



South Australian Agriculture

GRAIN LEGUMES AND OTHER CROPS



DEPARTMENT OF AGRICULTURE
SOUTH AUSTRALIA

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GRAIN LEGUMES FOR SUSTAINABILITY AND PROFIT

A Strategic Plan for a
Departmental Grain Legume Program

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DEPARTMENT OF AGRICULTURE

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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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GRAIN LEGUMES FOR SUSTAINABILITY AND PROFIT

A Strategic Plan for a Departmental Grain Legume Program

SUMMARY

Grain legumes have the potential to expand in their role as an integral part of a sustainable, profitable crop and pasture rotation. New and higher value markets exist or can be created, and the industry can expand if the current barriers to the achievement of their production and marketing potential are removed. The current decline in the area of crop sown in this previously expanding industry needs to be arrested and reversed. A Departmental strategic plan is provided to document current work and to look to new short, medium and long term initiatives for producing the additional outcomes required to develop the grain legume industry. A fully coordinated approach which integrates breeding, agronomic practices, marketing, and end-uses is required. A better quality product, well marketed and reliably produced using management techniques for long term sustainability and economic viability is required. The main thrust of the strategy is therefore to: maintain and improve the reliability, sustainability, profitability and cost efficiency of the grain legume industry; access premium food quality markets using improved varieties and appropriate crop species; expand existing markets, develop new export and local markets, and achieve established market premiums and new uses for grain legumes. New initiatives proposed for 1990/91 are:

First priorities:

Continue lentil breeding	(Continuing industry funds now obtained)
Continue disease screening for breeders	(Continuing industry funds now obtained)
Disease/plant nutrition interaction	(Continuing industry funds now obtained)
Disease/herbicide interaction	(Industry funds sought)
Weed control and crop tolerance	(State funds sought)
Weed ecology, control and alert	(Industry funds sought)
Chickpea and lentil agronomic package	(State funds sought)
Soil erosion avoidance	(Industry funds to be sought)
Product and marketing research	(State funds sought)

Second priorities:

Rhizobium strains and nitrogen fixation	(Industry funds to be sought)
Continue pea weevil	(Continuing industry funds now obtained)
Native budworm behaviour	(Industry funds sought)
Continue plant diagnostic tests	(Continuing Industry funds sought)
End use nutritional evaluation	(Industry funds sought)
Grain legume coordination	(State funds sought)

Third priorities:

Pea breeding expansion	(Industry funds should be sought)
Virology and seed testing	(State funds sought)
Insect economic treatment density	(State funds sought)
Lupin agronomy	(Industry funds sought)
Rodenticides	(Industry funds sought)

Resources and implementation methods are discussed in the plan. A synopsis of the main inputs and interactions which forms the basis for the strategic plan is shown later in figure 2. The current status and initiatives proposed are later summarised in table 2.

INTRODUCTION

This strategic plan for grain legumes outlines the industry and a Departmental program to assist it. Grain legumes are an important part of a sustainable farming system. Sustainability is the integration of economically viable systems of production that maintains or enhances our soil, water, animal and plant resources, and meets the immediate and long term needs of society. The role of grain legumes as a cleaning crop for cereal root diseases is well established. Their contribution to soil nitrogen is less than sown pasture legumes, but not exploitive as are cereals and oilseeds. It is now recognised that continuous cropping with cereals and grain legumes is highly profitable, but not necessarily sustainable in the longer term because of production difficulties, especially legume diseases, problem weeds, erosion, land capability and soil degradation. As well, if soil structure declines, then low protein, less marketable cereals may be produced unless nitrogen fertiliser is applied and reduced tillage techniques are used. The integration of cereal crops, grain legumes and sown legume pasture into a crop rotation can be sustainable and highly beneficial to the cereal and grain legume, as well as to soil structure and weed control. Greater skills are however required by the farmer eg reduced tillage, stubble retention, chemical use. It must be remembered that grain legumes are a highly profitable cash crop, and should be considered as more than just a tool to improve cereal yields.

The strategic plan proposed is aimed at overcoming the current production and marketing problems, hence reversing the decline, stabilising and expanding the grain legume industry to make it an important part of a more sustainable and marketable agricultural system. It tackles all aspects of the industry, and integrates them (see figure 2 later).

GRAIN LEGUME STRATEGIC PLAN

1. INDUSTRY STATEMENT

Grain legumes are high protein grain crops which should be an integral part of cereal crop rotations. Immediate financial benefits are obtained from their production and sale, as well as from their subsequent benefits to cereal crop rotations and livestock production. Retailers, processors, exporters, traders, consumers, and other agri-business also benefit from their production and use. Production in S.A. increased tenfold in a decade as the financial benefits became apparent, but the last two seasons have seen a declining area sown to grain legumes because of production problems which have developed (figure 1). The longer term potential is for further expansion of this lucrative industry once certain major barriers are overcome. Target feed markets are the EEC and Australia, and target human food markets are the Indian subcontinent and Middle East.

1.1 PRODUCTION

The major grain legume production in South Australia is from peas (173,000t), lupins (46,000t), broad and faba beans (33,000t), chickpeas (8,000t), common vetch (18,000t) and lentils (400t). Peas and lupins are principally for stockfeed, and beans, chickpeas and lentils for human consumption. Approximately 50% of grain legume production from South Australia was exported in 1988-89.

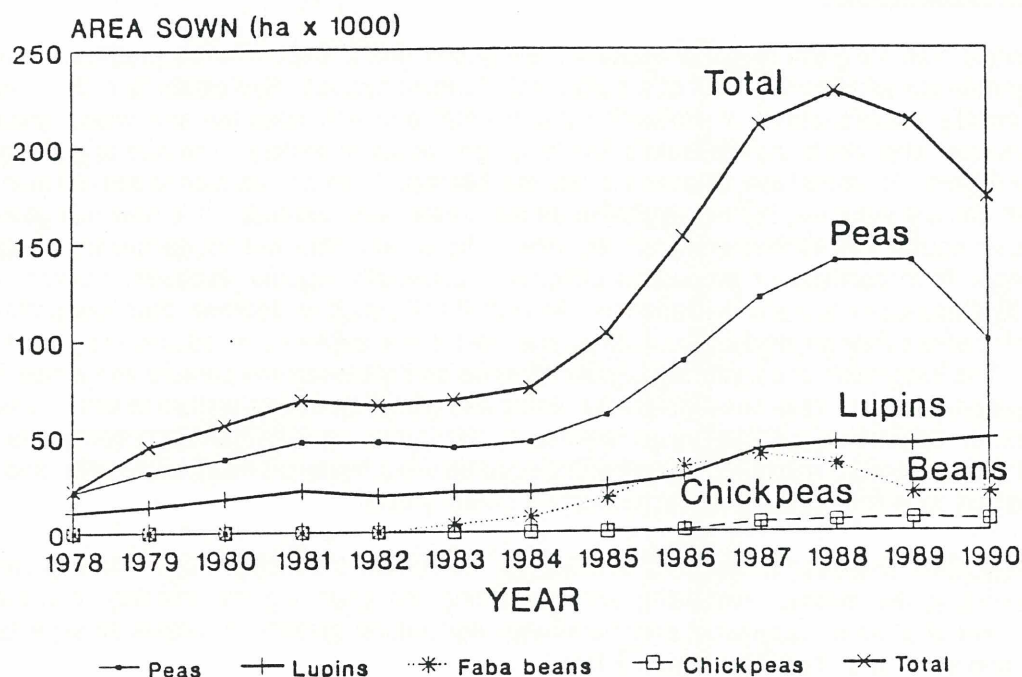
In 1987/88 the gross value of production of the four major grain legumes in South Australia was \$60 million. Valued added opportunities consisted of split peas for the domestic and export market, machine dressed faba beans for the Middle East and chickpeas to the Indian subcontinent.

