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1975 Soil fertility - grain lupins - long term rotation trials

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ANNUAL SUMMARY OF RESULTS

1976

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Soil Fertility - Grain Lupins

75GE9/323LEX
75BA6/ "
75WH9/ "
75NO28/ "
75A4/ "
75MT6/ "
75JE9/ "
75E4/ "

Long Term Rotation Trials

W56H/604EX
66M29/2083EX
67C13/2332EX
67N4/2333EX
68E5/2474EX
68SG5/2475EX
69GE20/2466EX
73SG16/3229EX

SOIL FERTILITY - GRAIN LUPINS 3231EX

Use of the stage 4 lupin variety trials to assess the effect of a year of sweet grain lupins on a following cereal crop was continued. The 1974 variety trials contained a number of lupin varieties randomised with two standard wheat varieties. Also at two times of planting.

Eight trials were selected:

74GE26 at Morawa
 74BA7 at Badgingarra
 74WH8 at Wongan Hills
 74NO8 at Bolgart
 74A8 at Beverley
 74MT8 at Mount Barker
 74JE9 at Gairdner River
 74E8 at Gibson

The 1974 plots in these trials were sown to Gamenya wheat in 1975 (except for 74MT8, Swan oats used to prevent "take-all" complication).

Morawa : 75GE9

History - old clover land; 1971-73 pasture,

1974 variety	Yield of 1975 wheat kg/ha
	Sown 14/6/74
Unicrop	342
Uniharvest	376
WB2	369
CB46	390
Gamenya	219
Falcon	232

5% LSD = 109

The early 1974 sowing was not included because the wheat plots were not sown in 1974.

1975 yields were low because of the bad infestation of ryegrass. Density of ryegrass was slightly greater after lupins. Therefore the differences in 1975 wheat yield could have been greater.

Badgingarra : 75BA6

History - 1969-71 clover; 1972 Unicrop; 1973 clover

1974 variety	Yield of 1975 wheatkg/ha	
	Sown 22/5/74	Sown 13/6/74
Unicrop	579	934
Uniharvest	497	924
WB2	565	984
CB46	501	911
66A01-1	569	888
Gamenya	410	788
Falcon	401	824
Darkan	592	911
Kondut	401	824

5% LSD = 218

There are no significant differences between 1974 varieties within one sowing date. The differences between sowing times is highly significant (0.1% level).

Although not a significant difference the response to a year of Darkan is interesting. Yield was similar to that after lupins. In 1974 grain yield from Darkan was similar to the other wheats. Therefore poor growth in 1974 can not be used to explain the better response.

Wongan Hills : 75WH9

History - 1962-66 clover; 1967 crop; 1968-69 clover; 1970 crop; 1971-73 clover.

1974 Variety	Yield of 1975 wheat kg/ha	
	Sown 17/5/74	Sown 31/5/74
Unicrop	1111	854
Uniharvest	1389	764
WB2	645	605
Gamenya	427	387
Falcon	427	298

5% LSD = 266

Reduced yield after WB2 was probably due to the relatively poor growth of WB2 in 1974. It yielded only 340 kg grain/ha compared to 1099 for Unicrop and 1136 for Uniharvest (average of 2 sowing times).

Bolgart : 75N028

History - old clover land; 1968-71 clover; 1972 crop; 1973 clover.

1974 Variety	Yield of 1975 wheat kg/ha	
	Sown 7/5/74	Sown 28/5/74
Unicrop	961	1022
Uniharvest	984	1078
WB2	849	1050
Gamenya	633	844
Falcon	685	760

5% LSD = 170

Weeds in the 1975 wheat crop were slightly worse on the early sown 1974 plots.

Beverley : 75A4

History - old clover land; 1967-69 clover; 1969-70 oats; 1971-72 clover; 1973 oats.

1974 Variety	Yield of 1975 wheat kg/ha	
	Sown 16/5/74	Sown 6/6/74
Unicrop	640	630
Uniharvest	707	733
WB2	600	510
Gamenya	607	533
Falcon	584	547

Treatments not significant

The 1975 crop was very poor and the weeds, mainly ryegrass, were thick. At no time could the 1974 lupin plots be picked. Even the ryegrass was uniform over the site.

Mount Barker : 75MT6

History - 1960-68 clover; 1969-70 crop; 1971-72 clover; 1973 crop.

