



DEPARTMENT OF AGRICULTURE AND FISHERIES, SOUTH AUSTRALIA

## Agronomy Branch Report



AGRONOMY BRANCH ANNUAL REPORT

1976 - 77

Report No. 89

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1976 - 77

EXECUTIVE OFFICERS:

A.F. Tideman, Chief Agronomist

G.D. Webber, Acting Principal Agronomist

M.R. Krause, Principal Research Officer

E.D. Higgs, Senior Research Officer

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- FOREWORD -

This report covers the activities of the Agronomy Branch of the Department of Agriculture & Fisheries for the twelve months ending 30th June, 1977.

Many changes occurred during the year as the Department developed some new directions. One of the more prominent of these was the move towards regionalisation of field services.

Some of the more significant developments that affected the technical operations of the Branch were the large plague locust outbreak in the latter part of 1976 and the arrival of the spotted alfalfa aphid and the blue green aphid on the Australian agricultural scene.

The Branch set up a special Task Force to develop a major programme to combat these pasture aphids.

There was continued emphasis on investigational work with new crops, including the start of field pea and oat breeding programmes, as well as work with other grain legume crops.

The work on pasture legumes also further expanded.

The Branch continues to be closely involved in overseas projects with two agronomists participating in the Libyan project and another two officers left in June for a plant collection mission in the Middle East region.

The close co-operation with industry marketing boards, farmer organisations and agri-business continued, and all officers value this close contact to assist them in their work.

Agronomy Branch officers also appreciated the assistance of other branches and technical organisations involved in South Australia's agriculture and the many farmers who assisted us with our programmes.

A.F. Tideman

CHIEF AGRONOMIST.

## AGRICULTURAL CONDITIONS & HARVEST RESULTS

For cereal growers, 1976 was another difficult year marked by the absence of definite "opening" rains, exacerbated by an exceptionally dry winter.

By July, many parts of South Australia had been specified drought areas by the State Government. Anticipated crop area had been slashed by 55 per cent of the estimates made on May 1, and practically no seeding had occurred in the Northern Mallee and Upper Eyre Peninsula.

The feed situation was becoming desperate and even the previously more favoured areas of Lower Eyre Peninsula, Kangaroo Island and the Lower South East were subjected to a series of heavy frosts which almost stopped feed growth. What little hay was available was selling for up to \$4.00 a bale, and feed grain from \$85.00 per tonne - a cost which was uneconomic for non-breeding stock. As the drought developed and feed became scarce, the Government introduced measures to dispose of surplus stock.

In late August, light rains brought some relief to parched crops and pastures and improved the outlook in the later cereal growing areas. But predictions were for only 40 per cent of the previous year's harvest given average spring rains even though the area sown to cereals increased by 10 per cent (mostly barley) as a result of the August rain.

September saw a further improvement in seasonal prospects with the advent of average to above average rainfall for the month, but it was too late for many of the earlier districts, such as Upper Eyre Peninsula and the Mallee districts.

However, pastures had still not made much progress and graziers were showing extraordinary interest in summer fodder crops to provide a source of feed for livestock after the sparse annual growth had dried off. Those in the drier districts still holding numbers of livestock considered unconventional alternatives, such as poultry manure, sawdust and orange peel, when supplies of feed barley from the Barley Board and feed wheat in Wheat Board silos in drought affected areas became exhausted.

To add to the problems of the season, plague locusts began to hatch during September in the northern fringes of the cereal belt, and a mysterious disease stunted a number of lupin crops in the South East. During October, widespread rains and cool conditions dramatically improved crops and feed prospects in areas where it was not too late. Falls of over 200 mm at Caltowie and Wirrabara in the Upper North promised average to above average cereal yields in this district. By contrast, it was estimated that about 20 per cent of farmers in the hard-hit drought area north of Streaky Bay and west of Poochera would not reap enough seed for sowing in 1977.

Feed supplies, too, were transformed by the rains of late September and early October and it seemed probable that significant tonnages of hay would be cut in the higher rainfall areas of the State. The record sowings of summer fodder crops received a good start to the season. The desperate measures for feeding stock poultry manure and orange peel were largely forgotten.

To complete the much happier picture, the semi-arid pastoral areas of the Far North, North East and to a lesser extent, the North West shared in the good spring rains. This not only benefited feed growth but replenished depleted stock water supplies, thus ensuring a continuing supply of the only significant number of fat cattle available to southern markets.

Pasture seed crop prospects also looked much brighter. The small annual medic and subterranean clover plants which were struggling to survive in early September, were now flowering and setting seed vigorously.

The widespread rains and cool conditions continued into November, although falls varied from below to above average, thus concluding a spring remarkable for almost unprecedented finishing conditions for crops and pastures.

Harvesting began in the earlier districts in late November, but green regrowth caused some problems.

Areas where the rains came too late to have little if any impact on crop and pasture production included north of Streaky Bay and west of Poochera, east of the Cleve-Cowell hills, from Bowmans to Nantawarra, north of Carrieton and Quorn, north-east of Truro, northern parts of the Southern Mallee and parts of the Murray Bridge district.

The earlier hatchings of locusts developed into a widespread plague and severe damage was caused to valuable crops and pastures by these pests, in spite of widespread spraying operations being carried out.

The first fire ban of the season was proclaimed for the North East Pastoral District on November 12.

Full scale cereal harvesting began in early December, some two to three weeks later than in years with normal spring rainfall. Yields were surprisingly good and exceeded earlier expectations, particularly for the major crops of wheat and barley. The wheat varieties Oxley and Egret did particularly well, while Clipper gave the highest yield in barley varieties.

Some very good crops of oilseed rape and sunflower were also reported by the time the harvest was completed.

Final crop estimates at the end of January were:-

Crop	Area (ha)	Production (tonnes)	Crop	Area (ha)	Production (tonnes)
Wheat	811,700	800,000	Linseed	2,800	3,300
Barley	759,300	950,000	Rape seed	4,100	6,500
Oats	115,500	90,000	Safflower	500	700
Rye	10,300	4,200	Lentils	40	30
Peas	8,600	7,200	Sunflower	6,500	6,500
Lupins	15,300	11,800			

Heavy rains in mid-January provided suitable soil moisture conditions for hatchings of second generation locusts. As in earlier hatchings, the co-operative efforts of the Department of Agriculture & Fisheries, district councils and landowners using insecticide provided by the State Government dispersed the infestation, but only after further damage to pastures, particularly in the South East region.

The autumn of 1977 again had below average rainfall with a grim period for stock feed, especially in areas hard hit by drought.

Widespread but inadequate rains fell in the agricultural areas in May but the Southern Ranges, Lower South East, Kangaroo Island and Lower Eyre Peninsula had useful falls.

By the end of June further rains had consolidated a break in the season in favoured districts, but good soaking rain was needed over the agricultural areas to enable seeding to be completed and to promote pasture growth.

The first half of calendar 1977 was a worrying period again for farmers whose prospects were for another difficult year.

AGRONOMY EXTENSION SECTION

SECTION LEADER:

S.G. Williams, R.D.A., Acting Senior Agronomist

EXTENSION OFFICERS:

Adelaide Office	N.R. Matz, Senior Special Agronomist
Kangaroo Island	R.C. Hagerstrom, R.D.A., Senior District Agronomist (War Service Land Settlement) - Study leave from January, 1977
Lower Eyre Peninsula	K.J. Holden, R.D.A., G.D.E., Senior District Agronomist
Eastern Eyre Peninsula	J.R. Cawthorne, R.D.A., R.D.A.T., District Agronomist
Upper Eyre Peninsula	T.R. Davidson, R.D.A., District Agronomist
Mid South East	P.J. Mowatt, R.D.A., G.D.E., Senior District Agronomist
Lower South East	P.L. Marrett, District Agronomist - Seconded to overseas service, Libya from August, 1976 P.M.S. Potter, B.Ag.Sc., District Agronomist - Transferred from Yorke Peninsula, September, 1976
Upper South East	T. Prance, R.D.A., R.D.A.T., District Agronomist
Murray Districts	K.G. Bicknell, D.D.A., Senior District Agronomist - Seconded to overseas service, Libya N.M. Brooks, R.D.A., Acting District Agronomist
Northern Mallee	B.C. Bull, R.D.A., Acting District Agronomist
Southern Mallee	J.N. Hannay, R.D.A., R.D.A.T., District Agronomist
Lower North	W.A. Michelmore, R.D.A., Senior District Agronomist
Upper North	A.E. Hincks, R.D.A., District Agronomist - Study leave New South Wales until December, 1976 R.S. Britton, R.D.A., Acting District Agronomist - (Temporarily transferred from Weeds Section) - Study leave Roseworthy College from January, 1977
Yorke Peninsula	T.R. Dillon, R.D.A., District Agronomist - Returned from overseas service, Libya, October, 1976
Central District	P.D. Fairbrother, R.D.A., District Agronomist



## AGRONOMY EXTENSION SECTION

With the retirement of Mr. J.D. McAuliffe, Principal Agronomist, early in August and no replacement being appointed during the financial year, Head Office staff was under constant pressure to keep up with the large additional work load.

District agronomists again provided technical, advisory and educational services to 14 specified districts in the State.

Agricultural industries and farmer groups have become more involved in the planning and development of extension programmes. This trend will add more effectiveness to the work being undertaken.

The smooth running of country services offered by this Section has been greatly improved since the appointment of four senior district agronomists who supervise and co-ordinate extension services in, and act as spokesmen for, four regions of the State, viz. Eyre Peninsula, the Northern Region, the Murray Mallee and the South East.

### Special Duties:

Properties were inspected and reports were prepared in connection with applications under the "Rural Advances Guarantee Act, 1963".

More than 100 property resubdivision assessments were arranged on behalf of the State Planning Office.

A cost-benefit study on reticulated water supplies for the south western section of Eyre Peninsula was carried out on behalf of the E. & W.S. Department.

### Visitors:

The Branch was closely involved with overseas visitors again this year. Meetings and country field visits were arranged for administrators and technologists representing the following countries:- U.S.A., Spain, Russia, Iran, Algeria, Japan, Afghanistan, the United Kingdom and Brazil. The use of annual legumes and shallow cultivation as practiced in the South Australian ley farming system was of particular interest to most of the visitors. Besides being issued with a large range of Departmental publications, the visitors were provided with copies of the book "Farming Systems in South Australia". A movie film to support this book is in the final stages of production.

### Overseas Aid:

Two district agronomists were seconded to the South Australian Demonstration Farm at El Marj in Libya. This farm has been established to demonstrate to Libyan farmers the "Ley Farming System" which has proved to be successful in South Australia in maintaining soil fertility, minimising cereal root disease problems and promoting high yielding crops.

Crop Production Reporting:

The revised service of issuing monthly reports on crop production, which was introduced in 1975-76, was maintained this year. This service is used extensively by agribusiness organisations to help them plan and cater for farmers' needs, such as fuel, herbicides, pesticides, fertiliser, machinery and spare parts. Handling and marketing authorities also depend on these production estimates to help plan for the handling, storage and marketing of the various crops.

Seed Schemes:

Registered, approved and certified seed schemes were in operation during the 1976-77 season. The registered wheat and barley schemes of the previous years continued and an approved seed scheme was introduced to cater for expected shortages of wheat and barley seed.

As a pilot trial a certified oat scheme for Avon and Swan varieties was introduced.

Due to a variety purity problem, West oats was grown as approved seed.

Tower oilseed rape was grown for the first time for the production of registered seed.

Purity and germination tests were continued and a variety purity check was carried out on our behalf by the Australian Barley Board. All samples submitted proved to be of the variety submitted.

The various seed schemes are used to provide farmers, at a reasonable cost, with seed of good quality as an aid to maintaining a high standard in crops grown in this State.

