establishment of pastures and production of pasture; and 3. a national commercial seed health testing service for annual medics].

6.3.7.1.1   To provide a national statement on seed-borne diseases of annual medics, their importance and where they occur.

6.3.7.1.2   To establish a commercial medic seed health testing service for wool producers establishing pastures.

Extension

6.3.7.2   Improved annual medic pastures and grain legume break crops.

To promote the sowing of medic pastures and/or grain legumes for soil fertility and control of cereal root diseases.

6.3.8   Legume variety testing.

Extension

6.3.8.1   Comparison of fodder yields for various 'hay' mixes trial.

Evaluate productivity of a number of cereal and legume mixes.

6.3.8.2   Pasture legume variety testing/husbandry demonstration.

To demonstrate and promote new cultivars of pasture legumes and relevant pasture management practices.

6.4 GENETIC IMPROVEMENT OF SHEEP.

6.4.1 Wool production traits.

6.4.2 Wool quality traits.

6.4.3 Skin characters.

6.4.4 Short tail Merinos.

6.4.5 Fleece Measurement Service.

6.4.6 WOOLPLAN.

RESOURCES: $728,623; 12.86 FTE's.

6.4   GENETIC IMPROVEMENT OF SHEEP.

6.4.1   Wool production traits.

Research

6.4.1.1 Phenotypic and genetic parameters for production traits of S.A. Merinos. [1. The accuracy of sheep selection programs based on assessment of young animals will be determined. 2. Performance recording schemes for wool sheep will be improved. 3. The potential for genetic improvement in the value of Merino sheep and wool production will be increased].

   6.4.1.1.1   To estimate phenotypic and genetic parameters for wool production, wool quality and reproductive traits measured or assessed on sheep at approximately 10 months of age with 6 months wool growth.

   6.4.1.1.2   To estimate the genetic relationships between wool production, wool quality and reproductive traits measured at 10 months of age and lifetime (adult) productivity.

Extension

6.4.1.2 Breeding and selection plans for Wanbi Research Station sheep flock.

   Utilisation of superior selection and breeding techniques.

6.4.2   Wool quality traits.

Research

6.4.2.1 Genetic parameters for wool quality traits.

   To estimate phenotypic and genetic parameters for wool quality traits on rams at 10 and 16 months of age, with 6 months wool growth, and on ewes at 16 months of age and at adult ages, with 12 months wool growth.

6.4.2.2 Inheritance and reduction of isolated pigmented fibres in Merinos.

   6.4.2.2.1   To investigate the inheritance of isolated pigmented fibres in white wool sheep and to develop practical procedures for identifying sheep which have the fault.

   6.4.2.2.2   To investigate the effects on the incidence of isolated pigmented fibres in wool tops produced from sheep which have been classed on the basis of non-fleece pigmentation.

6.4.3   Skin characters.

Research

6.4.3.1 Skin characters as selection criteria for Merino sheep.

   6.4.3.1.1   Evaluate the potential of skin characteristics measured in young sheep as selection criteria for adult fleece production.

6.4.3.1.2   Further the understanding of the genetic and nutritional factors governing follicle function.

6.4.4   Short tail Merinos.

Research

6.4.4.1   Breeding short tail Merinos.

6.4.4.1.1   To establish if the short tail character in Merinos is inherited and to determine the mode of inheritance.

6.4.4.1.2   To assist in the development of a short tail strain of Merino.

6.4.5   Fleece Measurement Service.

Extension

6.4.5.1   Operation of Turretfield Fleece Measurement Service.

6.4.5.1.1   To increase the adoption of improved sheep selection practices which arise from genetic research programs.

6.4.5.1.2   To promote to the wool industry the role of Turretfield as a technology resource centre and thereby increase the adoption of all new technology from research programs there.

6.4.6   WOOLPLAN.

Extension

6.4.6.1   WOOLPLAN. [Quicker genetic progress in the Merino stud industry leading to more efficient wool production on commercial properties].

6.4.6.1.1   The adoption of performance recording in the selection of sires and marketing of rams by the stud industry.

6.4.6.1.2   Commercial growers using WOOLPLAN information to select rams.

6.4.6.2   District advisory program - WOOLPLAN (Northern Region). [Improving the quality of wool produced ie. suitable micron, for a given area - in accordance with producers objectives].

Provide general advice on WOOLPLAN and its applications to the sheep graziers in the Northern Region.

6.4.6.3   WOOLPLAN extension - Eyre Region. [Improved rate of genetic gain will increase long-term efficiency of wool production].

To improve the rate of adoption and use of objective measurement in ram breeding flocks on Eyre Peninsula.

Development

6.4.6.4   Review and update of WOOLPLAN breeding objectives.

To review and update the WOOLPLAN breeding objective options, in order to ensure that all recently developed information is used, and that all traits for which there is genetic and economic potential for improvement are considered.

6.5   NUTRITION OF SHEEP.

6.5.1   Utilisation of stubbles and dry pastures.

6.5.2   Mineral, trace element, vitamin and water medication supplements.

6.5.3   Ration formulation and advice.

6.5.4   Fodder trees.

6.5.5   Sheep production systems.

RESOURCES: $190,770; 4.38 FTE's.

6.5   NUTRITION OF SHEEP.

6.5.1   Utilisation of stubbles and dry pastures.

Research

6.5.1.1   Nutrition and supplementation of sheep grazing stubbles and dry pasture.

6.5.1.1.1   To determine the effects of stubble handling techniques on the feeding value of those stubbles for sheep.

6.5.1.1.2   To determine circumstances under which supplementation of sheep grazing stubbles will be profitable.

6.5.2   Mineral, trace element, vitamin and other medication supplements.

Research

6.5.2.1   The passage of metal particles through the gut of sheep. [The determination of desirable physical characteristics of orally administered elemental supplements will permit the development of more efficacious mineral supplements and encourage the development of other supplements based on this method].

To determine the optimum physical characteristics of a particle which when given orally to sheep will be readily retained in the abomasum.

.6.5.2.2   Investigations of live weight and wool responses to selenium supplementation (CVL/E1).

Extension

6.5.2.3   Water medication trial. [Accurate advice about the ability of the units to provide a suitable nutritional supplement to sheep at an economic advantage].

To evaluate the use of commercially available water medication units for sheep.

6.5.2.4   Trace elements in sheep.

To assess trace element status of sheep and goats and the economic merits of treatment strategies.

6.5.2.5   Response in weaner sheep to a commercial water medication supplement. [Provision of the most practical and cost-effective method of supplementing sheep on stubbles to increase stubble breakdown and wool production].

6.5.2.5.1   To measure liveweight and wool growth response of weaner sheep grazing wheat stubbles on Minnipa Research Centre when given a commercial water medication supplement.

6.5.2.5.2   To measure rumen fluid ammonia concentration of weaners grazing wheat stubbles.

6.5.2.6   Cobalt deficiency in sheep on Kangaroo Island (E1/C1).

6.5.2.7 Contract project - Evaluation of cobalt pellets for sheep (E1/VS17).

6.5.2.8 Vitamin E supplements for sheep.

6.5.3 Ration formulation and advice.

Extension

6.5.3.1 Software development - TAKEAWAY project. [To provide district livestock staff with decision support software that calculates least cost supplementary or fully supplied rations for sheep and beef cattle].

> 6.5.3.1.1 To promote the use of the TAKEAWAY ration formulation system in South Australia.

> 6.5.3.1.2 To make TAKEAWAY available as a commercial software package.

6.5.3.2 District advisory program - TAKEAWAY, Northern Region. [Improving efficiency of production in sheep grazing, while allowing long term stability - particularly important in the rangeland and dry semi-arid areas].

> To provide an advisory service that assists producers in maintaining animal production (per head) through suitable nutrition levels - especially in periods where pasture feed is of low quantity and low quality.

6.5.3.3 Rations. [Improve productivity of sheep production enterprises in the Mid North].

> To provide stock owners with ration advice for feeding sheep.

6.5.3.4 Production feeding of sheep.

> To assess the performance of a balanced ration against predicted growth rates.

6.5.3.5 Livestock drought feeding kit.

> To compile a kit for farmers to assist in drought.

6.5.4 Fodder trees.

Extension

6.5.4.1 Fodder tree demonstration.

> To demonstrate the usefulness of fodder trees as drought reserve.

6.5.5 Sheep production systems.

Extension

6.5.5.1 Integration of sheep into the farming system. [1. An increase or decrease on unit sales. 2. Adoption of alternative methods if the units are not cost effective. 3. Better stubble utilisation methods leading to decreased soil erosion potential.]

> To define the costs/benefits in supplying urea to sheep grazing stubbles via water medication units.

6.5.5.2 Integration of sheep into the farming system. [1. Efficient use of sheep in the cereal/livestock zone. 2. Increased profit from the sheep enterprise. 3. Reduced soil erosion potential.]

6.5.5.2.1 The adoption of objective data as a basis for decision making with sheep enterprise decisions.

6.5.5.2.2 Stubble utilisation based on sheep weights, stubble assessment.

6.5.5.2.3 TAKEAWAY to formulate least cost supplementary and feedlot rations for sheep with different physiological status.

6.6 REPRODUCTIVE EFFICIENCY OF SHEEP.

6.6.1 Reproductive wastage.

6.6.2 Artificial insemination.

6.6.3 Embryo collection, culture and transfer.

6.6.4 Transgenic sheep.

6.6.5 Sheep production systems.

RESOURCES: $347,239; 6.54 FTE's.

6.6   REPRODUCTIVE EFFICIENCY OF SHEEP.

6.6.1   Reproductive wastage.

Research

6.6.1.1 Reproductive wastage in commercial Merino flocks.

To define the sources of reproductive wastage in South Australian commercial Merino flocks.

Extension

6.6.1.2 Reproduction in sheep.

To investigate reproductive losses in Merinos and to assess farm management systems for prolific crossbred ewes.

6.6.1.3 "LAMBS-UP" sheep reproduction package.

To collate and extend an extension package on sheep reproduction.

6.6.1.4 Lamb mortality investigation.

To find out mortalities from lambing to weaning in Murraylands Region.

6.6.2 . Artificial insemination.

Research

6.6.2.1 Improved artificial insemination in sheep.

To improve the fertility following AI of ewes with frozen-thawed ram semen by a low cost (vaginal or cervical) technique.

Extension

6.6.2.2 Artificial breeding extension.

To continue to provide information, advice and training for sheep, cattle, pigs and goats on a state wide basis.

6.6.3   Embryo collection, culture and transfer.

Research

6.6.3.1 Embryo collection, culture and transfer in sheep.

6.6.3.1.1 To improve the collection rates and viability after transfer of sheep embryos.

6.6.3.1.2 To further develop systems of _in vitro_ culture of sheep embryos.

6.6.4 Transgenic sheep.

Research

6.6.4.1 Production of transgenic sheep.

To produce sheep transgenic with genes associated with wool growth.

6.6.5 Sheep production systems.

Extension

6.6.5.1 Integration of sheep into the farming system. [1. More efficient use of available pasture by sheep. 2. Increased profit from the sheep enterprise.]

6.6.5.1.1 To ensure more efficient use of available pasture by sheep.

6.6.5.1.2 To increase profitability of the sheep enterprise.

6.6.5.1.3 To increase adoption of spring lambing by cereal livestock producers.

6.6.6 Semen Analysis.

Extension

6.6.6.1 Semen Analysis Service.

To provid an analytical service to certify standards of commercially processed and frozen mammalian semen.

6.7   SHEEP PESTS, HEALTH AND WELFARE.

6.7.1   Internal parasite control in sheep.

6.7.2   External parasites in sheep.

6.7.3   Footrot.

6.7.4   Chemical usage and residues.

6.7.5   Disease control and diagnosis.

6.7.6   Disease monitoring and assurance.

6.7.7   Animal welfare.

RESOURCES: $738,370; 15.91 FTE's.

6.7   SHEEP PESTS, HEALTH AND WELFARE.

6.7.1   Internal parasites of sheep.

6.7.1.1. To determine the epidemiology and pathogenicity of sheep internal parasites.

Research

6.7.1.1.1   Epidemiology of nematode infections in Merinos. (The study will indicate the strategic need for pre-lambing and/or weaner drenches in the management of gastro-intestinal nematodes in sheep in the cereal zone of South Australia).

To determine the relative importance of pasture contamination by pregnant ewes in the infection of weaners by nematodes and to determine the need for pre-lambing drenches.

Extension

6.7.1.1.2   Survey for Haemonchus infections in sheep from Fleurieu Peninsula, South Australia. (It is not known whether Haemonchus infections occur in sheep from the Fleurieu Peninsula. This survey will specifically answer this question and allow appropriate control measures to be implemented (if required)).

To determine the extent of Haemonchus infections in sheep from the Fleurieu Peninsula, South Australia.

6.7.1.2   To devise and evaluate strategic drenching programs.

Research

6.7.1.2.1   Immunology of nematode infections in sheep. (The development of more accurate and efficient diagnostic tests for nematode parasites in ruminants is required as imperative for disease surveillance and the evaluation of prevention and control strategies. The early diagnosis will allow prompt and appropriate action to be taken to reduce mortality and increase productivity).

To identify specific antigenic elements from nematode parasites of sheep and to evaluate their efficacy in the diagnosis of infections.

Extension

6.7.1.2.2   Internal parasite control - Central Region.

To co-ordinate sampling on properties for worm counts, and encourage the adoption of drench selection and drenching practices which will improve internal parasite control.

6.7.1.2.3   Internal parasite control - Kangaroo Island.

To co-ordinate sampling on properties for worm counts, and encourage the adoption of drench selection and drenching practices which will improve internal parasite control.

6.7.1.2.4   Internal parasite control - Captec® trial - Central Region.

To compare the worm burdens, body weights and fleece weights of sheep treated with Captec AB2® . capsules to those treated with an effective oral drench.

6.7.1.2.5   Worm control in the cereal zone - Eyre Region.

(More effective use of drenches will minimise costs and improve productivity and profitability for sheep producers. The project will also assist in delaying or preventing the onset of drench resistance in susceptible flocks on Eyre Peninsula).

6.7.1.2.5.1   Improve the efficiency of worm control in sheep in the cereal zone.

6.7.1.2.5.2   Survey internal parasite drench resistance in sheep in selected areas on Eyre Peninsula.

6.7.1.2.6   Seasonal incidence of nematode infections in sheep from the South-East Region of South Australia (The study was designed as an extension project to assess various drench strategies in the control of Haemonchus infections in South Australia).