1.2 CURRENT MARKETS

Value

In 1989/90, 413,000t of lupins (\$194-235/t) and 298,000t of peas (\$237-276/t) were exported from Australia worth \$190 million. In addition there were 100,000t of chickpeas exported (\$400-410/t) and 24,000t of broad bean (\$270-460/t) exported at a value of \$47 million. In the 10 months to April 1990, S.A. exported 117,000t of grain legumes, principally whole dried peas, with a value of \$35 million.

Figure 1 Area sown to grain legumes in S.A.



Source: ABARE Commodity stat. bull. 1989

1990 = SADA estimates

S.A. exported 117,000t of grain legumes, principally whole dried peas, with a value of \$35 million. Prices per tonne are volatile, as indicated in price ranges, and the unit prices of Australian lupins and peas are much lower than the unit values of other grain legumes (Table 1).

Table 1. Average Prices of various grain legumes in \$US per tonne

Average Export prices		\$US	(Range)
Lupins	1982-86		
- from Australia		159	(141-174)
Peas	1981-1985		
- from Australia		213	(96-331)
- from Canada		275	(245-309)
- from USA (green cotyledon)		392	(362-427)
Chickpeas	1981-1985		
- from Turkey		418	(371-556)
- from Mexico		656	(489-884)
- Total World		473	(415-571)
Lentils	1981-1985		
- from Turkey		369	(265-540)
- from USA		551	(423-694)
- from Canada		434	(379-497)
- Total World		424	(308-594)
Average Import prices			
Broad beans	1981-1985		
- to Italy		339	(242-883)
- to Saudi Arabia		418	(380-460)
- to German Fed. Rep.		249	(227-312)
- Total World		351	(262-642)

Developing countries

India is major target for export of chickpeas, lentils, and dry peas for human consumption. Grain legumes are a vital source of vegetable protein especially for the poor in developing countries. However demand for grain legumes is highly responsive to price and income, ie people on low incomes buy more grain legumes as prices decrease or as incomes increase. Capacity to pay is a constraint.

Developed countries

The EEC stockfeed market is a target market for grain legumes, especially dry peas, but is likely to become much more competitive as production increases significantly within the EEC, Canada and Eastern Europe. Demand depends on competitiveness with other feed grains, eg. minimum producer prices for EEC feed wheat on one hand, and the availability of substitute products from anywhere else on the other eg. cassava from Asia.

Domestic markets

Domestic use of grain legumes is dependent on relative prices of competing proteins, eg oilseed meals and meat meal, including imported products. In 1986/87 Australia imported 52,000 tonnes of soybean meal and 19,000 tonnes soy oil which could be replaced by Australian grain legumes. In 1988/89 imports were 394 tonnes of soybean, but 33,000 tonnes of soy oil. Up to 30% of our pea production has been used for pig and poultry feed. Lupins are more digestible for sheep and cattle than they are for pigs and poultry and are usually cheaper than peas.

1.3 INDUSTRY REGULATION

Grain legumes in Australia can be freely traded except in W.A. where the Grain Pool has sole domestic and overseas marketing control of lupins in that state. Phytosanitary inspections are required for export shipments to meet our export requirements and satisfy any specific requirements of the receiver. A National Grain Legume Consultative Committee (NGLCC) was formed in 1989 to assist the industry in self-regulation. A similar S.A. committee was formed in 1990 to advise the NGLCC. National grain legume standards have been developed by the NGLCC, and a code of hygienic practice is being developed.

1.4 PROCESSED PRODUCTS

There has been little product development work on grain legumes in Australia. Most retail packs consist of poly packs of seed. Imported canned products are available but are not being promoted. At the farmer end, most product is used for compound feed or is exported in bulk. There are significant quantities of split peas being packaged and exported (20,000t from S.A. in the 10 months to April 1990). Peas, beans and chickpeas are also cleaned, graded and bagged for export.

2. INDUSTRY POTENTIAL

2.1 POTENTIAL FOR INCREASED PRODUCTION

There is potential to increase production via crop rotation systems and plant breeding. The current barriers to production must be overcome before production can increase again.

Lupins: Potential to increase production on heavier soils which do not contain free lime. Potential for general increase in production now lupinosis risk reduced.

Peas: Short term potential is to try to sustain production until disease is controlled in the longer term. Production of smooth white peas with uniform cotyledon colour will improve marketing in the longer term, as will the production of marrowfat and green cotyledon varieties.

Beans: Short term potential is to try and sustain production until disease is controlled and management improved in the future.

Chickpeas: Potential for large production increase despite limited crop rotational benefits.

Lentils: Potential only to sustain production until suitable variety and production information becomes available in the future.

Vetch: Potential is to sustain production until markets are found.

2.2 POTENTIAL FOR MARKET DEVELOPMENT

Feed use of grain legumes is concentrated in developed countries where the potential is for large markets but at a price determined by other competitive products. Dry peas for monogastric rations and lupins for ruminant rations have almost unlimited markets, particularly in the EEC where subsidised prices enable the Australian product to undercut EEC local production. Australia itself is the second most important feed market, with the newly industrialised countries in south-east Asia emerging as lower priced feed outlets.

There are processing opportunities for food quality grain legumes, in particular chickpeas and lentils. Food consumption of grain legumes is concentrated in the developing countries, but human consumption of grain legumes needs to be researched for Western markets to adapt grain legumes to higher income consumption trends.