The following statistics have been compiled for the various seed schemes conducted by the Branch during 1976-77:-

<u>Crop</u>	<u>Area Hectares</u>	<u>No. of Growers</u>
Registered wheat	500	23
Registered barley	350	13
Registered oilseed rape	50	3
Approved wheat	500	12
Approved barley	150	5
Approved West oats	100	11
Certified Avon & Swan oats	45	5

Field Trials:

Field trials were used extensively again this year as a means of demonstrating to the farming community the value of new varieties of crops and pastures, new management techniques, fertiliser use and weed, disease and insect pest control. Much of this work was done in conjunction with Departmental research officers and in some cases, with industry people.

## Extension Programmes:

District extension programmes were continued by all extension officers. These programmes are developed and reviewed at regional meetings which are held three times a year on Eyre Peninsula, the Northern Region, the Murray Mallee and the South East.

Some of the main programmes carried out in 1976-77 included:-

### Cereal Crops

In conjunction with the Crop Agronomy Research group testing new varieties of wheat, barley, oats, rye corn and looking into the place of triticale as a new cereal crop for South Australia.

### Crops Other than Cereals

Lupins. Investigating varieties, seeding rates, weed control and assessing their value as a source of organic nitrogen in cereal crop rotations.

Sunflowers. The popularity of this crop has grown considerably during recent years, particularly in the South East. This trend is increasing. Programmes have been developed to improve varieties, sowing and harvesting techniques, weed, disease and insect pest control.

Steroid Drug Industry. Co-operation is being given by the Branch in assessing Solanum species at Loxton and Struan Research Centres. The object of this work is to see if a profitable steroid drug industry could be developed in South Australia.

Cereal Grain Quality. Programmes to control grain pests and reduce impurities of weed seeds and other crop seeds in grain delivered for sale were continued.

Annual Legumes. A survey was completed to assess the current use of annual legumes in the cereal areas. Demonstration plots were sown throughout the main cereal areas during the autumn of 1977 to demonstrate the value of annual legumes, the most suitable cultivars to grow and management practices necessary to maintain productive stands of annual legumes.

Fertilisers. In conjunction with the Soils Branch, demonstrations are being conducted to ascertain the most profitable superphosphate dressings to apply to cereals. The effect of nitrogen dressings on Weeah and Clipper barley on Eyre Peninsula is being assessed.

Application rates and types of fertilisers to use on Murray Swamp dairy pastures are being investigated with a local committee of farmers.

Weed Control. Besides programmes designed to control a wide range of weeds in crops, special programmes were designed to control the following specific weeds:- three-cornered jack (Eastern Eyre Peninsula): ryegrass control in crops (Southern Murray Mallee) and Paspalum control (Murray Swamps).

Soursob and yellow burr-weed control programmes planned for the Northern and Southern Mallee were deferred because of poor seasonal conditions.

Annual Ryegrass Toxicity. The current situation with this serious problem which has caused heavy stock losses in recent years was assessed. An officer visited Western Australia to ascertain control methods used in that State. A programme was initiated to eradicate an isolated outbreak near Murray Bridge.

Spotted Alfalfa Aphid. This devastating insect pest of lucerne and annual medics was identified for the first time in South Australia on 10/5/77 at Salisbury. A mini-conference which involved all extension officers of the Branch was held at Northfield Laboratories on 8/6/77. Extension programmes aimed at keeping spotted alfalfa aphid under control were introduced immediately the pest was discovered.

News Column. Assistance is being given by the Section in maintaining a regular agricultural news column in many of the country newspapers.

Agriculture in South Australia. This series of bulletins, which are published for each district of the State, are currently being up-dated. The bulletins provide details of the district production statistics on the main enterprises carried out in the district. They are used extensively by visitors, schools, business houses and people wishing to settle on the land.

Staff Movements & Activities:

Mr. Dillon returned in October, 1976 and Mr. Bicknell returned in June, 1977 from overseas duties at the South Australian Demonstration Farm at El Marj in Libya. Mr. Marrett left for Libya to replace Mr. Dillon in August, 1976.

Messrs. Brooks and Bull continued as acting district agronomists in place of these officers.

Mr. Potter transferred from Kadina to Mt. Gambier in September, 1976.

Mr. Britton acted as district agronomist until Mr. Hincks returned in January, 1977, from study leave at Hawkesbury College.

Mr. Hagerstrom left in January, 1977 to undertake the G.D.E. course at Hawkesbury College.

On the retirement of Mr. McAuliffe in August, 1976, Mr. Webber was appointed Acting Principal Agronomist and Mr. Williams, Acting Senior Agronomist.

Mr. Prance attended the Wimmera Machinery Field Days.

Mr. Mowatt attended Communications I Course as leader.

Messrs. Williams, Hannay, Bull and Britton had an educational visit to Eyre Peninsula and attended the Machinery Field Days at Cleve at the beginning of August, 1976.

The bi-annual Branch Conference was held at Roseworthy Agricultural College 30th August to 1st September, 1976.

Judging:

District agronomists assisted a number of Agricultural Bureaux with judging of bulk grain and crop competitions. They also assisted country show societies in judging agricultural produce.

Mr. Williams acted as judge in the Barley Grain Section and Mr. Fairbrother performed steward duties in the Wheat Grain Section at the Royal Show in August, 1976.

BUSHFIRE PROTECTION SECTION

SECTION LEADER:

B.J.T. Graham, R.D.A., Senior Bushfire Adviser

EXTENSION OFFICERS:

B.J. Francis

R.H.T. Freak

B.A. Green

FIELD ASSISTANT:

L.B. Hoff

SECRETARY, BUSHFIRE RESEARCH COMMITTEE:

J.M. Priest

## BUSHFIRE PROTECTION SECTION

During 1976-77 the Bushfire Section has continued to provide educational, publicity and advisory services to both the urban and rural communities throughout South Australia. Also there has been an increased demand by Government departments and service groups for fire prevention information related to the management of lands under their control.

It has been known for some time that the Bushfire Section will be amalgamated with the S.A. Emergency Fire Services to form the S.A. Country Fire Services. The Bushfire Research Committee was disbanded in May and it seems likely that the physical amalgamation will take place in early 1978 when the new Country Fire Services headquarters building at Keswick will be completed. It is expected that the role of fire protection through land management will still be a significant part of the Section's work, therefore it is important that a close association with the Department of Agriculture & Fisheries be maintained.

### Publicity:

The production and screening of 30 second television scatters through the four city television stations was again an important part of the 1976-77 summer publicity campaign. A similar programme was arranged with the country commercial stations, SES-8, Mt. Gambier and Channel 4, Pt. Pirie, where local fire authorities were used in televising fire prevention messages.

An approach by the Natural Disasters Organisation, Canberra, has led to an all states conference to arrange the establishment of an Australia-wide publicity programme on fire prevention and protection. Films, brochures and posters will be produced and made available free of cost for State programmes. A member of the Bushfire Research Committee attended this Conference.

### Fire Access Tracks:

Requests from three district councils for the construction of fire access tracks were approved and a total of \$4,600 was reimbursed to the District Councils of Tatiara, Elliston and Pt. Lincoln.

### Monarto:

The fire protection advisory services to the Monarto Development Commission has continued with additional work being undertaken to demonstrate the use of herbicides at low rates to provide suitable firebreaks. The Commission is now involved in Hills development planning and a similar advisory service is being supplied in this area.

### Roadside Phalaris Trials:

Trials conducted during the period 1973-77 show that an atrazine/ amitrole mixture (Vorox AA) at high rates is the most suitable chemical to control roadside phalaris. Other chemicals, e.g. glyphosate (Roundup); karbutilate (Residone); tetrapion (Frenock), can be used but their cost or side effects preclude them from other than special situations. Further work aimed at reducing application rates is in progress.

Fire Assessment:

Two major bushfires occurred on the outskirts of Adelaide at Golden Grove and Inglewood. Many houses, hobby farms and commercial properties were involved, the resultant losses including one occupied house, a considerable amount of fencing and pastures, plus the life of one resident who died while attempting to move stock.

A survey of the area revealed a lack of property fire protection and little prior awareness of the potential fire risk. It is remarkable that more houses were not destroyed. This and similar areas used for dwellings and hobby farms have a high disaster potential and every effort needs to be made to inform residents of the danger and methods of property protection.

Another fire on Eyre Peninsula claimed a life through circumstances not fully known, other than he was burnt to death while attempting to drive a utility through the fire front.

Conferences & Training Schools, Study Leave:

- \* National Fire Prevention Publicity Conference, Canberra
- \* E.F.S. Regional Officers & Delegates Conference
- \* E.F.S. Communications
- \* Eyre Peninsula Fire Fighting Association Conference
- \* Eyre Peninsula Local Government Association Conference
- \* Lower Eyre Peninsula Agricultural Bureau Conference
- \* Studying part-time Diploma of Arts (Journalism) - J.M. Priest
- \* Advanced Diploma Natural Resources, Roseworthy - B.J.T. Graham

Current Research Projects:

- \* Herbicidal control of unwanted vegetation
- \* A study of arson cases

Extension Projects:

- \* Rural Yough Community Aid project
- \* Bushfire television films
- \* Radio spots
- \* Fire Prevention Week
- \* Bushfire prevention signs
- \* "Help Save Our State" campaign
- \* Fire Alert Day
- \* Smokey party programme
- \* Stereos for country newspapers

Special Projects:

- \* Fire access tracks
- \* District fuel breaks
- \* Monarto bushfire control plans
- \* Bushfire investigations, - Golden Grove/Gumeracha fires
- \* Plastic fuel lines in vehicles
- \* Firebreaks in association with Natural Disaster Organisation
- \* Assistance to universities for approved research projects
- \* Roadside management study - Kingscote District Council

Committee Meetings:

- \* Roadside Vegetation Committee
- \* Meteorological District Boundaries Committee
- \* Publicity Sub-committee

Fact Sheets:

- \* R.H.T. Freak - "Fire Safety Electric Fencing"
- \* B.J. Francis - "Rotary Slashers"
- "Trees and Bushfires"
- \* B.A. Green - "Bushfires and Women"
- "Sprinklers for House Protection"
- "Fire Tolerance of Fence Posts"
- \* J.M. Priest - "Outdoor Living and Bushfires"

Chart:

- \* B.J. Francis - "Fire Protection Calendar" 10,000

Posters:

- Help Save Our State From Bushfires 2,000

Stickers:

- Help Save Our State From Bushfires 86,000

Extension Activities:

Individual contacts

Property visits	118
Office visits	187
Telephone enquiries	720
Group meetings	23
Field days & displays	24
District council visits	160

Mass media

Television programmes	3
Radio broadcasts	6
Press releases	24

<u>Committee meetings</u>	60
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CROP AGRONOMY SECTION

SECTION LEADER:

T.G. Heard, B.Ag.Sc.

RESEARCH OFFICERS:

M.J. Catt, B.Sc., Dip.Bus.Admin.

A.R. Barr. B.Ag.Sc.

L. Nitschke, B.Ag.Sc.

TECHNICAL OFFICERS:

R.J. Puckridge, R.D.A.

(Miss) C.F. Twigger, R.D.A.

Vacant

FIELD ASSISTANTS:

S.G. Cornish

M.R. Schubert

N.H. Steinborner

CROP AGRONOMY SECTION

Recent Developments:

Personnel

As in the previous year, there were a considerable number of changes in the personnel of the Crop Agronomy Section during 1976-77. These created a number of problems but it is anticipated that the appointments made will result not only in increased efficiency, but also in a diversification of research activities.