To monitor the effectiveness of two summer drenches (including Closantel®) in the control of Haemonchus and Trichostrongylus infections in sheep from the South-East Region of South Australia.

6.7.1.3 Determine the extent and significance of anthelmintic resistance.

Extension

6.7.1.3.1   Anthelmintic evaluation trials. (Drug evaluation trials are important on a regional basis to determine their efficacy in controlling parasite populations present. The results will contribute significantly to recommendations made as part of the Departmental "WORMCHECK" program).

To determine the efficacy of new anthelmintics on nematode parasites of sheep.

6.7.1.3.2   Anthelmintic resistance in sheep nematodes. (The survey will monitor the efficacy of current control measures designed to reduce the level of anthelmintic resistance amongst sheep nematodes).

To determine the incidence of drench resistance in sheep nematodes throughout the high rainfall areas of South Australia.

See also 6.7.1.2.5.2 .

6.7.2   **External Parasites.**

Research

6.7.2.1 **Sheep blowfly.**

6.7.2.1.1   Controlled release insecticides for fly and lice control. (The programme will attempt to develop controlled release insecticide systems which can give long term control of external parasites).

To assess the potential of controlled release insecticide systems for use in the control of sheep parasites.

6.7.2.1.2   Blowfly strike early warning system. (The project will determine the practical usefulness of a system for predicting body strike on South Australian properties).

To assess the efficiency and practical usefulness of an early warning system for predicting body strike.

6.7.2.2 **Sheep lice.**

Research

6.7.2.2.1   Insecticide resistance in sheep lice. (If high levels of resistance are found farmers will have to modify treatment practices in order to be able to achieve lice control on infested sheep).

6.7.2.2.1.1   To determine if resistance to pyrethroids is present in South Australian populations of Damalinia ovis and if so, to assess its importance as a factor contributing to louse infestation in South Australian flocks.

6.7.2.2.1.2   To create an awareness amongst sheep producers of the potential for development of resistance in sheep louse populations and of management practices which prevent this occurring.

Extension

6.7.2.2.2   Lice extension program ("LICECHECK"). [(1) The amount of insecticide used to control sheep body lice will be halved within 3 years. (2) The prevalence of properties affected with sheep body lice will not increase. (3) The development of chemically resistant populations of sheep lice will be reduced. (4) Producers will be trained to recognise and deal effectively with sheep body lice infestations.]

To reduce the amount of insecticide used for sheep lice control in SA.

(see also 6.7.2.2.1, 6.7.6)

6.7.3 Footrot.

Research

6.7.3.1 Classification of SA isolates of intermediate footrot.

> To determine the maximum virulence of *B. nodosus* that are field intermediate in SA.

6.7.3.2 Field behaviour of intermediate footrot. (Will supplement the limited information available on behaviour of intermediate strains of footrot in SA, resulting in better treatment recommendations, and better interpretation of early detected infections).

> To collect basic data on behaviour of field intermediate strains of *B. nodosus* on farm.

6.7.3.3 Cattle as carriers of intermediate footrot. (Strains of cattle as carriers of quarantineable footrot (under SA legislation) will be determined; currently this is unknown).

> To determine if cattle can act as carriers of field intermediate strains of *B. nodosus*.

6.7.3.4 Evaluation of use of antibiotics as an eradication treatment for intermediate footrot. [Verification of usefulness of a fourth treatment option (for flocks infected with footrot) that has lower manpower input requirements than the three current treatment recommendations].

> To determine if antibiotics are a treatment option for flocks infected with intermediate footrot.

6.7.3.5 Collection of footrot isolates. (Will enable research to be undertaken into field intermediate strains of footrot in SA).

> To establish a viable collection of field intermediate isolates of *B. nodosus*.

Extension

6.7.3.6 Footrot - Central Region.

> (Develop a computer program "FOOTFIX" for use by Departmental personnel involved in ovine footrot).

> To improve financial decision making options for controlling footrot.

> (See also 6.7.6)

6.7.4 Chemical usage and residues.

Research

6.7.4.1 Investigate into sources of arsenic contamination in sheep (recommendations to sheep producers on how to minimise the occurrence of arsenic residues in wool).

> To determine sources of arsenic contamination in wool.

6.7.4.2 Agricultural and veterinary chemicals - Murraylands Region.

> To provide information and advice on selection, usage and handling for farm animals.

Extension and regulatory

6.7.4.3 Traceback of clips contaminated with organochlorine or arsenic pesticides.

6.7.5 Disease control and diagnosis.

Extension/Diagnostic

6.7.5.1 Preparedness for exotic disease outbreak - taskforce member. (Reduction of short and long term loss in livestock production as a result of the introduction of an exotic disease).

6.7.5.1.1 Reduce outbreak risk of exotic diseases in Australia

6.7.5.1.2 Maintain/train a group of people able to react in an exotic disease outbreak.

6.7.5.2 Investigation of bacterial, viral and fungal infections in sheep. [(1) Reduce infectious diseases in SA sheep. (2) Ensure access to overseas markets].

> To support private practitioners and departmental field staff in diagnosis of infections in sheep; support to Department research projects (footrot, Turretfield); expert testing requirements.

6.7.5.3 Scouring sheep. (Specific diagnosis of causes of scours, precise treatment and establishment of new preventive programs).

> To check for bacteriology causes of diarrhoea; in sheep (Salmonella, yersinia).

6.7.5.4 Ovine brucellosis accreditation program. (To improve reproductive efficiency - sheep).

> To eliminate *Brucella ovis* from SA sheep flocks.

6.7.5.5 Investigation of infectious causes of lamb abortion/perinatal loss. (Increase reproductive efficiency in sheep).

> To determine infectious causes of lamb abortion/perinatal loss.

6.7.5.6 ARGT control extension program. (Minimal production and financial losses due to ARGT).

> To minimise losses to the sheep and wool industries on Eyre Peninsula from the disease ARGT, monitor the spread of the disease and provide early warning to farmers in newly affected areas.

6.7.5.7 Ram infertility.

> To determine if infertile rams are infected with *B. ovis* or *A. seminis*.

6.7.5.8 Animal health advisory. (By maintaining flock health through prevention and cure of sheep diseases accompanied by an improvement in flock husbandry, knowledge of managers to maintain and improve production efficiency and enterprise profitability).

6.7.5.8.1 To provide an ongoing service to stockowners to develop sound stock husbandry, nutrition and health programmes.

6.7.5.8.2 To promote the use of new techniques in stock management.

6.7.5.9 Weaner ill thrift - Kangaroo Island.

To identify problems contributing to weaner ill thrift and achieve the adoption of strategies which will improve weaner health and growth.

6.7.5.10 Caltrop poisoning of sheep - Murraylands Region.

To survey losses of sheep feeding on caltrop.

6.7.6 Disease monitoring, assurance and regulation.

Extension/Regulation

6.7.6.1 Animal health - regulatory. (The successful administration of regulations of the various acts concerned will prevent the export, incursion or spread of specific diseases or infections of livestock and, thus by ensuring the health of the state flock maintain productivity and export markets hence providing for the commercial well being of the sheep related industries).

To administer the regulatory requirements of various appropriate acts.

6.7.6.2 Servicing public and SA domestic livestock industries. [(1) To serve the public's requirement for information on animal health reports of the SA domestic livestock industries. (2) To minimise the incidence of notifiable disease occurrence in the SA domestic livestock industries].

To provide information to members of the public in response to verbal and written requests.

6.7.6.3 Livestock market inspections - Gepps Cross. [(1) Ensures that a functioning and reliable livestock marketing system continues to exist in SA. (2) Deter from sale at livestock auctions of livestock infected with notifiable diseases].

6.7.6.3.1 To ensure livestock sold through the auction system comply with Stock Diseases Act requirements.

6.7.6.3.2 To monitor livestock for presence of notifiable diseases, especially footrot and sheep lice.

6.7.6.4 Animal health advisory service. (Increased returns to growers due to improved management and minimal stock deaths/production losses).

To maximise returns to sheep and wool producers by improving flock husbandry knowledge and advising on the prevention and cure of sheep diseases.

6.7.6.5 Disease monitoring - Kangaroo Island.

> To maintain a record of disease incidence. To assist the KI Agricultural Council in the development of an extension programme on Sarcosporidiosis.

6.7.7 Animal Welfare.

Research

6.7.7.1 Studies on the stress physiology of husbandry practices in livestock production. (The wool industry will be advantaged by having objective data upon which it can base its justification of current invasive husbandry procedures such as mulesing, castration, tailing techniques etc. The welfare implication of these procedures have to be discussed in terms of how the animals actually respond, but also to the impact of not performing the procedures. Both of these issues need to be studied).

> To develop objective criteria by which the welfare implications of husbandry practices can be better assessed and discussed.
> (see also 6.4.4 - Breeding short tail Merinos)

6.8 PROVISION OF POLICY ADVICE ON THE SHEEP AND WOOL INDUSTRY.

The Sheep and Wool Section devotes a considerable amount of time in liaison with farmer groups and industry organisations to ensure it has all the necessary information available when advising the South Australian Department of Agriculture, the Minister of Agriculture, the Parliament or industry on policy issues.

6.8.1 Sheep and Wool Section liaison with industry.

6.8.2 Sheep and Wool Section, provision of policy advice to Minister of Agriculture and industry.

6.8.3 Sheep and Wool Advisory Group.

6.8.4 Economics Division, analysis of economic implications of policy changes.

RESOURCES: $67,600; 1.30 FTE's.

6.9 MARKETING AND PROCESSING OF SHEEP, WOOL, SKINS AND OTHER BYPRODUCTS.

Extension

6.9.1 Wool marketing and classing extension - Murraylands Region.

> To improve wool classing and producers knowledge of wool selling and marketing.

RESOURCES: $3,070; 0.07 FTE's.

6.10   WOOL HARVESTING AND HANDLING SYSTEMS.

Extension

6.10.1   To provide consultancies and resource services in the design of shearing sheds and sheep yards - Keith, SE Region.

6.10.2   To cooperate with the Wool Harvesting Engineering Information Service (Melbourne University, Australian Wool Corporation) in the development and provision of a national computer aided design (CAD) system for shearing sheds - Keith, SE Region.

6.10.3   Shearing shed management - Murraylands.

Train young farmers in all aspects of wool classing, management of shearing sheds and crutching.

RESOURCES: $4,455;   0.10 FTE's.

6.11   COMMUNICATION AND TRAINING.

6.11.1   Coordination and industry liaison - Sheep and wool section.

To coordinate regional extension programs, provide training to regional advisers and industry, and to liaise with the wool industry within the State and nationally.

6.11.2   Coordination of training programs - Animal Health Branch.

To increase skills in the diagnosis and management of diseases.

6.11.3   Project preparation - Eyre Region.

To satisfy Departmental objectives by completing project preschedules in various forms required.

6.11.4   Media contact - Eyre region.   [Farmers receive relevant and timely information to improve profits].

To inform producers of relevant technical information to improve productivity and profitability.

6.11.5   Use of stock agents for extension - Murraylands.

6.11.6   Australian Wool Corporation funded workshops (e.g. Sheep and Wool Refresher Courses).

RESOURCES: $63,420;   0.87 FTE's.

6.12   WOOL QUALITY.

Research

See 6.4.1, 6.4.2, 6.4.3

Extension
See also 6.4.5, 6.4.6

6.12.1   Development of a systematic approach to wool fibre diameter reduction - Statewide.

> To reduce the average fibre diameter in the State's woolgrowing flocks by one micron.

6.12.2   Livestock management and staple strength - Kangaroo Island.

> To determine the management factors that are affecting the staple strength of wool.

6.12.3   Increasing wool returns by delayed shearing of lambs at Minnipa Research Centre. [Reduced costs by not shearing lambs and increased value of fine lambs' wool due to its length. This could add $6 per head to lamb returns.]

> To demonstrate the benefits and management difficulties of delaying lamb shearing until 14 months of age to produce higher valued wool.

6.12.4   Shearing shed management course - Eyre Region. [A continued high reputation for the Australian wool clip].

> To improve the preparation of the Eyre Peninsula wool clip.

RESOURCES: $30,300; 0.74 FTE's.

6.13   SHEEP MANAGEMENT.

6.13.1   Farmer discussion groups.

6.13.2   Pasture assessment programs.

6.13.3   Livestock industry resources.

6.13.4   Economic management planning.

RESOURCES: $82,780; 1.93 FTE's.

6.13 SHEEP MANAGEMENT.

6.13.1 Farmer discussion groups.

Extension

6.13.1.1 Flock production performance program - Central Region. [To improve profitability of sheep production enterprises in the Lower North].

> To provide sheep owners with a program to allow them to evaluate the sheep enterprise costs and income and compare with others in similar production systems.

6.13.1.2 Livestock discussion groups - Central Region.

> To help farmers solve the problems, gain new information and techniques and help them review their farm operations through group techniques.

6.13.1.3 Karoonda sheep production group - Murraylands Region.

> To increase the profitability and adoption of new technology by Karoonda sheep producers.

6.13.1.4 Geranium and Meningie sheep production groups - Murraylands Region.

> To support these self formed groups and to carry out the financial assessments.

6.13.1.5 Sheep management recording service. [Increased profit per hectare from sheep production on Upper Eyre Peninsula].

> To provide an analysis of sheep enterprises' financial and physical performance to interested producers on Upper Eyre Peninsula and use this as a basis for discussion of sheep management.

6.13.2 Pasture assessment programs.

Extension

6.13.2.1 Pasture and Animal Assessment Program - Eyre Region. [The data obtained will enable computer models to be used to determine economic benefits of improved pasture production or altered sheep management].

> To increase the efficiency of wool production through improved pasture production and utilisation.

6.13.3 Livestock industry resources.

Extension

6.13.3.1 Livestock industry resource - Eyre Region. [Improved efficiency of livestock production].

> To act as a resource on livestock husbandry issues to other officers in the State, and to publish extension material.

6.13.3.2 Livestock resource Minnipa Research Centre. [Improved profitability from increased adoption of sound sheep and wool management practices and new technology by Eyre Peninsula producers].

> To assist with the management of the sheep flock and research and demonstration projects on Minnipa Research Centre.

6.13.3.3 Animal husbandry advisory service - Eyre Region. [Improved profitability of sheep and wool production on Eyre Peninsula by farmers adopting relevant and new technology].

