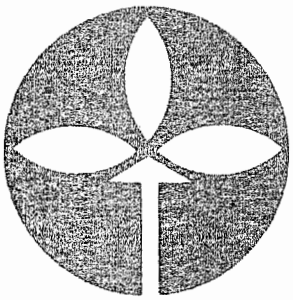

DEPARTMENT OF AGRICULTURE, SOUTH AUSTRALIA

Agronomy Branch Report

PASTURE ESTABLISHMENT AND PASTURE COMPETITION EXPERIMENTS ON SOILS INFESTED WITH SKELETON WEED IN THE MURRAY MALLEE OF SOUTH AUSTRALIA

R. Mc. R. Wood

Report No. 33

FOREWORD

This series of eight experiments was commenced in 1963 with financial support from the Wheat Industry Research Council and the South Australian Wheat Industry Research Committee.

The work was co-ordinated through the Sub-Committee for Skeleton Weed research which was formed at the 53rd Meeting of the Australian Agricultural Council in 1960. This Sub-Committee continued its work until November 1971 and during that period approximately $630,000 was directed from Wheat Funds to the skeleton weed research projects carried out by various research groups throughout Australia. South Australia was allocated approximately $57,000 which not only supported the work reported herein but it also made possible the projects recorded in Agronomy Branch Report No. 31 and No. 32. Mr. A.F. Tideman, acted as the South Australian technical representative on the Sub-Committee.

Although many farmers in the Murray Mallee assisted by making land available for trials, most of the work was conducted on the properties of Messrs. D.G. Dutschke of Karoonda and C.H. Johnson of Parilla. Their helpful co-operation is greatly appreciated.

I also wish to thank my colleagues in the Department of Agriculture for their advice and assistance. Much of the work reported was commenced by my predecessor, R.J. Luxmoore. His work was a good foundation for this programme. I also wish to particularly mention Messrs. Spry, Hughes and Lewis whose assistance in the field enabled the work to proceed under the many difficulties experienced.

October, 1971

R. McR. WOOD

Pasture Establishment and Pasture Competition Experiments on Soils infested with Skeleton Weed in the Murray Mallee of South Australia

a. BACKGROUND

In a publication in 1951, H.E. Orchard referred to the value of lucerne as a competitive pasture plant on skeleton weed areas, and urged that "paddocks should be sown to this valuable crop before the weed has completely taken charge". He emphasised however that lucerne needed "every assistance" in the early stages to establish and compete with another deep rooted perennial plant. Cuthbertson recently pointed out that lucerne almost completely eliminated skeleton weed in a paddock at the Wagga Experiment Farm in the period 1929-1934.

The above references to the value of lucerne seem quite logical, but in the Murray Mallee, reported cases of successful lucerne establishment and competition on Skeleton Weed areas have been very rare. However, there are cases where the lucerne, sown before the weed had any hold on the areas involved, has established successfully

A suggested reason for the apparent lack of farmer interest in pasture competition was the emphasis on chemical eradication in the first 15 years of skeleton weed control in South Australia. A further reference of the value of lucerne as a competitor was made by B.G. Hall in 1961, and his article contained advice on the best way to establish lucerne based on observations.

The first Departmental research along the line of agronomic control of skeleton weed in this state was in 1963, when R.J. Luxmoore commenced some small plot experiments in the Loxton district. Lucerne and annual medics were used. In 1964 lucerne was sown in larger plots at Parilla (see Project 3, experiment 5).

Wells, working at Walpeup in the Victorian Mallee has produced some very encouraging results with lucerne and annual medic competition on skeleton weed land. Wells and McClelland (1968) claim that densities of established lucerne of 3-4 plants per square foot are needed to give a 75 per cent reduction in skeleton weed density after 2-3 years of careful management. Competition between lucerne and skeleton weed is mainly for moisture during the summer period, whereas the effectiveness of annual medic competition was severely limited by rainfall variability (Wells, 1969).

b. OBJECTIVES

To assess the ability of annual pasture legumes and lucerne to establish, improve soil fertility and suppress skeleton weed by competition. To involve comparison of various species and cultivars of legume, techniques of sowing and use of fertilisers to promote successful establishment.

c. GENERAL SUMMARY

This project has confirmed the earlier indications (Project 3 Expt. 5) that lucerne (c.v. Hunter River) can be established successfully on areas infested with skeleton weed in the Murray Mallee.

The soil types where skeleton weed has formed dense infestations are very infertile and this fact has clouded the effects of treatments aimed at improving establishment of the lucerne.

The hand sown pasture competition experiments at Loxton gave an indication that lucerne would compete with skeleton weed, and there appeared to be no difficulties in establishment on the red mallee sand. However, a similar experiment on a slightly acid sand over clay at Karoonda was a failure as far as lucerne establishment was concerned.

The rotation trial at Parilla - Expt. 4 - was not run to its completion, but served to show how Harbinger medic and Dwalganup sub. clover would persist under grazing through two drought years. Lucerne, already weakened by a poor establishment did not survive the affects of grazing and the drought.

In experiments 5-8, herbicides applied in October were compared on their value for skeleton weed control over the summer-autumn period. A chemical fallow coupled with minimal residues of herbicide, was expected to improve establishment of the lucerne, sown the following May. A mechanical fallow treatment was planned, but was only included on one site.

Results from the use of herbicides such as 2,4-D, Amitrol and an atrazine - amitrol mixture did not show any consistent benefit from one season to the next. Application of 12 oz. a.e. 2,4-D in October, 1968 on one site resulted in an improved lucerne establishment, which was observed in August 1969 and October 1970 (Expt. 5). However on an adjacent site, (Expt. 7) the same treatment applied in October 1969, did not show any observable advantage. On this latter site, a small advantage due to the Amitrol + atrazine treatment was observed

Experiments 6 and 8 have given very little information because of poor seasonal conditions insect attack and infestations of other weeds. They have served to show the importance of thorough seedbed preparation for lucerne sowing. The chemical fallow treatments had a very minor effect on these sites.

d. TRIAL REPORTS

EXPERIMENT 1. (formerly WE 36 Expt. 1)

ASSESSMENT OF SOWING RATE OF ANNUAL MEDICS AND LUCERNE IN COMPETITION WITH SKELETON WEED.

LOCATION:

Loxton. Section 10B Hundred of Pyap (R.0 Habel)

Rainfall Average 10.71" 1963 rainfall = 13.1"
1964 = 13.5"
1965 = 8.7"

Soil Type Sandy Mallee

DURATION:

May 1963-August 1965.