Mr. B.J. Marshall resigned in October, 1976 while Mr. I.W. Magarey resigned in March, 1977. Both these officers had been involved largely in the barley programme for a number of years. Mr. M.J. Catt transferred from the Weed Science Section in August, 1976. He transferred his headquarters from Adelaide to Pt. Lincoln in January, 1977 as the first research officer to be appointed to Eyre Peninsula. Mr. L. Nitschke was appointed in October, 1976 to carry on the research programme on grain legumes. The appointment of Mr. A.R. Barr in March, 1977 broke new ground as he will, in addition to carrying on research programmes on the agronomy of barley and oats, also initiate an oat breeding programme. The appointment of Miss Christine Twigger to the vacant technical officer position in April, 1977 was also a first as it is believed she is the only female technical officer in the Department.

Cultivar evaluation programme

The wheat cultivars Oxley and Warimba and the oat cultivar Cassia were added to the lists of recommended cultivars following extensive testing by the Crop Agronomy Section.

Oxley has been recommended as an additional A.S.W. type in areas where Halberd is recommended. This will provide a choice for growers, particularly in situations where stem rust has greatly reduced the yield of the susceptible Halberd.

Warimba is a hard wheat of good quality and with currently adequate stem rust resistance. In trials it has given yields at least equivalent to those of currently grown hard varieties and could provide increased returns, particularly in the earlier finishing areas of the wheat belt.

Cassia is currently recommended on a trial basis for grazing and feed grain in later districts. Additional data is being gathered from current trials before a decision is made on complete recommendation. In recent trials Cassia has yielded almost as well as West. Cassia is envisaged as a possible replacement for Avon in later areas in situations where herbage production and grain production for animal feeding are of major importance.

The barley cultivar, Corvette, provided outstanding yields in the barley trial programmes. The high yield potential of this cultivar bred at the Waite Institute but released by the Queensland Department of Primary Industries will make it attractive to many farmers. However, Corvette is a feed type barley with a blue aleurone colour and the Australian Barley Board has already indicated that there will be a nil tolerance of this type of grain in Grades 1, 2 and 3.

The evaluation of a range of triticale lines continued in 1976-77. Yield results were somewhat disappointing with none of the lines yielding to the level of wheat or barley and none exhibiting outstanding adaptability to any of the environments under which they were tested.

#### Weed control

Trials conducted showed the effectiveness of diclofop-methyl (Hoegrass-Hoechst) for the control of both wild oats and annual ryegrass in wheat and barley. Registration of the product for the control of these two weeds in wheat, linseed, lupins and peas is expected soon. Difenzoquat (Avenga-Cyanamid) and isoproturon gave good control of wild oats and annual ryegrass respectively.

#### Conferences, Training Schools:

- \* Oil Seeds and Protein Grains Conference, Toowoomba, October, 1976 - T.G. Heard
- \* Spring Meeting and Symposium, Barley Improvement Trust Fund, Horsham, October, 1976 - T.G. Heard, B.J. Marshall
- \* Meeting Organising Committee, Cereal Agronomy Conference, Melbourne, November, 1976 - T.G. Heard
- \* Invited speaker, I.C.I. Minimum Tillage Conference, Perth, February, 1977 - M.J. Catt
- \* In-service Training School, Roseworthy College, February, 1977 - L. Nitschke

#### Major Research Projects:

- \* Wheat cultivar and crossbred evaluation
- \* Barley cultivar and crossbred evaluation
- \* Oat cultivar and crossbred evaluation
- \* Triticale evaluation
- \* Grain legume evaluation
- \* Breeding of oat cultivars for South Australia
- \* Weed control in lupins
- \* Weed control in peas
- \* Examination of continuous cropping rotations
- \* Examination of minimum tillage systems

#### Publications:

- Marshall, B.J. (1976) - "Barley in South Australia". Agronomy Branch Report No. 76.
- Catt, M.J. (1977) - "Cereal Weed Spraying Guide, 1977". S.A. Dept. of Agriculture & Fisheries.
- Heard, T.G. (1976) - "Wheat Varieties for 1977". S.A. Dept. of Agriculture & Fisheries Fact Sheet.

Marshall, B.J. (1976) - "Barley Variety Recommendations for 1977". S.A. Dept. of Agriculture & Fisheries Fact Sheet.

Barr, A.R. (1977) - "Oat Variety Recommendations for 1977". S.A. Dept. of Agriculture & Fisheries Fact Sheet.

ENTOMOLOGY SECTION

SECTION LEADER:

P.R. Birks, M.Ag.Sc.

RESEARCH OFFICERS:

P.G. Allen, M.Ag.Sc.  
D.C. Hopkins, M.Ag.Sc.  
D.E. Swincer, B.Ag.Sc.(Hons.)

TECHNICAL OFFICERS:

\*R.B. Jenkins  
C. Phillips, R.D.A.  
\*\*I.J. McFarland, R.D.A.

TECHNICAL ASSISTANTS:

G.S. Dearman  
K.R. Henry

\* Resigned January, 1977  
\*\* Appointed June, 1977

## ENTOMOLOGY SECTION

Two crises arose during 1976-77 which disrupted planned programmes. The locust outbreak involved all members of the Section for at least some time between October, 1976 and April, 1977, and the invasion of South Australia by the spotted alfalfa aphid in May, 1977 has created high priority problems involving half the Section.

### Plague Locusts:

Following widespread heavy rain in the Far North during 1974-75 and 1975-76 locusts invaded the Western agricultural areas of Eyre Peninsula and the near pastoral areas in the North during February and March, 1976. Departmental surveys, council and landowner reports under-estimated the extent of invasion and egg-laying.

Following a dry autumn and winter, hatching took place in late September and early October and was protracted because of cool weather and a patchy spring rain. Control operations were undertaken by most landowners in known infested areas and they appeared to be well in control of the situation. However, by late November and early December when fledging was well under way it became evident that there were large hatchings in the northern pastoral areas beyond the previously recognised and reported areas, and swarm escape was likely.

In the Western agricultural region control measures were undertaken by farmers, mainly against hoppers and fledging adults, and generally good control was achieved. Some damage occurred, especially to late maturing barley crops where these were sparse and drought affected.

Migration of swarms into Northern agricultural areas began in November but caused little damage to maturing cereal crops. Because little progress was made with landowners spraying invading swarms with ground equipment, an aerial spraying programme was initiated aimed at breaking up major swarms. The programme commenced on 19th December being first based at Jamestown and then at Clare. Spraying was hampered by unfavourable weather and by restrictions applied to safeguard honey bees. Major swarms were dispersed, partly by spraying and partly by the topography, but movement south continued, especially on 24th December. Severe damage was caused to lucerne in the Northern agricultural areas.

Invasion of the Adelaide Plains, Barossa Valley and from Central Adelaide Hills to the Murray Plains occurred from 24th December. Seedling vegetable crops, potatoes, grape vines, lucerne and summer fodder crops were attacked. The onset of sexual maturation and egg-laying reduced migration and intensified damage in these areas.

Heavy rains during January resulted in survival of a summer generation in areas from Murraytown, Wirrabara, Booborowie and Clare in the north and from Gawler, Barossa Valley and the Adelaide Hills. Extensive landowner spraying resulted in substantial control and minimal crop damage.

Insecticide to treat some 22,000 ha of spring generation and 7,000 ha of summer generation was distributed to district councils. Some \$242,000 was expended on locust control with major expenditure of \$162,000 for insecticide. Estimates of damage caused by locusts were \$2.043M., comprising losses of \$0.689M. in cereals, \$0.608M. in pasture and forage, \$0.450M. in lucerne seed and \$0.296M. in horticultural crops. A favourable benefit cost ratio of at least 3:1 was calculated, indicating improved locust control would be profitable.

Spotted Alfalfa Aphid:

On 10th May, 1977, Therioaphis trifolii f. maculata, the spotted alfalfa aphid was discovered in a small area at Salisbury. This followed similar outbreaks in Queensland, New South Wales and Victoria only weeks before. Within the next day or two, lighter infestations were found within 100 km<sup>2</sup> surrounding Salisbury, and within two weeks further heavy and light infestations were found from Blanchetown to Renmark along the River Murray.

Serious concern was registered because the damage caused by spotted alfalfa aphid to lucernes in America and in eastern Australia were very severe because of a toxin-like effect on the plants, and the extremely rapid rate at which aphids can multiply. Further, the susceptibility of annual medics to spotted alfalfa aphid was not known, except that some of the burr medics in America were attacked.

Whereas the long term prognosis for spotted alfalfa aphid control is excellent because of success in the U.S.A. using parasites and resistant varieties, these programmes will take several years to develop and acute problems are anticipated in the immediate future.

An aphid task force involving Agronomy, Plant Breeding and Entomology was established to devise and implement both short and long term control measures. Their task has been further complicated by the arrival of yet another aphid, Acyrtosiphum kondoi, the blue alfalfa aphid, which requires different parasites and different germ plasm for resistance.

Sitona Weevil:

Population measurements were continued to provide further information on the effects of weather on sitona and to provide information relevant to the timing and effectiveness of parasite releases.

The dry autumn of 1976, the second successive dry autumn, produced a similar pattern of egg laying and larval and pupal populations to that recorded in 1975. Together with 1974 data, a good measure of the extreme variations in sitona numbers and variations in timing has now been accumulated.

Peak egg populations (9.8 million/ha) occurred in early August, 1976, about the same timing and numbers as occurred in 1975. It is now considered that egg parasite releases should be made in June to August in years with dry autumns, or late May to July when opening rains occur in April.

Peak larval populations probably occurred in September, 1976, the same time as in 1975 and about a month later than in 1974. The October larval + pupal populations of 0.38 million/ha in 1976 compared closely with 0.48 million/ha in October, 1975, and were about 1/20th of the 1974 populations.

Adult emergence was not measured in 1976, but is considered likely to have equalled emergence in 1975 (0.25 million/ha), which was about 50% of the October larval + pupal population, and 1/20th of the 1974 population (4 million/ha).

The key factors influencing sitona populations appear to be:-

- \* Dry autumns reducing germination and therefore food for adults and especially young larvae.
- \* Dry springs reducing food storage by adults and hence their summer survival.
- \* Wetness during summer increasing disease of over-summering adults.

### Parasites:

The first shipment of the sitona egg wasp, Patasson lameerii, from France, arrived in Adelaide on 5th July, 1976 after passing through quarantine in C.S.I.R.O. Division of Entomology, Canberra. In the following two months it was taken through four generations with increases of 1.3 to 4.0 fold. About three-quarters of the expected fourth generation (1,500) was released at Brentwood on Yorke Peninsula on 9th September, 1976. The remaining quarter (570) were retained to maintain laboratory cultures over the summer.

Subsequent egg samplings from the release site were made in October, 1976, January and May, 1977, but all have failed to achieve parasite recovery.

Laboratory cultures using refrigerated sitona eggs shows a successive decline and final elimination of males in the culture. Females continued reproducing parthenogenetically until autumn but numbers declined and finally died out before fresh sitona eggs were available from cultured weevils.

Further supplies of Patasson lameerii collected in Greece were obtained through C.S.I.R.O. in June, 1977 for further multiplication and release.

The first consignment of Microctonus aethiopoides, sitona adult wasp, also arrived in June, 1977 for culture and release. Initial breeding has been more successful with approximately sixfold increases per generation, and releases have been made at Urania and Laura in July, 1977. Recovery from the field at Laura indicates possible successful field establishment.

### Pasture Cockchafer:

In 1976, the sheep grazing experiment conducted at Flaxley showed visual differences between treatments in pasture availability during winter. With the highest larval density (360 per m<sup>2</sup>) there were substantial bare areas within the pasture. Climatic conditions were poor for pasture growth during the autumn and winter and this provided the conditions in which pasture cockchafer can be most damaging. However, measurements of pasture at the end of winter did not show statistical differences. This was mainly due to the variability of pastures between treatments. Such variability is inherent in the design of the experiment, although every effort is made to minimise it when selecting the experimental site. Also, estimates made during winter rather than at the end of winter would probably have better shown the loss of pasture availability due to larvae.