1974 Variety	Yield of 1975 oats kg/ha	
	Sown 16/5/74	Sown 6/6/74
Unicrop	1772	2372
Uniharvest	1734	2147
WB2	1660	1922
P20855	1838	1819
P29866	1856	2381
P20880	2006	2475
P20882	2213	2663
Weiko III	1917	2175
66A01-1	1762	2081
Gamenya	1484	1716
Falcon	1326	1603

5% LSD = 470

The west half of this trial was noticeably better in growth due to better drainage. Thus 1975 oat yields after the late sown 1974 varieties (west side) were greater than after early sown because of site variation in 1975 rather than differences in 1974 sowing time.

Although not significant for all the varieties there is a trend to higher 1975 oat yield after the Lupinus luteus varieties (Weiko III, P20855, P20866, P20880 and P20882) than the L. angustifolius (Unicrop, Uniharvest and 66A01-1). This is despite the 1974 yield of L. luteus being much lower than L. angustifolius.

	Early sown 1974	1975 oat yield	Late sown 1974	1975 oat yield
L. luteus	1668 kg/ha	1966	1861	2303
L. angustifolius	2538	1756	2633	2200

A possible explanation is loss of seed before (or during) harvesting of the L. luteus. Whole seed of L. luteus is higher in crude protein than L. angustifolius (42% c.f. 34%). If there was a greater loss of higher protein seed under L. luteus then it is possible that there was more nitrogen available for the 1975 crop.

Gairdner River : 75JE9

History - new land

Trial had to be hand harvested. Results not yet received. Wheat after wheat was very poor, mainly because of severe root rot which virtually wiped out the second year wheat.

Gibson : 75E4

History - 1959-68 clover; 1969-70 crop; 1971-73 clover.

1974 Variety	Yield of 1975 wheat kg/ha	
	Sown 9/5/74	Sown 27/5/74
Unicrop	2929	2719
Uniharvest	2859	3562
WB2	2531	2789
P20855	3351	2672
P20866	2625	2978
P20880	2789	2999
P20882	2836	3281
Weiko III	2976	2859
66A01-1	2999	3327
Gamenya	2812	3070
Falcon	2976	2179

Treatments not significant

The 1974 variety trial was very poor. Lupin yields were around 250 kg/ha while wheat yielded about 500 kg/ha (early sown) and 1000 kg/ha (late sown).

LONG TERM ROTATION TRIALSW56H/604EXLocality : Paddock 3E on Wongan Hills Research StationSoil type : Wongan loamy sand

Plots were started in 1956 on a virgin sandplain site. Each plot was fallowed for one year, cropped twice and then sown to Dwalganup sub clover. Starting times for plots within a block were staggered so that the cropping phase was over the same four years, although after two, three, five or seven years of pasture the four blocks were further staggered to give replication with time.

Rainfall :

in mm

May	June	July	Aug	Sept	Oct	Total
24	45	94	18	37	49	267

Wheat Yields (Gamenya) kg/ha sown 19/6/75

		4th crop
Years clover	2	1036
	3	1086
	5	858
	7	1217

The plot with wheat after 5 years of pasture was infested with ryegrass. It is the last plot and adjacent to paddock 3E. Ryegrass seed blows in from this paddock.

After four crops, plots were resown to Dwalganup, top-dressed for one, two, three or four years then cropped again.

						kg/ha
1	crop	after	1	year	pasture	1819
1	"	"	2	"	"	2147
1	"	"	3	"	"	2251
1	"	"	4	"	"	2375

The 1974 resown pasture was very poor, which resulted in a poor yield after one year pasture, if compared to yield after 2 years pasture. However, yield recovery after one year of poor clover, when compared to the yield of a fourth crop, is good.

66M29/2083EXLocality : Paddock 5AE on Merredin Research StationSoil type : Merredin sandy clay loam.

An old land site, cleared in 1909, and sown to Cyprus barrel medic in 1955, cropped 1962 and 1964, medic resown in 1965. The medic pasture is allowed to regenerate after cropping and has been topdressed each year.

