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1976 Long term rotation trials

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ANNUAL SUMMARY OF RESULTS

1976 GROWING SEASON

IAN ROWLAND
PLANT RESEARCH DIVISION
DEPARTMENT OF AGRICULTURE
WESTERN AUSTRALIA

LONG TERM ROTATION TRIALS

W56H
66M29
67C13
67N4
68E5
68SG5
69GE20
73SG16

SOIL FERTILITY - GRAIN LUPINS

75TS23

W56H/604EX

Locality : Paddock 3E on Wongan Hills Res. Stn.

Soil type : Wongan loamy sand

History

The trial was started in 1956 on virgin sandplain. Each plot was fallowed for a year after clearing the scrub, cropped twice and then sown to Dwalganup sub clover. The pasture was topdressed and grazed for two, three, five and seven years, after which four wheat (var. Gamenya) crops were grown. Plots were then reseeded with Dwalganup, topdressed for a further one, two, three or four years and a single crop grown.

Rainfall : in mm.

May	June	July	Aug	Sept	Oct	Total
41	23	4	72	23	13	176

Wheat Yields : (Gamenya) sown on 22/6/76

	kg/ha
1 crop after 1 year pasture	2521
1 " " 2 " "	3426
1 " " 3 " "	3478
1 " " 4 " "	3435

There was no consistent effect of the previous length of pasture so they were grouped to give the yields shown.

After four crops, one year of reseeded pasture did not restore the soil fertility enough to give maximum yield, even though the clover component of the pasture in 1975 was good.

66M29/2083EX

Locality : Paddock 5AE on Merredin Res. Stn.

Soil type : Merredin sandy clay loam

History

An old land site, cleared in 1909. First sown to Cyprus Barrel medic in 1955, grazed and topdressed. Cropped 1962 and 1964. Medic resown in 1965. In the last few years the medic component of the pasture has disappeared and the pasture is dominated by ryegrass and barley grass. The proportion of the latter increases with age of the pasture.

Rainfall : in mm.

May	June	July	Aug	Sept	Oct	Total
22	21	13	51	31	26	164

Wheat Yields : (Gambie) sown on 13/7/76

Rotation	Crop	kg grain/ha
Control	11th	205
1 crop : 1 pasture	1	361
1 crop : 2 pasture	1	220
1 crop : 4 pasture	1	427
2 crop : 2 pasture	1st	288
	2nd	337
2 crop : 4 pasture	1st	609
	2nd	427
3 crop : 3 pasture	1st	615
	2nd	306
	3rd	266

Very dry conditions after seeding delayed germination until late August. Patchy germination, because of the weather, caused the differences in yields shown, except for the control plots which were choked with wild oats.

67C13/2332EX

Locality : Paddock 19B on Chapman Res. Stn. (Nabawa)

Soil type : Red brown loamy sand.

History

An old land site, cleared in 1903. Sown to Dwalganup sub clover in 1964, topdressed each year until the start of the trial in 1967.

Rainfall : in mm

May	June	July	Aug	Sept	Oct	Total
42	30	18	54	30	36	210

Wheat Yields : (Gamenya) sown on 7/7/76

Rotation	Crop	kg/ha
Control	10th	295
1 crop : 1 pasture	1	387
1 crop : 2 pasture	1	402
1 crop : 4 pasture	1	357
2 crop : 2 pasture	1st	417
	2nd	407
2 crop : 4 pasture	1st	456
	2nd	367
3 crop : 3 pasture	1st	541
	2nd	392
	3rd	332

The very dry conditions (for this area) reduced yields to the low levels shown.

It is interesting to note that the rainfall and grain yields are similar to 66M29.

