



DEPARTMENT OF AGRICULTURE, SOUTH AUSTRALIA

## Agronomy Branch Report

THE EXTENSION PROGRAMME FOR  
HILL COUNTRY IMPROVEMENT IN  
SOUTH AUSTRALIA

Progress Report 1966-1968.

J.D. McAuliffe

C. Phillips

Report No. 8

SOUTH AUSTRALIAN DEPARTMENT OF AGRICULTURE

AGRICULTURE BRANCH

EXTENSION PROGRAMME

HILL COUNTRY IMPROVEMENT

DESIGN OF PROGRAMME

1 AIM

To encourage wool and livestock production in the hill country areas of the Central and Northern Districts by:-

- (1) Improving pasture production and thereby sheep carrying capacity. The use of oats in a fodder conservation plan to supply, "year round" feed for sheep.
- (2) Improving wool yields per head by the above methods of better feeding and better husbandry.

2 AREA OF OPERATION

The estimated areas involved are:-

Red-brown earth farming land 1,500,000 acres.

Hill country capable of improvement 1,000,000 acres.

In general they include the Red-brown earth soils of the North (which to date have not shown the improvement which has taken place in the Mallee soil areas) and the adjacent hill country of Central and Northern Districts.

The following counties will be included as whole or part in the programme:

County	Dalhousie
	Frome
	Victoria
	Daly
	Stanley
	Burra
	Light
	Eyre
	Sturt
	Hindmarsh

(see attached map)

3 REASONS FOR THE PROGRAMME

- (1) Big increases in carrying capacity over the present figure of approximately  $\frac{1}{2}$  sheep per acre can be made.
- (2) The programme will embrace the Extension Programme "Legumes for Cereal Areas" in the districts which most need further encouragement.

4 OFFICERS RESPONSIBLE FOR THE PROGRAMME

- (1) The Chief Agronomist will be responsible for the initiation and functioning of the programme and to this end may require the assistance of the Chief Livestock Officer and the Chief Soils Officer for technical purposes and the Chief Extension Officer for extension diffusion.
- (2) The Senior Agricultural Adviser working with a nominee of the Extension Branch will co-ordinate all phases of the programme.
- (3) The District Agricultural Advisers for Central, Bala-klava, Upper North, Lower North, and Murray Bridge will be responsible for the programmes within their districts
- (4) Bushfire Protection Officers.

5 MEDIA USED

- (1) Personal contacts by District Agricultural Advisers and three project officers whose salaries and expenses are met by the Wool Research Trust Fund.
- (2) Group activities of meetings and field days organised through the Agricultural Bureau.
- (3) Mass Media
  - (a) Local newspapers
  - (b) "The Stock & Station Journal", the Adelaide "Chronicle" and the Department of Agriculture news bulletins.
  - (c) Broadcasting stations 5MU, 5CK and 5AN.

6 THE PROGRAMME FOR 1965

- (1) The Senior Agricultural Adviser and the District Agricultural Advisers concerned to make a situation analysis in respect to the following items to help in determining recommendations and deciding priorities for demonstration work:

- (a) Produce a map of the area showing land use zones based on soils and rainfall.
  - (b) Review present carrying capacity and assess the factors limiting production.
  - (c) Review Legume recommendations for each zone - determine where trials are necessary.
  - (d) Review super application information and decide recommendations.
  - (e) Review information about standing oat crops and determine how the growing of these crops be integrated into the programme.
  - (f) Review the prevailing economic position on farms in the area.
  - (g) Review methods being used for development including Cape Tulip Control; Aerial top dressing and the use of Perennial Grasses.
- (2) As determined from the above, decide where demonstration plots be placed this year.
- (3) Organise Field Days during 1965.