Lupins: Prices will be lower than competing legumes when premiums for peas and chickpeas are received for more acceptable food types. Lupins are better placed than peas to gain access to the Japanese feed market due to import quota restrictions on peas. Potential markets may include the expanding oilmeal markets of Indonesia, Saudi Arabia, Mexico, Malaysia, Philippines, China, Spain, Poland, Rumania and the USSR. There are a number of potential food uses being examined for lupins eg. Tofu.

Peas: The EEC and Australian stockfeed markets when combined provide an unlimited market. Currently these markets are indifferent to the type of pea received other than paying a premium for low moisture peas. Premiums are paid for smooth white peas with consistent cotyledon colour for splitting. There are small premiums also for dried green peas to markets such as India, Philippines, Colombia, Haiti, Peru and Venezuela, but in competition with the U.S.A. and Canada. There are markets in South-East Asia for marrowfat peas. The most lucrative pea market is for vining peas for freezing and canning.

Beans: A market exists for the green immature beans which can be canned or quick frozen, especially for U.K. and Middle East, but in competition with cheaper Chinese products. Small markets in the Middle East and Japan exist for larger, dried broad beans and also for faba beans. Feed markets are unlimited, in competition with peas and at a small discount to peas.

Chickpeas: Preferred legume for India, Pakistan and Bangladesh. The Kabuli chickpea is especially favoured in the Mediterranean. Turkey is the only major exporter. There are possible snack food markets to develop for chickpea. Australia can service up to 200,000t of desi and 100,000t of kabuli, but price will be dependent largely on India's ability to pay, and the limited size of the total world market for similar reasons.

Lentils: The one major supplier of red lentils in the world is Turkey which may reduce production to produce higher value irrigated crops from their previously dryland areas. Canada and the U.S.A. concentrate on green lentil production. Australia is capable of export targets of 80,000t of red and 20,000t of green lentils within five years. Total world market is around 500,000t.

Vetch: A promising new variety has been developed for livestock feed. Local and export markets need to be developed. There is market potential for hay mixes for livestock and pellets for the live sheep trade. Prices are lower than lupins, and there are problems in feeding to pigs and poultry. There is currently little world trade. Productivity of vetch relative to competing grain legumes in the better rainfall districts will be crucial for development, but vetch does show some promise for the lower rainfall areas.

2.3 PROCESSING OPPORTUNITIES

De-hulling lupins is expensive, but the de-hulled lupin is higher in protein and more digestible than whole lupins, and becomes more competitive with soybean meal. Because of Australia's virtual monopoly on lupin production and exports, the processing of lupins should be developed. Current exports of split peas could also be expanded with the right varieties being grown. The production of grain legume flour would also be feasible once markets are established and new uses developed for domestic consumption. There are many food uses for chickpeas and lentils which need to be adapted for western style consumption eg. hummus, falafel and snackpacks.

3. BARRIERS TO ACHIEVEMENT OF INDUSTRY/MARKET POTENTIAL

Concerns about the longer term biological and economic sustainability of grain legume/cereal/pasture rotations, whether real or perceived, are a barrier.

All crops

- * inability to produce and sustain grain legume types and quality required for known markets.
- * limited weed control options.
- * lack of product development, market development and consumer research.
- * lack of information for crop choice and market options.
- * threat of herbicide resistant weeds.
- * lack of adoption of known technology.
- * adoption of reduced tillage and stubble retention systems.

Lupins

- * disease incidence.
- * need greater on farm usage for livestock feeding.
- * limited agronomic information for heavier soils.
- * lack of varieties suited to heavier soils.
- * need development of dehulled lupins for pig and poultry rations.
- * shortages of export tonnages.

Peas

- * lack of suitable varieties with disease resistance and quality required by markets.
- * soil erosion.
- * disease incidence, especially that aggravated by herbicide usage or nutrient deficiency.
- * lack of nutritional information for livestock rations.
- * pea weevil and other insect pests.

Beans

- * lack of suitable varieties with disease resistance and seed quality required by markets.
- * susceptibility to moisture stress.
- * disease incidence, especially that related to herbicide and additive use, or fertiliser deficiency.

Chickpeas

- * limited agronomic information available.
- * reduced rotational benefits for subsequent cereals.
- * lack of adapted varieties with quality required by markets.
- * shortage of export tonnage.

Lentils

- * absence of adapted varieties of the type and quality required by markets.
- * lack of general agronomic information.
- * limited rotational benefits for subsequent cereals.

Vetch

- * market information and acceptance.
- * lack of nutritional information for livestock.
- * disease incidence.

4. DEVELOPMENT OF GRAIN LEGUME INDUSTRY PROGRAM

4.1 MISSION STATEMENT

To increase the direct contribution of the grain legume industry to the S.A. economy.

4.2 PROGRAM OBJECTIVES

The main program inputs and their interactions are shown in figure 2.

Variety Improvement

Varieties of grain legumes are bred and evaluated for stable yields, marketable quality, and acceptable plant type and adaptation.

Plant Nutrition

Efficient and cost effective fertiliser and land use strategies are developed and promoted for grain legumes, leading to long term sustainability.

Disease Control

Disease control in grain legume crops is improved.

Weed Control

Weeds and herbicide use will not restrict grain legume yields or areas sown.

Insect Control

The impact of insects on the quantity and quality of grain legume yield will be reduced, and the use of insecticide minimised.

General Agronomic

The interaction between time of sowing, seeding rate, tillage practice, variety, weed control and disease control is understood for grain legume crops.