DESIGN:

Randomised block factorial of 3 replicates.
Species (4) Barrel medic, Jemalong medic, Harbinger medic and Hunter River Lucerne.
Sowing rates: Nil, 1, 5, 20 lbs/acre.
Plot Size: 20 links x 10 links.

METHODS:

Plots were hand sown with 105 lbs. superphosphate and 35 lbs. sulphate of ammonia per acre on 22/5/63. Assessments of skeleton weed density were made during the growing season. Pasture establishment counts were made on 10/7/63. Pastures were sprayed with DDT and Malathion for control of earthmites on 19/6/63 and 9/6/64.

RESULTS:

(a) Spring assessment of Skeleton Weed Density (22/10/63)
Statistical analysis of these assessments indicated no difference between pasture species but skeleton weed density was reduced at the higher seeding rates of 5 and 20 lbs./acre:

Seeding Rate (lb. per acre)	Mean Skeleton Weed Density (per sq. ling) 22/10/63
0	3.17
1	3.33 L.S.D. 5% = 0.58
5	2.58
20	2.33*

Sown Legume	Mean Skeleton Weed Density (per sq. link)
Lucerne	2.76
Barrel	2.90
Jemalong	2.93 N.S.
Harbinger	2.86

(b) Summer Assessment (15/1/64) Skeleton Weed Density

Seeding Rate (lb. per acre)	Rosettes (per sq. link)	
0	2.60	
1	2.70	
5	2.22	N.S.
20	1.98	

Sown Legume	Rosettes (per sq. link)
Lucerne	1.95
Barrel	2.49
Jemalong	2.47
Harbinger	2.59

(c) Autumn Assessment (14/4/64) Skeleton Weed Density

Medic	Rosettes (per sq. link)	
Barrel	2.47	
Jemalong	2.65	
Harbinger	2.72	N.S.
Lucerne	2.35	

Seeding Rate (lb./acre)	Rosettes (per sq. link)
0	3.25
1	2.53
5	2.56
20	1.86

(d) Spring Assessment (21/10/64) Skeleton Weed Density

Sown Legumes	Rosettes (per sq. link)
Barrel	2.94
Jemalong	3.08
Harbinger	3.07
Lucerne	2.87

Seeding Rate (lb. per acre)	Rosettes (per sq. link)
0	3.00
1	3.13
5	2.81
20	3.17

In 1963 and 1964 seasons there were no significant differences between medic species on skeleton weed density. The higher seeding rates however did reduce skeleton weed density, but at the spring assessment in 1964, these differences were not apparent. The pasture growth in 1964 was not good and skeleton weed density built up again to be the same for all treatments.

(e) Spring Assessment (21/10/65)

There was no significant effect of the initial seeding rate treatment on skeleton weed density however differences between legume species were obtained in 1965 season.

Skeleton Weed Density

Sown Legume	Rosettes (per sq. link)
Barrel	2.47
Jemalong	1.72
Harbinger	1.63
Lucerne	1.07*
L.S.D. 5% = 0.57	

Seed Rate (lb. per acre)	Rosettes (per sq. link)
0	1.96
1	1.81
5	1.54
20	1.58

DISCUSSION:

The 1965 assessments of skeleton weed density suggest that lucerne has been the most effective competitor with the weed. This effect was less apparent in 1964 or 1963, indicating that the competitive ability of lucerne increases once it becomes well established.

The plots were hand sown and these techniques may result in abnormal establishment. This trial was carried out without grazing. This factor must be borne in mind when considering the practical aspects of pasture competition with skeleton weed.

EXPERIMENT 2. ASSESSMENT OF SEEDING RATE AND PHOSPHATE APPLICATION ON THE COMPETITION OF ANNUAL MEDICS WITH SKELETON WEED

LOCATION:

Karoonda. D. Dutschke Sn. 44 Hundred Marmon Jabuk.

Rainfall Average: 13.8" for 1964 = 13.8"
1965 = 8.5"

Soil Type: Sandy Mallee Soil

DURATION:

May 1964-August 1965.

DESIGN:

Randomised block factorial: 3 replicates
Species: Hannaford medic, Jemalong medic, Harbinger medic.
Superphosphate: 0, ½, 1, 2 cwt. per acre.
Plot Size: 20 links x 10 links.

METHOD:

The trial was hand sown on 14/5/64.
Assessments of skeleton weed density were taken during spring.

RESULTS:

In both the 1964 and 1964 seasons, there were no effects of annual medic pastures on skeleton weed density.

The mean density for the site was 5.5 rosettes per sq. link in 1964 and 3.0 rosettes per sq. link in 1965 season.

The pasture growth obtained on this site was poor and legume nodulation may have been a problem. A test for soil pH was made with the following results:

		pH
Site 1	0-3"	6.0
	3-6"	5.8
Site 2	0-3"	5.9
	3-6"	6.3

CONCLUSION:

The acid nature of this sand suggests that the use of lime and lime pelleting of legume seed may greatly enhance pasture growth.

EXPERIMENT 3. ASSESSMENT OF SEEDING RATE AND PHOSPHATE APPLICATION ON THE COMPETITION OF TWO LUCERNE VARIETIES WITH SKELETON WEED

LOCATION:

Loxton. R.O. Habel. Sm.10' Hundred Pyap.

Rainfall average: 10.7" for 1964 = 13.5"
1965 = 8.7"

Soil Type: Sandy Mallee soil

DURATION:

15/5/64-21/10/65

DESIGN:

Randomised block factorial: 3 replicates
Varieties: Hunter River, African
Superphosphate: 0, ½, 1, 2 cwt. per acre
Sowing Density: 2, 5 lb. per acre
Plot Size: 20 links x 10 links

METHOD:

The trial was hand sown on 15/5/64.
Assessments of skeleton weed and lucerne were taken during spring.

RESULTS:

(a) In the 1964 season, the establishing lucerne did not significantly influence skeleton weed density. The mean density for the site was 5.6 rosettes per sq. link at the spring assessment (21/10/64). Lucerne density was increased with seeding rate from 3.1 plants per sq. link at the low sowing rate to 3.8 plants per sq. link at the high sowing rate.

Visual estimates of lucerne vigour were also taken on 21/10/64 with the following significant results: (The data was transformed to Fisher's Scores (+ 1.5) for ordinal or ranked data).

Lucerne Vigour

Seeding Rate (lb./acre)	Mean (transformed data)	
2	1.08	
5	1.39	L.S.D. 1% = 0.25

Superphosphate (cwt./acre)	Mean (transformed data)	
0	0.53	
½	1.22	
1	1.51	L.S.D. 5% = 0.27
2	1.69	

There was an increase in lucerne vigour with increase in superphosphate rate up to 1 cwt. per acre, however the seeding rate effect observed was probably due to lucerne density rather than vigour.