The programme designed for the 1965 season was commenced during that year. Production of a map of the area showing land use zones was commenced. The reviews of (b), (c), (d) and (e) above were made and a "work plan" based on departmental recommendations was produced for the use of officers working in the field at the person-to-person and group levels. Details of these are as follows:-

RECOMMENDATIONS AT COMMENCEMENT OF PROGRAMME 1965

Area	Rainfall	Legumes	Grasses	Ave. am. Super	Oats	Present Carrying
Higher rainfall podsollic soils	20"	Mt. Barker-Eden Valley naturally occurring - Woogenellup. Clare for the less acid soils. Lucerne for the better drained flats and lower slopes. Strawberry clover for wetter flats.	Phalaris tuberosa Perennial Rye Grass on alternative for better situations	90 lbs.	oats where possible	1/acre
Steep rocky hill country predominantly non-arable	17"-20"	Clare, Geraldton, Yarloop, Woogenellup, Barrel 173 for lime soils.	Phalaris tuberosa when possible	60 lbs.	oats where possible	1/3 /acre
Hill country higher percentage arable.	17"-20"	As above, lucerne on moderate slopes.	Phalaris tuberosa Currie Cocksfoot Wimmera Rye Grass	90 lbs.	oats where possible	1/2-1 /acre
Hill country predominantly red-brown earth soils	14"-20"	Geraldton, Dwalganup Yarloop for some of the better rainfall areas lucerne.	Wimmera Rye Grass Currie Cocksfoot and Phalaris in favoured areas	40-60lbs.	oats where possible	1/3-2/4 S/A
Hill country predominantly Calcarious Soils	12"-15"	Lucerne-Barrel 173 = Early Cyprus barrel	W.R.G.	40-60lbs.	oats where possible	1/3-2/4 S/A
Hill country predominantly Calcarious Soils	15" & over	Lucerne - Barrel 173- Early Gyprus barrel, Clare	W.R.G. - Currie Cocksfoot and Phalaris in favoured areas	40-60lbs.	oats	1/3-2/4 S/A

7 PROGRAMME FOR 1966

The programme for 1965 was continued for 1966. All sections started in 1965 were given further consideration and the others given some attention.

- (a) The map of the area showing land use zones based on soils and rainfall was to be completed.
- (b) The collection of data to assess factors which were limiting production was commenced.
- (c) Legume recommendations to be further reviewed.
- (d) Super recommendations to be further reviewed.
- (e) Work to commence in collating information about standing oat crops.
- (f) A start to be made collecting data for the assessment of economics of using superphosphate on Hill Country.
- (g) Work to commence on the control of weeds aerial top dressing and the use of perennial grasses.

So far as possible this programme was adhered to:-

- (a) was accomplished and a "mini" copy appears in Appendix I. "Legumes for our Hill Country" (V.J. Patrick)
- (b) factors limiting production were considered and the following were listed as being influencing factors:-
  - (1) People
  - (2) Availability of finance for Hill Country in relation to the rest of the property.
  - (3) Availability of water
  - (4) a) Lack of Superphosphate  
b) Limit to application of Phosphate to natural pastures.
  - (5) Machinery available for Hill Country Work.
  - (6) Lack of suitable pasture species.
  - (7) Control of insect pests.
  - (8) Lack of subdivision for better pasture utilization
  - (9) Weeds, e.g. Cape Tulip, Saffron Thistle.
  - (10) Vermin Control.

- (c) Legume recommendations were further reviewed and modifications made to the Zones as determined in 1965. These are also contained in Appendix I. Legumes for our Hill Country (V.J. Patrick).
- (d) The importance of the use of Superphosphate to improve quality and quantity of pasture production in hill country was given special attention throughout the year through the medium of bureau meetings and field days.
- (e) Actual and simulated aerial top dressing trials were started, perennial grass trials were commenced and a programme of work on the control of Salvation Jane was continued.

## 8 PROGRAMMES FOR 1967 and 1968

These comprised in the main a continuance of the programme set in 1965 and re-organised in 1966. Activities in the 1967 season were affected by drought.

### A SUMMARY OF THE FIELD TRIALS AND DEMONSTRATIONS BEING CONDUCTED

#### I METHODS OF ESTABLISHMENT

##### 1 Seeding without cultivation

Because of the inaccessability of much of the hill country and the difficulties of seeding by conventional methods it was decided to look at the possibility of aerial seeding and methods of seeding without cultivation. This work, where planes were not available simulated aerial application of seed and superphosphate as closely as possible.

1 site was established in 1965  
 5 sites in 1966  
 4 sites in 1967  
 1 site in 1968

A full range of the annual legumes suitable to the respective sites and lime pelleted and non-pelleted seed were used in these trials.

Generally results have been disappointing for a variety of reasons including the drought season of 1967, Red legged earth mite damage to seedings and to ants consuming seed spread before the break of the season. However, in some situations, the establishment of legumes plus the effect of top dressing have been sufficiently promising to induce the landholder to expand his programme.