> To improve profitability and efficiency of sheep and wool production on Eyre Peninsula by provision of an advisory and extension service to individuals, farmer groups and agribusiness.

6.13.4 Economic management planning.

Extension

6.13.4.1 Gross margin booklet - Central Region. [To allow current and potential farmers to compare enterprises on a standard basis. To provide bankers and other economic forecasters with information on current farm enterprise profitability].

> To contribute standard gross margins to the annually produced district gross margin booklet.

7. RESOURCES ALLOCATED TO SHEEP AND WOOL IN THE DEPARTMENT OF AGRICULTURE.

7.1 ALLOCATION OF RESOURCES TO OPERATIONAL PROGRAMS.

The information of resource allocation has been obtained from the following sources:

*   Information was supplied, by way of a circulated *pro forma*, to the Wool Commodity Group by all relevant officers who responded in the Division and Regions; this was cross-referenced against:

*   the financial summaries of expenditure on the Wool Commodity produced by the current Departmental system; and

*   the trust fund expenditure records for the Wool Research and Development Corporation.

It should be noted that this resource information does not include many of the administrative overheads incurred by the Department. These include the costs of operating clerical and accounting staff, regional and divisional management costs, research and extension management, and Directorate and Ministerial costs.

A spreadsheet program has been designed to hold all project and financial details for the Wool Commodity, and this will be regularly updated as programs and projects are reviewed, and as more accurate project information is obtained and coordinated by the Commodity Group.

The resources allocated to the thirteen Operational Programs encompassing the Wool Commodity are shown in Figures 4 and 5. Figure 4 provides information on staffing and the proportion of total resources allocated to each program, and Figure 5 shows the total funds and trust funds allocated to each program.

These Operational Programs have been further grouped into "areas of work" to show the allocation of resources (total and trust funds) in Figure 6. The areas of work defined for the Wool Commodity are:

*   Plants and soil;
*   sheep production;
*   sheep health;
*   marketing and harvesting of wool and wool products; and
*   policy, administration and liaison with industry.

Figure 7 presents the allocation of resources (total, state and trust funds) to the disciplines of research, extension and regulation. The following conclusions can be drawn from the analyses presented in Figures 4 to 7:

*   The majority of resources are currently allocated to Operational Programs 1 to 7.

*   These Operational Programs mainly encompass the areas of "plants and soils", "sheep production", and "sheep health".

*   Trust funding is currently mainly restricted to the areas of "plants and soil" and "sheep production", and almost entirely to the research discipline.

Figure 4. Allocation of Resources by Operational Program
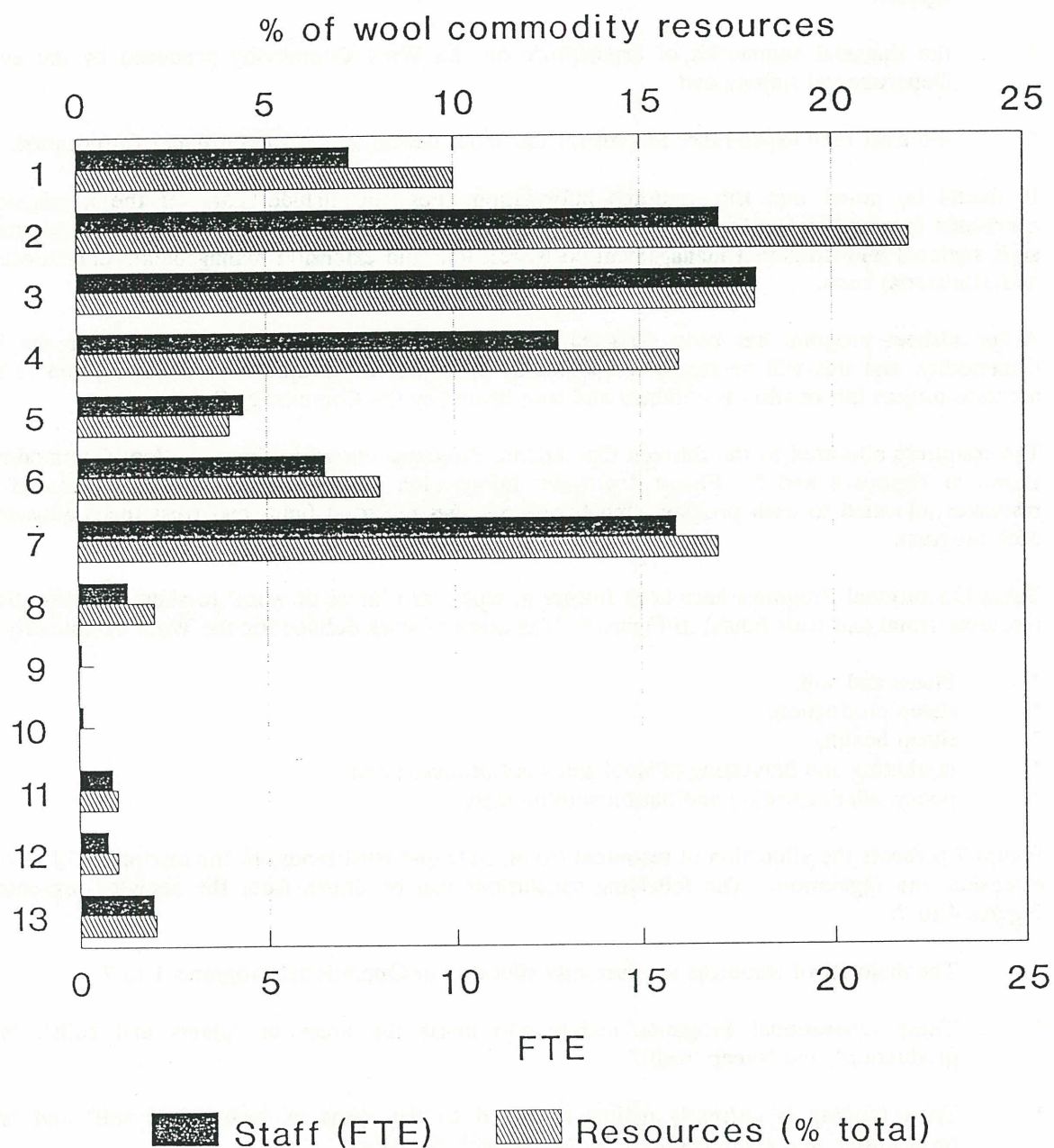
Figure 5. Allocation of Resources by Operational Program

Total $ (Thousands)

Total Funds   Trust Funds
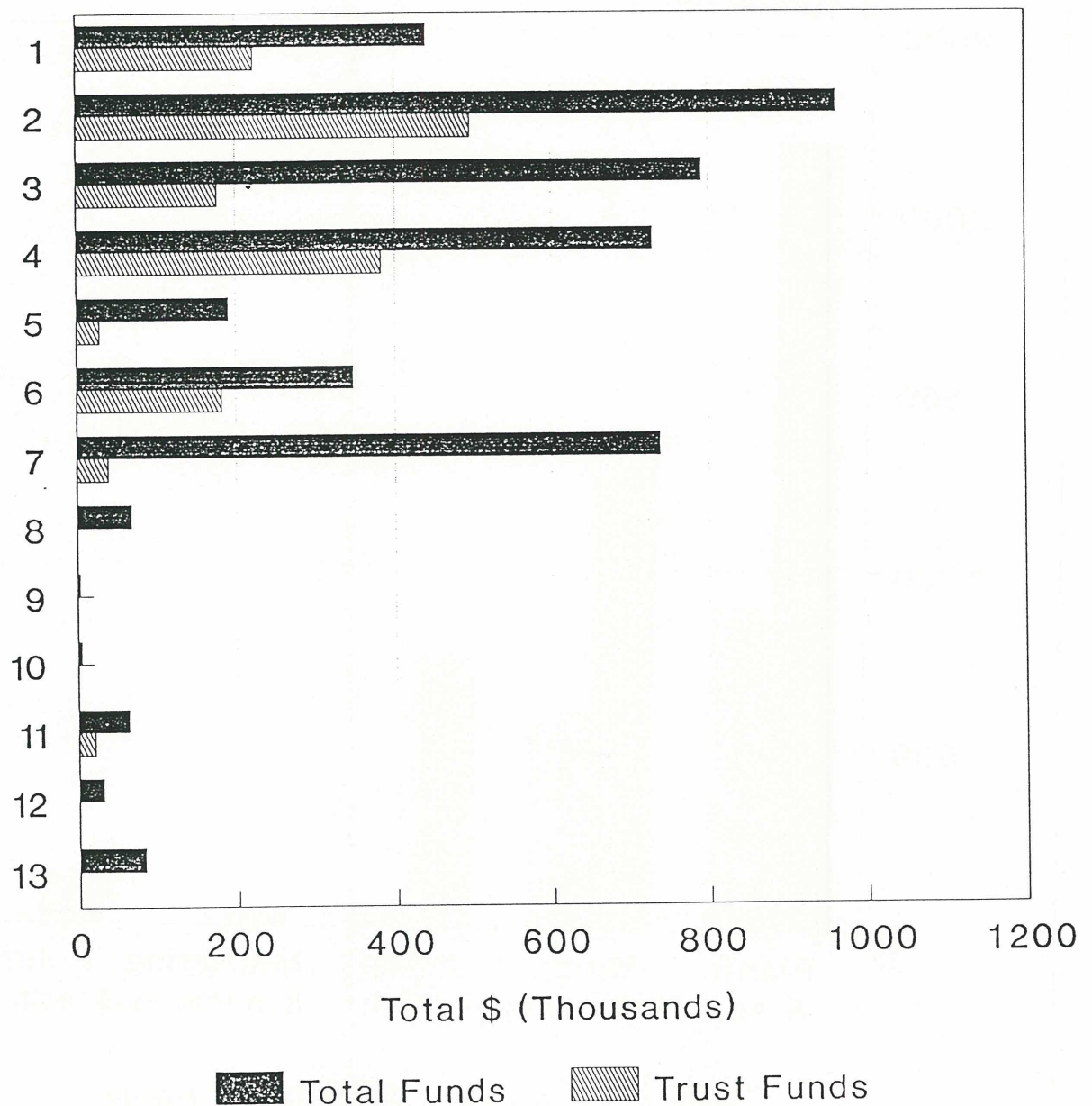
Figure 6. Allocation of resources by Area of Work
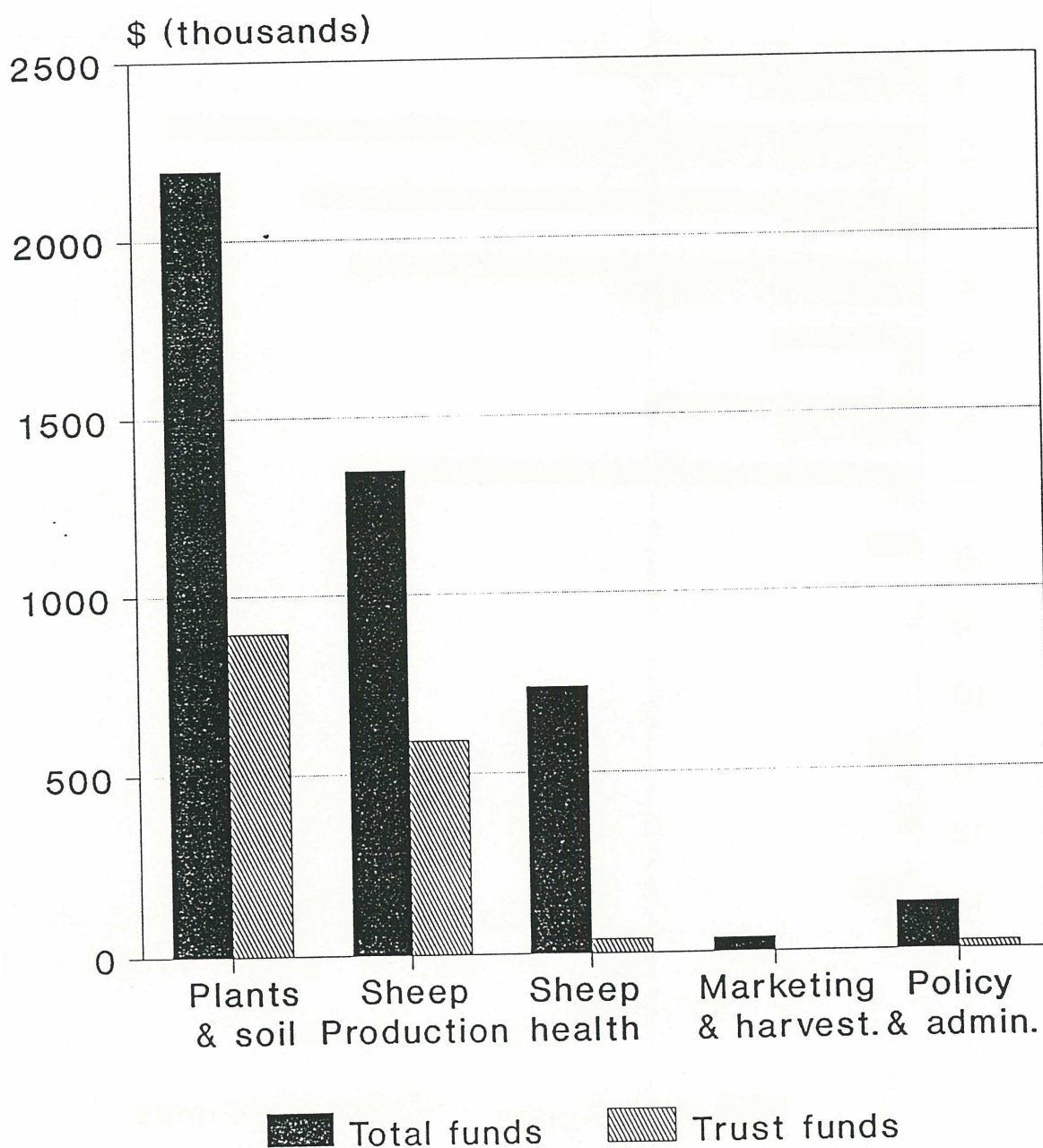
Figure 7. Allocation of Resources by Function
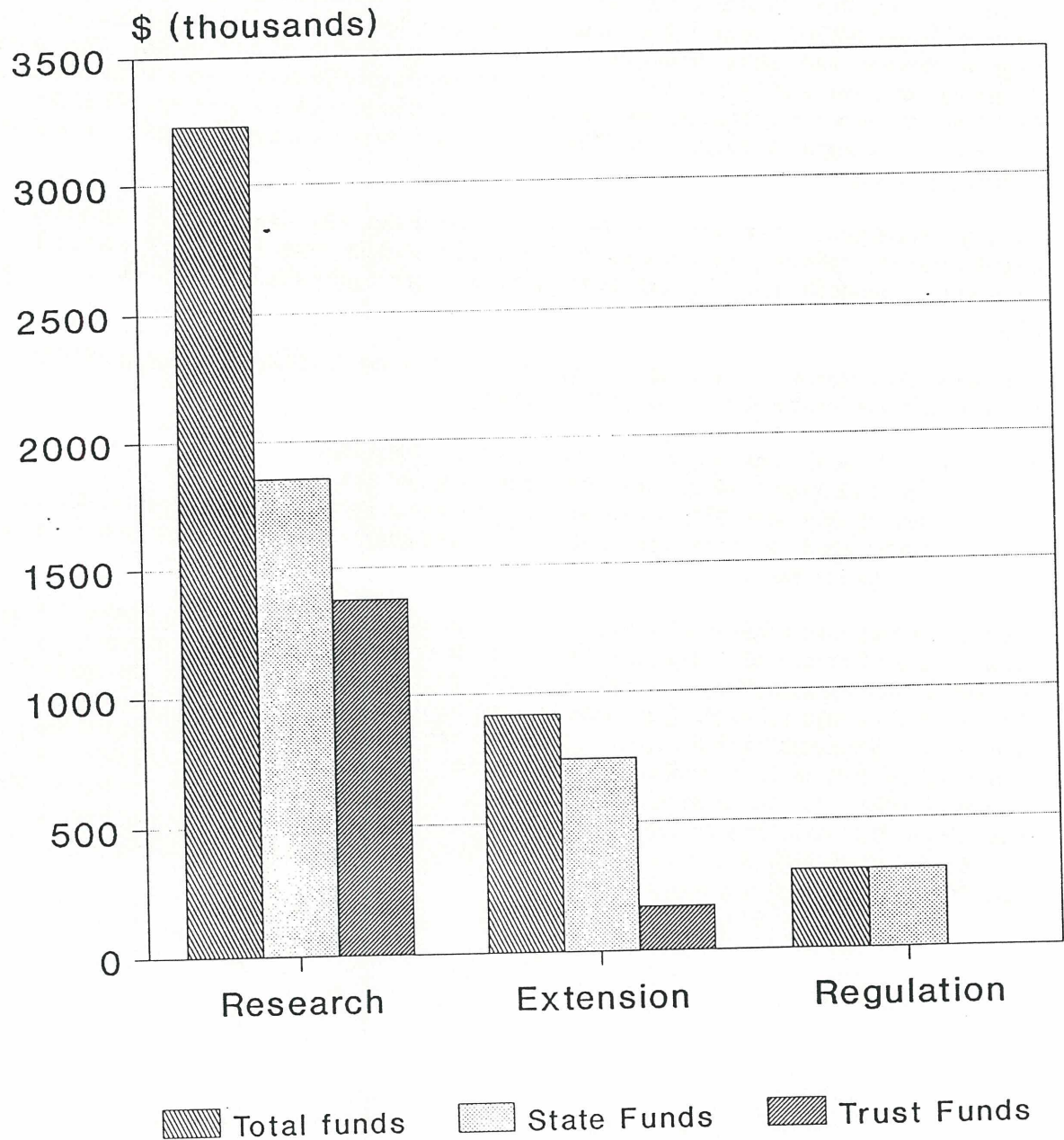
8.   REVIEW OF OPERATIONAL PROGRAMS .