A further grazing experiment is being conducted at Mundulla in 1977 using a new experimental design aimed at further reducing the initial variation in pasture between treatments. Pasture estimates will be made more regularly during the critical winter period.

### Dung Beetle:

Onthophagus binodus was recovered at Wangary, Eyre Peninsula in late 1976. This is the first record of an introduced dung beetle becoming established in South Australia. O. binodus was released at this site in October, 1973, however, all the areas where this species has established in southern Australia are permanently moist and because this species appears to be more active during the summer, it is likely that its spread will be confined to those areas assured of summer moisture.



Two new species, Onitis aygulus and Euoniticellus pallipes, which are thought to be better adapted to southern South Australian conditions than most of the earlier released species, were released at Turretfield and Streaky Bay, and at Charleston, respectively, in June, 1977.

Dung beetle trapping to monitor the activity of native dung beetles has begun so that introduced dung beetles can be selected to complement this activity.

#### Cereal curculio:

Cereal curculio larvae were a problem in 1976, especially in cereals in the Bordertown-Naracoorte districts. The lower recommended rate of application of chlorpyrifos seed dressing (40 g a.i./100 kg seed) did not always provide complete crop protection. However, yields of treated crops were much higher than untreated crops. In 1977, an experiment is being conducted to assess the efficacy of a higher rate of chlorpyrifos seed dressing and three other seed dressings.

#### Grain Pests:

The Grain Hygiene Committee was formed by the Minister of Agriculture to investigate ways of improving grain hygiene practices in South Australia. It comprises representatives of United Farmers & Graziers of S.A. Incorporated and Department of Agriculture & Fisheries.

The Committee recommended a trace-back and inspection scheme without dockages, but involving a two-stage penalty of increased sampling and restriction of grain movement.

This system is very different to compulsory farm inspection first proposed to the Australian Wheat Growers' Federation in 1973. It is, however, very similar to the trace-back system proposed by the Australian Wheat Growers' Federation in 1973 and re-affirmed in 1975.

Regulations proposed under the "Fruit and Plant Protection Act, 1968" will give the proposed grain hygiene officers authority to operate.

While a general levy was considered logically the neatest method of funding, it appeared unattainable at present. The Committee considered infestation as a marketing problem and proposed that the scheme would be funded at least in part by the grain industry.

#### Rutherglen Bug:

Large populations of Nysius vinitor, Rutherglen bug, have occurred every year in the expanding areas of sunflower crops growing in the South East. Spraying has produced apparently unsatisfactory kills so that increasing quantities and more toxic sprays have been used. A research programme was carried out to evaluate the effectiveness of various sprays and to evaluate the need for spraying. Results indicate that spraying after flowering is not warranted. Large populations (up to 1000 per head) in maturing heads have no significant effect on yield.

Spraying is warranted only during the early bud stage, about 60 days from planting, until early flowering. Preliminary guidelines of 6 adult bugs per head were used as an indication for timing sprays. Maldison ULV or EC were the cheapest of the effective sprays.

Alternatives to DDT:

Endosulfan and chlorpyrifos, both applied at 350 g/ha, were effective in controlling heliothis and pea weevil in field peas, but chlorpyrifos failed to give sufficient residual effect for commercial application, especially against heliothis. Permethrin, a synthetic pyrethroid, was effective at extremely low rates, down to 10 g a.i./ha.

Conferences, Training Schools & Study Leave:

- \* XVth International Congress of Entomology, Washington, U.S.A., August, 1976 - P.G. Allen
- \* Study Tour - 11th July to 15th September, 1976 visiting research centres in New Zealand, U.S.A., England, West Germany and France, with special reference to damage assessment research techniques - P.G. Allen
- \* Science Technician Certificate Course - K.R. Henry and G.S. Dearman

Committees:

- \* 8th Entomology Committee of Standing Committee on Agriculture, Melbourne - October, 1976 - P.R. Birks (Chairman)
- \* Stored Products Sub-committee of Entomology Committee, Melbourne - October, 1976 - P.R. Birks
- \* Australian Plague Locust Commission - P.R. Birks
- \* Plague Locust Review Committee - P.R. Birks, C. Phillips, P.G. Allen, K.R. Henry
- \* Arid Zone Working Party - P.G. Allen
- \* South Australian Grain Hygiene Committee - P.R. Birks
- \* South Australian Advisory Committee on Australian Encephalitis - P.G. Allen
- \* Agronomy Branch Quarantine Committee - P.R. Birks
- \* Lucerne Aphid Task Force - D.E. Swincer

Major Research Projects:

- \* Damage Assessment of Pasture Cockchafer (Aphodius tasmaniae) in Pasture - P.G. Allen, K.R. Henry
- \* Release of Introduced Dung Beetles in South Australia - P.G. Allen, K.R. Henry
- \* Insect Pests of Germinating Cereal Crop - P.G. Allen, K.R. Henry
- \* The Biology and Ecology of Sitona Weevil - D.C. Hopkins, G.S. Dearman
- \* Multiplication, Release and Evaluation of Parasites of Sitona Weevil - D.C. Hopkins, G.S. Dearman
- \* Developing Seedling Insecticide Protectant Techniques for Aphid Susceptible Lucerne and Medic Cultivars - D.E. Swincer, I.D. McFarland
- \* Pesticide Residue Investigations

- \* Heliothis punctigera control - D.E. Swincer, R.B. Jenkins
- \* Evaluation of Pesticides against Pea Weevil - D.E. Swincer, R.B. Jenkins
- \* Control of Rutherglen Bug in Sunflowers - D.E. Swincer
- \* Seasonal Flight Activity of Cutworm Species - D.E. Swincer, R.B. Jenkins
- \* Developing Integrated Control of Lucerne Aphids in S.A. (Aphid Task Force) - E.D. Higgs
- \* The Incidence of Stored Product Pests on Farms and Their Resistance to Insecticides - P.R. Birks, C. Phillips

Extension Projects:

- \* Survey and Control of Australian Plague Locust - P.R. Birks, C. Phillips, P.G. Allen, K.R. Henry

Publications:

- Swincer, D.E. - Summary of Crop and Pasture Pest Recommendations, 1977. Extension Bull. No. 11.77, S. Aust. Dept. Agric.
- Allen, P.G. (1976) - "Alternative Insecticides for the Control of Pasture Cockchafer (Aphodius tasmaniae Hope) in Pasture". Aust. J. Expt. Agric. Anim. Husb. 16:755-757.
- Allen, P.G. (1976) - "Assessment of Damage to Annual Pastures by the Pasture Cockchafer (Aphodius tasmaniae) in South Australia". Aust. J. Agric. Res. 28:663-670.
- Allen, P.G. (1976) - "Assessment of Damage to Annual Pastures by the Scarab, Aphodius tasmaniae, in South Australia". XVth Int. Congress Ent., Washington.
- Allen, P.G. (1977) - "Locust Control - Maldison Applied with Conventional Spray Equipment". Fact Sheet No. 25/77. South Australian Department of Agriculture & Fisheries.
- Birks, P.R. (1976) - "Plague Locust Control". Fact Sheet No. 154/76 - South Australian Department of Agriculture & Fisheries.
- Birks, P.R. (1977) - "Spotted Alfalfa Aphid". Tech. Note No. 7/77 - South Australian Department of Agriculture & Fisheries.
- Grierson, I.T. & Allen, P.G. (1977) - "Cereal Curculio (Desiantha caudata Pasc.) Damage to Wheat Following Different Pre-sowing Tillage Programmes". Aust. J. Expt. Agric. Anim. Hus. 17:466-468.
- Hopkins, D.C. (1977) - "Sitona Egg Wasp". Fact Sheet (in press).
- Mowatt, P.J. & Birks, P.R. (1976) - "Field Cricket Control". Fact Sheet - South Australian Department of Agriculture & Fisheries.
- Swincer, D.E. (1977) - "Spotted Alfalfa Aphid". Fact Sheet No. 85/77 - South Australian Department of Agriculture & Fisheries.

Extension Activities:

Personal contacts

On farm visits	200
Rural group - meeting, field days	33
Office, laboratory, trial site visitors	50
Telephone enquiries	2,250
Regulatory inspections	1
District council visits	70

Mass media

News items	50
Information publications	10
TV, radio broadcasts	35
Agricultural conditions reports	8

REPORT OF APHID TASK FORCE AS AT 30/6/77

The arrival of the spotted alfalfa aphid (SAA) and blue alfalfa aphid (BAA) in Australia is an event of very great agricultural significance. The SAA was first identified in South Australia on 10th May, 1977, but most had been present for a month or two prior to that date. This can be inferred from the intensities of the initial infestation, the geographical extent of infestation and reports of farmers of damage being noted at earlier stages. It is unlikely, however, that the SAA arrived any earlier than December, 1976.

One BAA has been identified in South Australia but no infestations were seen in the period under consideration.

It is anticipated that the SAA will spread rapidly to infest all lucerne areas of South Australia within a year or two. If not countered it will destroy almost 1M. ha of lucerne and lucerne-based pastures as Hunter River, the predominant cultivar, is highly susceptible. It is likely that medic pastures close to lucerne areas will also be severely damaged. The more distant medic pastures may not be so extensively damaged as the aphid which can only over-summer on growing lucerne, will have to re-invade the medic pastures each year.

A multi-discipline aphid task force has been assembled to plan and, in due course, execute measures which will rapidly bring the aphids under control.

The BAA is likely to cause significant damage (if not controlled) to subterranean clover and strawberry clover pastures, as well as lucerne and annual medics.

The main work undertaken by the Task Force to date has been:-

- \* Acquisition and review of the scientific literature relevant to the SAA and BAA.
- \* Developing general plans for a series of projects covering:-
  - \*\* Parasite rearing and release
  - \*\* Breeding resistant medics and lucerne
  - \*\* Multiplying seed of foreign bred lucernes resistant to SAA and BAA
  - \*\* Maintaining a strict quarantine on imports of lucerne seeds.
- \* Acquisition of additional facilities, including insectaries and greenhouses.
- \* Preparing potted lucerne plants for rearing aphids for producing parasites.
- \* Undertaking advisory and public relations work with farming communities.

PASTURE ECOLOGY SECTION

SECTION LEADER:

P.S. Cocks, M.Ag.Sc., Ph.D.

SENIOR RESEARCH OFFICERS:

P.R. Gibson, B.Ag.Sc.

P.M. Kloot, M.Ag.Sc.

M.V. Smith, M.Ag.Sc., M.Ec.

FIELD ASSISTANTS:

J.R. Phillips

D. Carter

PASTURE ECOLOGY SECTION

Major Achievements & Developments:

Several new discoveries about the ecology of subterranean clover highlight the Section's activities during 1976-77.

New Lines of Sub. Clover:

As a result of surveying plants contaminating wool sold at the Adelaide wool sales, several hundred new lines of subterranean clover have been revealed. The significance of this discovery is two-fold. Firstly, it greatly increases the number of lines known to be naturalised in southern Australia. Secondly, it indicates that many more lines, possibly thousands, are present, which strongly suggests that the species is evolving "native" lines, peculiar to Australia.

The importance of the evolutionary process is being studied in a field near Kalangadoo in the Lower South East. It is becoming clear that recombination and natural selection are continuous processes leading to a population of considerable heterogeneity, including many newly evolved well-adapted lines. Some of the lines present are apparently colonising specialised environments.

As well as being of great scientific interest these discoveries will have major practical application in the breeding of new cultivars.