(b) In the 1965 season, skeleton weed density counts were taken on 21/10/65 and a reduction in density was noted with increase in phosphate application rate. There are small differences between lucerne varieties and seeding rates.

Superphosphate (cwt/acre)	Mean (rosettes per sq. link)
0	3.81
½	3.41
1	2.93
2	2.52

L.S.D. 5% = 0.54

Pastures	Mean (rosettes per sq. link)	
Volunteer	3.71	
Hunter River 2 lb./ac.	3.47	
Hunter River 5 lb./ac.	2.81	
African 2 lb./ac.	3.10	N.S.D. between rates
African 5 lb./ac.	2.74	or cultivars.

L.S.D. 5% = 0.60

EXPERIMENT 4. SOIL FERTILITY CHANGES AND CEREAL RESPONSES TO FERTILISER NITROGEN FOLLOWING LEGUME PASTURES ON SKELETON WEED LAND.

LOCATION:

Parilla. C.H. Johnson Section 2 Hundred of Parilla.

Rainfall: Average 13.7" 1964 = 17.8"
1965 = 11.7"
1966 = 10.89"

Soil Type: Solodized solonetz.

DURATION:

Pasture for 3 years - 1965-1967
Crop in 4th year - 1968

DESIGN:

Randomised block with four replicates.

Treatments
Harbinger medic
Jemalong medic
Lucerne (Hunter River)
Dwalganup Sub Clover

Plot Size: 28' x 90'

METHOD:

In 1964: Treatments were sown with 120 lb. superphosphate per acre but establishment was poor due to wind blasting.

In 1965: Species were resown on 1/4/65 with 130 lb. superphosphate and 100 lb. lime per acre. The legume seed was inoculated and lime pelleted and sown with fertiliser, using disc drill equipment.

The annual legumes were sown at 10 lbs. of seed per acre and the lucerne at 2 lbs. per acre.

On 5/4/66 the plots were topdressed with superphosphate (84 lbs./acre) and trace elements copper sulphate, zinc sulphate at 7 lb./acre and molybdenum trioxide, 2 oz./acre. The fertilizer was applied with a disc drill set to a depth of 1½"

In July 1966, 80 lbs. of muriate of potash (48%) was applied with the disc drill, and insects were treated with Rogor (3 ozs./ac.) using a portable mister. On 14/9/66, the plots were finally assessed and skeleton weed density counts were taken.

RESULTS:

(a) Pasture production:
Quadrat cuts were taken on 22/9/65 and the following mean total dry weight yields were obtained.

Sown Legume	Yield (lb. per acre)
Harbinger	1500 Usually good
Jemalong	1530
Lucerne	1020
Dwalganup	1400

(b) Pasture composition:
This was visually estimated using a four class system.

Class 1	100-75% legume
2	50-75%
3	25-50%
4	0-25%

The mean estimates indicate the high percentage legume content of the pastures.

Sown Legume	Mean Estimates
Harbinger	1.8
Jemalong	1.3
Lucerne	2.3
Dwalganup	2.0

(c) Skeleton Weed Density
Quadrat counts were made on 28/10/65 and the following mean densities were obtained.

Sown Legume	Mean Density (rosettes/sq. link)
Harbinger	10.4
Jemalong	10.6
Lucerne	14.1
Dwalganup	15.9

(d) Soil nitrogen status
Samples were taken on and total soil nitrogen was determined (Department of Chemistry).

Total Soil Nitrogen

Depth -	0-3"	0.096%
	3-6"	0.042%

(e) Pasture composition 1966 season
The method used was the same as for 1965. The mean estimates for the four pasture species are given.

Sown Legume	Mean Estimates
Harbinger	2.0
Jemalong	2.9
Lucerne (Hunter River)	4.0
Dwalganup sub. clover	2.2

The proportion of legume was less in the 1966 season than in 1965. Lucerne density was very low, suggesting that many plants died in the summer period. The plots received light grazing in summer.

(f) Skeleton weed density 1966 season
Plots were counted on 14/9/66. Mean densities are given below:

Sown Legume	Skeleton Weed Denisty (Rosettes per sq. link)
Harbinger	4.4
Jemalong	4.7
Lucerne	5.7
Dwalganup	5.7

The density of rosettes in 1966 was much lower than in 1965 and there were fewer rosettes on the annual medic plots compared with lucerne and Dwalganup.

The cereal crop was not sown on the area in 1968. The growth of pasture on the area was severely limited by the dry conditions in the Mallee during 1966 and 1967.

However, regeneration of the Harbinger medic and the Geraldton sub clover occurred in 1968 with the return of better seasonal conditions. The lucerne failed to establish satisfactorily - this may be attributed to lack of controlled grazing and the drought. The Jemalong was less adapted to the area than the other annuals.

EXPERIMENT 5. (formerly W.E. 61 Expt. 1A)

LUCERNE ESTABLISHMENT ON SKELETON WEED LAND

LOCATION:

Karoonda. Section 44 Hundred of Marmon Jabuk

Rainfall Mean 13.65" Oct.-Dec. 1968 = 3.91"
Total 1969 = 14.90"
Total 1970 = 12.14"

Soil Type Solodised Solonetz

DURATION:

October 1968 - December 1970. The period of observation on this trial may be extended beyond this date but additional results were not available at the time of compiling this report.

PERSONNEL:

R. McR. Wood and A.W. Lewis.

BACKGROUND:

As an aid to establishing lucerne, the practice of long fallow has been used in the Victorian Mallee, and it has been claimed to reduce skeleton weed by 50 per cent (Wells, 1969). However fallowing on lighter soils in the Murray Mallee has been discouraged for many years following exploitive cropping rotations and severe wind erosion earlier this century. Possibly, for experimental purposes, a carefully controlled mechanical fallow, prepared in August in the year before sowing the lucerne would be some benefit, but there are practical considerations (e.g. erosion, loss of grazing) which make it undesirable as a general practice on sandy soils.

The use of some herbicides to prepare and maintain a fallow period over the summer needed some evaluation in this State - this is not to be confused with low rates of certain herbicides as an aid to pasture establishment - see Project 3. The use of 2,4-DB as a post emergent aid to lucerne establishment has been covered in project 3. However, this technique is given further evaluation in this project as a side issue to assist in the main aim of the project.

AIM:

1. To compare chemical and cultivation treatments as part of a programme of lucerne establishment on skeleton weed areas of the Murray Mallee.