8.1   OBJECTIVES AND METHODS OF INDUSTRY REVIEW.

Formal requests have been made to the Advisory Board of Agriculture (ABA) and the United Farmers and Stockowners (UF&S) to nominate representatives to assist with the commodity planning process.

In the case of the Wool Commodity, industry consultation has been done through the Sheep and Wool Advisory Group (SWAG), which was established in 1986 by the Sheep and Wool Section to assist with program planning and policy development within the Department of Agriculture.   The industry representatives nominated by the UF&S to assist with commodity planning were already members of SWAG and the new ABA representative has been invited to attend SWAG meetings.   In addition, Mr Don Blesing, woolgrower member of SWAG, has acted as a consultant member of the Wool Commodity Group.

Industry consultation in relation to the Wool Commodity Plan has included assistance with identification of problems, issues or opportunities confronting the wool industry, periodic review and up-dating of commodity programs, and development of industry priorities and ranks for Departmental projects.

For the formal review of Operational Programs and projects in 1990, members of SWAG were supplied with a survey which consisted of the following:

*   a list of the thirteen wool commodity Operational Programs;
*   a list of all projects within each Operational Program; and
*   a list of fifty constraints to sustainable production and market development in the wool
         industry which were developed during a "brainstorming" session conducted by the commodity
         group (see section 5).

SWAG members were asked to allocate priorities (high, medium or low) to all Operational Programs, projects within Operational Programs, and to the issues listed as constraints to sustainable production and market development (they were also invited to add any additional issues to the latter list they thought were of high priority).   The industry representatives were also requested to rank the wool commodity Operational Programs from 1 to 13 in order of importance.   The survey forms were distributed by mail on 15 November and collected and discussed at the SWAG meeting held on 20 November 1990.   At this meeting, SWAG members also discussed the Wool Commodity Plan in general and made comments on the allocation of resources to Operational Programs (data in Figs 4, Page 81; and Fig 5, Page 82), "areas of work" (data in Fig 6, Page 83) and "disciplines" (data in Fig 7, Page 84) within the wool commodity.

8.2 MEMBERS OF THE SHEEP AND WOOL ADVISORY GROUP (SWAG)

MEMBER	OCCUPATION	REPRESENTING
Mr Don Blesing	Woolgrower	Aust. Federation of Performance Breeders
Mr Peter England	Woolgrower	"
Mr Richard Vickery	Woolgrower	" (vice P. England or D. Blesing)
Mr Ron Collins	Stud Breeder	South Australian Stud Merino Sheepbreeders' Association
Mr Ryves Hawker	Stud Breeder	"
Mr Jim Ashby	Stud Breeder	" (vice Ryves Hawker)
Mr Ross Pollock	State Manager, AWC	Australian Wool Corporation
Mr Michael McBride	Woolgrower	UF&S and Wool Council of Australia
Mr Ian Rowett	Woolgrower and Stud Breeder	"
Mr Chris Bretag	Woolgrower and stud breeder	Advisory Board of Agriculture
Mr Don Mitchell	Woolgrower	"
Mr Ian Turner	Woolgrower	"
Mr Raymond Michell	Wool Processor	G.H. Michell & Sons
Mr Brian Noblett	Wool Broker	Elders Pastoral
Mr Colin Curtis	Stud Stock Agent	"
Mr John Secomb	State Stock Manager	Dalgety Bennets
Dr Chis Maxwell	PO (S&W) (Chairman)	Department of Agriculture
Mr Ian Rogan	PRO (S&W)	"
Dr Dennis Gifford	A/PRO (S&W)	" (vice I. Rogan)
Mr Harry Nash	SO (S&W)	"
Mr Jim Walkley	SRO (S&W)	"

8.3   ANALYSIS OF WOOL COMMODITY PROGRAM BY SWAG.

A total of 12 responses from SWAG members were received and analysed. The data on priorities were analysed by assigning a score of 3 for high priority, 2 for medium priority and 1 for low priority. The mean priority was then determined for each Operational Program or project by dividing the total score by the number of responses. A mean rank was determined for each Operational Program by dividing the total of ranks by the number of responses.

8.3.1   Operational Programs.

The mean rank and priority for each Operational Program is presented in the table below. The programs are presented in rank order.

RANK	OPERATIONAL PROGRAM (program number)	PRIORITY*
1.	Genetic improvement of sheep (4).	2.55
2.	Breeding and selection of pasture plants (2).	2.33
=3.	Wool quality (12).	2.45
=3.	Soil fertility, structure, plant & water use (1).	2.27
5.	Communication and training (11).	2.55
6.	Management & utilisation of pastures/rangelands (3).	2.09
7.	Sheep pests, health and welfare (7).	2.27
8.	Marketing & processing of sheep, wool, etc (9).	1.91
9.	Nutrition of sheep (5).	2.18
10.	Reproductive efficiency of sheep (6).	2.00
11.	Sheep management (13).	2.08
12.	Provision of policy advice (8).	2.00
13.	Wool harvesting & handling systems (10).	1.82

*	low priority:	< 2.00
	medium priority:	2.00 to 2.25
	high priority:	> 2.25

The ranking can be considered an expression of the importance of Operational Programs to the wool industry as seen by SWAG members. The priorities, on the other hand, indicate where SWAG members believe the Department should be concentrating its resources. For example, SWAG members believe that the "marketing and processing of wool products" is of middle-ranking importance to the wool industry (rank 8); however, they think it is a low priority (1.91) area for activity by the Department of Agriculture. This is a reasonable conclusion as the program is largely covered by the activities of the AWC, CSIRO, IWS and private industry.

Another example is "wool quality", which ranks below "breeding and selection of pasture plants" in industry importance (=3 vs. 2), but should have higher priority for allocation of Departmental resources (2.45 vs. 2.33).

The majority of high priority and high ranking programs are those which already have the greatest allocation of resources by the Department. However, the exceptions are 3. "wool quality" and 5. "communication and training".

RECOMMENDATION: That the Department increase direct resources towards the development of programs addressing the improvement of wool quality and the facilitation of communication and training both within the Department of Agriculture and in the wool industry.

8.3.2 Projects within Operational Programs.

A full list of projects within Operational Programs, with their priorities as assessed by SWAG members is given in APPENDIX I.

The top 15 projects according to SWAG priority are listed in the table below.

PROJECT NUMBER & NAME	PRIORITY[*]
4.1 Turretfield Fleece Measurement Service (S)	3.00
7.1 Internal parasite control in sheep (R)	2.90
7.2 Control release insecticides for flies and lice (R)	2.70
2.1 National sub-clover improvement program (R)	2.67
2.3 Pasture legumes for low rainfall agricultural areas (R)	2.67
3.14 Pasture establishment, renovation & management (E)	2.67
4.6 Phenotypic & genetic parameters SA Merinos (R)	2.67
11.1 Sheep & Wool Section, extension coordination (E)	2.67
8.2 Sheep & Wool Section, liaison with industry (E)	2.67
13.6 Pasture & Animal Assessment, Eyre Region (E)	2.67
4.12 WOOLPLAN, national project (E)	2.60
7.26 Animal health advisory program (E)	2.60
2.2 Selection of low phosphorus tolerant pasture legumes (R)	2.56
3.12 & 3.13 Increasing pasture production and utilisation (E)	2.56

*	low priority:	< 2.00
	medium priority:	2.00 to 2.25
	high priority:	> 2.25

These projects represent one service (S) (7%), 6 research (R) (40%) and 8 extension (E) projects (53%). Although these projects mainly fall within the higher priority Operational Programs, there are high priority projects which fall within low priority Operational Programs. For example, high priority project 8.2 (Sheep & Wool Section, liaison with industry), falls within the low ranking Operational Program 8 (provision of policy advice).

RECOMMENDATION: That the industry priorities allocated to individual projects be used as a guide only for allocation of resources within Operational Programs. The overall Operational Program priorities should be the main guide for resource allocation, provided they are regularly reviewed by both the Commodity Group and industry.

8.3.3   Constraints to sustainable production and market development.

The top 18 wool industry issues according to SWAG priority are listed in the table below.

INDUSTRY ISSUE	PRIORITY[*]
1. Adoption of existing technology	2.82
2. Provide trace-back for wool contamination	2.73
3. The wool stockpile and its management	2.64
4. Review WRDC priorities	2.55
5. Staff skills and training in the Department	2.55
6. Pesticide residues	2.45
7. Nutrient requirements of sheep	2.45
8. Objective measurement	2.45
9. World demand for wool	2.42
10. Control of footrot	2.36
11. Reduction of reproductive wastage	2.36
12. Reduction in the costs of wool harvesting	2.36
13. Sale by description	2.36
14. Lowering of average fibre diameter in Merino flocks	2.27
15. Determining appropriate method for setting wool price	2.27
16. Poor pastures	2.27
17. Farm management support services	2.27
18. Grower conservatism	2.27

*	low priority:	< 2.00
	medium priority:	2.00 to 2.25
	high priority:	> 2.25

SWAG members believe that some of these issues are outside the control and/or influence of the Department of agriculture (viz. 2,3,9,13,15,& 18). The Commodity Group's view on gaps in the allocation of resources to some of these areas is outlined below (8.4).

8.4   GAPS IN RESOURCE ALLOCATION IDENTIFIED BY THE COMMODITY GROUP.

8.4.1   Management and utilisation of pastures and rangeland vegetation.

* obtaining pasture production data,

* providing farmers with pasture management knowledge.

8.4.2   Genetic improvement of sheep.

* adoption of genetic principles,

* provision of a full fleece measurement service,

* efficient utilisation of artificial breeding technology.

8.4.3   Nutrition of sheep.

* demonstration of management strategies to cope with the summer/autumn feed shortage.

8.4.4 Sheep health, pests and welfare.

* programs to alert farmers to pesticide residue risks to both farmers and industry,

* programs to alert farmers to animal welfare issues and ways of complying with Senate Select Committee recommendations.

8.4.5 Provision of policy advice on the industry.

* resources in the Department are minimal,

* downturn in industry and potential marketing changes will require more specialist officers in this area, e.g. economists,

* more activity in interpretation and distribution of wool market information.

8.4.6 Harvesting, processing and marketing of wool, skins and other by-products.

Although this is not an area for major activity by the Department of Agriculture, encouragement should be given in appropriate areas to:

* support and fund new technology (e.g. for processing and wool harvesting);

* support and fund (from an appropriate source) development of value-added products and by-products.

8.4.7 Communication and training.

* few departmental resources are allocated to this area; support required for resources dedicated to curriculum development.