Rainfall :

in mm

May	June	July	Aug	Sept	Oct	Total
24	34	73	36	34	43	234

Wheat Yields (Gambee) sown 25/6/75

Rotation	Crop	kg grain/ha
Control	10th	456
1 crop : 1 pasture	1st	315
1 crop : 2 pasture	1st	846
1 crop : 4 pasture	1st	787
2 crop : 2 pasture	1st	598
	2nd	557
2 crop : 4 pasture	1st	707
	2nd	778
3 crop : 3 pasture	1st	492
	2nd	693
	3rd	469

All plots were very weedy, mainly grass weeds such as wild oats, barley grass, ryegrass and phalaris. Differences in weed density accounted for differences in yield. Plots with ryegrass had yield reduced the most. Weeds did not follow any particular rotation.

67C13/2332EXLocality : Paddock 19B on Chapman Res. Station (Nabawa)Soil type : Red brown loamy sand

An old land site, cleared in 1903 and in Dwalganup sub clover pasture from 1964 to the start of the trial in 1967.

Rainfall :

in mm

May	June	July	Aug	Sept	Oct	Total
49	92	129	46	37	34	387

Wheat Yields (Gamenya) sown 17/6/75

Rotation	Crop	kg grain/ha
Control	9th	1897
1 crop : 1 pasture	1st	1821
1 crop : 2 pasture	1st	1856
1 crop : 4 pasture	1st	1984
2 crop : 2 pasture	1st	2636
	2nd	1955
2 crop : 4 pasture	1st	2122
	2nd	1342
3 crop : 3 pasture	1st	2576
	2nd	1964
	3rd	2112

There was no obvious reason, such as a higher weed population, to explain the lower yields from the first crop in a 1 : 2 or 1 : 4 rotation compared to that from a 2 : 2, 2 : 4 or 3 : 3 rotation.

67N4/2333EX

Locality : Newdegate Research Station

Soil type : Grey sand over gravel at 20-30 cms.

An old land site, cleared in 1951 and in pasture (Dwalganup sub clover) from 1963 to 1967.

Rainfall :

in mm

May	June	July	Aug	Sept	Oct	Total
44	32	61	62	28	47	274

Wheat Yields (Gamenya) sown on 2/5/75

Rotation	Crop	kg grain/ha	# ryegrass/lm ²
Control	9th	-	-
1 crop : 1 pasture	1st	1383	11
1 crop : 2 pasture	1st	-	-
1 crop : 4 pasture	1st	1741	3
2 crop : 2 pasture	1st	1757	2
	2nd	906	56
2 crop : 4 pasture	1st	1664	3
	2nd	1010	47
3 crop : 3 pasture	1st	1876	4
	2nd	1313	59
	3rd	829	40

The control of nine successive crops was completely choked with ryegrass. In October 1975 these two plots were opened and sheep allowed to graze off the ryegrass.

There was a problem of ryegrass competition in second and third crops. The yield of a third crop is probably reduced due to fertility decline as well as weeds.

Ryegrass buildup is not bad in the 1 crop : 1 pasture rotation, but the yield is down compared to the other first crops. It is possible that one year of pasture, although about 50% clover, is not enough to maintain available nitrogen.

68ES/2474EX

Locality : Paddock N1A on Esperance Downs Research Station (Gibson)

Soil type : Fleming gravelly sand.

Cleared in 1951 and sown to clover, cropped in 1961 and 1962 then Woogenellup and Broome Grass sown in 1963, topdressed until start of trial in 1968. Lupins sown in the trial in 1974.

Rainfall :

in mm

May	June	July	Aug	Sept	Oct	Total
64	26	105	69	34	71	369

Lupin Yields (Uniharvest) sown 15/5/75

Rotation	kg grain/ha
Control 2nd lupin	1896
1 lupin : 1 clover	2270
1 lupin : 1 barley	2468
2 clover : 1 lupin : 1 barley	2191
2 clover : 1 barley : 1 lupin	2497
4 clover : 1 lupin : 1 barley	2300
4 clover : 1 barley : 1 lupin	2320

Barley Yields (Clipper) sown 4/7/75

Rotation	kg grain/ha
Control 8th crop	689
1 barley : 1 lupin	1417
2 clover : 1 lupin : 1 barley	1826
2 clover : 1 barley : 1 lupin	2038
4 clover : 1 lupin : 1 barley	2409
4 clover : 1 barley : 1 lupin	2591

The 1 lupin : 1 barley rotation is at present only just starting from a 1 rape : 1 pasture and the previous clover pasture could still have an effect on lupin yield.