2. To study the competition between the lucerne and skeleton weed over several seasons.

DESIGN:

a. Treatments in the Spring in the year before sowing the lucerne:
   1. Control - no treatment
   2. 2,4-D amine (12 oz. a.e. per acre at early runup stage)
   3. Picloram (0.25 oz. a.e. per acre at early runup stage)
   4. Scarifier (mechanical fallow - August-September).

b. Statistical - above treatments randonised but unreplicated on each of 2 sites. Split plot nitrogen treatment at sowing time, split again for post emergence 2,4-DB treatment.

   4 Spring treatments x 2 nitrogen rates x 2 herbicide treatments (year before sowing) at seeding (post emergence) = 16 plots.

c. Plot size 60' x 200' spring treatments 1968
   20' x 200' sown plots
   10' x 200' 2,4-DB post emergence spray

d. Assessments
   1. Lucerne establishment density August 1969
   2. Skeleton Weed rosette density August 1969
   3. Lucerne density - May 1970
   4. Lucerne density - October 1970
   5. Skeleton weed density

METHODS:

W.E. Expt. 1A (D.G. DUTSCHKE, KAROONSA)

An area was selected on heavily infested skeleton weed land on 16/10/68, and four main plots were laid out. Two of these were treated the same day with 0.25 oz. a.e. picloram/acre and 12 oz. a.e. 2,4-D amine respectively, using a boomspray delivering 10 gallons per acre. The remaining two plots were left untouched. One of these was to have been worked up with a scarifier but a lack of moisture prevented this operation from from being carried out.

After heavy rains in late February, 1969, the trial was worked up by Mr. Dutschke in preparation for sowing lucerne.

The trial area was sown on 21/5/69 under fine weather conditions and moist soil. A 9 hoe Mitchell combine was used, fitted with a small seeds box. Hoses from the latter were ties in pairs behind the rear tynes of the combine so that the lucerne was sown in the bottom of farrows, 14" apart. No harrows were used, in order to leave the soil ridged.

Superphosphate + trace elements Cu, Zn and Mo was applied first, at 140 lbs. per acre. (This mixture contained 7 lbs. Cu, 7 lbs. Zn and 2 oz. Mo per 187 lb. sack).

Alternate plots were sown with 120 lbs./ac. of 1:1 super-ammonia, while the ramaining plots were sown with 65 lbs./ac. of plain superphosphate.

The Hunter River lucerne (inoculated and lime pelleted 5 days prior to sowing) was sown at 5 lbs. of seed per acre, together with a cover crop of approximately 20 lbs. per acre of Noyep barley.

The trial area was fenced off after sowing. Red legged Earth-mite infestations were treated with 4 fl. oz. of "Imidan 15R" per acre in early June and again in early July 1969. The area was treated with 12 fl. ozs. of 25% D.D.T. product per acre to control pink cutworm on 25/10/69.

On 13/8/69, when the lucerne had 3-5 leaves, 12 ozs. a.e. 2,4-DB per acre were applied to the eastern half of each plot.

Because some rain fell soon after treatment, and extra 2,4-DB spraying was carried out on 19/8/69, at a lower rate of 8.0 oz. a.e. 2,4-DB per acre. This brought the total amount applied to 20.0 oz. a.e. per acre.

The density of lucerne seedlings and skeleton weed was counted on 6/8/69 using four 10 sq. link quadrats per plot. A similar count was taken on 4/5/70, omitting skeleton weed density counts.

RESULTS:

Density counts recorded on the above occasions are recorded in the following tables.

Table 1. Lucerne Seedling Density (6/8/69)
(Counts per 10 sq. link quadrat)

	Previous Treatments		Counts				
	October 1968	1969 Season	A	B	C	D	Mean/ 10 sq. links
1	Picloram 0.25 oz.	-	24	15	15	19	18.3
2	"	+N	15	32	27	31	26.3
3	Control	-	25	19	21	25	22.3
4	"	+N	16	24	25	16	20.3
5	2,4-D 12 oz.	-	33	35	19	25	28.0
6	" "	+N	36	23	49	15	30.8
7	Control	-	5	17	18	12	13.0
8	"	+N	23	32	13	24	23.0
	Mean/10 sq. links		22.0	24.5	23.0	21.0	

Table 2. Skeleton Weed Density (6/8/69)
(Rosettes per 10 sq. link quadrat)

	A	B	C	D	Mean/10 sq. links
1	41	96	46	35	34.5
2	28	34	33	44	34.8
3	74	102	93	10	69.8
4	51	43	27	27	37.0
5	20	72	63	69	56.0
6	75	30	74	59	59.5
7	23	38	49	31	35.3
8	18	36	49	28	32.8
	41.5	56.3	54.5	38.0	

(Plot treatments as for Table 1)

Table 3. Lucerne Density (plants per 10 sq. link quadrat)

Plot	PREVIOUS TREATMENTS Oct. 1968	1969 Season		COUNTS A	B	C	D	MEAN/ 10 SQ. LINKS	
1	Picloram 0.25 oz.	-N	2,4-DB	2	1	2	4	2.3	
2	"	-N	-	2	3	0	3	2.0	
3	"	+N	2,4-DB	1	7	0	7	3.8	
4	"	+N	-	0	1	3	4	2.0	10.1
5	Nil -	-N	2,4-DB	4	5	1	4	3.5	
6	"	-N	-	1	12	0	0	3.3	
7	"	+N	2,4-DB	1	1	0	1	0.8	
8	"	+N	-	0	9	2	1	3.0	10.6
9	Amine 2,4-D 12 oz.	-N	2,4-DB	8	6	12	12	9.5	
10	"	-N	-	1	16	15	1	8.3	
11	"	+N	2,4-DB	4	8	2	5	4.8	
12	"	+N	-	10	7	1	2	5.0	27.6
13	Nil -	-N	2,4-DB	4	6	4	2	4.0	
14	"	-N	-	1	1	15	5	5.5	
15	"	+N	2,4-DB	0	0	7	7	3.5	
16	"	+N	-	0	6	4	6	4.0	17.0

Further assessment of the experiment was conducted on 27/10/70. Results of lucerne and skeleton weed counts are tabulated below:

LUCERNE DENSITY (Plants per 10 sq. link quadrat)

(27/10/70)

Plot	Treatment Oct. 1968	1969 Treatment	Counts A	B	C	D	Mean/ 10 sq. links	
1	Picloram 0.25 oz.	-N 2,4-DB	1	21	2	3	6.8	
2	"	-N -	0	1	8	1	2.5	
3	"	+N 2,4-DB	4	1	1	5	2.8	
4	"	+N -	0	6	1	0	1.8	(55)
5	Nil -	-N 2,4-DB	5	8	4	1	4.5	
6	"	-N -	1	1	3	3	2.0	
7	"	+N 2,4-DB	0	2	6	1	2.3	
8	"	+N -	0	0	5	5	2.5	(45)
9	2,4-D 12 oz.	-N 2,4-DB	10	0	3	10	5.8	
10	"	-N -	3	10	2	5	5.0	
11	"	+N 2,4-DB	4	8	3	5	5.0	
12	"	+N -	2	0	4	2	2.0	(71)
13	Nil -	-N 2,4-DB	4	5	4	2	3.8	
14	"	-N -	0	3	3	3	2.3	
15	"	+N 2,4-DB	0	7	1	2	2.5	
16	"	+N -	2	1	6	3	3.0	(46)

The 10 sq. link quadrats included two rows, 14" apart, and four were thrown at random along the length of each plot. Quadrat dimensions were 18" x 30".