8.4.8 Wool quality.

* very few resources are allocated to assist the adoption of the Code of Practice for clip preparation and management of sheep to produce a high quality product,

* currently some industry-funded research resources are allocated in this area (6.4.1, 6.4.2, 6.4.3).

8.5 GAPS IN THE WOOL COMMODITY PROGRAM IDENTIFIED BY SWAG.

SWAG believed the current allocation of resources to the thirteen Operational Programs (see Fig 4, Page 81) was generally appropriate. There were some exceptions to this and specific comments on programs and projects which are outlined below.

8.5.1 Wool quality, and communication and training.

More resources should be allocated in the areas of "wool quality" and "communication and training" (both within the Department and with industry); some under-resourced programs will require re-training of staff.

8.5.2 Allocation of resources.

Work and resources should be concentrated on the higher priority Operational Programs where expertise and experience were greatest; resources and people may be spread too thinly at present.

8.5.3 New grass varieties.

There was some discussion about the need for the development of new grass varieties (particularly for the 500 - 625mm rainfall zone); the concensus view was that resources were better directed to improving the utilisation of current varieties.

8.5.4 Wool marketing.

The Department of Agriculture should not be directly involved in wool marketing, but rather should act to assist communication of product information between marketers and woolgrowers; wool resources in the Department should also be concentrated on helping woolgrowers meet the market requirements and part of the campaign to increase grower returns by reducing contamination.

8.5.5 Wool harvesting.

There are enough grower and government resources in wool harvesting research, and no need for Departmental involvement other than in the provision of information on appropriate harvesting technology and methods.

8.5.6 Extension effectiveness.

SWAG members were concerned at the imbalance in the allocation of resources between research and extension, with approximately three times in favour of research (see Fig 7). They believed that extension resources should be increased, but *not* at the expense of research resources. There is also a need for advisers to improve their extension effectiveness; this relates to:

* use of appropriate channels (e.g. Agricultural Bureaux, Stud Merino Breeders Association, Farm Management Society etc.);

* the personality and method of approach of advisers: there is a perception that advisers are less approachable now than in the past; this may be related to a lack of specialist knowledge due to "generalisation" of advisers; some account should be taken of this when introducing charging for services;

* the apparent low level of training, experience and expertise of individual advisers;

* the presence of too many "generalist" advisers with no "specialist" sheep and wool advisers in the Department; and

* good advisers do not stay very long; the Department needs to address the reasons for this, which may include salaries, training, career paths, etc.

There was agreement that the programs identified as high priority needed one-to-one extension for effective adoption. This is not currently Departmental policy, but this may be addressed by the change to a "user-pay" policy.

8.5.7 Turretfield Fleece Measurement Service.

There was unanimous agreement that the Turretfield Fleece Measurement Service was seen as accurate, well-run and highly respected. SWAG members believed the service was very "user-friendly" and should continue as a priority.

8.6   REALLOCATION OF RESOURCES IN THE WOOL COMMODITY PROGRAM IDENTIFIED BY SWAG.

An examination of the industry (SWAG) survey of programs and projects reveals the following:

8.6.1   The following Operational Programs are considered to be of low priority:

Reproductive efficiency of sheep;
Marketing and processing of sheep, wool, skins and other by-products.

8.6.2   The following Operational Programs are considered of marginal priority:

Management and utilisation of pastures and rangelands vegetation;
Nutrition of sheep;
Sheep pests, health and welfare;
Provision of policy advice on the sheep and wool industry;
Sheep management;
Wool harvesting and handling systems.

8.6.3   The following points should be noted about the above Operational Programs:

a. Reproductive efficiency of sheep: Some regional resources allocated to this area could be re-allocated, but there is one major research project within this program that rated high priority (6.1 Survey of reproductive wastage in Merino flocks). There is a potential to save some $100,000 in State funds if this Operational Program was reviewed. This reduction does not include industry funded work e.g. the transgenic sheep project.

b. Marketing and processing of sheep, wool, skins and other by-products: The Department currently has very few resources in this area, and should only become involved where there appears to be a processing opportunity for South Australia, and a coordinated approach with the Department of Industry, Trade and Technology is warranted.

c. Management and utilisation of pasture and rangelands vegetation: The Department should carefully review its projects in this area with a view to re-allocating resources away from some projects. The SWAG survey identified a number of low priority projects which should be re-assesed. These particularly included local trials and surveys.

d. Nutrition of sheep: The Department's efforts in this area are fragmented across regions, and could benefit from a coordinated approach - possibly operated through Turretfield Research Centre. Very few of the projects in this operational program were rated as high priority by the industry representatives, but the program itself was identified as of medium priority. This suggests that the projects being undertaken are not industry-relevant, and a statewide coordination of projects is required to rationalise those of low priority and focus effort on higher priority projects.

e. Sheep pests, health and welfare: This Program has the largest number of projects. The industry survey indicated a wide variation in priority given to individual projects.

Low priority projects tended to fall into the following categories:

* Regulation (e.g. Ovine Brucellosis Accreditation (OBA), market inspections, disease monitoring);
* Surveys and locally based evaluation trials;
* Animal welfare;
* Lice trials (locally based);
* Agricultural and Veterinary Chemicals.

The Ovine Brucellosis Accreditation scheme could become a full cost recovery area. Animal welfare is an area of increasing importance, and should continue to be supervised by agencies which recognise its importance in agriculture. Other low priority projects should be internally assessed with a view to reducing resources in some areas and recovering costs in others (see Table 3, Page 100).

High priority projects tended to fall into the following categories:

* Statewide research - flies and lice;
* Internal parasite control;
* Parasite resistance.

f. Provision of policy advice on the sheep and wool industry: This was given a low/medium priority by industry. Despite this, all current Departmental projects in this area were rated as high priority. It is suggested that resources in this area should be maintained or increased (see Table 3, Page 100).

g. Sheep management: This is another area where there was a wide variety of priorities depending on individual projects. This suggests that a better statewide coordination of activities would benefit producers. Low priorities were particularly given to projects involving "discussion groups" and livestock resources not specifically devoted to research (such as underutilised research stations). Despite the rural downturn, consultancies in these areas may still be viable. The Department should consider charging for some of these services or discontinue them.

8.6.4 Summary.

With the exception of industry funded research projects, Operational Programs 6. ("Reproductive efficiency of sheep") and 9. ("Marketing and processing of sheep, wool, skins and other by-products") could be discontinued (9) or reduced (6); creating a potential saving of $100,000 of State funds. These funds should be considered as partial savings, and partial re-allocations to higher priority Operational Programs (such as "Genetic improvement of sheep"). Operational Programs on "Management and utilisation of pasture and rangelands vegetation", "Nutrition of sheep", "Sheep pests, health and welfare", and "Sheep management" should be carefully assessed with a view to:

* streamlining and coordinating higher priority projects across the state;

* reducing regulatory activity where possible.

The best approach to reducing resources in the wool commodity is *rationalisation of low priority projects* within Operational Programs, and a *statewide coordination* of all Operational programs (as per Table 3, Page 100).

8.7 REVIEW OF THE STATE'S CURRENT SHEEP AND WOOL MANAGEMENT EXTENSION EFFECTIVENESS.

8.7.1 Introduction.

In 1988/89, Mr Harry Nash (senior officer, sheep and wool) reviewed all extension programs in sheep and wool management across the State with relevant livestock advisers. The following represents a follow-up to the 1988/89 program when the initial assessment was completed and report written on 20th February 1989.

Towards the end of 1990, visits were made to district livestock advisers to assess the level of their sheep and wool management extension effectiveness and support for the four major across-regions programs:

* Woolplan;
* Wormcheck;
* Lambs - up;
* Nutrition (Takeaway).

8.7.2 Program.

Most of the livestock advisers had been part of the previous program and were well prepared to respond to the need for a detailed report on time spent supporting various projects.

8.7.3 Discussion.

The previous report showed that 14 advisers in regions and in head office provide nearly 6 Full Time Equivalent (FTE) support to sheep and wool management extension programs in South Australia.

Comments from staff on that report indicated that a more complete picture would be presented if animal health and regulatory staff had been included. This suggestion resulted in the inclusion of 3 extra people in the 1990 assessment.

Not all staff were visited because many of those who participated in the previous exercise responded by correspondence to meet the needs of this year's program. Visits were made to eight of the 19 people involved in sheep and wool management extension programs.

The trend for senior management to fill vacancies with staff expected to provide a multi functional service has continued. Previously 14 people provided 6 FTEs currently 19 provide 10 FTE's in support of sheep and wool management activities.

At a meeting held early in 1990 to investigate the provision of animal health services into the year 2000, there were many opinions expressed concerning the threat to providing an efficient service in specific activities (e.g. exotic disease control) when officers were required to have a multi function role.

There is a groundswell of opinion which believes the current commodity program development will alleviate some of the concerns.

8.7.4 Estimated percentage of district livestock advisers' time spent on major sheep and wool extension programs, 1990/91.

A summary of the information gathered during Harry Nash's trip around the regions is given in Table 2 on Page 96.

8.7.5 Summary.

8.7.5.1 South Australia is well served by a group of experienced and enthusiastic livestock advisers. The effectiveness of the service will improve as the three "new" advisers complete their technical training program and gain more knowledge of their district needs.

The State's wool producers can expect about 15 years of quality advice from a dedicated group whose purpose is to maintain a viable wool industry.

8.7.5.2 The Sheep & Wool Section in conjunction with Regional and Divisional Management, should present the strongest case possible to establish a livestock "apprenticeship" scheme. This could be met by employing new graduates as technical officers on Research Centres (preferably Turretfield) and give them a good grounding to prepare them for district advisory work after 5 to 8 years.

8.7.5.3 If the trend to fill positions with staff who are expected to provide a multi-function service continues it is essential that formal training programs be developed to bring service standards up to expectations as early as possible. Funding needs to be set aside for this out of Divisional and Regional budgets annually.

8.7.5.4 All regional livestock advisers emphasised the need to maintain a senior officer (sheep and wool) whose job it would be to liaise with regional staff, to maintain the flow of new technology and to arrange training programs which are the two major responsibilities of the position. Secondly it was essential to hold Sheep & Beef Industry Group meetings at least twice a year as a means of keeping in touch in a formal sense. Informal officer to officer communication during the year is important to ensure across regions technology transfer occurs.

8.7.5.5 Opportunities to improve advisers understanding of extension methodology, to practise communication skills and to realise the importance of interpersonal relationships can't be emphasised enough. Under pressures of resource constraints it is too easy for management to overlook the importance of these skills on the grounds that it can be picked up on the job. The Senior District officer level of management is responsible for monitoring their district staff's performance in these areas.

8.7.5.6 There are two important extension programs which livestock advisers will be asked to support in the coming years:

* encourage growers to reduce their average wool fibre diameter by one micron;

* apply the code of practice for clip preparation more rigorously particularly in relation to eliminating contamination, increasing lot size, reducing incidence of weak or tender wool and improving the fleece to pieces ratio.

These two programs will help the industry meet emerging market trends and improve its future long term viability.

8.7.6 Conclusion.

It seems the provision of a multi-function concept by the one position in a district office will continue. To support this, high quality training programs are essential to provide the best possible services and effectively meet the needs of the wool industry. Across regions communication between advisers to maintain the spread of up to date information is essential for successful relevant extension.

Table 2: Percentage and total of FTEs supporting four major wool sheep extension projects.

OFFICER AND REGION MAJOR EXTENSION PROGRAMS					
Percentage of time supporting					
	Wormcheck	Woolplan	Lambs-up	Nutrition	TOTAL
Eyre					
Brian Ashton	-	5	20	35	60
Mark Langman	20	-	-	-	20
Tony Morbey	3	5	5	5	18
Denice Rendell	5	5	10	10	30
Northern					
Robyn Duffy	-	10	10	20	40
Central					
Trevor Clark	-	-	-	15	15
Simon Ellis	25	-	10	15	50
Ian McFarland	15	5	10	20	50
Chris Scheid	5	5	5	10	25
Albert Singh	-	30	15	10	55
Mike Stanley	10	-	-	10	20
Chris Tuckwell	5	5	10	10	30
Murray Lands					
Dale Manson	-	5	25	5	35
Dick Klingberg	10	-	-	10	20
South East					
Adrian Barber	-	-	-	20	20
Roland Pittar	10	25	5	10	50
Tim Woonton	5	10	10	15	40
TOTAL FTEs	1.13	1.10	1.35	2.20	5.78

8.8   GENERAL RECOMMENDATIONS.

8.8.1   Attention should be given to the imbalances in allocation of staff and resources between research and extension with the aim of increasing resources to extension (particularly information collection, strategic planning and communication to industry). This should *not* be done at the expense of current wool sheep research resources, as this would:

* adversely affect industry profitability;

* reduce overall resources to the wool industry; and

* diminish external funding.

8.8.2   Extension effectiveness: The Commodity Group recommends that the Department change its policy regarding

* the "generalist/specialist" duties of livestock advisers;

* "one-to-one" versus "group" extension;

* the training, experience and expertise of livestock advisers.

and implement immediate changes to enable personnel to support the industry and facilitate change by introducing specialist sheep and wool advisers, increasing "one-to-one" extension, and providing training to assist these changes.

8.8.3   Priority should be given to the operational program "genetic improvement of sheep" by the development of the Turretfield Fleece Measurement Service and its integration into a Statewide program as recommended in the document "Technology Transfer Program for: Genetic Improvement of Wool Quality in South Australia" (Rogan, Maxwell & Gray, 1990).

8.8.4   The Department should direct resources towards the development of programs addressing the improvement of wool quality and the facilitation of communication and training both within the Department of Agriculture and in the wool industry.

8.8.5   Sheep and Wool Advisory Group review of projects: the industry priorities allocated to individual projects be used as a guide only for allocation of resources within Operational Programs. The overall goals and priorities should be the main guide for resource allocation, provided they are regularly reviewed by both the Commodity Group and industry.

8.8.6   The under-resourcing of the following areas be redressed:

* gathering and application of pasture production data;

* demonstration of management strategies to cope with the summer/autumn feed shortage;

* programs to alert farmers and industry to pesticide residue risks;

* interpretation and distribution of wool market information;

* the adoption of the Code of Practice for clip preparation and management of sheep to produce a high quality product.