67N4/2333EX

Locality : Newdegate Res. Stn.
Soil type : Grey sand over gravel at 20-30 cms.
History : 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
48	22	27	101	49	33	280

Wheat Yield : (Gamenya) sown on 18/6/76

Rotation	Crop	kg/ha	#ryegrass 4/8/1976	
Control	10th	921	182/sq m	*
1 crop : 1 pasture	1	1750	195 "	*
1 crop : 2 pasture	1	2217	2.2 "	
1 crop : 4 pasture	1	2417	1.4 "	
2 crop : 2 pasture	1st	2476	2.5 "	
	2nd	911	62 "	
2 crop : 4 pasture	1st	2310	2.5 "	
	2nd	1910	120 "	*
3 crop : 3 pasture	1st	2671	12 "	
	2nd	556	174 "	
	3rd	516	416 "	

* The experimental chemical HOE23408 was used on these plots. It gave a complete kill of ryegrass. Unfortunately the quantity available was insufficient to spray all the plots with a high ryegrass count.

The yield decline due to ryegrass competition is obvious in the second and third crops not sprayed. In the second crop sprayed, the yield drop may have been due to early ryegrass competition (sprayed on 6/8/76) and to the presence of "takeall".

In the short 1:1 rotation the yield has been lower the last two years. This year the drop may have been due to ryegrass competition before spraying but is probably because a year of clover is not sufficient to maintain soil fertility on this sandy soil.

68E5/2474EX

Locality : Paddock N1A on Esperance Downs Res. Stn.
(Gibson)

Soil type : Fleming gravelly sand.

History : Cleared in 1951 and sown to clover, cropped in 1961 and 1962 then Woogenellup sub clover and Brome grass were sown in 1963, topdressed until the start of the trial in 1968. Lupins were sown in trial in 1974.

Rainfall : in mm.

May	June	July	Aug	Sept	Oct	Total
27	51	77	77	50	43	325

Lupin Yields : (Uniharvest) sown on 30/6/76
Simazine sprayed 5/7/76

Rotation	kg/ha
Control 3rd lupin	1187
1 lupin : 1 clover	1162
1 lupin : 1 barley	1192
2 clover : 1 lupin : 1 barley	1376
2 clover : 1 barley : 1 lupin	1356
4 clover : 1 lupin : 1 barley	1481
4 clover : 1 barley : 1 lupin	1390

Barley Yields: (Clipper) sown on 16/7/76

Control 9th barley	562
1 barley : 1 lupin	2064
2 clover : 1 lupin : 1 barley	2346
2 clover : 1 barley : 1 lupin	1865
4 clover : 1 lupin : 1 barley	2244
4 clover : 1 barley : 1 lupin	2297

The first three of the lupin results had some ryegrass present in the crop, but it was not severe and the lupins had grown above it. Pod set in all lupins was relatively poor. The presence of ryegrass may have produced higher moisture stress and greater pod loss, hence lower yield.

There was no effect of having a year of barley as a cleaning crop for the lupins. However, this site does not yet have any lupin diseases, as shown by the healthy third successive lupin crop.

The ninth successive barley crop was very poor. Annual ryegrass had choked the crop, however, both the barley and the ryegrass looked nitrogen deficient.

Barley after lupins was affected by ryegrass.

There was no observable reason for the lower yield of barley after two years clover. The plot had no weeds and looked healthy.

Ryegrass was present in barley grown after lupins but not in those grown after clover, however, only at a low level and did not affect yield.

68SG5/2475EX

Locality : Paddock H5 on Salmon Gums Res. Stn.
Soil type : Complex of Kumarl loam (heavy) and Circle Valley/Beete calcareous sandy loam (lighter).

History

Cleared in 1962, then cropped until the start of the trial in 1968. Two of the four blocks were sown to Cyprus Barrel medic which is toppedressed with superphosphate. The other two blocks regenerate volunteer pasture which is not toppedressed.

Rainfall : in mm.

May	June	July	Aug	Sept	Oct	Total
14	17	13	29	27	39	139

Wheat Yields : (Madden) sown on 1 & 2/7/76

The overall yield was very low, mean of 290 kg/ha, however, very poor germination in most plots meant that the results varied due to this rather than the treatments.

69GE20/2466EX

Location : Bridgeman's property, Horrocks.
Soil type : Red brown loamy soil with red clay sub soil.
Rainfall : in mm. (for Northampton, 12 km east of site)

May	June	July	Aug	Sept	Oct	Total
35	32	21	69	31	20	208

Wheat : (Gamenya) sown on 23/8/76.