## Aerial Seeding in Upper North, 1967

Four sites aerial seeded in April and May, onto dry hills. Lack of good opening rains prevented a satisfactory germination. On one site where some ground cover gave protection from drying winds satisfactory establishment and seed set resulted. Another site on limey hills resulted in 20% germination of Rose clover which resulted in a satisfactory seed set.

### Comments

1. When seeding in mid April to mid May there is a 50-70% chance of good opening rains for germination.
2. Some short dry ground cover gives an advantage over bare hills, by preventing runoff and allowing the seed to germinate in a moist environment.
3. Aerial seeding is inexpensive, approx. 25 cents for 2 lbs. seed per acre and 3 cents for each additional 2 lbs. of seed. Graziers can mix their own seed in bulk super heap or loader scoop before super goes in aircraft hopper at little extra expense above cost of super application.
4. Selection of varieties best adapted for the growing season, rainfall and soil type is essential.

## 2 Chemical Ploughing

To develop interest and to gain information about chemical ploughing two trials were established in 1966.

At one site chemical ploughing and sod seeding was compared with seeding into a prepared seed bed, and at the other, four methods of seeding were compared, after the application of chemical to control weed growth.

### Comments

In 1966 sowing on a prepared seed bed was far superior to sod seeding into chemically ploughed ground at Mt. Crawford. On the other site, at One Tree Hill, broadcasting followed by a spiked roller, broadcasting after cultivation and disc drilling methods were moderately successful. Establishment by straight broadcasting was unsuccessful with the exception of one species, Currie Cocksfoot.

In 1968 a hilly paddock at Lyndoch completely infested with Salvation Jane was sod seeded with 6 lbs. per acre of Woogenellup subterranean clover and 20 lbs. per acre of Avon oats. The paddock was boom sprayed four weeks later with  $\frac{1}{2}$  lb. a.e. 2,4-D per acre. Heavy grazing of spray affected Salvation Jane occurred. An excellent subterranean clover pasture resulted with a good seed set



3 Top dressing and trampling by livestock

At two sites in 1968 seed and fertilizer were applied and stock concentrated and hand fed on the areas.

Establishment of Woogenellup and Geraldton subterranean clover was good at one site where odd plants of Currie Cocksfoot also established. At the other site the seeded spp. failed. Weeds growth (*Erodium* spp.) provided vigorous competition at both sites.

4 Seeding of *Phalaris tuberosa* under an oat crop

At one site, Australian *Phalaris* and sub clover was under-sown with oats in May, 1968. The paddock was cut for hay in spring and the regrowth allowed to mature before heavy grazing in January. Establishment of *Phalaris* was excellent. This little used method of seeding reduced the cost of establishment of *Phalaris*.

II Perennial Grass Comparisons

A general lack of interest in perennial grasses by landholders in the area and a lack of knowledge about the performance of some of more recent cultivars under South Australian conditions led to the establishment of trial sowings over a wide range of conditions.

2 sites were established in 1966.

7 sites in 1967

7 sites in 1968 - some of these were repeated sowings on the 1967 sites where failure was due to drought.

Details of site situation and notes on the performance of some of the spp. are as follows:-

1966 sowings

Mt. Crawford	28" rainfall	Establishment of sown cultivars fair. Winter seedling growth of C.P.I. 19305 in year of sowing was outstanding. Survival of all cultivars following drought conditions of 1967 was very poor. Observations will continue in 1969.
Wirrabara	23" rainfall	Comparison between Australian <i>Phalaris</i> and Currie Cocksfoot. Survival of both species good, their performance also good.