8.8.7   The reallocation of resources in the following ways should be considered:

With the exception of industry funded research projects, Operational Programs 6. ("Reproductive efficiency of sheep") and 9. ("Marketing and processing of sheep, wool, skins and other by-products") could be discontinued (9) or reduced (6); creating a potential saving of $100,000 of State funds (see Table 3, Page 100). These funds should be considered as partial savings, and partial re-allocations to higher priority Operational Programs (such as "Genetic improvement of sheep"). Operational Programs on "Management and utilisation of pasture and rangelands vegetation", "Nutrition of sheep", "Sheep pests, health and welfare", and "Sheep management" should be carefully assessed with a view to:

*   streamlining and coordinating higher priority projects across the state;

*   reducing regulatory activity where possible.

8.8.7   **The best approach to reducing resources in the wool commodity is *rationalisation of low priority projects* within Operational Programs, and a *statewide coordination* of all Operational programs (as per Table 3, Page 100).**

9.   OUTCOMES SOUGHT FOR THE SHEEP AND WOOL INDUSTRY.

It is extremely difficult to estimate the financial benefits to the State from undertaking the work outlined above. For example, a one percent reduction in wool costs at the farm level gives a return to South Australian woolgrowers of $1.33 million annually, or a net present value of $24 million. Benefits also accrue to growers in other States and to wool consumers.

The following outcomes are expected for the sheep and wool industry in the short term:

9.1   If the South Australian wool and sheep industry fails to change to meet market needs it will rapidly decline in size and value, from $701 million in 1989/90 to possibly less than half that figure.

9.2   Along with this situation of declining value and importance, changes within the industry which improve productivity, efficiency and meeting market requirements should increase gross returns by 4% or $14 million per annum.

9.3   The implementation of the Department of Agriculture's programs are required to successfully achieve these improvements in returns.

Table 3, Page 100 outlines the relationships between the Departments programs and outcomes for the sheep and wool industry.

Table 3. GOALS AND OUTCOMES FOR THE WOOL INDUSTRY

PRIORITIES	BARRIERS	GOALS	OUTCOMES	OPERATIONAL PROGRAMS	$ CURRENT	CURRENT FTE	$ DESIRED	DESIRED FTE	REQUIRED STRATEGIES
1.2.1 Increased productivity & enhanced wool quality	* low prices for wool and sheep * lack of understanding limiting production efficiency * poor adoption of improved technology * poor knowledge of market requirements	a. Increase understanding of production systems & their capacity to meet market needs.	* improved efficiency of grazing management	1 3	188476 712322	3.09 16.24	188476 712322	3.09 16.24	
			* Improved production efficiency and health	5 7 13	190770 664533 66224	4.38 14.32 1.54	90000 450000 66224	2.00 10.00 1.54	* Rationalise low priority projects * Implement cost recovery
			* Improved lamb marking percentage	6	138896	2.62	100000	2.00	* Rationalise low priority projects * Coordinate program on statewide basis
			* farmer understanding how to genetically improve wool quality	4 12	82798 15150	1.46 .37	102272 25000	1.46 .62	* Increases resources
1.2.2 Increased output of & value of wool products	* lack of resources	b. Improve policy advice to government Industry	* better coordination of activities between Industry and government	11	19026	.26	30000	.56	
			* more timely and accurate Information * better quality advice to the Minister	8	67600	1.30	150000	3.30	
	* lack of Info. on market needs	c. Improve understanding of market needs & market Information	* improved marketing of wool & genetic material	9 10	3070 446	.07 .01	0 5000	.00 .10	
			* development of "value-added" wool products * Improved Information systems * better quality Info. from market to producer	11 12	22197 15150	.30 .37	35000 25000	.65 .62	
	* small number of Influentual studs dominate genetic progress * lack of adoption of management & clip preparation practices	d. Improve quality of raw wool presented to the market	* genetically Improved wool quality in the State's Merino flocks	4	480229	8.48	593182	8.48	* Expand Turretfield Fleece Measurement Service * Provide consultancies * Facilitate sire referencing
			* improved efficiency of grazing management	3 13	79147 16556	1.80 .39	79147 16556	1.80 .39	
			* Improved production efficiency & health	7 10 11	73837 4009 22197	1.59 .09 .31	50000 45000 35000	1.20 .90 .65	* Rationalise low priority projects * Implement cost recovery
	* shift in funds to textile research & development * less research funds	e. Conduct R & D of national significance	* Increased Industry funding to Department	1 2 6	251301 962786 208343	4.13 17.07 3.92	251301 962786 150000	4.13 17.07 2.90	
			* genetically Improved wool quality	4	165596	2.92	204545	2.92	
TOTALS SAVINGS 1991/92					4450659	87.03	4366811 83848	82.62 4.41	

10. ACKNOWLEDGEMENTS.

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	PRIORITIES			MEAN PRIOR.
	High	Medium	Low	
1. SOIL FERTILITY, SOLID STRUCTURE, PLANT NUTRITION & WATER USE	6	4	3	2.23
1.1 Residual benefits of zinc	2	5	2	2.00
1.2 Phosphorus in wheat-pasture	1	5	3	1.78
1.3 Field calibration, sulphur	3	5	1	2.22
1.4 Expert system, liming	5	4	1	2.40
1.5 Soil salinity, KI	4	4	1	2.33
1.6 Soil acidity, KI	2	6	1	2.11
1.7 Soil conservation, KI	2	4	3	1.89
1.8 Soil pH/nutrient monitoring, KI	1	6	2	1.89
1.9 Monitoring soil pH/nutrients, CH	1	5	3	1.78
MEAN	2.33	4.89	1.89	2.04
2. BREEDING AND SELECTION OF PASTURE PLANTS	7	5	2	2.36
2.1 Nat. sub-clover improvement	6	3		2.67
2.2 Selection, low P tolerant legumes	5	4		2.56
2.3 Pasture legumes, low rainfall	6	3		2.67
2.4 Breeding ARGT resistant ryegrass	5	1	3	2.22
2.5 Salt tol./resistance to Stagonospora	2	6	2	2.00
2.6 Annual medic genetic resources	2	5	2	2.00
2.7 Dryland salinity, Murray Mallee	3	5	2	2.10
2.8 Pasture species for the deep sands	3	3	4	1.90
2.9 strains of Rhizobium	1	4	4	1.67
MEAN	3.67	3.78	1.89	2.20
3. MANAGEMENT AND UTILISATION OF PASTURES AND RANGELAND VEGETATION	4	5	4	2.00
3.1 Pastures in cropping systems	6	3	1	2.50
3.2 Past. estab. red-brown earth	4	4	1	2.33
3.3 Evaluation grazing systems models	3	2	6	1.73
3.4 Survey of annual medic seed		8	1	1.89
3.5 Grazing management sheep saltbush	3	4	3	2.00
3.6 Degraded grasslands, semi-arid S.A.	3	1	6	1.70
3.7 Invertebrate pests in annual medic.	2	6	1	2.11
3.8 Biology & control perennial weeds	1	5	3	1.78
3.9 Biology & control golden dodder	1	3	5	1.56
3.10 Barley grass in sub-clover		7	2	1.78
3.11 Silver grass in legume	5	3	1	2.44
3.12 Inc. past. prodn., C. Hills.	6	2	1	2.56
3.13 Inc. past. prodn., S. Hills	6	2	1	2.56
3.14 Past. estab., ren. man., KI	6	3		2.67
3.15 Fodder Yields, hay mixes		3	6	1.33
3.16 Cover crop x medic rate, Wanbi		5	4	1.56
3.17 Cover crop x lucerne rate, Wanbi		4	5	1.44
3.18 Grass control in pasture	3	4	2	2.11
3.19 Imp. ann. medica & grain legumes	5	3	1	2.44
3.20 Past. legume var. testing	3	5	1	2.22
3.21 Grass seed survey		3	6	1.33
3.22 Integrated dingo control		4	4	1.50
MEAN	2.71	4.00	2.90	2.07

	PRIORITIES			MEAN PRIOR.
	High	Medium	Low	
4. GENETIC IMPROVEMENT OF SHEEP	7	5	1	2.46
4.1 Turretfield Fleece meas. service	10	1		2.91
4.2 Gen. param. wool quality traits	6	3	2	2.36
4.3 Isol. pigmented fibres in merinos	5	4	2	2.27
4.4 Breeding short tail Merinos		1	9	1.10
4.5 Skin char. as select. criteria	5	3	2	2.30
4.6 Phen. Gen. parameters SA Merinos	7	1	2	2.50
4.7 WOOLPLAN, Northern Region	5	4		2.56
4.8 WOOLPLAN, district advisory program	5	4	1	2.40
4.9 Wanbi flock breed. & select		6	4	1.60
4.10 Review update WOOLPLAN objectives	5	5		2.50
4.11 Sire referencing schemes	5	5		2.50
4.12 National WOOLPLAN	6	5		2.55
4.13 WOOLPLAN, Eyre Region	5	5		2.50
MEAN	4.92	3.62	1.69	2.31
5. NUTRITION OF SHEEP	3	8	2	2.08
5.1 Nutrit. sheep graz. stubb, dry past	5	4	2	2.27
5.2 Metal particles through the gut		1	9	1.10
5.3 Live wt. wool resp. to selenium	1	4	5	1.60
5.4 Cobalt deficiency on KI	1	2	6	1.44
5.5 Eval. Cobalt pellets, contract	1	2	6	1.44
5.6 Vitamin E supplements for sheep		3	6	1.33
5.7 TAKEAWAY district advisory program	3	2	4	1.89
5.8 Feeding urea to sheep on stubbles	1	1	8	1.30
5.9 Sheep wts. stubble ass. & TAKEAWAY	3	2	5	1.80
5.10 Water medication trial	4	2	4	2.00
5.11 Trace elements in sheep, C. Hills	1	4	4	1.67
5.12 Production feeding of sheep, Murraylands	2	2	5	1.67
5.13 Fodder tree demo., Murraylands	1	3	6	1.50
5.14 Livestock drought feeding Kit, Murraylands	2	7	1	2.10
5.15 Water medication - Eyre Region	1	2	4	1.57
MEAN	1.73	2.73	5.00	1.65
6. REPRODUCTIVE EFFICIENCY OF SHEEP	2	8	3	1.92
6.1 Reproductive wastage Mer. flocks	5	4	1	2.40
6.2 Production of transgenic sheep	1	4	5	1.60
6.3 Embryo coll., cult., transfer	2	6	2	2.00
6.4 Improved AI in sheep	5	2	3	2.20
6.5 Adoption of spring lambing	2	3	4	1.78
6.6 Reprod. efficiency sheep, C. Hills	1	2	6	1.44
6.7 Lambs-up reproduction package	4	3	3	2.10
6.8 Lamb mort. invest., Murraylands	3	4	3	2.00
6.9 Artificial breeding extension, Murrayland	1	3	6	1.50
MEAN	2.67	3.44	3.67	1.89

	PRIORITIES			MEAN PRIOR.
	High	Medium	Low	
7. SHEEP PESTS, HEALTH AND WELFARE	4	7	2	2.15
7.1 Int. parasite cont. in sheep	9	2		2.82
7.2 Cont. rel. insecticides flies lice	9	1	1	2.73
7.3 Immunology nematode infections	4	4	1	2.33
7.4 Anthelmintic evaluation trials	2	4	3	1.89
7.5 Haemonchus survey, Fleurieu		4	5	1.44
7.6 Seasonal incidence sheep nematodes SE	2	5	3	1.90
7.7 Anthelmintic resistance	3	5	1	2.22
7.8 Epidemiology nematode infections	2	5	2	2.00
7.9 Insecticide resistance in sheep lice	1	8		2.11
7.10 Regulation & info. on St. Dis. Act	1	5	3	1.78
7.11 Market Inspect., Gepps Cross	1	2	6	1.44
7.12 Class. SA intermediate footrot	4	4	1	2.33
7.13 Field behaviour inter. footrot	3	5	1	2.22
7.14 Cattle as carriers inter. footrot	2	2	5	1.67
7.15 Antibiotics eradicate footrot	4	4	1	2.33
7.16 Collection of footrot isolates	4	3	2	2.22
7.17 Evaluation pour-on lousicides	1	4	4	1.67
7.18 Stress physiology of husb. pract.	1	3	5	1.56
7.19 Lice extension program	3	5	1	2.22
7.20 Exotic disease preparedness	4	4	1	2.33
7.21 Invest. bact. viral fungal infects.	1	5	3	1.78
7.22 Scouring sheep	1	3	5	1.56
7.23 Ov. Bruce. accred. scheme	2	3	4	1.78
7.24 Infect. causes lamb abortion/ perinatal	3	2	4	1.89
7.25 Ram infertility	2	5	2	2.00
7.26 Animal health advisory	6	4		2.60
7.27 Animal health, regulatory	3	4	2	2.11
7.28 Footrot, Cent. Region	4	5		2.44
7.29 Sheep lice, Cent. Region	2	5	2	2.00
7.30 Weaner ill thrift, KI	3	3	3	2.00
7.31 Int. parasite control, Cent. Hills	3	5	1	2.22
7.32 Int. parasite control, KI	5	3	1	2.44
7.33 Pour-on lousicides, Cent. Reg.		5	4	1.56
7.34 Lice resistance, Cent. Region		5	4	1.56
7.35 Animal regulatory, C & SE Regions	1	3	5	1.56
7.36 Disease monitoring, KI	1	3	5	1.56
7.37 Captec trial, C Hills			9	1.00
7.38 Caltrop poisoning, Murraylands		4	5	1.44
7.39 Ag. & vet. chemicals, Murraylands	1	4	4	1.67
7.40 Worm control - Eyre Region	2	6		2.25
7.41 ARGT extension - Eyre Region	1	7	1	2.00
7.42 Animal regulation - Eyre Region		4	5	1.44
7.43 Animal health advisory - Eyre	2	6	1	2.11
MEAN	2.40	4.02	2.70	1.96

