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DEPARTMENT OF AGRICULTURE

Western Australia

SUMMARY OF EXPERIMENTAL RESULTS 1977

LONG TERM ROTATION TRIALS

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

I. ROWLAND
PLANT RESEARCH DIVISION

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
29	40	17	60	7	26	179

Wheat Yields : (Gamenya) sown on 10/6/77.

	kg/ha
1 crop after 1 year pasture	1150
1 " " 2 " "	1194
1 " " 3 " "	1257
1 " " 4 " "	1296

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

Plots that were crop after 1 year pasture were accidentally sown at twice the seeding rate.

Annual ryegrass was very bad and the crop was sprayed with Hoe-grass on August 29th. Dry conditions after spraying meant that the ryegrass was not killed.

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
31	35	10	43	11	24	154

Wheat Yields : Madden sown on 18/6/77.

Rotation	Crop	kg grain/ha
Control	12th	34
1 crop : 1 pasture	1	116
1 crop : 2 pasture	1	185
1 crop : 4 pasture	1	95
2 crop : 2 pasture	1st	165
	2nd	95
2 crop : 4 pasture	1st	173
	2nd	147
3 crop : 3 pasture	1st	147
	2nd	131
	3rd	89

Rain early in June, before seeding, provided a good germination which then was severely stressed for moisture. Plants did not tiller much and by the end of September were drying off. The control plot (12th successive wheat crop) was choked with wild oats. There was no obvious reason for the three low yielding plots.

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
44	41	16	71	4	24	200

Wheat Yields : (Gamenya) sown on 25/6/77

Rotation	Crop	kg/ha
Control	11th	840
1 crop : 1 pasture	1	824
1 crop : 2 pasture	1	819
1 crop : 4 pasture	1	583
2 crop : 2 pasture	1st	423
	2nd	462
2 crop : 4 pasture	1st	378
	2nd	520
3 crop : 3 pasture	1st	788
	2nd	704
	3rd	861

A second dry year again reduced yields from this trial. There was no obvious reason for the lower yields in the 1:4, 2:2 and 2:4 rotations.

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
51	33	33	58	63	54	292

Wheat Yield : (Gamenya) sown on 31/5/77.

Rotation	Crop	kg/ha	#ryegrass 12/7/77
Control	11th	327	28/sq m
1 crop : 1 pasture	1	344*	151 "
1 crop : 2 pasture	1	1509	49 "
1 crop : 4 pasture	1	1431*	16 "
2 crop : 2 pasture	1st	1520	16 "
	2nd	203	37 "
2 crop : 4 pasture	1st	1334*	8 "
	2nd	193	25 "
3 crop : 3 pasture	1st	1558	3 "
	2nd	773	49 "
	3rd	268	366 "

Comments

1) * These plots had a lot of brome grass (mainly Bromus rigidus) which must have reduced yield.

2) Annual ryegrass competition in the crop of a 1:1 rotation was severe and combined with brome to reduce the yield.

3) Take-all in second crops was very severe. Especially in the 2:2 and 2:4 rotations where about 98% of the crop was seriously affected. Yields were further reduced by annual ryegrass growing better than the diseased wheat.

4) The third crop in a 3:3 rotation did not have as much noticeable take-all as second crops.

5) Total dry matter (i.e. wheat and weeds) sampled on 20th October show a possible reduction in soil fertility in a 1:1 rotation:-

1:1	4150kg DM/ha
1:2	6630 "
1:4	7250 "

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
126	38	15	47	51	50	327

Lupin Yields : (Uniharvest) sown on 20/6/77
Simazine sprayed 20/6/77

Rotation	kg/ha
Control : 4th lupin	265
1 lupin : 1 clover	1088
1 lupin : 1 barley	935
2 clover : 1 lupin : 1 barley	973
2 clover : 1 barley : 1 lupin	976
4 clover : 1 lupin : 1 barley	410
4 clover : 1 barley : 1 lupin	1209

Barley Yields: (Clipper) sown on 8/7/77

Control : 10th barley	1150
1 barley : 1 lupin	2137
2 clover : 1 lupin : 1 barley	2113
2 clover : 1 barley : 1 lupin	2129
4 clover : 1 lupin : 1 barley	2178
4 clover : 1 barley : 1 lupin	2158

Comments

- 1) Lupins in the control plots were showing signs of disease buildup. About 30% of the plants were stunted, possibly due to a root disease. Annual ryegrass was also very bad in the 4th successive lupin crops.
- 2) Other lupin crops have from 2 to 5% of stunted plants, except the lupin after 1 year clover which had about 10% effected.
- 3) Annual ryegrass was bad in the lupin after barley but the crop was competing well and yielded similar to the more weed-free crops after 2 years clover.
- 4) Yields from lupins after 4 years clover were surprising. Observations made on these plots on the 18th Oct did not suggest any large differences in growth. Lupins after a barley crop had slightly less diseased plants and annual ryegrass but it did not seem enough to have produced the yield difference shown.
- 5) There were no differences in the yield of barley following a legume. The control barley had a lot of annual ryegrass. Rainfall was very low for Esperance and probably prevented any yield response to increased soil fertility.

68SG5/2475EX

Locality : Paddock H5 on Salmon Gums Res. Stn.
Soil type : Complex of Kumarl loam (heavy) and Circle Valley/Beete calcarious 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 topdressed with superphosphate. The other two blocks regenerate volunteer pasture which is not topdressed.

Rainfall : in mm,

May	June	July	Aug	Sept	Oct	Total
41	19	7	23	36	51	177

Wheat Yields : (Madden) sown on 31/5/77

Low rainfall after sowing again gave a very poor germination, particularly on the heavier soil type. These two blocks were not worth harvesting. The lighter soil was harvested but variability in germination caused mainly by "Kopi" patches confounded any yield differences caused by rotation. Overall the wheat grown after volunteer pasture looked and yielded better than wheat after medic pasture, average 196kg/ha (volunteer) compared to 106kg/ha.

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 wooly clover). In 1973 the trial started with pasture being sown to a mixture of Harbinger, Cyprus and Tornafield medics.

Rainfall : in mm.

Rotation	kg grain/ha				
	1	2	3	4	Mean
1 crop : 1 medic	258	224	375	294	288
2 crop : 2 medic 1st	274	130	342	511	314
2nd	270	224	338	182	254
1 crop : 3 medic	279	199	504	411	348

Wheat Yield : (Madden) sown on 26/5/77.

Annual ryegrass was very bad and had a marked effect on yield. A linear regression was fitted to ryegrass numbers/sq metre and grain yield/ha :

$$\text{Yield} = 500 - 0.74 \# \text{ ryegrass/sq.m.}$$
$$R = 0.83$$

However, there were no significant effects of the rotation treatments on the number of ryegrass plants or on the grain yield.