Grass Trials:

Another major project of the Section is the measurement of sheep performance when grazing three perennial grass cultivars at Mt. Alma in the southern hills. One of the grasses, Demeter tall fescue, has produced more wool and carried heavier sheep than the other two, Mt. Alma perennial ryegrass and Siro hybrid Phalaris, in two out of three years. It can do this because of its ability to respond to summer rains, the resulting green feed being more nutritious than the dry residues of the other grasses.

Legume Survey:

During the year a further five areas of the cereal zone were surveyed to determine farmer attitude to the use of annual legumes. A total of eight regions have now been surveyed. The results should provide a sound basis for future decisions on research and extension in these areas.

The areas surveyed this year were:-

- \* Upper Eyre Peninsula - Hundreds of Pygery, Carina, Minnipa
- \* Eastern Eyre Peninsula - Hundreds of Verran and Rudall
- \* Lower Eyre Peninsula - Hundreds of Cummins and Shannon
- \* Yorke Peninsula - Hundreds of Tiparra and Kilkerran
- \* Murray Mallee - Hundreds of Vincent, Hooper, Marmon-Jabuk and Wilson

Officers of the Pasture Ecology Section were greatly assisted by district officers during this survey.

Following the survey a series of demonstration plots have been established throughout the cereal zone by Mr. N.M. Brooks, Seeds Promotion Officer. It is hoped that these plots will demonstrate to farmers the great economic benefit of using annual legumes in their pastures. Fifteen sites were established during 1977.

Committees:

The Section provided (in the person of Mr. M.V. Smith) economic advice to a number of Departmental committees.

- \* The Primary Producers Emergency Assistance Advisory Committee
- \* Ministerial Review Committee to review the plague locust outbreaks of 1976-77
- \* Ministerial Review Committee on the administration of natural disaster aid in South Australia
- \* Assessment of the possible economic effects of the spotted alfalfa aphid and the blue alfalfa aphid
- \* Convenor of the Committee organising the Agronomy Branch Workshop on "Review of the Research/Extension Needs of the Mixed Farming Areas of South Australia"

Chemical & Label Registration:

The assessment of submissions to the Technical Committee on Agricultural Chemicals and of labels submitted for registration has been a major responsibility of Mr. P.M. Kloot, Senior Weeds Research Officer. During this year 15 submissions to TCAC and 95 registration applications or amendments were received. This is slightly lower than the number dealt with in the previous year.

Much time was spent completing the development of the new Weed Officers Certificate offered by the Department of Further Education. The first students have recently completed the new course successfully.

Mr. Kloot with Mr. M.J. Catt, is also involved in providing the "Weeds" unit for the Certificate in Ornamental Horticulture course offered by the Department of Further Education.

At the close of the year, a new section was formed - the Weed Research Section. Two officers of this Section, Mr. P.M. Kloot and Mr. D. Carter, formed the nucleus of the new group.

Conferences, Training Schools & Study Leave:

- \* P.S. Cocks - Ecological Society of Australia Symposium, Adelaide
- \* P.M. Kloot - Ecological Society of Australia Symposium, Adelaide
- \* M.V. Smith - Australian Farm Management Society Conference - held at Roseworthy Agricultural College and Gawler, 9-11th February, 1977

Mr. P.M. Kloot commenced a part-time Ph.D. course in the Agronomy Department, Waite Agricultural Research Institute. The subject is a study of the alien flora of the South Australian cereal zone - its nature, the factors influencing its composition and related matters.



Publications:

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- Cocks, P.S., Webber, G.D., Mathison, M.J. & Crawford, W.J. (1977) - "Pasture Seeds from South Australia". Dept. of Agriculture & Fisheries, Adelaide.
- Gibson, P.R. (1977) - "Persistence of Perennial Ryegrass (Lolium perenne L.) Under Grazing in a Mediterranean-type Environment of South Australia". Proc. XIII Int. Grassl. Cong., Leipzig, GDR (in press).
- Gibson, P.R. (1977) - "Inter-relationships of Pasture Production, Pasture Utilisation and Animal Production from Grazed Pastures on Kangaroo Island, South Australia". Proc. XIII Int. Grassl. Cong., Leipzig, GDR (in press).
- Gibson, P.R. - Animal production from three perennial based pastures. Accepted for inclusion in Proc. Aust. Soc. Anim. Prod. 12.
- Gibson, P.R. - Effect of stocking rate and pasture type on the fleece characteristics of Merio wethers. Accepted for inclusion in Proc. Aust. Soc. Anim. Prod. 12.
- Gibson, P.R. (1977) - "Effects of Stocking Rate and Botanical Composition on Animal Production from Sown Pastures in a Mediterranean-type Environment". M.Ag.Sc. Thesis, University of Adelaide, Adelaide, S. Aust.
- Kloot, P.M. (1976) - "The Species of Adonis Naturalised in Australia". Muelleria (Melbourne).
- Kloot, P.M. & Boyce, K.G. (1977) - "Inhibition of Legume Seed Germination by Wireweed (Polygonum aviculare)". Aust. Seed Research Conf. 1977 3(b) 15-16.
- Smith, M.V. (1977) - "Farmer Usage of Annual Medics in a Ley Farming Area in South Australia". Paper prescribed at XIIIth International Grasslands Congress held at Leipzig, May, 1977.
- Smith, M.V. & Carr, P.M. (1977) - "Review of Natural Disaster Aid in South Australia with Special Reference to Drought". Special Report for Minister of Agriculture - May, 1977.
- Smith, M.V. (1977) - "Grazing Management of Dryland Lucerne Pastures on Sandy Soil". S.A.D.A.F. Fact Sheet 78/77.
- Smith, M.V. (1977) - "Why Medics Aren't Growing as Well as They Used To!" Paper presented to Crop Science Society meeting at Roseworthy Agricultural College, 15th April, 1977.
- Smith, M.V. - I The Plague Locust Control Campaign - South Australia 1976-77  
- II Recommendations for the Future Control of the Plague Locust in South Australia.
- Smith, M.V. - Agronomy Branch Report No 83 - Ministerial Review Committee 1977 - M.V. Smith was a member of working party of 10 chaired by Mr. A.F. Tideman.

Major Research Projects:

- \* The competitive ability, yield and seasonal fixation of nitrogen of three cultivars of subterranean clover - W.G. Wootton and P.S. Cocks
- \* Evaluation of five pasture types in terms of livestock changes and wool production - P.R. Gibson
- \* Evaluation of perennial grass cultivars under grazing - P.R. Gibson
- \* Survey of annual legume adoption in mixed farming areas - M.V. Smith
- \* Vegetable fault in wool - P.S. Cocks and J.R. Phillips
- \* Colonisation, persistence and evolution of subterranean clover - P.S. Cocks

PLANT BREEDING SECTION

SECTION LEADER:

M.J. Mathison, B.Ag.Sc.

RESEARCH OFFICERS:

I.D. Kaehne, M.Ag.Sc.

TECHNICAL OFFICERS:

\*B.C. Bull, L.D.A.  
C.S. Morner, Landm. (Univ. Sweden)  
D.W. Parker, R.D.A.T.

LABORATORY OFFICERS:

Miss B.M. Martin  
Mrs. S.B. McLean

FIELD ASSISTANTS:

R.D. Haesy  
G.W. Patten

PLANT BREEDING SECTION

Major Achievements & Developments:

The Plant Breeding Section report might almost be divided into two, covering the eras pre- and post-lucerne aphids as the detection of these pests in Australia in autumn and winter, 1977 has led to rapid changes in direction in breeding lucernes and annual medics.

Pre-aphid:

Improved facilities for the Plant Breeding Section were commissioned during 1976-77. These include a work room and more offices, a large equipment shed with a mezzanine floor, a controlled low temperature seed storage room to preserve valuable medic and lucerne germplasm, and modifications to laboratory areas shared with the Pasture Seed Production Research Section. The improved facilities have already improved staff morale and made the Section's daily routines more efficient.

Considerable progress was made in both the lucerne and the annual medic breeding projects. Field plots of lucerne populations bred at Northfield for resistance to stem nematode and other diseases were established at Langhorne Creek for further evaluation. Likewise, newly bred waterlogging and flooding tolerant lucerne populations were established near Naracoorte, following glass-house selection at Northfield and field selection near Meadows in the Adelaide Hills. Breeding of populations of lucernes resistant to continuous grazing by sheep with acceptable levels of productivity has been successful. Some five populations are quite outstanding in field plots under grazing. It is anticipated that there is sufficient germplasm resistant to SAA and BGA within these populations to enable aphid resistant grazing tolerant cultivars to be developed from them. High yielding lucernes under irrigation have also been successfully bred. Some blocks for seed production and further evaluation of the improved lucernes were set up at Northfield with a view (pre-aphid) to early release of new cultivars.

Breeding for resistance to feeding by adult sitona weevil has continued to be more difficult in lucerne than in the annual medics, but small improvements have been made. In the annual medics about 50 accessions have been identified with some resistance to adult weevil feeding. Twenty of these were sown in 1977 for field evaluation at three localities usually heavily prone to sitona weevil attack.

Medicago tornata introductions were sown in 1976 at Field (south of Coonalpyn) following on their good performance on an array of sandy soils in other parts of the State. Several performed very well at Field. Elsewhere good drought resistance was shown by several of them regenerating in 1976. Seven lines were sown in 1977 on seed growers' properties at Field to produce seed for further evaluation and cultivar development for sandy soils.

About 16 annual medic introductions which have performed well on hard setting red brown earth at Belalie North were sown there for further testing in 1976-77 with a view to early development of new cultivars. The best of these medics are either M. polymorpha burr medic or M. scutellata snail medic types.

The Australian Wheat Research Council funds the siyona weevil resistance breeding and selection and shares with the South Australian Wheat Research Committee in the funding of annual medic breeding. The Australian Wool Corporation largely funds the lucerne breeding. In addition to continuing to receive this industry financed support, the Plant Breeding Section receives State Government finances. In 1976 and 1977 grants from the State Government Unemployment Relief Scheme have also assisted in the progress made in the breeding projects, in starting to set up the long term storage of germplasm and in the initial screening of plants for resistance to SAA.

#### Post-aphid:

Following the detection of spotted alfalfa aphid (SAA) on the Adelaide Plains in May, some thousands of field plots of lucernes and annual medics were kept aside for field resistance screening at Northfield. Glasshouse screening for SAA resistance was started with annual medic cultivars and breeding material at Northfield and co-operative work started for blue green aphid (BGA) resistance screening by D.S.I.R. research workers at Palmerston North, New Zealand. Simultaneously, BGA and SAA resistant lucerne germplasm was obtained from a D.S.I.R. plant breeder at Lincoln in New Zealand and other suitable resistant material sought from American breeders. (See also the report on setting up an Aphid Task Force).

#### Conferences, Training Schools, etc.:

Mr. Kaehne was awarded the degree of M.Ag.Sc. by the University of Adelaide for his work on waterlogging tolerance in lucerne. Messrs. Kaehne and Mathison attended the combined 3rd SABRAO Congress (Society for the Advancement of Breeding Researches in Australasia and Oceania) and the Australian Plant Breeding Conference in Canberra in February, 1977 and were subject reviewers in the respective Conference sessions for which they had prepared papers accepted. Mr. Mathison prepared specialist papers on plant genetic resources and participated in a SABRAO Genetic Resources Workshop in Canberra before the 3rd SABRAO Congress, and in a joint PPC-HC Working Party on Plant Genetic Resources in Melbourne on 28-29th June, 1977.

In mid-1977 Mr. Kaehne commenced a part-time Ph.D. candidature at the University of Adelaide studying "The significance of inbreeding and outcrossing for a self-pollinated crop plant".