Dry conditions at the start of the season resulted in this trial not being seeded until August 23. The resulting crop was not worth harvesting.

73SG16/3229EX

Locality : Davies' lease, Salmon Gums

Soil type : Circle Valley sand.

History

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

Wheat Yield : (Madden) sown on 25/7/76,
sprayed 2.4D (80%) on 17/8/76

Rotation	kg grain/ha			
	1	2	3	Mean
1 crop : 1 medic	870	860	749	826
2 crop : 2 medic 1st	748	838	801	796
2nd	443	369	228	347
1 crop : 3 medic	564	501	393	486

5% L.S.D. = 216

Second crop after 2 years' medic was affected by ryegrass and possibly "take-all".

First crop after 3 years' medic was affected by "take-all". The 3rd year medic pasture in 1975, had noticeably more barley grass than other pasture.

N.B.: Rep. 4 was mistakenly sprayed with 2.4D at 3.16 l/ha rather than 0.5 l/ha. Yields were reduced.

SOIL FERTILITY - GRAIN LUPINS

75TS23

Locality : B. White's, South Eneabba

Soil type : Grey gravelly sand over clay.

History : New land, cleared in 1974, ploughed and trial sown in 1975.

1975 Treatments

Lupins (Unicrop) at two seeding rates, 50 and 120 kg/ha with superphosphate at 0, 155, 300 and 560 kg/ha; sub clover (Seaton Park) at 20 kg/ha with 0, 65, 130 and 250 kg super/ha; wheat (Gamenya) at 50 kg/ha and super the same rates as clover, plus 90 kg urea/ha. These treatments were aimed to give a range of yield of the 3 species by using super at optimum, $\frac{1}{2}$ and $\frac{1}{4}$.

1975 Yields :

Treatment	Tops Dry Wt	5% LSD	Grain	5% LSD
Lupin 50 Super 0 155 300 560	0 kg/ha 842 1247 2584	707	0 kg/ha 205 535 834	244
Lupin 120 Super 0 155 300 560	0 kg/ha 1395 1968 2332	707	0 kg/ha 288 537 731	244
Clover 20 Super 0 65 130 250	0 kg/ha 1623 1976 2653	194	0 kg/ha 197 357 685	144
Wheat 50 Super 0 65 130 250	91 kg/ha 1669 2955 3672	1020	0 kg/ha 368 726 920	144

1. Grain from lupins includes grain on the ground (from quadrat samples). The Hege 125 harvester dropped a lot of grain, approximately 50% of yield shown was on the ground.
2. Yield from clover is for the clean seed from burr samples.

3. Yield from wheat is as harvested, no correction was made for grain loss.
4. Yield of Tops are from quadrat cuts for lupins and wheat and metre readings for clover. The lupins had dropped most of their leaves due to Brown Spot infection.

1976 Treatment

The stubble of wheat and surface material of clover was burnt. Insufficient lupin stubble to carry a fire. Plots ploughed across the 1975 direction, scarified and sown to wheat (Gamenya), with 200 kg super/ha, also at right angles to the 1975 plots.

1976 Yields of Gamenya wheat sown on the 1975 treatments:

1975 Crop	Nil	$\frac{1}{2}$	$\frac{1}{2}$	Opt.
Lupin 50	367	598	755	850
120	384	711	812	812
Clover	560	560	579	661
Wheat	453	585	541	485

5% L.S.D. = 88

There is a highly significant ($P < 0.1\%$) correlation between the 1976 wheat yield and both the 1975 lupin vegetative and grain yield.

The yield of 1976 wheat grown on 1975 clover was correlated ($P < 5\%$) to the yield of clover seed, but not to the vegetative yield. Although the growth of clover in 1975 was very good the wheat grown in 1976 did not respond to the expected buildup in soil fertility.

Although 200 kg super/ha was used with the 1976 wheat, residual superphosphate on the lupin plots may have affected the 1976 wheat yield.