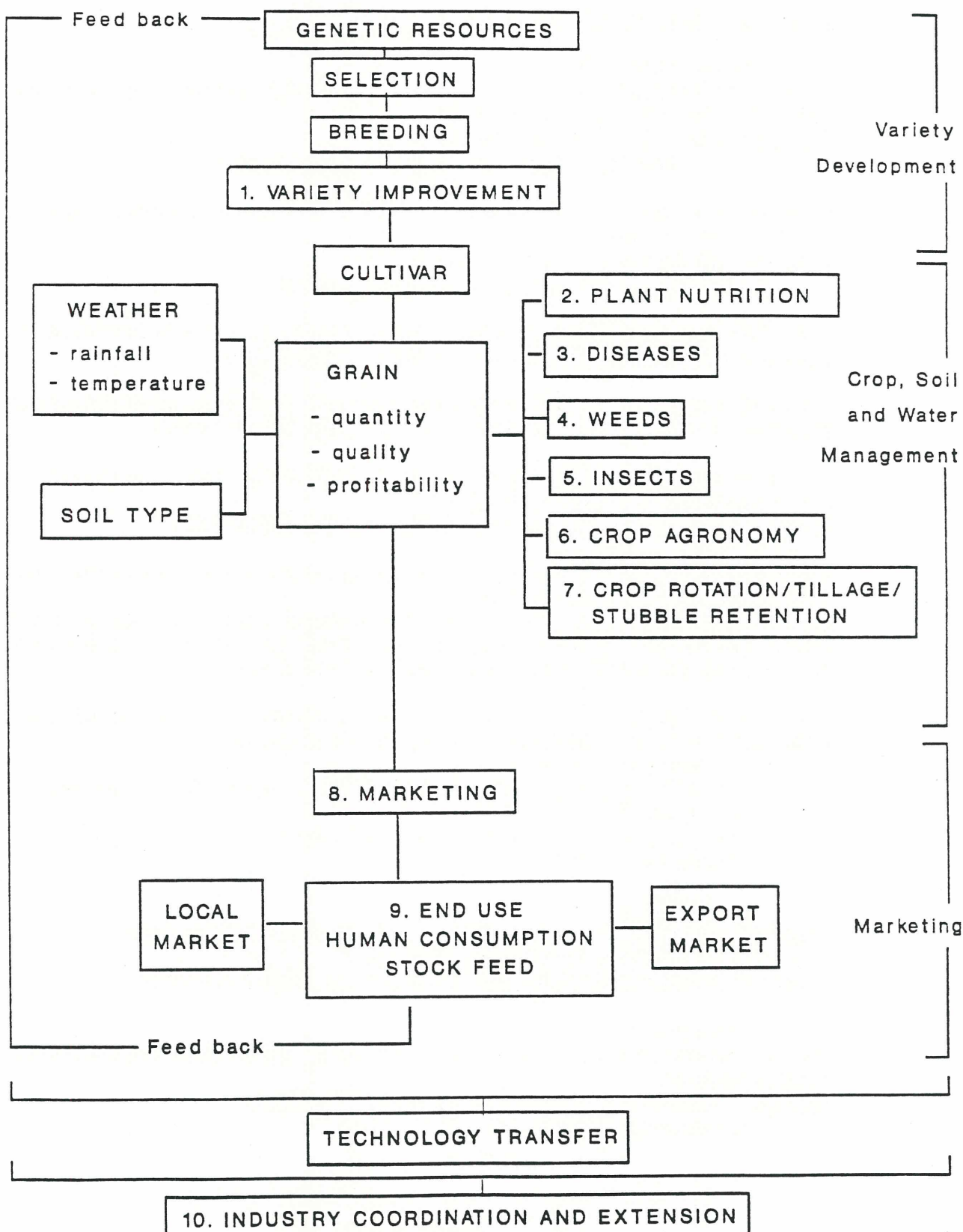
Crop Rotation/Tillage/Stubble Retention

Grain legumes will be grown in crop rotations which sustain the long-term future of the environment whilst maximising both short-term farm income and benefits to subsequent crops.

Marketing and Handling

The marketing and handling of grain legumes is improved.

Figure 2: A synopsis of the main inputs and interactions determining the production and marketing of grain legumes in South Australia. Refer to table 1 for summary of topics in the numbers.



Grain Legume End-use

The number, type and efficiency of end-uses for grain legumes are increased.

Grain Legume Coordination and Extension

The grain legume industry is promoted, organised, informed and coordinated.

4.3 EXISTING PROJECTS 1990/91 - Specific short term Outcomes

Variety Improvement

Varieties and lines of peas are bred for stable performance, high yield and acceptable disease resistance, adaptation, plant type and quality.

Strategies:- Continue national field pea breeding project.

- breeding, disease screening, selection, field testing.

Lentil genotypes are identified, selected and bred to be adapted to southern Australian conditions and requirements.

Strategies:- Continue national lentil breeding project.

- Selection, breeding, screening, field testing.

Assistance is given to interstate breeders in the release of improved lupin varieties for SA.

Strategies:- Participation in national lupin variety evaluation program.

Assistance is given to interstate breeders in the release of improved chickpea varieties for SA.

Strategies:- To participate in the national chickpea variety evaluation program.

Assistance is given in the breeding and release of improved faba bean varieties which are high yielding and adapted to southern Australia.

Strategies:- To co-operate with the national faba bean breeding program.

Current varieties, and breeders lines with potential for release, are evaluated across South Australia's grain legume growing areas.

Strategies:- Provide a stable, coordinated variety testing program which includes all grain legume crops, retains industry and crop specialist contact, and has use of a data base for information storage and retrieval. Make varietal recommendations.

New varieties of grain legumes are commercialised to provide them to growers as quickly, widely and cheaply as possible, but recovering costs of production.

Strategies:- Seeking commercial partners.

- Consider registering varieties with Plant Variety Rights (PVR) where extensive markets, especially overseas.
- Re-cooping costs of production through initial seed sales.
- Promote the varieties.

Plant Nutrition

Diagnostic tests are developed and calibrated to aid in sound fertiliser advice:

* plant tissue tests for Mn, Zn and P for peas, beans.

Strategies:- Research to establish critical nutrient levels. Extend information.

Disease Control

The efficiency and efficacy of fungicide use for control of ascochyta and chocolate spot of faba beans is improved.

Strategies:- Glasshouse and field screenings to develop strategies.

- Extension to encourage use.

The spread of stem nematode is delayed.
Strategies:- research, survey and extension.

Weed Control

Herbicide recommendations are made for grain legumes.
Strategies:- Herbicides evaluated for crop tolerance and weeds controlled.

Insect Control

Pea weevil control methods are implemented by industry.
Strategies:- Co-ordination and publicity by Pea Weevil Control Industry Working Party.

- Control of volunteer peas in cereals.
- Careful monitoring of pea weevil flights and early warning given.
- Early harvesting.

General Agronomy

Nil.

Crop Rotation/Tillage/Stubble Retention

Information is obtained on soil, crop and cereal disease trends over the longer term.
Strategies:- Monitor long term rotation, tillage and stubble retention trials.

- Publicise information.

Marketing and Handling

Grain legumes for export are inspected, and phytosanitary certificates for specific importers quarantine requirements issued.
Strategies:- Inspections.

Inspections are made for grade standards at export, using firm, generally agreed, national export grade standards established by the grain legume industry.

Strategies:- Support industry to establish national export grade standards.

- Support industry to approach Department of Primary Industries and Energy to consider grade at export inspections.

Grain Legume End-use

Nil.

Grain Legume Coordination

Strategic planning and industry consultation has commenced.
Strategies:- Departmental Grain Legume Commodity Group formed.