SKELETON WEED DENSITY 27/10/70

(counted in the same quadrats used for lucerne density assessment)

Plot	Treatment Oct. 1968	1969 Treatment	Counts A	B	C	D	Mean/ 10 sq. links	
1	Picloram 0.25 oz.	-N 2,4-DB	30	44	8	28	27.5	
2	"	-N -	25	31	8	17	20.2	
3	"	+N 2,4-DB	10	53	8	19	22.5	
4	"	+N -	39	32	19	33	30.7	(404)
5	Nil -	-N 2,4-DB	37	23	20	27	26.7	
6	"	-N -	28	26	20	21	23.7	
7	"	+N 2,4-DB	30	46	12	23	27.7	
8	"	+N -	35	37	16	28	29.0	(429)
9	2,4-D 12 oz.	-N 2,4-DB	24	33	18	18	23.0	
10	"	-N -	30	44	22	31	31.7	
11	"	+N 2,4-DB	28	31	13	22	23.5	
12	"	+N -	22	42	21	19	26.0	(417)
13	Nil -	-N 2,4-DB	15	23	10	21	19.7	
14	"	-N -	26	33	13	24	24.0	
15	"	+N 2,4-DB	13	20	14	8	13.7	
16	"	+N -	31	15	2	27	18.7	(305)

DISCUSSION:

This experiment indicates some promise in the use of 2,4-D in October, prior to sowing lucerne in the following May. The reduction in trash and dead skeleton weed plants during Autumn is an advantage in preparing a clean seedbed. Moisture storage over the summer period would benefit lucerne establishment in years of little summer rainfall, but this was not the case in this experiment. Heavy rains in February 1969 replensihed subsoil moisture, and there was little loss due to the growth of Skeleton weed in Autumn.

The advantage shown by the lucerne to the 2,4-D summer fallow was visible in the second spring after sowing, but was not tested statistically.

PROJECT 4. EXPERIMENT 6 Formerly W.E. 61 Expt. 1B

LUCERNE ESTABLISHMENT ON SKELETON WEED LAND

LOCATION:

Parilla. Section 114 Hundred of Parilla (Mr. J. Fuller)

Rainfall Mean 14.83" Oct.-Dec. 1968 = 3.94"
Total 1969 = 16.86"
Total 1970 = 13.56"

Soil Type Solodised solonetz.

DURATION:

October 1968-January 1970

PERSONNEL:

R. McR. Wood and A.W. Lewis

BACKGROUND:

As for Expt. 5.

DESIGN:

As for Expt. 5.

METHODS:

The area, which had a medium skeleton weed infestation, was pegged out and sprayed on 16/10/68 - under ideal spraying conditions. Two plots received the spray treatment: 12 oz. a.e. 2,4-D/acre and 0.25 oz. a.e. Picloram. One of the remaining plots was to have been worked up for fallow but lack of moisture precluded this.

After an initial working in March by the farmer, the area was sown on 20/5/69 with a 9 how Mitchell combine, fitted with a small seeds box.

Superphosphate + 7 lbs. Cu, 7 lbs. Zn, 2 oz. Mo was applied over the whole area at 140 lbs./acre.

Hunter River lucerne (lime pelletted and inoculated) was sown at 5 lbs./acre with 120 lbs. 1:1 Super Ammonia on alternate plots. On the remaining plots, lucerne was sown with 65 lbs. plain super. A cover crop of Noyep barley was sown at 20 lbs./acre.

Red legged earthmites were treated on 3/6/69 using 4 fl. oz. of "Imidan 15" per acre. Growth of the lucerne was slow and a further "Imidan" treatment was applied on 9/7/69.

Inspection on 13/11/69 revealed a very poor lucerne establishment. The barley cover crop was reaped by the farmer and although plots were not reaped separately, there was a yield response to nitrogen.

The area was inspected on 13/1/70, and no lucerne could be found.

CONCLUSION:

The failure of the lucerne to establish was probably due to the effects of red legged earthmite damage which weakened the lucerne in its early growth stages. Although some seedlings established, they died in the dry spring of 1969. A total of 32 points of rain fell at Parilla in October and November. The 30 year averages (1934-1964) for Parilla are:
October 139 pts.
November 100 pts.

EXPERIMENT 7. (W.E. 61 Expt. 3A)

LUCERNE ESTABLISHMENT ON SKELETON WEED LAND

LOCATION:

Karoonda. Section 44 Hundred of Marmon Jabuk (Mr. D.G. Dutschke)

Rainfall Mean 13.65" Sept.-Dec. 1969 = 3.11"
Total 1970 = 14.03"

Soil Type Solodised solonetz. Heavily infested with Skeleton Weed.

DURATION:

October 1969-December 1971. This report can only cover results available at December 1970, but observations have continued during 1971.

PERSONNEL:

R. McR. Wood, A.W. Lewis.

BACKGROUND:

Experiments were commenced in October, 1968 to suppress the growth of skeleton weed over the summer months by using herbicides and mechanical cultivation treatments (See previous two experiments). A treatment with 12 oz. a.e. 2,4-D per acre in early October has given promising results in reducing skeleton weed growth over the summer, but it is not yet known whether this will aid lucerne establishment in the following season. Two theoretical advantages from reduction of skeleton weed over the summer-autumn period are (1) Moisture conservation, (2) Reduction in the amount of trash (mainly dry Skeleton Weed) which enables the preparation of a cleaner seedbed. The increased effectiveness of 2,4-D amine when applied to Skeleton Weed at the late rosette stage (early October) has been observed in previous experiments, and this treatment is less effective when applied in August or in the late October-November period.