1967 sowings

Melrose	26" rainfall	Germination of sown species good, struggled for survival under drought conditions of 1967. Observations to continue in 1969.
Birdwood	28" rainfall	Failed to survive summer in year of sowing - discontinued.
Springton	18" rainfall	Very poor establishment. Plots sprayed May 1968 with $\frac{1}{2}$ lb. a.e. 2,4-D Amine to control Salvation Jane. G.A. 40 p.rye. persisted the best.
Rhynie	21" rainfall	Germination of sown species good. Weed competition (geranium) and drought conditions prevented satisfactory establishment. Scattered plants of Phalaris C.P.I. 19305, Sirocco phalaris, Australian phalaris, Currie Cocksfoot, Berber cocksfoot, G.A. 40 perennial ryegrass, G.A. 41 (now Medea perennial ryegrass) and Victorian perennial ryegrass.
Manoora	19" rainfall	Scattered plants of Sirocco phalaris Currie and Berber Cocksfoot, G.A. 40 and Medea perennial ryegrass survived and established. Observations to continue in 1969.
Tungkillo	18" rainfall	Only G.A. 40 and Medea perennial ryegrass established, and these were only fair. Their production in autumn 1968 was good but they were out produced in winter and spring by barley grass and <u>geranium</u> . Plots were sprayed with Diquat to reduce <u>geranium</u> . Heavy, continuous grazing during first summer in year of sowing obviously inhibited growth and production from these two perennial ryegrasses. Observations to continue in 1969.
Auburn	20" rainfall	Good establishment of all species sown Sirocco, Medea and Currie outstanding in autumn and winter of 1968, but all species swamped by annual grasses during spring. Trial to be continued.

1968 sowings

Kanmantoo	18" rainfall	Excellent establishment of all species sown. Quadret cuts taken for dry matter yield. Sirocco, Medea, Currie and Berber highest yielding in year of sowing.
Moculta	18" rainfall	Same as above.
Delamere	30" rainfall	Sown on newly cleared country. Very good establishment of all species sown. Siro 1146 Phalaris showed outstanding seedling vigour, growth and establishment on this site.
Eden Valley	24" rainfall	Good establishment, some areas waterlogged, Sirocco and Siro 1146 had outstanding seedling vigour.
Williamstown	26" rainfall	Sown by sod seeding, into Reglone and Grammoxone sprayed area. Excellent establishment of all species.
Tungkillo	18" rainfall	Competition from Geranium and Capeweed prevented a reasonable establishment. Observations to be made in 1969.
Clare	22" rainfall	Sown in November, survival generally very poor. New plot to be sown in 1969.

Weed Control

Salvation Jane, Capeweed and Wild Geranium are pasture weeds which on occasions reach dominating proportions in pastures in the area.

The control of Salvation Jane in a renovation programme has been studied since 1967 and it is proposed to continue the work at this site.

Results to date - Lyndoch trial

In April, 1967, spraying rosette leaves of Salvation Jane gave 100% control on all four replicates using 1 lb. a.e. 2,4-D Amine and  $\frac{1}{2}$  lb. a.e. 2,4-D Ester.

Where  $\frac{1}{2}$  lb. a.e. 2,4-D Amine was used, 100% control was achieved on two replicates and 80% and 94% control on the other two replicates.

In April, 1968, spraying rosette leaves of Salvation Jane with  $\frac{1}{2}$  lb. a.e. 2,4-D Ester gave 100% control on two replicates with 97% and 92% control on the other two replicates. The 1 lb. a.e. 2,4-D Amine treatment averaged 93% control on four replicates. The  $\frac{1}{2}$  lb. a.e. 2,4-D Amine treatment averaged 78% control on four replicates.

Mention has been made of sod seeding followed by 2,4-D spraying under Methods of Establishment.

In 1968 at one site the chemical Bucril was used to control capeweed in oats. The very wet season was favouring capeweed growth which threatened to ruin the oat crop.

Bucril M.A. was applied as a post emergent seedling spray. Outstanding control of Capeweed resulted with no apparent damage to the oat crop. Five chain strips were reaped from a sprayed and unsprayed area. The sprayed area yielded 54 bushels per acre, the unsprayed area yielded 31 bushels per acre.

Information from W.E. Hawker who conducted a trial on his property at Clare revealed similar outstanding results with Bucril for controlling Capeweed in an oat crop.

#### Legume Establishment on Sandy Soils for poor fertility

At one site in 1968 a trial using inoculated seed, lime pelleted seed, superphosphate, lime, and trace elements were used in various combinations in an attempt to get information about establishment on these soils.

Excellent establishment followed inoculation. No differences were noted between the lime and no lime treatments or from lime pelleting.

#### Dryland Lucerne comparisons

In 1968 three lucerne varieties, viz. Hunter River, African and Cancreep were sown at two sites.

It is expected that establishment counts and dry matter yields will be obtained from these sites which are situated away from the recognised lucerne growing areas.

#### Legume variety demonstration on hard setting clay loam soils

On one site (19" rainfall) in 1968 the suitability of Jemalong barrel medic, Geraldton and Woogenellup subterranean clovers is being demonstrated.