- S.A. Grain Legume Consultative Committee formed.
- extension of information and promotion of industry.

4.4 NEW SHORT-TERM INITIATIVES FOR 1990/91 - Specific short term Outcomes

Variety Improvement

Lentil genotypes continue to be identified, selected and bred to be adapted to southern Australian conditions and requirements.

Strategies:- Selection, breeding, screening, field testing.

Pea genotypes with either improved nodulation and root systems, or tolerance to cold and frost are identified and incorporated into the breeding program.

Strategies:- Breeding, screening and field testing.

Common vetches are obtained which have: higher yield, desirable seed quality, drought tolerance, upright habit for easier harvest and resistance to chocolate spot.

Strategies:- import, test and breed lines.

Plant Nutrition

Improved strains of inoculum are available for earlier and prolonged nodulation and nitrogen fixation, especially under wet, cold conditions.

Strategies:- Rhizobia strain research, nitrogen fixation studies.

Diagnostic tests continue to be developed and calibrated to aid in sound fertiliser advice:

* plant tissue tests for Mn, Zn and P for peas, beans and chickpeas.

Strategies:- Research to establish critical nutrient levels.

Disease Control

The relationship between disease, herbicide usage and plant nutrition is established.

Strategies:- Survey, growth room and field experiments, extension.

Seed tests to detect viral and other economically important seed-borne pathogens are developed for use by grain legume growers.

Strategies:- Virology research, develop tests.

- Extension to encourage use.

Pea and bean lines with disease resistance continue to be screened and incorporated in the breeding programs.

- Strategies:- Disease screening, breeding.

Weed Control

The reasons for variable weed control and crop damage with some herbicide treatments are understood.

Strategies:- Detailed glasshouse and field testing of herbicides.

Alternatives to herbicides as means of weed control are established.

Strategies:- determine germination patterns of weeds.

- determine palatability of weeds.
- assess likelihood of crop or pasture rotations for control.

Herbicide resistance is avoided, or managed where already present.

Strategies:- National alert program and workshop.

Insect Control

Early-warning systems for adult pea weevil invasion of crops are developed. Early pea harvest with respect to pea weevil development is defined. Pea lines with resistance to pea weevil are identified and incorporated into the National Pea Breeding Program.

Strategies:- Pheromone traps developed.

- Daily ambient temperatures used to predict invasion, behavioural criteria.
- Grain moisture content, crop colour tested.
- Field screening for lines of peas resistant to pea weevil.
- Incorporate resistant lines into breeding program.

Economic treatment densities for native budworm larvae and aphids are assessed in peas, faba beans and lupins, and commercially practical sampling methods determined.

Strategies:- Grain yield and quality losses assessed and related to pest density.

- Sampling methods developed.

The feeding behaviour of native budworm in grain legume crops is explained to assist in the selection of resistant lines and to improve insecticidal controls.

Strategies:- determine ovipositional and larval feeding behaviours for native budworm.

General Agronomy

An agronomic package for the growing of chickpeas and lentils is developed.

Strategies:- Research on sowing dates, location, seeding rates, varieties, herbicide, rotation benefit. Extend results.

Suitable agronomic techniques and varieties for growing lupins on heavy soils and in low rainfall (350-400mm) areas are established.

Strategies:- Agronomic research and extension in low rainfall and heavy soil areas.

A rodenticide is registered to prevent mice damage in grain legume crops.

Strategies:- Residue data and MRL's determined.

Crop Rotation/Tillage/Stubble Retention

Trash retention, reduced tillage and other techniques are developed for use by farmers to reduce erosion losses and prevent soil degradation.

Strategies:- Development of suitable herbicide strategies.

- Testing of suitable machinery.
- produce better root systems.
- Extension effort on crop choice, grazing and harvest techniques.

Marketing and Handling

Research on product development, market promotion, market information, consumer research and market structures for grain legumes has commenced.

Strategies:- Explore marketing initiatives.

- Identify opportunities for processing grain legumes.
- Develop criteria necessary for successful local processing.
- Publicity and promotion.

End-use

Predictive associations are established for amino acid levels, major chemical predictors of energy, and major potential nutritional inhibitors for use in international and local marketing strategies.

Strategies:- Chemical analyses of whole peas, testa and cotyledons.

- preliminary nutritional evaluation of the other important grain legumes.

Coordination and Extension

A Departmental grain legume strategic plan is formed and implemented, and the grain legume industry is informed and coordinated.

Strategies:- Departmental grain legume commodity working party.

- S. A. and National Grain Legume Consultative Committee attendances.
- Industry liaison intra and inter state.
- Develop international experience in research, marketing and extension matters.
- Develop promotion and extension campaigns.

4.4.1

SUMMARY OF 1990/91 NEW INITIATIVES

	Possible source	Staff	\$
<u>First Priorities</u>			
Variety improvement			
Continue lentil breeding	(Industry)	(1)	(\$26,283)*
Disease			
Disease and herbicide interaction	(Industry)	(1)	(\$54,264)
Disease and plant nutrition interaction	(Industry)	(-)	(\$19,271)
Continue disease screening for breeders	(Industry)	(1)	\$23,964)
Weed control			
Weed control and crop tolerance studies	State	1	\$45,000
Weed ecology and control	Industry	1	\$72,000
Herbicide resistance alert	Industry	-	\$99,000
General agronomy			
Chickpea and Lentil agronomic Package	State	2	\$100,000
	(Industry)	(1)	(\$37,343)
Crop rotation/tillage/stubble retention			
Soil erosion avoidance	Industry	1	\$50,000
Marketing and handling			
Product and marketing research	State	1	\$60,000
<u>Second Priorities</u>			
Plant nutrition			
Rhizobium strains and nitrogen fixation	Industry	1	\$55,000
Continue plant diagnostic tests	Industry	1	\$64,000
Insect control			
Continue pea weevil	(Industry)	(-)	(\$19,085)
Native budworm behaviour	Industry	1	\$33,000
Coordination and Extension			
Grain legume coordination	State	-	\$15,000
End-use			
Nutritional evaluation	Industry	-	\$10,500
<u>Third Priorities</u>			
Varietal improvement			
Pea breeding expansion	Industry	1	\$35,000
Vetches	Industry	2	\$74,000
Disease			
Virology and seed testing	State	1	\$50,000
Insect control			
Insect economic treatment density assessment	State	1	\$50,000
General agronomy			
Lupin agronomy	Industry	2	\$75,000
Rodenticides	Industry	1	\$42,000
TOTAL	State funds were sought for 1990/91	6	\$320,000
	Industry funds were sought for 1990/91	(4)	(\$180,210)*
	Seek funds from Industry for 1991/92	11	\$609,500

* (\$) = Industry funds being sought for 1990/91

4.5 **PROPOSED MEDIUM-TERM INITIATIVES TO 1992/93 - Specific Medium-term Outcomes**

Variety Improvement

Genotypes with improved nutrient efficiencies are being exploited in breeding programs.