	PRIORITIES			MEAN PRIOR.
	High	Medium	Low	
8. PROVISION OF POLICY ADVICE ON THE SHEEP AND WOOL INDUSTRY	4	5	4	2.00
8.1 S & W section, Dept & Minister	5	2	2	2.33
8.2 S & W section, liaison with industry	6	3		2.67
8.3 Sheep and Wool Advisory Group	5	3	1	2.44
MEAN	5.33	2.67	1.00	2.48
9. MARKETING AND PROCESSING OF SHEEP, WOOL AND SKINS	3	5	5	1.85
9.1 Wool market and classing, Murraylands	1	4	4	1.67
MEAN	1.00	4.00	4.00	1.67
10. WOOL HARVESTING AND HANDLING SYSTEMS	4	5	4	2.00
10.1 Shearing shed man., Murraylands	2	4	3	1.89
MEAN	2.00	4.00	3.00	1.89
11. COMMUNICATIONS AND TRAINING	7	6	0	2.54
11.1 S & W section, extension coordination	6	3		2.67
11.2 Stock agents extension, Murraylands		2	7	1.22
11.3 AWC funded workshops	5	4		2.56
11.4 Project preparation - Eyre Region		1	8	1.11
11.5 Media contact - Eyre Region		8	1	1.89
MEAN	2.20	3.60	3.20	1.89
12. WOOL QUALITY	7	4	2	2.38
12.1 Reduction of wool fibre diameter	6	3	1	2.50
12.2 Management & staple strength, KI	4	5	1	2.30
12.3 Delayed shearing lambs - Eyre Region	3	4	2	2.11
MEAN	4.33	4.00	1.33	2.30

	PRIORITIES			MEAN PRIOR.
	High	Medium	Low	
13. SHEEP MANAGEMENT	3	9	2	2.07
13.1 Flock prod. perform. program, C Region	3	5	1	2.22
13.2 Gross margin book, C Region	3	5	2	2.10
13.3 Discussion groups, C Region	1	5	3	1.78
13.4 Karoonda group, Murraylands	2	3	4	1.78
13.5 Geranium & Meningie groups, Murray	2	3	4	1.78
13.6 PAAP - Eyre Region	6	3		2.67
13.7 Shearing shed management - Eyre Region	1	4	4	1.67
13.8 Livestock industry resource - Eyre Region	1	5	3	1.78
13.9 Sheep management recording - Eyre	3	6		2.33
13.10 Livestock resource Minnipa - Eyre		4	5	1.44
13.11 Animal husbandry advisory - Eyre	1	6	2	1.89
MEAN	2.09	4.45	2.55	1.95

	High	Medium	Low	
OVERALL MEANS	2.88	3.78	2.68	2.02

SUMMARY OF OPERATIONAL PROGRAMS, SORTED IN PRIORITY ORDER

11.	COMMUNICATIONS & TRAINING	2.54
4.	GENETIC IMPROVEMENT OF SHEEP	2.46
12.	WOOL QUALITY	2.38
2.	BREEDING & SELECTION OF PASTURE PLANTS	2.36
1.	SOIL FERTILITY, SOLID STRUCTURE, PLANT & WATER USE	2.23
7.	SHEEP PESTS, HEALTH & WELFARE	2.15
5.	NUTRITION OF SHEEP	2.08
13.	SHEEP MANAGEMENT	2.07
3.	MANAGEMENT & UTILISATION OF PASTURES AND RANGE LAND VEGETATION	2.00
8.	PROVISION OF POLICY ADVICE ON THE SHEEP & WOOL INDUSTRY	2.00
10.	WOOL HARVESTING & HANDLING SYSTEMS	2.00
6.	REPRODUCTIVE EFFICIENCY OF SHEEP	1.92
9.	MARKETING & PROCESSING OF SHEEP, WOOL, SKINS & OTHER BYPRODUCTS	1.85

		PRIORITIES			MEAN PRIOR.
		High	Medium	Low	
31.	Adoption of existing technology	10	2		2.83
29.	Provide trace-back to prods on contamin.	9	3		2.75
2.	Stockpile and its management	7	5		2.58
34.	Staff skills training in Department	9	1	2	2.58
15.	Review WRDC priorities	7	4	1	2.50
50.	Objective measurement	7	4	1	2.50
5.	World demand for wool	8	3	2	2.46
17.	Pesticide residues	5	7		2.42
43.	Wool harvesting - reduce costs	6	5	1	2.42
49.	Sale by description	7	3	2	2.42
20.	Nutrient requirements in sheep	7	2	3	2.33
42.	Reduce reproductive wastage	6	4	2	2.33
4.	Lower average fibre diameter in Merino flocks	5	6	1	2.33
8.	Method for setting reserve price	6	4	2	2.33
30.	Farm management support services	6	4	2	2.33
32.	Grower conservatism	5	6	1	2.33
16.	Regulate footrot	5	5	2	2.25
3.	Wool market feedback	5	5	2	2.25
21.	Finer fibres	4	7	1	2.25
47.	Support resources for industry	3	9		2.25
26.	Poor pastures	5	4	3	2.17
18.	Disease control/resistance	4	6	2	2.17
23.	Slow genetic change	4	6	2	2.17
27.	Pastures for the less than 300mm rainfall area	4	6	2	2.17
37.	Export mutton markets	5	4	3	2.17
7.	Pesticide residues	3	7	2	2.08
39.	Replace cellulose with wool fibre	5	3	4	2.08
44.	Government funds/resources	5	4	4	2.08
1.	Biotechnology and its applications	2	8	2	2.00
33.	Work with the middle segment of farmers	2	8	2	2.00
19.	Animal welfare	4	3	5	1.92
35.	Disease monitoring	3	5	4	1.92
36.	Exotic breeds	2	7	3	1.92
22.	Existing Merino strains	2	6	3	1.91
28.	Reduce stock numbers, inc. fleece wt/hd	3	4	5	1.83
45.	Freight charges (internationally)	3	4	5	1.83
6.	AWC supply technology to overseas processing	2	5	5	1.75
10.	Building insulation in roofs	2	5	5	1.75
48.	Greenhouse effect		9	3	1.75
14.	Regulate export of genetic material	4	1	7	1.75
24.	Adoption of artificial breeding technology	1	5	6	1.58
9.	Wool for upholstering car seats	1	5	6	1.58
38.	Skins and by-products		7	5	1.58
40.	Exploit low land values		7	5	1.58
46.	Waste disposal (wool processing)	1	5	6	1.58
11.	Get back to blankets	1	4	7	1.50
13.	Regulate national flock size	2	1	10	1.38
12.	Lower value futures markets		4	7	1.36
41.	Processors buy cheap land in Australia		3	9	1.25
25.	Produce sheep with bare breech		2	10	1.17
51.	Control sand fescue, winter pastures	1			3.00
52.	Genetic evaluation/sire referencing	1			3.00

		PRIORITIES			MEAN PRIOR.
		High	Medium	Low	
53.	Management for high tensile strength	1			3.00
54.	Contaminant management	1			3.00
55.	Choice of flock structure	1			3.00
56.	Optimal replacement policy (culling)	1			3.00
57.	Micron management	1			3.00
58	Information feedback to processors	1			3.00
MEAN		3.47	4.09	2.88	2.08

OPERATION PROGRAMS FOR THE WOOL SHEEP INDUSTRY
ANALYSIS OF SWAG COMMITTEE RESPONSES TO PROGRAMS AND PROJECTS

	SWAG MEMBER NUMBER															MEAN * RANK
	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	
Soil fertility, soil structure, plant nutrition and water use	1	1	12	1	4	1	6	10	9	7	6	10	4	9		5.79
Breeding and selection of pasture plants	3	7	4	2	10	2	5	10	2	2	7	10	5	2		5.07
Management and utilisation of pastures and range land vegetation	2	3	9	3	12	7	3	4	13	6	8	4	6	11		6.50
Genetic improvement of sheep	6	4	1	8	3	11	1	3	3	3	1	4	7	4		4.21
Nutrition of sheep	5	10	7	6	5	4	13	7	8	11	9	4	9	10		7.71
Reproductive efficiency of sheep	8	5	8	10	9	12	7	8	7	5	10	10	13	5		8.36
Sheep pests, health and welfare	4	6	13	11	7	8	8	5	6	4	2	4	12	3		6.64
Provision of policy advice on the sheep and wool industry	13	13	3	13	13	10	9	2	5	10	11	3	3	13		8.64
Marketing and processing of sheep, wool, skins and other by-products	12	2	2	4	8	9	12	10	1	12	3	10	8	12		7.50
Wool harvesting and handling systems	11	11	6	12	1	13	11	3	10	13	12	4	2	1		7.86
Communications and training	9	8	10	5	2	5	2	10	4	9	5	2	1	7		5.64
Wool quality	10	12	5	9	6	3	4	1	12	1	4	1	11	6		6.07
Sheep management	7	9	11	7	11	6	10	6	11	8	13	4	10	8		8.64

*   Overall mean rank 6.82; lower mean ranking indicates higher priority

OPERATIONAL PROGRAMS FOR THE WOOL SHEEP INDUSTRY

	FTE	SALARIES		OPERATING		TOTAL	% of TOTAL	TOTAL TRUST
		State	Trust	State	Trust			
1. SOIL FERTILITY, SOIL STRUCTURE PLANT NUTRITION & WATER USE								
1.1 Residual benefits of zinc	3.70	148000	0	5000	69954	222964	5	69964
1.2 Phosphorus in wheat-pasture	.25	10000	0	5000	41210	56210	1	41210
1.3 Field calibration, sulpher	1.15	1039	44961	0	5830	51830	1	50791
1.4 Expert system, liming	1.00	0	49859	0	10904	60763	1	60763
1.5 Soil salinity, Kl	.10	4000	0	400	0	4400	0	0
1.6 Soil acidity, Kl	.26	10400	0	700	0	11100	0	0
1.7 Soil conservation, Kl	.19	7600	0	800	0	8400	0	0
1.8 Soil pH/nutrient monitoring, Kl	.19	7600	0	300	0	7900	0	0
1.9 Monitoring soil pH/nutrients, CH	.38	15200	0	1010	0	16210	0	0
TOTAL	7.22	203839	94820	13210	127908	439777	10	222728

OPERATIONAL PROGRAMS FOR THE WOOL SHEEP INDUSTRY

	FTE	SALARIES State	Trust	OPERATING State	Trust	TOTAL	% of TOTAL	TOTAL TRUST
2. BREEDING AND SELECTION OF PASTURE PLANTS								
2.1 Nat. sub-clover improvement	2.53	25705	75495	0	20000	121200	3	95495
2.2 Selection low P tolerant legume	1.30	35405	16595	2000	15500	69500	2	32095
2.3 Pasture legumes, low rainfall	2.00	80000	0	8534	0	88534	2	0
2.4 Breeding ARGT resistent ryegrass	3.70	48000	100000	29621	163537	341158	8	263537
2.5 Salt tol./resistance to Stagonos	1.00	0	40000	0	35000	75000	2	75000
2.6 Annual medic genetic resources	5.70	228000	0	0	0	228000	5	0
2.7 Dryland salinity, Murray Mallee	.12	4800	0	332	0	5132	0	0
2.8 Pasture species for the deep san	.12	4800	0	210	0	5010	0	0
2.9 Strains of Rhizobium	.60	0	19152	0	10100	29252	1	29252
TOTAL	17.07	426710	251242	40697	244137	962786	22	495379

OPERATIONAL PROGRAMS FOR THE WOOL SHEEP INDUSTRY

	FTE	SALARIES		OPERATING		TOTAL	% of TOTAL	TOTAL TRUST
		State	Trust	State	Trust			
3. MANAGEMENT AND UTILISATION OF PASTURES AND RANGE LAND VEGETATION								
3.1 Pastures in cropping systems	1.03	41200	0	0	25000	66200	1	25000
3.2 Past. estab. red-brown earth	1.13	45200	0	1500	0	46700	1	0
3.3 Evaluation grazing systems model	1.00	40000	0	3000	0	43000	1	0
3.4 Survey of annual medic seed	1.05	25588	14412	0	13500	53500	1	27912
3.5 Grazing management sheep saltbus	1.40	56000	0	7000	0	63000	1	0
3.6 Degraded grasslands, semi-arid S	.15	6000	0	0	0	6000	0	0
3.7 Invertebrate pests in annual med	5.69	195923	31677	1500	3280	232380	5	34957
3.8 Biology & control perennial weed	1.10	44000	0	500	3500	48000	1	3500
3.9 Biology & control golden dodder	.65	26000	0	0	0	26000	1	0
3.10 Barley grass in sub-clover	.35	14000	0	200	0	14200	0	0
3.11 Silver grass in legume	.35	14000	0	500	0	14500	0	0
3.12 Inc. past. proch., C. Hills	.62	24800	0	1750	0	26550	1	0
3.13 Inc. past. proch., S. Hills	.27	10800	0	1100	0	11900	0	0
3.14 Past. estab. ren. man., Kl	.12	4800	0	250	0	5050	0	0
3.15 Fodder yields, hay mixes	.24	9600	0	700	0	10300	0	0
3.16 Cover crop x medic rate, Wanbi	.26	10400	0	1150	0	11550	0	0
3.17 Cover crop x lucerne rate, Wanbi	.25	10000	0	1150	0	11150	0	0
3.18 Grass control in pasture	.19	7600	0	200	0	7800	0	0
3.19 Imp. ann. medica & grain legume	.05	2000	0	200	0	2200	0	0
3.20 Past. legume var. testing	.07	2800	0	290	0	3090	0	0
3.21 Grass seed survey	.07	2800	0	350	0	3150	0	0
3.22 Integrated dingo control	2.00	0	63649	0	21600	85249	2	85249
TOTAL	18.04	593511	109738	21340	66880	791469	18	176618

OPERATIONAL PROGRAMS FOR THE WOOL SHEEP INDUSTRY

	FTE	SALARIES		OPERATING		TOTAL	% of TOTAL	TOTAL TRUST
		State	Trust	State	Trust			
4. GENETIC IMPROVEMENT OF SHEEP								
4.1 Turretfield Fleece Meas. Service	2.00	0	0	30000	0	30000	1	0
4.2 Gen. param. wool quality traits	.96	38400	11044	0	43200	92644	2	54244
4.3 Isol. pigmented fibres in Merino	2.03	81200	33043	3000	1560	118803	3	34603
4.4 Breeding short tail Merinos	.56	22400	0	1000	0	23400	1	0
4.5 Skin char. as select. criteria	4.00	72817	87183	0	55960	215960	5	143143
4.6 Phen. Gen. parameters SA Merinos	1.18	47200	0	1000	0	48200	1	0
4.7 WOOLPLAN, Northern Region	.10	4000	0	0	0	4000	0	0
4.8 WOOLPLAN, district advisory prog	.80	32000	0	3000	0	35000	1	0
4.9 Wanbi flock breed. & select.	.01	400	0	86	0	486	0	0
4.10 Review update WOOLPLAN objectiv	.16	6400	0	0	7280	13680	0	7280
4.11 Sire referencing schemes	.00	0	0	0	33550	33550	1	33550
4.12 National WOOLPLAN	1.00	0	54108	0	55892	110000	2	110000
4.13 WOOLPLAN, Eyre Region	.06	2400	0	500	0	2900	0	0
TOTAL	12.86	307217	185378	38586	197442	728623	16	382820