Mr. Bull (on secondment) departed in May, 1977 in an under-study role with Mr. E.J. Crawford, Senior Plant Introduction Officer, on a Middle East pasture legume seed collecting and consultancy mission with ICARDA (International Centre for Agricultural Research in the Dry Areas).

#### Farmer Contacts, Field Days, etc.:

Progress reports on research in the Plant Breeding Section have been given to farmers and the general public in the form of radio talks, addresses at Agricultural Bureau conferences and grower meetings, and talks and guided tours for groups and individuals visiting Northfield Research Laboratories. Further contact with the farming community occurs at the Section's regional experimental sites which are mostly on the properties of farmer co-operators. Farmers and agri-businessmen frequently contact members of the Section for professional advice.

As well as local and interstate visitors, many overseas research workers visit the Section for exchange of information and/or training. Overseas visitors during 1976-77 included research workers and administrators from Algeria, Brazil, Spain, Iran, Tunisia, United Kingdom, U.S.A. and U.S.S.R.

Current Major Research Projects:

Breeding New Cultivars of Annual Medics for the Australian Wheatbelt.

Sward Testing of Annual Medic Hybrids and Introductions to Select Breeding Lines and Potential Cultivars.

Seed Coat Permeability Studies in Annual Medicagos.

Selecting and Breeding Annual Medicagos Resistant to Adult Sitona Weevils.

Lucerne Introduction and Quarantine Programme.

Lucerne Selection for High Yield and Persistence under Irrigated and Dryland Conditions.

Lucerne Selection for Adaptation to Waterlogged and Poorly Drained Conditions.

Selection of Lucerne for Persistence under Continuous Grazing.

Lucerne Selection for Resistance to Stem Nematode.

Lucerne Selection for Resistance to Adult Sitona Weevil Damage.

Evaluating Seasonal Productivity of Tall Fescue Introductions for Selection and Breeding.

Maintenance of Herbage Plant Seed Collection (in collaboration with Plant Introduction and Pasture Seed Physiology Sections).

Breeding Medics and Lucernes Resistant to Spotted Alfalfa Aphid (SAA) and Blue Green Aphid (BGA) - see Aphid Task Force item.

Publications:

Kaehne, I.D. (1977) - Preliminary observations on the performance of hybrids between diverse morphological forms of lucerne. Proceedings Australian Plant Breeding Conference and 3rd SABRAO Congress, Canberra, February, 1977. 14(1)-9-11.

Kaehne, I.D. (1976) - Stem nematode resistance in lucerne. Australian Plant Breeding & Genetics Newsletter No. 26. 97-98.

Kaehne, I.D. (1976) - Studies in waterlogging tolerance in lucerne. Thesis submitted to University of Adelaide in partial fulfilment of degree of M.Ag.Sc.

Mathison, M.J. (1977) - The Australian collection of annual Medicago germplasm. A background paper for joint PPC-HC Working Party on Plant Genetic Resources, Melbourne, June 28-29, 1977.

Mathison, M.J. (1977) - Notes on some of Australia's plants useful to man in relation to germplasm collection and preservation. A Position Paper for SABRAO Genetic Resources Workshop, Canberra, February 12-13, 1977.

Mathison, M.J. (1977) - Sitona weevil resistance in annual Medicago species. Proceedings Australian Plant Breeding Conference & 3rd SABRAO Congress, Canberra, February, 1977. 14-(b)-1-6.

- Mathison, M.J. (1976) - Breeding for resistance to sitona weevil. Seed Industry Newsletter No. 1, S.A. Dept. Agric. & Fish. & S. A. Seed Producers Association.
- Mathison, M.J. (1976) - West European study tour and pasture legume seed collecting in the USSR, Balkans, North Africa and Lebanon. Australian Plant Breeding & Genetics Newsletter No. 26, 115-119.
- Mathison, M.J. (1976) - Perennial grasses, rust and a cautionary tale. Australian Plant Breeding & Genetics Newsletters No. 26, 115-115.
- Cocks, P.S., Webber, G.D., Mathison, M.J. & Crawford, E.J. (1978) - "A Guide to Pasture Seeds from South Australia". S.A. Government Printer, Adelaide. In press.

PLANT INTRODUCTION SECTION

SECTION LEADER:

E.J. Crawford, R.D.A.

LABORATORY ASSISTANT:

Mrs. M.S. Schubert (part-time)

PARAFIELD PLANT INTRODUCTION CENTRE:

B.G. Nankivell, R.D.A.

P.C. Mobbs, H.D.A.

\*P.L. Blesing

L.K. Ramsay

S.H. Kelly

K.S. Roberts

W.R. Porter

R.C. Bellchambers

\* Seconded to overseas service, Libya



PLANT INTRODUCTION SECTION

Major Achievements & Developments:

Continuing liaison between the Section and officers of international organisations associated with increased agricultural production in developing countries, is evidenced by the visits of 36 officers from various organisations of 14 countries. Many of these visitors have been concerned with both the preservation of plant genetic resources and the use of annual legumes as a component of the ley farming system, a principle that is gaining increasing recognition in many North African and Middle East countries.

As a result of this, the Department's annual medic gene pool is continuing to increase in international recognition and further collecting missions are being planned for the near future.

During the year, 1339 new lines of material were received for initial assessment, 94% of which are annual species of Medicago.

Morphological and agronomic assessment of 566 lines of annual medics at the Parafield Plant Introduction Centre, represented four species from 19 countries.

Some 106 selections were made for varying characteristics within the initial lines established.

Of the 672 lines and selections grown, 47% exhibited better seedling vigour than the control cultivars.

Increased winter production is a major criterion for selection of better cultivars and 80 lines exhibited better winter production than the controls.

These were essentially of Moroccan origin, with lesser numbers from Algeria and Tunisia.

Earliness of flowering is important to ensure adequate seed set and 36 lines flowered earlier than the earliest commercial cultivar, "Cyprus" barrel medic. These lines were essentially from Libya.

The resowing of a sward trial incorporating 171 genotypes of 48 of the existing 52 annual sub-species of the genus Medicago was seriously affected by the adverse climatic conditions experienced throughout the growing season and no herbage yield determinations were made.

However, despite drought conditions, 82% of the entries produced seed, highlighting the importance of time of flowering as it affects seed production in any one year.

The area sown in 1975 was fallowed in autumn, 1976 and sown to barley in winter and natural regeneration will be studied in the year following cropping.

The total annual rainfall of 303.6 mm (the lowest since the drought year of 1967, viz. 278 mm) was 35% below average, the growing season rainfall (April/November) being 236 mm on 95 wet days.

During the period mid-May to mid-September, 19 frosts were recorded at Parafield, the lowest terrestrial minimum temperature being  $-3.4^{\circ}\text{C}$  during a period of six consecutive frosts in July.

Low daily winter rainfall recordings necessitated irrigation of seed production areas which returned lower than usual yields.

Similar drought conditions prevailed in many country regions and experiments in low rainfall areas failed. However, in later maturing districts, good spring rainfall ensured seed set on most experiments and natural regeneration will be studied following germination rains in 1977.

Planned trials on the Murray Plains were not sown because of drought. However, trials sown at Manoora and Narridy as part of the Paragosa gama medic replacement programme established well and seeded down well as a result of late spring rainfall.

Summer thunder storms in January, 1977 resulted in a considerable germination on some trials, all seedlings dying because of lack of follow-up rains.

A dry May in 1977 deferred sowing of new trials and natural regeneration of older trials.

Training Schools, Conferences, etc.:

* Staff training school	1
* Conferences	2
* Symposia	5

Current Major Research Projects:

- \* Classification of new herbage plant introductions
- \* Sward evaluation of Ghor barrel medic, Medicago truncatula, at three regional centres
- \* Sward evaluation of four selected lines of M. rugosa at two regional centres
- \* Sward evaluation of four lines of Trifolium subterranean spp. brachycalycinum at two regional centres
- \* Demonstration and agronomic evaluation of 171 genotypes of 48 annual sub-species of the genus, Medicago
- \* Extension of the annual Medicago gene pool

Extension Services:

* Field days	3
* Visitors - International	36 from 14 countries
Interstate	2
Local	70

Publications:

- Crawford, E.J. (1976) - "Agronomic assessment of the annual species of Medicago L." XIIIth Inter. Grassld. Congress, 1977.
- Boyce, K.G. & Crawford, E.J. (1977) - "Testing interspecific differences in seed germination rate using a two-dimensional thermogradient plate". Aust. Seeds Res. Conf. 1977.
- Crawford, E.J. (1977) - "Changes in seed coat permeability in annual species of Medicago with special reference to the variability in M. rugosa Desr." Aust. Seeds Res. Conf. 1977.
- Crawford, E.J. (1977) - "Purpose and Principles of Plant Introduction". Series of lectures for international post-graduate students at Roseworthy Agricultural College.
- Crawford E.J. (1977) - "Subterranean clover cultivar requirements by geographic zones in South Australia". Subterranean clover workshop, Perth, 1977.
- Crawford, E.J. (1977) - "Registration - a sequence in developing a cultivar". Subterranean clover workshop, Perth, 1977.
- Crawford, E.J. (1977) - Notes to botanists and taxonomists. A.P.G. Newsletter, 1977.
- Crawford, E.J. (1977) - News and personal items. A.P.G. Newsletter, 1977.

PLANT PATHOLOGY SECTION

SECTION LEADER:

A.J. Dube, B.Ag.Sc.(Hons.), Ph.D.

RESEARCH OFFICERS:

S.M. Ali, B.Ag., M.Sc., Ph.D.  
A.H. Mayfield, B.Ag.Sc.

LABORATORY OFFICER:

C.J. Wilmshurst

FIELD ASSISTANT:

R. Short, O.N.D., D.B.S.

## PLANT PATHOLOGY SECTION

This year the Plant Pathology Section has commenced a major collaborative research project with the Crop Agronomy Group and the Research Centres Branch. This is a pea disease resistance and pea improvement project. The project has been designed with a core group of research workers and an advisory group which have industry orientated backgrounds. The advisory group are made up of representatives from dried pea and freezing pea industries as well as from United Farmers & Graziers and district agronomists. The first part of the project is the collection of germ plasm already nearly 1,000 lines have been collected. These are from Weibullsholm Plant Breeding Institute in Sweden, John Innes Institute, International collection Geneva, New York State, India, Germany and South Africa. This collection is being screened for sources of resistance to the Ascochyta complex with the aim of back crossing resistance into commercial cultivars. This year a third of the collection will be grown in the field to document their various agronomic characters. The leafless, semi-leafless and fasciated characters are viewed as having considerable advantages in production.

### Breeding for Barley Scald Resistance:

This year the 3rd and 4th selfing and screening of the fourth back-cross to Clipper have been completed. 140 families from 8 lines have now been planted in the field; this has been done in association with the Crop Agronomy group. These lines have a combination of two or three different genes for scald resistance. In the field this year the lines will be multiplied, assessed for scald and mildew resistance as well as agronomic characters and finally assessed on commercial barley classification.

### Losses Due to Scald:

A significant loss in yield due to leaf scald was obtained in a disease assessment trial in 1976; each per cent of leaf 2 (from the top) with leaf scald at Feeke's growth stage 11.1 (milky ripe) was associated with 0.6 per cent loss in yield of grain. Disease at earlier growth stages was associated with a greater loss in yield than at later growth stages. Work on yield losses due to leaf scald will continue using near-isogenic lines for resistance to leaf scald (bred by Dr. S.M. Ali, S.A. Department of Agriculture & Fisheries).

### Powdery Mildew of Barley:

Good control of powdery mildew and some significant increases in yield were obtained with seed treatments and foliar sprays with fungicides in trials in 1976. Trial work is continuing. Seed treatments are being tested in more detail, particularly in lower Yorke Peninsula. Foliar sprays (including applications by aircraft) are being tested further, particularly in the Lower South East.