Strategies:- Identify nutrient efficient genotypes.

- Develop or breed from genotypes identified.

Disease Control

The efficiency and efficacy of fungicide use for control of ascochyta and chocolate spot of faba beans is improved.

Strategies:- glasshouse and field screenings to develop strategies.

- extension to encourage use.

Weed Control

Herbicide recommendations are made for reduced tillage and stubble retention farming systems aimed at reducing soil erosion risks.

Strategies:- herbicides evaluated under these and conventional farming systems.

Farmers will be able to identify weeds, and weed spread in seed and fodder will be minimised.

Strategies:- Weed identification displays extension.

- advice and encouragement to farmers.
- add more serious weeds (eg bifora, bedstraw) to scheduled lists.

Insect Control

Pea weevil control methods are implemented by industry.

Strategies:- co-ordination and publicity from pea weevil control industry working party.

- control of volunteer peas in cereals.
- careful monitoring of pea weevil flights and early warning given.
- early harvesting.

Data are obtained for registration of insecticides which:

- * cover all pests/grain legume crop interactions.
- * have low mammalian toxicity.
- * reduce insecticide costs to farmers.

Strategies:- insecticide screening experiments for the various pests in the field.

- insecticide recommendations made.

General Agronomy

The yield potential from early sowing of peas and faba beans is being exploited using reliable, economic disease control strategies.

Strategies:- Research on disease by sowing time interaction.

- Research on disease control methods.
- Research on other factors influencing disease.
- Extension of results.

Improved techniques for crop establishment are obtained and extended.

Strategies:- Research on press wheels, seed placement and depth; seedling insects.

- extension.

Predictions of 'potential yield' for each grain legume crop are estimated from a computer model.

Strategies:- measure water use efficiency for each crop, develop model, use for farmers.

Crop Rotation/Tillage/Stubble Retention

The number of grassy weeds in grain legume crops needed to carry significant cereal root diseases into the subsequent cereal crop is established and extended.

Strategies:- Research and extension of results.

Computer software on gross margins of crop rotations will be available for grain legume, pasture and crop selection.

Strategies:- Software developed and carry-over effects of crops accounted for.
-use promoted.

Marketing and Handling

Market intelligence on price trends, market options and storage options is provided to grain legume growers on each harvest, and predictions given to assist in crop planting decisions.

Strategies:- Monitoring markets and publicising changes.
- provide information on warehousing and private storage.

The grain legume industry has confidence that the size of the crop produced is not a marketing problem at competitive prices.

Strategies:- Extension.

Assistance is given to any grain legume marketing ventures which improve the certainty of marketing.

Strategies:- Consultation, marketing advice.

Positive, coordinated information is provided to growers in choosing the most profitable grain legume.

Strategies:- Account for effects of location, relative price information trends, varying market access, and yield by price comparisons.
- Computer software on gross margins for crop rotations.
- extension.

The marketing efficiency for local end-users will be improved.

Strategies:- Growing under contracts will be understood and used by farmers.
- Development of receival/delivery specifications.
- Establishment of market-based price differentials for specified receival standards.
- Media publicity.

Premises of registered grain legume exporters are inspected for compliance with the code of hygienic practice required to avoid possible salmonella contamination.

Strategies:- Inspection done during normal inspections for export registration.

Growers will deliver quality grain legume samples which are near pure of type, free of admixture and weeds, and without disease or insect damage.

Strategies:- extension of importance of quality product in market place.

End-Use

Nil.

4.6 PROPOSED LONG-TERM INITIATIVES - Specific Longer Term Outputs

Plant Nutrition

The field conditions under which nitrogen fertiliser applied at seeding is beneficial to grain legume crops and subsequent cereals is understood.

Strategies:- Research and subsequent extension.

Computer software is established and used for fertiliser advice.

Strategies:- Computer programming.

Fertiliser requirements for grain legume crops are identified from soil and plant tests.

Strategies:- Development and calibration of soil and plant tests, especially for phosphorus and sulphur.

The possible benefits from the use of sowing seed containing high nutrient contents is determined.

Strategies:- Research and subsequent extension.

The possible benefits from the sowing of seed which has been coated with nutrients is determined.

Strategies:- Research and subsequent extension.

Different fertiliser products are compared for their efficiency, cost effectiveness and benefits to grain legume crops.

Strategies:- Comparison research and subsequent extension.

The acidification of soils with intensive grain legume crop rotation is reduced.

Strategies:- Research and subsequent extension.

Disease Control

Pea varieties are bred with resistance to ascochyta blight and powdery mildew.

Strategies:- diseases screening.

- breeding.

Faba bean varieties are bred with resistance to ascochyta blight and chocolate spot.

Strategies:- screening and breeding.

Integrated disease control strategies are developed using fungicides to supplement genetic disease resistance and improve disease control when resistance is inadequate.

Strategies:- fungicide evaluation, use of resistant varieties and subsequent extension.

The importance of other pea diseases (bacterial blight, downy mildew) is established, and if necessary, resistance found and incorporated into the breeding program.

Strategies:- surveys, field experiments on yield loss.

- screening and breeding.

Guidelines as to the safe frequency of sowing the same grain legume crop in a paddock are determined.

Strategies:- study all major sources of field infection.

- field experiments on the effects of cropping rotation, time of sowing and seed disease levels on severity of ascochyta blight in peas.
- crop disease and management surveys.
- liaison D.A.R.A. (Vic.).
- extension.

Stem nematode is controlled.

Strategies:- research, survey and extension.

Insect Control

Biological control agents of pea weevil are sought and tested in the system used to grow field peas in S.A.

Strategies:- co-operate with CSIRO in overseas search for parasites, host specificity testing, mass rearing and release of parasites.

The need to seek improved control strategies for etiella moth is assessed.

Strategies:- determine extent, frequency and level of damage in S.A.

Crop rotation/tillage/stubble retention

The potential for grain legumes as green manure crops in rotation with cereals is known.

Strategies:- Research and subsequent extension.

End-use

The possibility of developing value-added markets for grain legumes is explored.

Strategies:- Consultation with industry.

New markets are sought for existing and new uses of grain legumes.

Strategies:- Market development work.

The potential for broadly applicable contractual arrangements between growers and feed users is assessed.

Strategies:- Consultation.