Picloram is also very active on Skeleton Weed at low rates (0.25-1.0 oz. per acre) when applied in the August-October period. As this herbicide can move into the plant through the soil as well as the leaves and stems, it can be applied at times when the plant is less active (e.g. the colder months of August-early September). However, the serious disadvantage of picloram is its residual toxicity in the soil - a factor which prevents successful legume establishment for 12 months or more, depending on the rate used. (See project 3). The length of residual life in the soil is strongly dependent on leaching in our Mallee soils. Further studies with picloram at low rates in relation to legume establishment have been reported. Mechanical cultivation treatments were attempted with little success in October, 1968 on one site (Expt. It was realised that these cultivation treatments should be carried out in moist soil in July-August.

In 1969, it was decided to include amitrol in the October spray treatments to compare its effect on the weed with 2,4-D amine. Although more expensive than 2,4-D, amitrol does not introduce the residue problem which accompanies the use of picloram. Some knowledge of the effectiveness of amitrol on skeleton weed in the Murray Mallee is desirable; Some work with this herbicide has been reported by Wells in Victoria. The post emergence 2,4-DB treatment still requires further evaluation. There were no advantages evident from its use in Expts. 5 and 6.

AIMS:

1. To compare chemical and cultivation treatments for their ability to aid lucerne establishment in the following season.

2. Once established, the lucerne will be studied in relation to its competition with skeleton weed over several seasons.

DESIGN:

(a) Statistical At the time the trials were laid out, 12 treatments (A-M) were planned, 7 of which were to be applied initially. The remaining treatments were intended for a later application depending on weather conditions and stage of skeleton weed growth. When the required conditions failed to eventuate, the mechanical fallow treatment and later herbicide applications, were cancelled and a post emergent treatment for the lucerne in 1970 was substituted.

The situation is as follows:-

7 treatments, replicated twice October, 1969	= 14 plots
1 treatment, replicated 10 times July-Aug. 1970	= 10 plots
1 control treatment, replicated 8 times	= 8 plots

The October treatments were randomised throughout two blocks of 16 plots. The controls were placed evenly throughout these blocks and the remaining plots were left for the post emergence treatment.

(b) Treatments

A	2,4-D amine	12 oz. a.e./acre	Oct. 1969
B	Amitrol	16 oz. a.i./acre	"
C	"	32 oz. a.i./acre	"
D	Picloram	0.125 oz. a.e./acre	"
E	"	0.25 oz. a.e./acre	"
F	Amitrol + Atrazine mix	16 oz. a.i. (amitrol)/acre	"
G	" "	32 oz. a.i. (amitrol)/acre	"
H	2,4-DB	12 oz. a.e./acre	Early Aug. 197
J	"	"	" "
K	"	"	Late Aug. 1970
L	"	"	" "
M	Control	No Spray Treatment	

(c) Plot Sizes 15' x 100' sprayed. Pegged 20 feet wide for farmers implements. 16 plots in each block - total area 0.75 acres.

(d) Assessments
1. Initial skeleton weed density (November 1969).
2. Lucerne establishment density - (October 1970).
3. Skeleton weed density - (October 1970).
4. Visual assessments during October 1970.

METHODS:

The site was selected, pegged and sprayed on 7/10/69. The skeleton weed plants were showing signs of running up (flowering stalks were 1" high).

A 15' trailer mounted boomspray was pulled by Landrover and delivered 10 gallons of spray per acre. Mixing of concentrates in water was done on the spot. Fine conditions prevailed and there was negligible wind.

Products used in above treatments

1. October 1969
A "Weedar 77" (R) 2,4-D 48.4% a.e. triethanolamine salt.
B,C "Weedazol TL plus" (R) Amitrol 25% plus ammonium thiocyanate.
D,E "Tordon 50-D" (R) Picloram 5% a.e. + 2,4-D 20% a.e.
F,G. "Vorox AA" Amitrol 40% + Atrazine 40% a.i.

2. August 1970
"Embutox 40" 2,4-DB 40% a.e. Sodium and Potassium salts.

Because of the dry conditions which prevailed during late September-November period, it was not possible to proceed with Mechanical fallow treatments.

The trial area was worked up by Mr. Dutschke in April 1970 following some rain. The lucerne was sown on 12/5/70 on a clean moist seedbed, using a 9 hoe Mitchell combine and small seeds box.

Fertilisers - Superphosphate 7 lbs. Cu, 7 lbs. Zn, 2 oz. Mo was applied at 180 lbs./acre. Hunter River Lucerne was sown at $4\frac{1}{4}$ lbs. per acre (lime pelleted) equivalent to 3 lbs. of Lucerne seed per acre, with a cover crop of Noyep barley at 20 lbs./acre. Hoses from the small seeds box were tied in pairs behind the rear tynes so that lucerne row spacing was 14".

A red legged earthmite infestation was treated on 11/6/70 with 4 oz. Imidan per acre. Another similar treatment was applied on 12/8/70.

2,4-DB was applied on 6/8/70 on some plots and the remaining plots due for this treatment were sprayed on 31/8/70.

An assessment of lucerne establishment was carried out on 27/10/70, and visual assessments were taken on 1/10/70.

RESULTS:

INITIAL SKELETON WEED DENSITY 19/11/69

Random counts taken on unsprayed plots only approximately 1 month after October treatments had been applied. Densities expressed as stalks per 10 sq. links. Two counts A & B were taken per plot.

BLOCK I			BLOCK II		
PLOT NO.	A	B	PLOT NO.	A	B
1	29	19	18	28	26
5	26	19	20	12	35
6	23	28	21	37	29
7	36	53	22	35	37
10	36	45	24	15	25
11	17	33	25	31	23
13	46	54	26	19	30
14	31	28	28	19	26
15	28	28	32	24	12
TOTAL BLOCK I = 579			TOTAL BLOCK II = 463		
TOTAL A = 492			TOTAL B = 550		

G.T. = 1042

Mean of 36 counts = 28.9 plants/10 lk^2 S.D. $\pm$ 10.01

VISUAL ASSESSMENT LUCERNE VIGOUR AND SKELETON WEED DENSITY 1/10/70

RATINGS 1-10 (Where 10 = maximum growth for site).