### Chemical Control of Cereal Eelworm:

Rates of application of Nemagon sprayed in the furrow were compared. At three sites rates of 3 litres per hectare and higher significantly reduced the numbers of "knots" per plant as well as white females per plant. Yield increases were achieved at two sites only, though plant variation may have accounted for the lack of response at the other site. At 6 litres per

hectare yield increases were 0, 25 and 92%, the latter increase was in an area droughted for the first half of the season. Farmer application of 3 l/ha on barley at the same site led to an increase of 23%. More trials are planned this year on wheat, barley and oats using Nemagon and Nemagon-superphosphate mixes.

Disease Recordings:

The discovery of Ectes Ackerbohne Mosaic virus and other unidentified viruses in seed directly imported from the United Kingdom to South Australia has caused concern. These diseases are a threat to the tick and broad bean industry and also to other legume based industries. A case has been made to change State quarantine laws; as well there has been a submission to the Commonwealth Department of Health. The discovery of Selenophoma donacis (barley speckle) at Mt. Gambier has led to its being identified in most barley growing areas of South Australia; its distribution and frequency of occurrence will be followed.

Other Current Research Projects:

- Development of Disease Assessment Keys
- Resistance to Cereal Eelworm in Barley
- Rust Survey
- Smuticide Evaluation

SEED PHYSIOLOGY SECTION

SECTION LEADER:

K.G. Boyce, M.Ag.Sc., Ph.D.

RESEARCH OFFICER:

C.M.J. Williams, B.Ag.Sc.(Hons.)

TECHNICAL OFFICER (LABORATORY):

Miss A.M. Kelly

## SEED PHYSIOLOGY SECTION

The work of the Section involves generation of technical information relating to production, processing, storage and utilisation of all types of seeds. Investigations are in progress on herbage, cereal, grain legume, vegetable, flower and turf seeds.

### Seed Production:

Agronomic research continued at Kybybolite Research Centre to determine the influence of stocking rate, grazing management and nitrogen fertiliser on seed yield and wool production using three perennial grass species. To date, the results have highlighted the over-whelming influence of the length of the grazing season on maximum economic return of both seed and wool. Grazing pressure and fertiliser application, although important, have lesser influence. However, an integrated strategy system of management appears necessary for maximum economic productivity.

Other field projects include continuation of the evaluation of seed production potential of foreign and local cultivars of herbage grasses and legumes, turf grasses, flowers and vegetables. Studies on harvest technology of perennial grasses are continuing with the development of preferred time and method of harvesting Phalaris tuberosa. An improved technique for windrowing phalaris crops before harvest has been researched and incorporated into production technology information available to seed producers. A new method has been developed for pre-harvest management of vegetable seed crops which are prone to loss due to seed shattering from the mature head. A quick drying glue sprayed onto the crop just prior to harvest results in significant increases in seed yield and economic returns.

Growth retardants have been used on onion and carrot seed crops to reduce plant height to facilitate harvest. By use of a package approach of growth retardant, glue spraying, modification of a harvester and seed drying the first successful mechanical harvest of onion seed was achieved by a commercial seed grower.

### Seed Quality:

Two seed quality experiments of significance are in progress. Commercial size lots of all the major herbage grasses and legumes are being monitored for quality deterioration in six commercial seed warehouses around the State. The results of this experiment will give seed merchants a guide to the storage life of those seeds. A successful extension project has been carried out in association with Mr. E.S. Hogg of the Seed Production Section. This project was aimed at showing seed growers, processors and merchants the need for monitoring of seed moisture levels to prevent seed quality deterioration. The use of moisture meters was introduced and this instrument is now in service with practically all processors and merchants.

Seed quality in lupins has been investigated. Many samples of seed for sowing have been shown by germination test to be of poor quality. The relationship between laboratory test and field performance is under investigation. Initial indications are that the standard laboratory test is a reasonable guide for predicting seed germination and subsequent establishment in the field.

A test for seed quality in lucerne and phalaris seed is being investigated with use of accelerated deterioration techniques for rapid aging of seed. Correlations between the laboratory test and seed storage are being made for lucerne seed at a seed warehouse at Keith.



Germination Response:

In the laboratory and controlled environment units, experiments are in progress to show the germination response of various seeds to temperature as an aid to selection in the plant introduction programme and as a guide for routine seed testing.

In addition the inhibition of germination of the seed of annual Medicago species by the presence of wireweed is being investigated. This is a major problem in wireweed infested districts of the mixed cereal farming areas. It appears that a substance which prevents root and shoot elongation of medic seed is washed from wireweed by rain, thus upsetting normal germination response.

Conferences & Study Leave:

- \* Australian Seed Research Conference, Tamworth, N.S.W., 28-31 March, 1977 - K.G. Boyce.
- \* South Australian Seedgrowers Co-operative Annual General Meeting, Adelaide, 26 November, 1976 - K.G. Boyce.
- \* Attendance at 13th International Grasslands Congress, Leipzig, GDR and visit to seed companies in Europe and United Kingdom - C.M.J. Williams

Research Projects:

- \* Effect of grazing and nitrogen applications on perennial grass seed yield - C.M.J. Williams, K.G. Boyce
- \* Time of harvest studies for perennial grass seed crops - K.G. Boyce
- \* Evaluation of seed production potential of foreign bred species - K.G. Boyce, C.M.J. Williams
- \* Influence of temperature on seed germination - K.G. Boyce
- \* Seed quality investigations with lupins - K.G. Boyce, R.M. Kain
- \* Harvest studies on vegetable seeds - C.M.J. Williams
- \* Phenological development in sown pasture grasses - K.G. Boyce, L. Cook and F. Robinson (latter two from Victorian Department of Agriculture)
- \* Storage studies with herbage seeds - K.G. Boyce, E.S. Hogg, G.E. Cooper
- \* Inhibition of medic seed germination by wireweed - K.G. Boyce, P.M. Kloot
- \* Seed quality investigations in lucerne and phalaris seeds - K.G. Boyce

Publications:

- Boyce, K.G. (1977) - "Predicting relative storability of lucerne seed lots from an accelerated deterioration test". Aust. Seed Sci. Newl. No. 3 (in press)
- Boyce, K.G. (1977) - "Relationship between seed weight and subsequent plant weight in 'Trikkala' sub. clover". Aust. Seed Sci. Newl. No. 3 (in press)
- Boyce, K.G. (1977) - "The physiology of seed vigour - A review". Aust. Seeds Res. Conf., March, 1977, Tamworth, N.S.W.
- Boyce, K.G. & Crawford, E.J. (1977) - "Testing interspecific differences in seed germination rate using a two-dimensional thermogradient plate". Aust. Seeds Res. Conf., March, 1977, Tamworth, N.S.W.
- Boyce, K.G. & Coleman, W.O. (1977) - "Harvesting methods for seedmaster". Agronomy Branch Report No. 86.
- Boyce, K.G. & Hogg, E.S. (1977) - "Storage of seeds". S.A.D.A.F. Techn. Note 100/60.
- Boyce, K.G. & Kain, R.M. (1977) - "Relationship between laboratory germination and plant establishment in lupin". Aust. Seeds Res. Conf., March, 1977, Tamworth, N.S.W.
- Boyce, K.G. & Schubert, C. (1977) - "Harvesting of medic seed". Agronomy Branch Report No. 85.
- Cocks, P.S., Boyce, K.G. & Kloot, P.M. (1976) - "The Hordeum murinum complex in Australia". Aust. J. Bot., 24:651-62.
- Hogg, E.S. & Boyce, K.G. (1976) - "Moisture content testing of pasture seeds". S.A.D.A.F. Fact Sheet 130/26.
- Hogg, E.S. & Boyce, K.G. (1977) - "Moisture content testing of vegetable seeds". S.A.D.A.F. Fact Sheet 207/22.
- Hogg, E.S. & Boyce, K.G. (1977) - "Moisture content testing of oilseeds". S.A.D.A.F. Fact Sheet 140/23.
- Kloot, P.M. & Boyce, K.G. (1977) - "Inhibition of legume seed germination by wireweed, Polygonum aviculare." Aust. Seeds Res. Conf., March, 1977, Tamworth, N.S.W.
- Williams, C.M.J. (1977) - "Glueing inflorescences increases yield and quality in vegetable seed crops". I. Single plant trials. II. Large scale commercial trial. Aust. Seeds Res. Conf., March, 1977, Tamworth, N.S.W.
- Williams, C.M.J. & Boyce, K.G. (1977) - "The effect of closing date, stocking rate and nitrogen application on seed and wool production from tall fescue, Festuca arundinacea Schreb.) pastures". 13th Inter. Grassl. Cong. (in press).
- Williams, C.M.J. & Simons, I.V. (1976) - "Glue spraying increases vegetable seed yield". S.A.D.A.F. Fact Sheet 290/23.

SEED PRODUCTION SECTION

SECTION LEADER:

D.C. Ragless	(1/7/76 - 31/12/76)
E.D. Higgs, B.Ag.Sc.	(1/1/77 - 26/6/77)
K.G. Boyce, M.Ag.Sc., Ph.D.	(27/6/77 -

SEED PRODUCTION ADVISERS:

Adelaide

N.M. Brooks, R.D.A.  
G.E. Cooper  
C.A. Schubert

Struan

W.O. Coleman, R.D.A.  
E.S. Hogg, R.D.A.  
I.H. Simons

TECHNICAL ASSISTANT:

Miss J.G. Birrell

## SEED PRODUCTION SECTION

### Staff Changes:

There have been a number of staff changes during the year.

Mr. Ragless accepted a position in a joint Australian-Thailand seed multiplication/storage project for 18 months which commenced in January, 1977.

Mr. Higgs was appointed supervising officer until the lucerne aphid control programme became such that he was involved with this programme full time.

Dr. Boyce was then appointed supervising officer of the Section.

Mr. Brooks transferred from the Murray Bridge office to Head Office to set the annual legume demonstration programme on a sound footing.

### Total Production:

#### Quantity of Seed

Total production of certified seed released for sale until 30th June, 1977 was 1,859 tonnes compared with 2,000 tonnes last year. This is surprising due to the lower Jemalong barrel medic and Hunter River lucerne crops in the North. This has been offset by a large Hunter River lucerne crop in the South East and the increase in oats and Clare subterranean clover crops.

The locust plague which passed through the Northern agricultural areas during last summer was particularly damaging to the lucerne crops. The lucerne seed harvest was about 15% of an average crop.

#### Yields

Yields were again at a reasonably high level, due to the greater experience and expertise growers are developing. In particular, Clare subterranean clover yielded exceptionally well in the Mundulla area with a few paddocks going over 1,000 kg/ha.

#### Diseases

Clover disease (*Kabatiella caulivora*) was not such a problem in 1976. The spread of grey leaf spot disease in all legume crops caused some concern in certified crops, but practically no damage appeared to the seed. The resistance of the Marri Lupin cultivar to this disease was quite noticeable.

#### Seed Quality

The hard seed percentage of a number of irrigated lucerne lines in the South East was greater than usual, particularly in the later harvested crops. Several lots of seed were scarified to overcome this problem.

### Seed Certification Programme:

#### Crops Sown Under Supervision

In the South East there has been a 25% increase in the pre-sowing inspections for the establishment of new certified seed crops. The most popular of these are the lucernes - Hunter River, Paravivo and a new lucerne called Luna, which is for an export market.

There was a similar increased interest in lupin sowings with the variety, Unicrop, being by far the largest area sown.

#### Oat Certification

The sowing of Avon and Swan oats for certification is becoming well established in the South East. All classes of seed, pre-basic, basic, 1st generation and certified, will be produced, with a considerable quantity of certified Avon becoming available from next harvest.