4.7 SUMMARY OF PROGRAM STATUS

A summary of the programs is shown in table 2.

5. POTENTIAL RESOURCES

The State resources required initially are:

- * New State funded positions for staff to conduct the new initiatives: 4 State funded staff (FTE's) first priority State; 0 FTEs Second priority State; 2 FTEs Third priority state.
- * Operating budgets for new initiatives.
- * General office facilities for new staff.
- * Proportion of officers time to supervise new State and trust funded initiatives.

A summary of priorities and potential resources is shown in Section 4.4.1.

6. IMPLEMENTATION OF DEPARTMENT PROGRAM

New initiatives will be pursued, along with established projects to overcome the barriers to the expansion of the grain legume industry. The strategies outlined are those considered most likely to succeed in enabling the potential benefits of grain legumes to eventuate.

As previously indicated (4.4.1), some of the new initiatives should be industry funded. Other initiatives are deemed State responsibilities because Industry has not accepted previous applications. This is particularly so with developing chickpeas and lentils. The State should be prepared to fund the development of these new industries and the associated market inputs in the interest of State development.

The Grain Legume Research Council has had insufficient funds since its inception, and the other Grains Councils and Committees have not actively encouraged grain legumes, although they do

Table 2: Summary of the proposed research needs for efficient production and marketing of various grain legumes grown in South Australia.

	Pea	Lupin	Bean	Chick pea	Lentil	Vetch
1. Variety Improvement						
: Breeding	S	I	W	I	S/RS	RS
: Variety testing	S	S	W	S	S/RS	RS
: Grain yield	S	I	W	I	S/RS	RS
: Grain quality	S	I	W	I	S/RS	LP
: Range of maturities	S	I	W	I	S/RS	LP
: Assist harvesting	S	-	NA	-	S/RS	RM
: Nodulation/root system	S	-	-	-	-	LP
: Cold/frost tolerance	S	-	-	-	-	LP
: Increased branching	S	-	-	-	-	LP
2. Plant Nutrition						
: Nitrogen application	RL	RL	RL	RL	RL	RL
: Tissue test-P	S	RM	S	RS	LP	LP
: Tissue tests-minor nutrients	S	LP	S	RS	LP	LP
: Nutrient seed coatings	RL	RL	RL	RL	RL	RL
: High nutritive seeds	RL	RL	RL	RL	RL	RL
: Nutrient efficient cultivars	RL	RL	RL	RL	RL	RM
: Rhizobium strains	RS	RL	RS	C	LP	LP
: Fertiliser computer software	RL	RL	RL	RL	RL	RL
: Fertiliser comparisons	RL	RL	RL	RL	RL	RL
3. Disease Control						
: Virus seed test	RS	RS	RS	RS	LP	LP
: Resistant cultivars	S/RS	I	S/W/RS	I	PR	RM
: Rotations	RL	RL	RL	RL	RL	RL
: Seed dressings	I	-	-	I	RS	-
: Foliar sprays	I	-	SI	LP	I	RL
: Disease/nutrient/herbicide interaction	RS	LP	RS	RL	LP	LP
4. Weed Control						
: Problem weeds	S	S	S	LP	LP	LP
: Damage assessment	RL	RL	RL	LP	LP	LP
: Alternative control tactics	RS	RM	RS	LP	LP	LP
: Crop tolerance herbicide	S/RS	S/RS	S/RS	S/RS	S/RS	S/RS
: Weed identification and spread	RM	RM	RM	RM	RM	RM
5. Insect Control						
: Damage assessment	I	I	RS	LP	LP	LP
: Resistant cultivars	PR	-	-	-	-	-
: Registered insecticides	RM	RM	RM	RL	RL	RL
: Biological control	C	-	-	-	-	-
: Warning system	PR	RL	RL	LP	LP	LP
6. Crop Agronomy						
: Rodenticides	RS	RS	RS	RS	RM	RM
: Depth of seeding (Minimum tillage)	RM	RM	RM	RM	LP	LP
: Time x rate seeding	RM	RS	RM	RS	RS	RL
: Stubble retention	RS	RS	RS	RL	RL	RS
: Stubble retention	RS	RS	RS	RL	RL	RS
: Potential yield model	RM	RM	RM	RM	RM	RM

continued over page

Table 2 continued

	Pea	Lupin	Bean	Chick pea	Lentil	Vetch
7. Crop Rotation/Tillage/Stubble Retention : Retention of stubble : Minimum tillage techniques : Soil erosion prevention : Prevention cereal disease : Gross margins for rotations : Soil acidification	S RS RS S/C/RM RM RL	S RS LP RM RM RL	S RS LP S/RM RM RL	- RM LP LP RM RL	- RM LP LP RM RL	- RM LP LP RM RL
8. Marketing : Market information : Market structure crop profitability market development product development market promotion consumer research product specification	S/I S/I S/I I/RS I I S/I	S/I S/I S/I I/RS I I S/I	S/I S/I S/I RS RS RS S/I	S/I S/I S/I RS I I S/I	S/I S/I S/I RS I I S/I	S/I RS RS RS RS RS RS
9. End-use Development : amino acid level : energy and a.a. utilisation : DE and ME levels : predictors for DE and ME : nutritional inhibitors : dehulling	RS RL RS RS RS RM	RL RS RS RL RL RL	LP RL LP LP LP LP	LP RL LP RL LP RL	LP RL LP RL LP RL	RM RM RM RL RM LP
10. Industry Co-ordination : State Consultative Committee : Industry Liaison : International experience	S S RS	S S RS	S S RS	S S RS	S S RS	S S RS

LEGEND:

S	-	research in progress	-	Department of Agriculture, South Australia
C	-	research in progress	-	CSIRO
W	-	research in progress	-	Waite Agricultural Research Institute
I	-	research in progress	-	Interstate research organisations
PR	-	proposed research, SADA, pending funds		
RS	-	research need in the short-term (1990/91)		
RM	-	research need in the medium-term		
RL	-	research need in the long-term		
LP	-	low priority research need currently because of limited area of crop or limited chance of success		
-	-	research not warranted		
NA	-	not applicable		

contribute to research.

Planning is required to:

- (a) plan State funded projects.
- (b) write industry fund submissions.
- (c) co-ordinate with other commodity group interests.
- (d) seek supervisor involvement and location.
- (e) continue to consult with industry.

Provision for increased positions is essential on the State and industry funded proposals. The key to an increased input into grain legumes is having the additional staff to conduct the work.