Treatment	Lucerne		Skeleton Weed		Cover Crops		
A	7, 5	Av. = 6.0	9, 9	Av. = 9.0	8 3	Av. 5.5	A
B	6, 6	6.0	9, 9	9.0	6 5	5.5	B
C	7, 6	6.5	10, 9	9.5	8 4	6.0	C
D	8, 2	5.0	10, 8	9.0	4 3	3.5	D
E	4, 4	4.0	10, 8	9.0	7 6	6.5	E
F	8, 7	7.5	10, 9	9.5	5 4	4.5	F
G	9, 6	7.5	9, 9	9.0	9 3	6.0	G
H	5, 4	4.5	9, 8	8.5	4 8	6.0	H
J	3, 4	3.5	9, 7	8.0	3 3	3.0	J
K	6, 7	6.5	9, 9	9.0	1 4	2.5	K
L	8, 4	6.0	10, 8	9.0	2 4	3.0	L
M	(5,6,7, 7,7,5,4, 5,8,5,)	Av. = 5.9	(9,9,9, 10,9,10, 8,9,8,10)	Av. = 9.1	2,2,1, 4,5,6,3, 3,2	2.9	M

Lucerne

Visual assessments on 1/10/70 showed slightly improved lucerne growth on treatments F & G (Vorox AA), while slightly depressed growth was noted on plots under treatments H, J, (2,4-DB early) and D, E (Picloram).

Skeleton weed density appeared uniformly high on all plots.

The cover crop observations were quite variable within treatments and growth was generally poor, due mainly to the very low fertility of the site. Herbicide treatments applied in the previous October resulted in a slightly better growth, particularly treatment E (Picloram). However, the 2,4-DB plots were no different to the controls.

	BLOCK I		BLOCK II		
TREATMENT	A	B	A	B	MEANS
A	18	49	45	60	43.0
B	21	43	50	51	41.3
C	46	14	50	26	34.0
D	55	16	60	17	37.0
E	56	41	50	45	48.0
F	30	34	38	25	31.8
G	35	26	58	20	34.8
H	50	39	15	26	32.5
J	46	31	22	48	36.8
K	35	37	54	9	33.8
L	30	52	60	23	41.3
M (Control)	50	24	40	28	
	35	43	60	29	
	40	58	55	19	41.2
	55	58	10	50	
	27	47	30	56	
	629	622	697	532	

Mean of 64 observations = 38.8 rosettes/10 $1k^2$, S.D. = 14.6

From this table it is concluded that the herbicide treatments did not have an observable effect on skeleton weed density 12 months after application.

Comparison with counts on 19/11/69 indicates an increase in skeleton weed density with cultivation and application of fertilisers. Variability has increased due mainly to the treatments imposed.

LUCERNE DENSITY 27/10/70

Seedlings per 10 sq. links, counted in two random quadrats, A & B)

	BLOCK I		BLOCK II		MEANS
TREATMENT	A	B	A	B	
A	14	7	32	10	15.7
B	25	13	20	9	16.7
C	24	7	22	14	16.7
D	18	20	9	11	14.5
E	6	5	13	12	9.0
F	20	19	17	4	15.0
G	31	12	24	13	21.5
H	17	15	10	14	14.0
J	21	9	8	15	13.2
K	17	5	14	12	12.0
L	13	12	20	9	13.2
M	11	14	30	22	
	11	13	18	18	
	14	10	20	21	16.05
	17	15	21	17	
	26	6	6	11	
	291	182	284	212	

Counts by observer A appear to be greater than observer B
Mean A = 17.9 S.D. ± 7.3 Mean B = 12.3 S.D. ± 4.7
Overall mean = 15.1 S.D. ± 6.7

From this table it is apparent lucerne establishment was aided by treatment G (Vorox AA) and depressed by treatments D, E (Picloram). A slight depression was noted with treatments H-L (2,4-DB).

The remaining treatments A-C and F were similar to controls.

Project 4, EXPERIMENT 8 (W.E. G 1 Expt. 3B)

LUCERNE ESTABLISHMENT ON SKELETON WEED LAND

LOCATION:

Parrakie. Section 22 Hundred of Price (Mr. R.T. Fearn)

Rainfall Mean 14.03" Sept.-Doc. 1969 = 2.81"
Total 1970 = 12.33"

Soil Type Solodised solonetz

DURATION:

October 1969-December 1971.
(Progress Report based on results in hand December 1970)

PERSONNEL:

R. McR. Wood and A.W. Lewis.

BACKGROUND:

As for Expt. 7.

AIM:

As for Expt. 7.

DESIGN:

As for Expt. 7.

METHODS:

The site was pegged out and initial herbicide sprays were applied on 8/10/69. (The mechanical cultivation treatments were omitted because of the dry weather conditions).

The dense skeleton weed was well advanced and central stalks were just apparent. Sprays were applied with the 15' trailer mounted boomspray as in Expt. 7. There was a slight S.E. breeze when spraying commenced at 1.00 p.m.

Random quadrat counts were taken on 18/11/69 from the untreated plots to obtain an estimate of initial skeleton weed density.

The trial site was worked up with a scarifier in April 1970. All cultivations were along the plots - to minimise herbicide movement laterally. The lucerne was sown 14/5/70 under good conditions. (Very little trash present). A 9 hoe Mitchell combine, fitted with a small seeds box was used. Lucerne was sown at 3 lbs./acre (approx.) at 14" spacing; the seed had been lime pelletted. A cover crop of Noyep barley was sown at 20-25 lbs./acre, and harrows were not used. The fertiliser was Superphosphate = 7 lbs. Cu, 7 lbs. Zn and 2 oz. Mo applied at 180 lbs. per acre. The trial area was fenced off to exclude stock on 27/5/71, and it was noted that the area badly needed rain.

On 11/6/70, 4 oz. of "Imidan 15" was applied with a misting machine to control an infestation of Red Legged Earthmite.

By 8/7/70, lucerne seedlings had emerged but dry conditions and earthmites were taking a toll. About a month later (5/8/70) the first post emergent 2,4-DB treatment (12 oz. a.e./acre) was applied. The second 12 oz. a.e. 2,4-DB treatment was applied on 31/8/70.

An observation on 2/10/70 indicated lucerne was falling behind. General weed competition (brome grass, rye grass and wild geranium) and Red Legged earthmites were taking their toll. Visual assessments were recorded.

An assessment was made on 27/10/70, and it was decided to conclude the trial (See Results).

RESULTS:

Initial Skeleton Weed Denisty 18/10/69

(2 Random quadrats per plot. Rosettes per 10 $1k^2$ *)

PLOT NO.	A	B	PLOT NO.	A	B
1	2.4	42.1	18	14.6	13.0
5	4.8	10.5	20	2.4	12.2
6	1.6	0	21	4.1	15.4
7	6.5	9.7	22	0.8	13.0
10	28.4	2.4	24	0	13.0
11	13.0	8.9	25	13.8	14.6
13	47.8	13.8	26	10.5	35.6
14	32.4	3.2	28	0	5.7
15	25.9	0.8	32	7.3	10.5

Total A = 316.3 Total B = 224.4 Mean 12.2 S.D. ±12

As can be seen from the above table, natural variation in skeleton weed density was high.