Oat Trials

In 1968 two trials of likely oat varieties were carried out to find out the highest yielding varieties, information on recovery after grazing and grain holding ability.

The varieties tested were Avon, Kent, Early Kherson, Coolabah Irwin, Swan, Bundy and Cooba. The top three varieties for grain yield were Swan 48.0 bush., Avon 46.9 bush. and Coolabah 43.6 bush. For grain holding ability Cooba appeared slightly superior to Early Kherson which in turn was better than Swan and Avon.

Extension Activities

At the group level, bureau meetings and field days have been used to extend the information being collected and documented about improvement of pasture in the hill country of the State. No complete record has been kept of the meetings at which this work is discussed. However, it is supplied on request by the three district agricultural advisers working in the area as well as the officers directly associated with the programme.

Well attended field days have been conducted as follows:-

1965	Keyneton	Hill country pasture establishment and standing oat crops.
1966	Rhynie	Inspection aerial seeding, standing oats, stone clearing and Phalaris establishment
	Mt. Crawford	Inspection perennial grass species, and methods establishment of Phalaris.
	Belalie East	Legume establishment, variety recommendation.
	Wirrabara	Bulk handling super and aerial top dressing.
	Lyndoch	Chemical ploughing and sod seeding phalaris, sub clover.
	Truro	G.D. Webber - Agricultural Bureau Field Day - clover establishment under oats in hilly paddocks.
1967	Auburn-Manoora	Perennial grass species comparison.
	Lyndoch	Salvation Jane Trial, sod seeding oats.
	Moculta-Angaston	Skeleton Weed outbreak inspection, demonstration for procedures of eradication.

1968	Keyneton	Establishment lucerne and clover under oats in rough hill country - Pasture School - District Adviser.
	Lyndoch	Chemical ploughing using 2,4-D for sod seeding oats and clover, Salvation Jane Trial.

In carrying out the survey work, various trials to obtain information and supervising demonstration work the officers employed on this programme have been able to discuss problems of hill country improvement at the person-to-person level. It seems that it is at this level that the most effective work can be done.

#### Staff

V. Patrick	July 1965 April 1968	Adelaide resigned
A.E. Hincks	July 1965 11/7/68	Jamestown transferred
Campbell Phillips	May 1967 November 1968	Nuriootpa Adelaide
T.J. Dillon	3/2/69	Jamestown
P.D. Fairbrother	19/2/69	Nuriootpa

Maintaining the full compliment of three Project Officers sponsored by the Wool Research Trust Fund has been difficult. The officers employed have given enthusiastic and efficient service and have assisted greatly in making the progress made so far with this programme. The shortage of suitable officers for these positions and the movement of those employed to more responsible positions has affected the progress of this programme.

#### Seasonal Conditions 1965

The first three months of the year were very dry. Only light rains were recorded in April but good falls in May and June provided a solid start to the season. Favourable conditions continued through July, August and early September. Dry conditions then followed until November when substantial rains occurred. These were followed by thunderstorm rains in December. Although too late to be of full value they proved useful in most of the hills areas.

#### Season Conditions 1966

Isolated thunderstorms occurred during January and February. These were followed by general rains in March, the usefulness of which was largely offset by a completely dry April.

Useful falls "opened" the season in May and were followed by frequent light falls in June and above average rain for July. Rains in August and October were disappointing but September was above average.

Heavy falls were recorded towards the end of November and early December but these were too late to be of any real value to annual pasture plants. The perennials, lucerne and Phalaris benefited.

#### Seasonal Conditions 1967

Unusually dry conditions in April, inadequate general rains in May, continuing dry conditions in June, and patchy rainfall during July which varied from a few points in some areas to above average in others resulted in a very poor start to the pasture season.

Following useful rains in August, the favourable rains of early September and October were offset by the hot dry and windy finish to these months.

The rainfall over the agricultural areas of the State was only 50% of normal - one of, if not the driest season on record.

#### Seasonal Conditions 1968

Rainfall well in excess of average was recorded over the whole State for the months of January, February and March. These were followed with what could be termed the "opening" to the season during the last week of April. Good winter and early spring rains followed by dry conditions prevailed for most of September. General rains in October with follow up falls in November and December brought record total rainfall for the year at many centres. The season could well be described as one of the best on record for pasture production.

# Country — Upper and Lower North and Central Districts