6.1 SPECIFIC REQUIREMENTS FOR THE NEW 1990/91 INITIATIVES

6.1.1 State funds sought 1990/91

Chickpea/Lentil Agronomy

This new project requires a Research Officer plus Technical Officer located at the Crop Research and Development Branch so they can service several Regions. Technical Supervisor would be W. Hawthorne in the South East Region. Budget (\$100,000 p.a.) from State because Industry has not funded previous applications, including one to the S.A. Wheat Research Committee for 1990/91.

The research required would be: time of sowing, seeding rate, variety, location, weed control, maximum residue levels (MRLs) and other requirements for legislation.

Product and Marketing Research

Requires a new State appointment of SO-3 officer plus operating (\$60,000) located in Economics/Marketing Branch. Tasks include working with the Industry; publicising improved productivity and profit per hectare and ways of overcoming any barriers to this achievement; product development (e.g. Vetch/oat hay); establishing where newer crops fit in the market place and in farm profitability, rotations, soil types and climate; ensuring commercial enterprise picks up any new developments; identify market niches; value added opportunities; research funding possibilities; bulk export assistance; provide unbiased market information.

Weed Control

Requires a new State funded Research Officer and operating funds (\$45,000) based at the Crop Research and Development Branch. Supervisors would be I. Black with liaison with A. Mayfield (Central Region) and S. Powles (Waite Research Institute). Program requirements would be to conduct phytotoxicity studies and soil tests in glasshouse. The effects of conditions at spray application would be assessed and ways to rationalise chemical use. The overall aim would be to provide a background understanding on chemical use and develop quick tests for assessing crop safety. Information to assist in chemical registration would also be obtained.

Grain Legume Co-ordination

Travel budget of \$15,000 is sought from the State in 1990/91 to enable attendance at meetings, field days in the State. As well, attendance at State and National Grain Legume Consultative Committee meetings and at the Second International Food Legume Conference at Cairo in 1991.

Insect Treatment Density

A new Research Officer funded by the State (\$50,000) is required, located in the Entomology Unit and supervised by P. Allen. Trials would be conducted to assess crop losses due to native budworm and aphids, and relate these to pest numbers.

Virology and Seed Testing

A new State funded virologist is required (\$50,000) located at the Plant Pathology Unit and supervised by A. Dube. Some provision for space may be required. The appointee should develop seed tests for grain legumes and conduct research to understand virus problems in the field and on seed.

6.1.2 Industry funds were sought for 1990/91

Lentil Breeding

Continuing funds have been successfully sought from Grain Legumes Research Council to continue lentil breeding. No further action required.

Disease/Nutrition Interaction

Funds have been successfully sought from the Grain Legumes Research Council. No further action required.

Disease/Herbicide Interaction

Funds were unsuccessfully sought from the S.A. Wheat Research Committee. An application to the Grain Legume Research Council for 1991/92 has been forwarded by I. Black of the Weed Research Unit.

Disease screening for Breeders

Continuing funds have been successfully sought from the Grain Legumes Research Council to continue the disease screening support to the pea and bean breeding programs.

Pea Weevil Control

Continuing funds have been successfully sought from the Grain Legumes Research Council.

6.1.3 Industry funds to be sought for 1991/92

Vetches

A research application by I. Kaehne, Crop Research and Development Branch, has gone to the Barley and Wheat Research Councils to evaluate vetch lines.

Pea breeding expansion

Technical support for the expansion of the pea breeding program is required to service the two new initiatives of: identifying and exploiting genotypes with improved nodulation and root systems; cold and frost tolerance. A technical Officer should be sought by M. Ali from the Grain Legumes Research Council.

Plant diagnostic tests

Continuing funds have been sought from the Grain Legumes Research Council for 1991/1992 by D. Lewis, South-East Region.

Nodulation and Nitrogen Fixation

A researcher would need to be appointed to investigate nodulation and nitrogen fixation. A cooperative program with the Waite Research Institute and CSIRO should be formulated. It is suggested that the Grain Legumes Research Council or the Wheat and Barley Research Councils be approached (\$55,000). Supervision would come from the Plant Nutrition Unit plus R. Ballard from the South-East Region. The appointee would be involved in field testing inoculums. The main aim would be to maximise nitrogen fixation and soil nitrogen build up.

Weed control and ecology

A research application by A. Mayfield, Central Region, has gone to the Grain Legumes Research Council to study ways of reducing problem broadleaf weeds in grain legumes through management in the previous year.

Herbicide resistance alert

Funding for a National herbicide resistance alert program has been sought from the Wheat Research Council for 1991/92 (\$99,000) by N. Brooks of the Farm Chemicals Branch. The project is to extend known information to farmers and hold a workshop on the topic.

Disease/Herbicide Interaction

A research application to the Grain Legume Research Council for 1991/92 has been forwarded by I. Black of the Weed Research Unit.

Native budworm behaviour

A joint research application by P. Bailey, Entomology Section, and Flinders University has gone to the Grain Legumes Research Council to study Native budworm behaviour to determine if plant resistance mechanisms are then possible.

Rodenticides

A research application by G. Mutze, Animal and Plant Control Commission, has gone jointly to the four Grain Research Councils to enable the registration of a rodenticide for mice control.

Lupin Agronomy Package for Heavy Soils

Funds should be sought from the S.A. Wheat and Barley Research Committees (\$75,000) for a Research Officer, Technical Officer and operating funds. Supervision should come from the Crop Research and Development Branch with technical supervision by W. Hawthorne of the South-East Region. The trial program should establish the reasons for low yields, e.g. physical barriers to root growth, diseases, soil depth, carbonate levels. Seeding rates, depth, technique and times should be established also.

Soil Erosion and Land Degradation

Required is a Research Officer located at the Soil Management Unit, Plant Services Division, and supervised by R. Fawcett. Soil Conservation funding should be sought (\$50,000). Strategies would be to develop an extension bulletin on wind and water erosion prevention techniques to use with grain legumes. New techniques and criteria for managing crops pre-sowing and post-harvest need to be determined, and known methods demonstrated.

Nutritional Evaluation for Livestock

This requires industry funds (\$10,500) for operating expenses in the Pig Research Unit and supervised by R. Davies who will liaise with stock feed users, manufacturers and marketing people. Nutritional analyses will be conducted on the grain legumes with potential for production and use in monogastric rations.

7. REVIEW AND EVALUATION

The grain legume strategic plan will be reviewed regularly by the Departmental grain legume commodity group recently formed. Liaison with industry will continue to occur at the S.A. Grain Legume Consultative Committee meetings, Pea Breeding Advisory Committee Meetings, U.F.S. Protein and Oilseeds Committee meetings, Grain and Agricultural Commodity Association meetings, and other informal occasions.

8. ACKNOWLEDGMENTS

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