Barley grown after lupins had more ryegrass which could have reduced yields. However, the barley responds to the longer length of pasture even after lupins, when ryegrass was bad.

68SG5/2475EX

Locality : Paddock H5 on Salmon Gums Research Station.

Soil type : Complex of Kumarl loam and Circle Valley/Beete calcareous sandy loam. Two of the four blocks are on the heavier soil.

The site was cleared in 1962, then cropped until the trial started in 1968. Two of the four blocks were sown to Cyprus barrel medic which is topdressed each year with superphosphate. The other two blocks are allowed to regenerate volunteer pasture which is not topdressed.

All crop plots are sprayed with Avadex to help control ryegrass.

Rainfall :

in mm

May	June	July	Aug	Sept	Oct	Total
28	36	28	22	11	74	199

Wheat Yield (Madden) sown 22/5/75

Rotation	Crop	kg grain/ha			
		Light soil	Heavy soil	Mean	
Control + 50 kg urea/ha	12th	391	361	376	
Control no urea	12th	351	432	392	
1 crop : 1 medic	1st	1142	1261	1202	e
1 crop : 3 medic	1st	1007	1157	1117	de
3 crop : 3 medic	1st	850	718	784	ab
	2nd	750	643	696	a
	3rd	1071	1111	1091	cde
1 crop : 1 volunteer	1st	1065	926	996	cd
1 crop : 3 volunteer	1st	1053	950	1002	cd
3 crop : 3 volunteer	1st	1305	1150	1228	e
	2nd	1144	1253	1199	e
	3rd	938	926	932	bc

5% LSD = 162

Ignoring the controls which are choked with ryegrass, an A.O.V. was fitted to the remaining treatments. There are no significant differences between the light and heavy soil blocks. The treatments are significantly (0.1% level) different. Means with the same letter are not significantly different (5% level).

The result is that there is no clear cut overall superiority of medic pastures to increase wheat yields. This may have been due to the low September rainfall, which was made up of light showers (the heaviest 3.2 mm) causing wheat on the more fertile medic plots to "hay off" before those on volunteer pasture.

69GE20/2466EX

Location : Bridgeman's Property, Horrocks

Soil type : Red brown loamy soil with red clay sub soil.

Daliak sub clover is sown as the main pasture component. Two of the treatments include a year of bare fallow which has proved very difficult in this area. These plots usually have at least a 25% cover of grasses, mainly ryegrass which is a known host plant to carry the eelworm through.

Wheat Yields (Gamenya) sown 27/6/75

Rotation	Crop	kg grain/ha	Belworm Rating 6/8/75
Control + 228 kg Agran 34/ha	7th	226	} 93
" + 114 " " " "	"	222	
1 crop : 1 pasture	1st	447	72
1 crop : 1 fallow : 1 pasture	1st	213	15
1 crop : 2 pasture	1st	725	8
1 crop : 4 pasture	1st	cattle	22
2 crop : 2 pasture	1st	279	29
+ 114 kg Agran 34/ha	2nd	242	52
2 crop : 1 fallow : 2 pasture	1st	ryegrass	9
+ 114 kg Agran 34/ha	2nd	258	52

All plots were affected by severe ryegrass infestation, despite better cultivation and virtual lack of ryegrass when the trial was examined in mid July (except in the Control crop plots). The ryegrass has made any comparisons of yield differences due to eelworm impossible.

73SG16/3229EX

Locality : Davies' Lease, Salmon Gums.

Soil type : Circle Valley sand.

This area of land was cropped in 1971 and 1972 after two years volunteer pasture, mainly grasses and some wild legumes (Goldfields medic and woolly clover). In 1973 the trial started and the pasture sown was a mixture of Harbinger, Cyprus and Tornafield medic.

Wheat Yield (Madden)

Reps

Rotation	Crop	1	2	3	4	Mean
1 crop : 1 medic	1st	1249	1343	1207	1238	1259
2 crop : 2 medic	1st	1118	1277	1214	1200	1202
	2nd	951	1083	1228	1228	1059
1 crop : 3 medic	1st	1118	1127	1287	1194	1182

b
b
a
b

5% LSD = 121

Second crop after two years medic yielded significantly (5% level) less than the other treatments. Probably due to heavier ryegrass competition.