#### New Crops

A number of new crops have entered certification for the first time. They include Cassia oats, Glenelg linseed, Robinson snail medic, Marri lupins and Cream Gold onion.

#### Plot Testing

Twenty-three lines of seed were pre-control tested of which seven met the standard required for certification and two lines are still to be analysed, the remainder were rejected. A few lines were grown for observation only.

Some 358 annual post-control plots were sown and analysed. Eight lines failed to meet the required standard.

There were 58 lines of Hunter River lucerne under observation for entry into the certification scheme. Thirty-one lines of Hunter River lucerne sown in 1975 were accepted into the certification scheme with one being rejected.

Seven lines of Hunter River lucerne are being grown as spaced plants to check on winter growth behaviour of lines that have shown some inconsistency in the row plots.

All Paravivo lucerne generations are being grown as spaced plants to ascertain if any changes can be noted in the generations from breeders' seed through to 2nd generation.

O'Connors and Palestine strawberry clover rows are being grown for observation as well as Haifa and Tamar white clover.

All lines of perennial grasses grown for certification in 1975 are being grown for observation and identification.

All basic seed lines of Swan and Avon oats, Unicrop and Uniharvest lupins were grown for identification and observation.

In January, 1977, 30 kilogrammes of breeders' Currie cocksfoot was harvested, of which 6 kilogrammes have been sown in the South East to produce basic seed.

#### Extension Programmes:

##### Annual Legume Demonstration Programme

This programme was started in 1976 but did not get off to a good start because of the dry season and lack of manpower.

Mr. Brooks transferred to the Section in March, 1977 and has been involved with the setting-up and sowing of 16 sites using annual medics and subterranean clovers.

The seed industry and the Departmental district agronomists have again been involved. Locality and site plans have been completed and on-site sign posting arranged.

The aim is to demonstrate whether a reasonable economic return is possible by sowing and using correct management techniques with annual legumes.

#### Seed Production Meetings

Seed grower meetings were held on:-

- \* Latest developments in phalaris seed harvesting
- \* Production of shaftal clover seed
- \* Production of lupin seed
- \* Production of vegetable seeds

In addition a seed cleaners' school for south eastern cleaners was held in Adelaide.

#### Current Projects:

- \* Sirosa phalaris promotion
- \* Shaftal clover seed production
- \* Carbon banding of grass seed crops
- \* Lucerne seed production under irrigation
- \* Demeter fescue seed production
- \* Phalaris seed production
- \* Medic seed production
- \* Costs of seed production
- \* Seed storage
- \* Promotion of certified seed
- \* Fungicide investigations in shaftal clover

#### Conferences & Schools:

Mr. Higgs attended the following meetings which were held concurrently in Brisbane in February, 1977:-

- \* The Australian Seed Industry Advisory Committee meeting
- \* The Co-ordinating Committee for Seed Certification meeting
- \* The Chief Seed Testing and Regulatory officers meeting

In addition, Mr. Higgs met the O.E.C.D. representatives in Brisbane after the committee meetings.

The Seed Production Section has been represented at most of the Seed Industry Association and Seed Producers Association meetings.

Some members of the Section attended the Annual Symposium of the South Australian Seedgrowers Co-operative Ltd.

All members of the Section attended a mini-conference on the lucerne aphid problem.

Mr. Hogg attended the Australian Seeds Research Conference held at Tamworth, New South Wales during March, 1977.

Liaison:

A number of interstate and overseas visitors visited the Section during the year. Overseas visitors from Spain, Rhodesia and the United States and interstate visitors from Queensland, New South Wales and Victoria, including four certification officers from New South Wales on a study tour.

The Seed Industry Newsletter, which is published bi-monthly, has become well established as a medium for informing people involved with the seed industry of the latest developments, news items, Departmental policies, etc.

Mr. Higgs and Dr. Boyce have been actively involved in the proposed new seeds legislation. Mr. Higgs prepared a discussion paper on the proposed new legislation and this was widely circulated and commented on.

A summary of comments were presented to the Minister, who in turn has published a "white paper" detailing the principles of the new legislation. This is being circulated for comment by people involved in the seed industry.

Publications:

- Birrell, J.G. (1976) - Individual Growers' Performance, 1975-76. Seed Production Section Report.
- Birrell, J.G. (1976) - Certified Pasture Seed, Average Yield Per Grower, Per Property, Per Year, 1966-1976. Agronomy Branch Report No. 75.
- Brooks, N.M. (1977) - "Annual pasture legume cultivar demonstrations". Agronomy Branch Report No. 82.
- Brooks, N.M. & Carroll, P. (1977) - "Tama ryegrass and Maral shaftal clover - an annual pasture mixture". S.A.D.A.F. Fact Sheet 138/10.
- Cooper, G.E. (1976) - "Seed for certified crop establishment". S.A.D.A.F. Fact Sheet No. 140/43.
- Hogg, E.S. & Simons, I.H. - "South East Seed Industry Weed Control Activities - 1976". Agronomy Branch Report No. 77.
- Williams, S.G. & Brooks, N.M. (1977) - "Spotted alfalfa aphid and lucerne management". S.A.D.A.F. Fact Sheet 121/622.

WEED SCIENCE SECTION

SECTION LEADER:

G.B. Baldwin, M.Sc., R.D.A.

EXTENSION OFFICERS:

R.S. Britton, H.D.A.  
J.A. Dickinson, N.D.A. (U.K.), M.R.A.C.  
S.J. Garrick  
D.I. Murrie, R.D.A.(Hons.)  
K.R. Smith, W.D.A., R.D.A.T.

OFFICE ASSISTANT

Mrs. M. Hill

PEST PLANTS COMMISSION

EXECUTIVE OFFICER:

J.M. O'Neil, R.D.A.

PEST PLANT AGRONOMISTS:

C.R. Alcock, R.D.A., H.D.D.(Hons.)  
W. Judd, R.D.A.T.

PASTORAL LANDS ADVISER:

A.W. Lewis



WEED SCIENCE SECTION

The year 1976-77 proved to be no less difficult for the Weed Science Section than the preceding one. The Senior Agronomist (Weed Science), Mr. Baldwin, continued his studies in the United Kingdom returning to Adelaide in March, 1977, with a masters degree in Plant Protection. Mr. Smith successfully completed the fourth year in agricultural technology at Roseworthy Agricultural College and in February this year, Mr. Britton commenced the agricultural technology course at Roseworthy.

Graham Fromm was appointed to the Section on 1st November, 1976 to fill the vacant position at Murray Bridge.

Pest Plants Commission:

Appointments to the new Pest Plants Commission were gazetted on 22nd July, 1976 when Mr. O'Neil, a senior weeds adviser, was appointed as Executive Officer to that Commission. Two other weed extension officers, Messrs. C.R. Alcock and A.W. Lewis, were also transferred to the Commission advisory staff. Although the Weed Section has been reduced in numbers by these appointments, the Section's previous responsibility for noxious weed control will eventually be wholly transferred to the Commission.

Skeleton Weed:

The spread of the weed on Yorke and Eyre Peninsulas and in the Mid and Lower North continues to cause concern and although it is inevitable that infestations will increase in these areas, farmers are urged to take measures to delay this situation developing as long as possible.

Biological control following the introduction of the rust, midge and mite to the Murray Mallee is most effective in areas of high weed densities. Even so, partial control with the biological agents so far introduced is all that can be hoped for.

Although fairly common in New South Wales, a broader leaf variety of skeleton weed which is not attacked by the skeleton weed rust, has recently been reported from at least two centres in the Murray Mallee. C.S.I.R.O. is at present investigating several rusts in an effort to isolate one which may attack this plant.

Silver-leaf Nightshade:

It has now been shown conclusively that areas infested with silver-leaf nightshade have a depressing effect on cereal yields. In New South Wales yields were halved where weed densities exceeded 18 plants per square metre and in South Australia three to five plants per square metre gave wheat yield reductions of from 25 to 60 per cent, the heavier losses being experienced on the sandier soils. Co-ordinated work will continue between the four states, New South Wales, Victoria, Western Australia and South Australia, in an endeavour to solve problems associated with this weed.

### Biological Control of Emex spp.:

Further releases of the weevil, Apion antiquum, were made throughout the year but results continue to be disappointing. In no dryland situation have the insects been observed to survive the hot dry summer conditions. At the Loxton Research Centre under irrigated conditions, the insects have survived and multiplied.

Work is, however, continuing in an effort to find an agent more suitable to our climatic conditions and C.S.I.R.O. has already released a bio-type of Apion antiquum at Loxton which was collected from a hotter drier region of South Africa. Apion violaceum from Morocco is also under study.

### "Off-target" Damage:

Although instances of herbicide damage to crops were reported, no serious problems were experienced during 1976-77. An intensified educational programme to alert landowners to this danger has been planned for the Clare area this coming season following slight hormone spray damage to approximately 250 hectares of vines in the Auburn, Watervale area in November, 1976. A lower key programme will continue in other potential problem areas.

### Water Hyacinth:

Following agreement between the States of New South Wales, Victoria and South Australia and the Commonwealth Government, a sum of \$250,000 was expended on control measures in the Moree water hyacinth infestation during the year. Results to date have been encouraging following the construction of earth levees to divert flood waters from the area followed by 2,4-D spraying and the apparently successful introduction of a weevil for biological control. It is hoped that support for this project will continue until adequate control or eradication is achieved.

### Field Trials:

Trials to evaluate various herbicides for weed control in field crops, including cereals, lupins and sunflowers, continued although staff shortages and the extremely dry weather conditions during winter made assessments difficult.

Brackern fern control using a mixture of Asulox and distillate looks promising although final assessments have yet to be made. Interim observations indicate that the addition of distillate (10% of the mixture) does enhance the effectiveness of Asulox with the possibility that the recommended 12 l/ha of Asulox alone, could be reduced.

### Committees, Conferences, Training Schools & Study Leave:

- \* Mr. Baldwin returned from the United Kingdom in March, 1977 after attaining his master's degree in Plant Protection
- \* Mr. Smith completed the fourth year Agricultural Technology course at Roseworthy Agricultural College
- \* Mr. Britton commenced the Agricultural Technology course at Roseworthy in February, 1977
- \* The 13th Australian Weeds Committee meeting, Hobart, 5th-9th July, 1976 - D.I. Murrie

- \* Ministerial meeting with Water Hyacinth Working Party, Moree, New South Wales, 28th July, 1976 - D.I. Murrie
- \* Agronomy Branch Conference, Roseworthy Agricultural College, 30th August-1st September, 1976
- \* Noogoora burr interstate Conference, Sydney, 8th December, 1976 - D.I. Murrie
- \* Water Hyacinth Inter-governmental Liaison Committee meeting, Moree, New South Wales, 28th February,- 2nd March, 1977 - D.I. Murrie
- \* Silver-leaf nightshade corresponding group meeting, Wagga Wagga, New South Wales - 17th-21st April, 1977 - D.I. Murrie
- \* Aerial Agricultural Association of Australia Convention 77, Pt. MacQuarie, New South Wales - 28th May, 1977 - G.B. Baldwin

Current Extension Projects:

- \* Biological control of Emex spp. (continuing)
- \* "Off-target" damage educational campaign (continuing)
- \* Bracken fern control with the herbicide Asulam - using additives to increase effectiveness and reduce costs
- \* Weed control in lupins
- \* Yellow burr-weed control in cereals and pasture in the Murray Mallee
- \* Bromo grass control in cereal crops on Eyre Peninsula
- \* Survey of the effects of biological control on skeleton weed in the Murray Mallee
- \* Continued efforts to control skeleton weed by herbicides in the western half of the State
- \* Control of soldier thistle in cereal crops and pastures in the Mid North
- \* Appraisal of water hyacinth control measures at Moree, New South Wales