Visual Assessments of Lucerne, Skeleton Weed and Cover Crop Growth

On 1/10/70. (Ratings are No. of Points out of 10 where 10 = best growth for site).

Treatment	Lucerne			Skeleton Weed			Clover Crop		
A	3	5	Av.4.0	4	3	Av. 3.5	7	3	Av.5.0
B	5	8	6.5	2	3	2.5	4	2	3.0
C	5	8	6.5	4	4	4.0	6	4	5.0
D	5	3	4.0	2	1	1.5	3	4	3.5
E	1	2	1.5	3	2	2.5	4	4	4.0
F	2	7	4.5	1	3	2.0	6	7	6.5
G	4	5	4.5	3	3	2.0	7	7	7.0
H	5	3	4.0	5	2	3.0	2	3	2.5
J	3	3	3.0	5	2	3.5	2	2	2.0
K	3	3	3.0	2	3	2.5	2	2	2.0
L	2	3	2.5	3	2	2.5	2	3	2.5
M	2,3,5,4,3 4,7,5,3,3		4.0	4,3,2,2,3 1,2,3,2,3		2.5	4,3,3,3,3,3 3,3,3,2,2		2.9

The overall establishment of lucerne was less than anticipated, and under such conditions, conclusions drawn must be considered in the light of this. Establishment was poor on most control plots and on treatments A (2,4-D) D (Picloram-low) F, G (Vorox **AA**) and H (2,4-DB). Depressed growth was noted with Treatments E (Picloram-high), J, K, L (2,4-DB), while an apparent advantage to treatments B and C (Amitrol) can be seen.

Skeleton weed growth was generally greater or as great on the sprayed plots as on the controls. One exception appears to be treatment D (Picloram-low) but this effect is very likely to be due to chance.

With the exception of the 2,4-DB Treatments, cover crop growth was slightly enhanced by the spray treatments in the previous October. The high rate of Vorox AA in October resulted in the greatest improvement in cover crop growth.

When inspected on 27/10/70, the plots were heavily infested with Brome Grass (Bromus sp.) annual Rye Grass (Lolium sp.) and Erodium sp. Severe competition to the lucerne seedlings had resulted in their failure to effectively establish.

The importance of cultivations prior to sowing the lucerne in order to kill annual weeds, has been borne out in this trial. Seasonal conditions were dry after seeding for a period, and also in October, when moisture requirements for seedling lucerne is critical

It was not considered worthwhile to count the remaining lucerne plants, although a few could survive the summer. Treatment effects would have been lost in the high level of variability present on the site. (See Skeleton Weed Density Table.)

APPENDIX I

Monthly rainfall totals and annual totals for three official recording centres in the Murray Mallee 1963-1970.

PARILLA

	JAN.	FEB.	MAR.	APR.	MAY	JUNE	JULY	AUG.	SEP.	OCT.	NOV.	DEC.	ANNUAL
1963	213	73	16	148	259	338	190	235	81	67	12	33	1579 (1366)*
64	39	30	23	175	76	89	147	161	419	247	245	134	1781
65	2	0	26	79	118	54	185	328	96	9	139	78	1173
66	66	172	39	8	81	90	225	61	89	96	17	135	1089
67	3	147	36	0	67	28	88	133	108	31	0	42	683
68	129	53	102	112	176	164	135	210	66	231	121	100	1599
69	13	489	339	70	191	39	196	87	119	8	24	101	1686
70	51	4	45	164	104	155	64	128	147	46	330	119	1357

KAROONDA

	JAN.	FEB.	MAR.	APR.	MAY	JUNE	JULY	AUG.	SEP.	OCT.	NOV.	DEC.	ANNUAL
1963	182	27	1	134	331	227	146	170	56	95	7	50	1424 (1383)*
64	37	54	19	142	73	98	110	117	250	131	208	137	1781
65	5	0	9	43	130	117	116	188	111	18	69	46	852
66	38	94	33	23	17	102	126	58	74	67	35	181	973
67	23	53	12	23	84	24	75	154	68	33	0	28	577
68	45	72	93	152	215	108	122	135	55	157	83	72	1309
69	29	445	122	78	166	20	169	73	129	6	35	104	1383
70	58	2	34	113	81	114	64	139	223	26	220	140	1214

PARRAKIE

	JAN.	FEB.	MAR.	APR.	MAY	JUNE	JULY	AUG.	SEP.	OCT.	NOV.	DEC	ANNUAL
1963	183	15	48	137	314	322	230	230	103	64	17	108	1772 (1403)*
64	30	66	23	227	98	137	230	179	319	208	258	192	1967
65	3	0	42	97	215	71	188	230	107	30	141	75	1119
66	69	111	60	26	130	175	284	111	112	99	39	193	1409
67	19	78	50	16	95	24	107	162	136	20	5	32	744
68	112	28	63	167	321	193	118	236	104	287	140	87	1756
69	45	518	178	110	196	37	249	109	177	3	37	140	1791
70	90	0	34	116	106	149	108	191	202	57	226	153	1432

* 30 year mean rainfall in brackets

APPENDIX II

Monthly Rainfall Totals, as recorded by farmers on whose properties trials were conducted in the period 1969-1970 inclusive.

Mr. D.G. Dutschke — KAROONDA

	JAN.	FEB.	MAR.	APR.	MAY	JUNE	JULY	AUG.	SEP.	OCT.	NOV.	DEC.	YEAR
1968	53	79	104	154	227	128	151	169	60	208	109	74	1516pts
1969	32	443	118	92	168	27	214	85	146	6	36	123	1490
1970	72	5	39	130	98	149	88	153	209	37	247	176	1403

Mr. C.H. Johnson — PARILLA

	JAN.	FEB.	MAR.	APR.	MAY	JUNE	JULY	AUG.	SEP.	OCT.	NOV.	DEC.	YEAR
1968	116	50	77	83	269	198	150	188	74	230	119	42	1596
1969	14	490	253	127	218	39	213	81	122	NIL	27	107	1691
1970	78	8	29	190	121	124	70	106	155	34	326	110	1371

Mr. R.T. Fearn — PARRAKIE

	JAN	FEB.	MAR.	APR.	MAY	JUNE	JULY	AUG.	SEP.	OCT.	NOV.	DEC.	YEAR
1968	62	88	45	76	342	126	102	184	99	231	115	72	1542
1969	34	451	119	120	165	24	217	82	138	-	44	99	1483
1970	55	-	49	125	100	95	102	149	166	37	217	138	1233

APPENDIX III

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