OPERATIONAL PROGRAMS FOR THE WOOL SHEEP INDUSTRY

	FTE	SALARIES		OPERATING		TOTAL	% of TOTAL	TOTAL TRUST
		State	Trust	State	Trust			
5. NUTRITION OF SHEEP								
5.1 Nutrit. sheep graz. stubb. dry p	1.50	60000	0	5000	0	65000	1	0
5.2 Metal particles through the gut.	1.20	26027	21973	0	6580	54580	1	28553
5.3 Live wt. wool resp. to selenium	.15	6000	0	500	0	6500	0	0
5.4 Cobalt deficiency on KI	.13	5200	0	500	0	5700	0	0
5.5 Eval. Cobalt pellets, contract	.13	5200	0	0	0	5200	0	0
5.6 Vitamin E supplements for sheep	.02	800	0	200	0	1000	0	0
5.7 TAKEAWAY, district advisory prog	.50	20000	0	0	0	20000	0	0
5.8 Feeding urea to sheep on stubble	.25	10000	0	400	0	10400	0	0
5.9 Sheep wts, stubble ass. & TAKEAW	.10	4000	0	800	0	4800	0	0
5.10 Water medication trial	.10	4000	0	300	0	4300	0	0
5.11 Trace elements in sheep, C. Hil	.04	1600	0	250	0	1850	0	0
5.12 Production feeding of sheep, Mu	.10	4000	0	240	0	4240	0	0
5.13 Fodder tree demo., Murraylands	.01	400		200	0	600	0	0
5.14 Livestock drought feeding Kit	.02	800	0	300	0	1100	0	0
5.15 Water medication - Eyre Region	.13	5200	0	300	0	5500	0	0
TOTAL	4.38	153227	21973	8990	6580	190770	4	28533

OPERATIONAL PROGRAMS FOR THE WOOL SHEEP INDUSTRY

	FTE	SALARIES		OPERATING		TOTAL	% of TOTAL	TOTAL TRUST
		State	Trust	State	Trust			
6. REPRODUCTIVE EFFICIENCY OF SHEEP								
6.1 Reproductive wastage Mer. flocks	2.50	69493	30507	3000	21713	124713	3	52220
6.2 Production of transgenic sheep	1.83	32341	40859	0	16000	89200	2	56859
6.3 Embryo coll., cult., transfer	.88	35200	0	3000	0	38200	1	0
6.4 Improved A I in sheep	.88	2000	46046	0	27250	75296	2	73296
6.5 Adoption of spring lambing	.05	2000	0	100	0	2100	0	0
6.6 Reprod. effiency sheep, C. Hil	.04	1600	0	200	0	1800	0	0
6.7 Lambs-up reproduction package	.20	8000	0	390	0	8390	0	0
6.8 Lamb mort. invest., Murraylands	.09	3600	0	1040	0	4640	0	0
6.9 Artificial breeding extension, M	.07	2800	0	100	0	2900	0	0
TOTAL	6.54	157034	117412	7830	64963	347239	8	182375

OPERATIONAL PROGRAMS FOR THE WOOL SHEEP INDUSTRY

	FTE	SALARIES		OPERATING		TOTAL	% of TOTAL	TOTAL TRUST
		State	Trust	State	Trust			
7. SHEEP PESTS, HEALTH AND WELFARE								
7.1 Int. parasite cont. in sheep	1.40	56000	0	3000	0	59000	1	0
7.2 Cont. rel. insecticides flies li	1.10	44000	0	2000	0	46000	1	0
7.3 Immunology nematode infections	.10	4000	0	1000	0	5000	0	0
7.4 Anthelmentic evaluation trials	.20	8000	0	100	0	8100	0	0
7.5 Haemonchus survey, Flerieu	.20	8000	0	500	0	8500	0	0
7.6 Seasonal incidence sheep nematod	.10	4000	0	100	0	4100	0	0
7.7 Anthelmentic resistance	.20	8000	0	1000	0	9000	0	0
7.8 Epidemiology nematode infections	.25	10000	0	200	0	10200	0	0
7.9 Insecticide resistance in sheep	.20	8000	0	1000	0	9000	0	0
7.10 Regulation & info. on St. Dis.	.20	8000	0	1500	0	9500	0	0
7.11 Market Inspect., Gepps Cross.	.30	12000	0	2000	0	14000	0	0
7.12 Class. SA intermediate footrot	.41	16200	0	2000	0	18200	0	0
7.13 Field behaviour inter. footrot	.20	8000	0	1000	0	9000	0	0
7.14 Cattle as carriers inter. footr	.20	8000	0	1000	0	9000	0	0
7.15 Antibiotics eradicate footrot	.20	8000	0	1000	0	9000	0	0
7.16 Collection of footrot isolates	.11	4400	0	500	0	4900	0	0
7.17 Evaluation pour-on lousicides	.20	8000	0	2000	0	10000	0	0
7.18 Stress physiology of husb. prac	.50	20000	0	5000	31000	56000	1	31000
7.19 Lice extension program	.40	16000	0	5020	0	21020	0	0
7.20 Exotic disease preparedness	.20	8000	0	0	0	8000	0	0
7.21 Invest. bact. viral fungal infe	.05	2000	0	0	0	2000	0	0
7.22 Scouring sheep	.05	2000	0	0	0	2000	0	0
Continued next page								

OPERATIONAL PROGRAMS FOR THE WOOL SHEEP INDUSTRY

	FTE	SALARIES		OPERATING		TOTAL	% of TOTAL	TOTAL TRUST
		State	Trust	State	Trust			
7. SHEEP PESTS, HEALTH AND WELFARE (cont.)								
7.23 Ov. Bruce. accred. scheme		0	0	0	0	0	0	0
7.24 Infect. causes lamb abortion/pe	.05	2000	0	0	0	2000	0	0
7.25 Ram infertility	.05	2000	0	0	0	2000	0	0
7.26 Animal health advisory	1.35	54000	0	2860	0	56860	1	0
7.27 Animal health regulatory	1.65	66000	0	9350	0	75350	2	0
7.28 Footrot, Cent. Region	.05	2000	0	0	0	2000	0	0
7.29 Sheep lice, Cent. Region	.10	4000	0	0	0	4000	0	0
7.30 Weaner ill thrift, KI	.19	7600	0	800	0	8400	0	0
7.31 Int. parasite control, Cent. KI	.18	7200	0	1050	0	8250	0	0
7.32 Int. parasite control, KI	.10	4000	0	1000	0	5000	0	0
7.33 Pour-on lousicides, Cent. Reg.	.07	2800	0	0	0	2800	0	0
7.34 Lice resistance, Cent. Region	.12	4800	0	1800	0	6600	0	0
7.35 Animal regulatory, C & SE Region	3.29	131600	0	10250	0	141850	3	0
7.36 Disease monitoring, KI	.12	4800	0	300	0	5100	0	0
7.37 Captec trial, C. Hills	.10	4000	0	0	7400	11400	0	7400
7.38 Caltrop poisoning, Murraylands	.07	2800	0	740	0	3540	0	0
7.39 Ag & Vet. Chemicals, Murraylands	.05	2000	0	50	0	2050	0	0
7.41 Worm control - Eyre Region	.09	3600	0	300	0	3900	0	0
7.42 ARGT extension - Eyre Region	.20	8000	0	500	0	8500	0	0
7.43 Animal regulation - Eyre Region	.58	23200	0	2400	0	25600	1	0
7.44 Animal health advisory - Eyre	.73	29300	0	2450	0	31650	1	0
TOTAL	15.91	636200	0	63770	38400	738370	17	38400

OPERATIONAL PROGRAMS FOR THE WOOL SHEEP INDUSTRY

	FTE	SALARIES		OPERATING		TOTAL	% of TOTAL	TOTAL TRUST
		State	Trust	State	Trust			
8. PROVISION OF POLICY ADVICE ON THE SHEEP & WOOL INDUSTRY								
8.1 S & W section, Dept. Minister	.90	36000	0	10800	0	46800	1	0
8.2 S & W section, liaison with indust.	.30	12000	0	3600	0	15600	0	0
8.3 Sheep & Wool Advisory Group.	.10	4000	0	1200	0	5200	0	0
TOTAL	1.30	52000	0	15600	0	67600	2	0
9. MARKETING & PROCESSING OF SHEEP, WOOL, SKINS & OTHER BY PRODUCTS								
9.1 Wool market & classing, Murrayl.	.07	2800	0	270	0	3070	0	0
TOTAL	.07	2800	0	270	0	3070	0	0

OPERATIONAL PROGRAMS FOR THE WOOL SHEEP INDUSTRY

	FTE	SALARIES State	Trust	OPERATING State	Trust	TOTAL	% of TOTAL	TOTAL TRUST
10. WOOL HARVESTING & HANDLING SYSTEMS								
10.1 Shearing shed man., Murraylands	.10	4000	0	455	0	4455	0	0
TOTAL	.10	4000	0	455	0	4455	0	0
11. COMMUNICATIONS & TRAINING								
11.1 S & W section, extension coordina	.70	28000	0	8400	0	36400	1	0
11.2 Stock agents extension, Murrayl	.04	1600	0	120	0	1720	0	0
11.3 AWC funded workshops	.00	0	0	0	20000	20000	0	20000
11.4 Project preparation - Eyre Reg.	.08	3200	0	100	0	3300	0	0
11.5 Media contact - Eyre Region	.05	2000	0	0	0	2000	0	0
TOTAL	.87	34800	0	8620	20000	63420	1	20000
12. WOOL QUALITY								
12.1 Reduction of wool fibre diameter	.50	20000	0	0	0	20000	0	0
12.2 Management & staple strength, K	.14	5600	0	500	0	6100	0	0
12.3 Delayed shearing lambs - Eyre Reg.	.10	4000	0	200	0	4200	0	0
TOTAL	.74	29600	0	700	0	30300	1	0

OPERATIONAL PROGRAMS FOR THE WOOL SHEEP INDUSTRY

	FTE	SALARIES		OPERATING		TOTAL	% of TOTAL	TOTAL TRUST
		State	Trust	State	Trust			
13. SHEEP MANAGEMENT								
13.1 Flock prod. perform. program, C.	.05	2000	0	100	0	2100	0	0
13.2 Gross margin book, C Region	.02	800	0	0	0	800	0	0
13.3 Discussion groups, C Region	.24	9600	0	700	0	10300	0	0
13.4 Karoonda group, Murraylands	.10	4000	0	160	0	4160	0	0
13.5 Geranium & Meningie groups, Mur	.14	5600	0	740	0	6340	0	0
13.6 PAAP - Eyre Region	.07	2800	0	450	0	3250	0	0
13.7 Shearing shed management - Eyre	.03	1040	0	100	0	1140	0	0
13.8 Livestock industry recording - E	.09	3600	0	200	0	3800	0	0
13.9 Sheep management recording - E	.07	2800	0	150	0	2950	0	0
13.10 Livestock resource Minnipa - E	.07	2800	0	240	0	3040	0	0
13.11 Animal husbandry advisory - E	1.05	42000	0	2900	0	44900	1	0
TOTAL	1.93	77040	0	5740	0	82780	2	0
OVERALL TOTAL	87.02	2677978	780563	225808	766310	4450659	100	1546873

OPERATIONAL PROGRAMS FOR THE WOOL SHEEP INDUSTRY
SUMMARY A

| | FTE | SALARIES | | OPERATING | | TOTAL | % of TOTAL | TOTAL TRUST |
		State	Trust	State	Trust			
1. Soil fertility, soil structure, plant nutrition and water use	7.22	203839	94820	13210	127908	439777	10	222728
2. Breeding and selection of pasture plants	17.07	426710	251242	40697	244137	962786	22	495379
3. Management and utilisation of pastures and range land vegetation	18.04	593511	109738	21340	66880	791469	18	176618
4. Genetic improvement of sheep	12.86	307217	185378	38586	197442	728623	16	382820
5. Nutrition of sheep	4.38	153227	21973	8990	6580	190770	4	28553
6. Reproductive efficiency of sheep	6.54	157034	117412	7830	64963	347239	8	182375
7. Sheep pests, health and welfare	15.91	636200	0	63770	38400	738370	17	38400
8. Provision of policy advice on the sheep and wool industry	1.30	52000	0	15600	0	67600	2	0
9. Marketing and processing of sheep, wool, skins and other by-products	.07	2800	0	270	0	3070	0	0
10. Wool harvesting and handling system	.10	4000	0	455	0	4455	0	0
11. Communications and training	.87	34800	0	8620	20000	63420	1	20000
12. Wool quality	.74	29600	0	700	0	30300	1	0
13. Sheep management	1.93	77040	0	5740	0	82780	2	0
TOTAL	87.02	2677978	780563	225808	766310	4450659	100	1546873

OPERATIONAL PROGRAMS FOR THE WOOL SHEEP INDUSTRY
SUMMARY B

| | FTE | SALARIES | | OPERATING | | TOTAL | % of TOTAL | TOTAL TRUST |
		State	Trust	State	Trust			
Plants and soil	42.33	1224060	455800	75247	438925	2194032	49	894725
Sheep production	25.71	694518	324763	61146	268985	1349412	30	593748
Sheep health	15.91	636200	0	63770	38400	738370	17	38400
Marketing & harvesting	.91	36400	0	1425	0	37825	1	0
Policy, administration & training	2.17	86800	0	24220	20000	131020	3	20000
TOTAL	87.02	2677978	780563	225808	766310	4450659	100	1546873

OPERATIONAL PROGRAMS FOR THE WOOL SHEEP INDUSTRY
SUMMARY C

| | FTE | SALARIES | | OPERATING | | TOTAL | % of TOTAL | TOTAL TRUST |
		State	Trust	State	Trust			
Research	60.96	1755538	726455	96015	649468	3227476	73	1375923
Extension	19.12	644640	54108	101943	116842	917533	21	170950
Regulatory	6.95	277800	0	27850	0	305650	7	0
TOTAL	87.02	2677978	780563	225808	766310	4450659	100	1546873