1973

Progress and data available for investigations

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WESTERN AUSTRALIA

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This report summarises progress and data available for the following investigations.

1. Fallow Re-assessment.

2. Root Penetration and Distribution in Wheat.

3. Moisture use by Lupins, Rape and Wheat.

4. Variety Investigations in respect of Root Growth.

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1. Fallow Re-assessment - 72M29.

Aim: To re-examine case for fallow as an agronomic practice in Western Australia.

Location: Merredin Research Station.

Soil Type: Merredin clay loam.

History: Old pasture land - 7 years of barrel medic prior to 1972.

The programme which was initiated in 1972 included an establishment and assessment year for three adjacent sites which were to be used in successive years. The following treatments have been/are to be imposed during the establishment years.

1. Maximum moisture conservation treatment. To be cultivated with first rains and subsequently when necessary for weed control. Long fallow.
2. Minimum moisture conservation. To be sown to wheat.
3. Chemical fallow. To be sprayed prior to seed set.
4. Mechanical fallow. To be cultivated after seeding operations. Standard fallow operation for the area.
5. Pasture - to be left in pasture.
6. Short fallow - to be left in pasture and cultivated if and when summer rains eventuate.

The timing of all operations to be left in the hands of the Farm Manager. The area established in 1972 was cropped for assessment in 1973. A second area was established in 1973. Data that are being accumulated will describe effect of treatments on soil nitrogen, moisture conservation and yield. These data are to be supplemented by root distribution data as a function of moisture availability and pasture and grain protein analyses.

Comments:

Total available moisture at seeding and grain yields for 1973 are listed in Table 1.

1. Maximum moisture storage of 6.69 cm. with the long fallow treatment constrasted significantly with the 1.31 cm. following cropping in 1972. Yields were accordingly significantly higher with long fallow.
2. The differences between the "standard" fallow treatments were minimal with a slight advantage to mechanical fallow.
3. The higher yield from long fallow and the difference between long fallow and continuous cropping resulted despite excellent growing conditions in 1973.

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4. Available nitrogen in March of 1973 as indicated by ppm NO_3 are also listed in Table 1. The high value for continuous cropping was inexplicable. The mechanical fallow and long fallow values were significantly higher than those of the other treatments.
5. With long fallow imposed in 1973 on the second establishment area, moisture penetrated to 90 cm. from the surface (Figure 1). Profiles suggested greater moisture storage following mechancial than chemical fallow.

Table 1. Available nitrogen in March 1973, available water at seeding in 1973 after fallow treatments were imposed in 1972 and yields in 1973.

Treatments	Available Water cm.	Yield bus/acre	kg/ha	Available Nitrogen ppm NO_3
Continuous crop	1.31	16.8	1055.6	25.3
Short fallow	3.21	22.0	1381.9	20.2
Pasture-crop	3.39	24.6	1546.4	18.9
Chemical fallow	3.90	23.0	1444.4	20.1
Mechanical fallow	4.73	25.0	1569.4	27.1
Long fallow	6.69	28.5	1791.6	29.3

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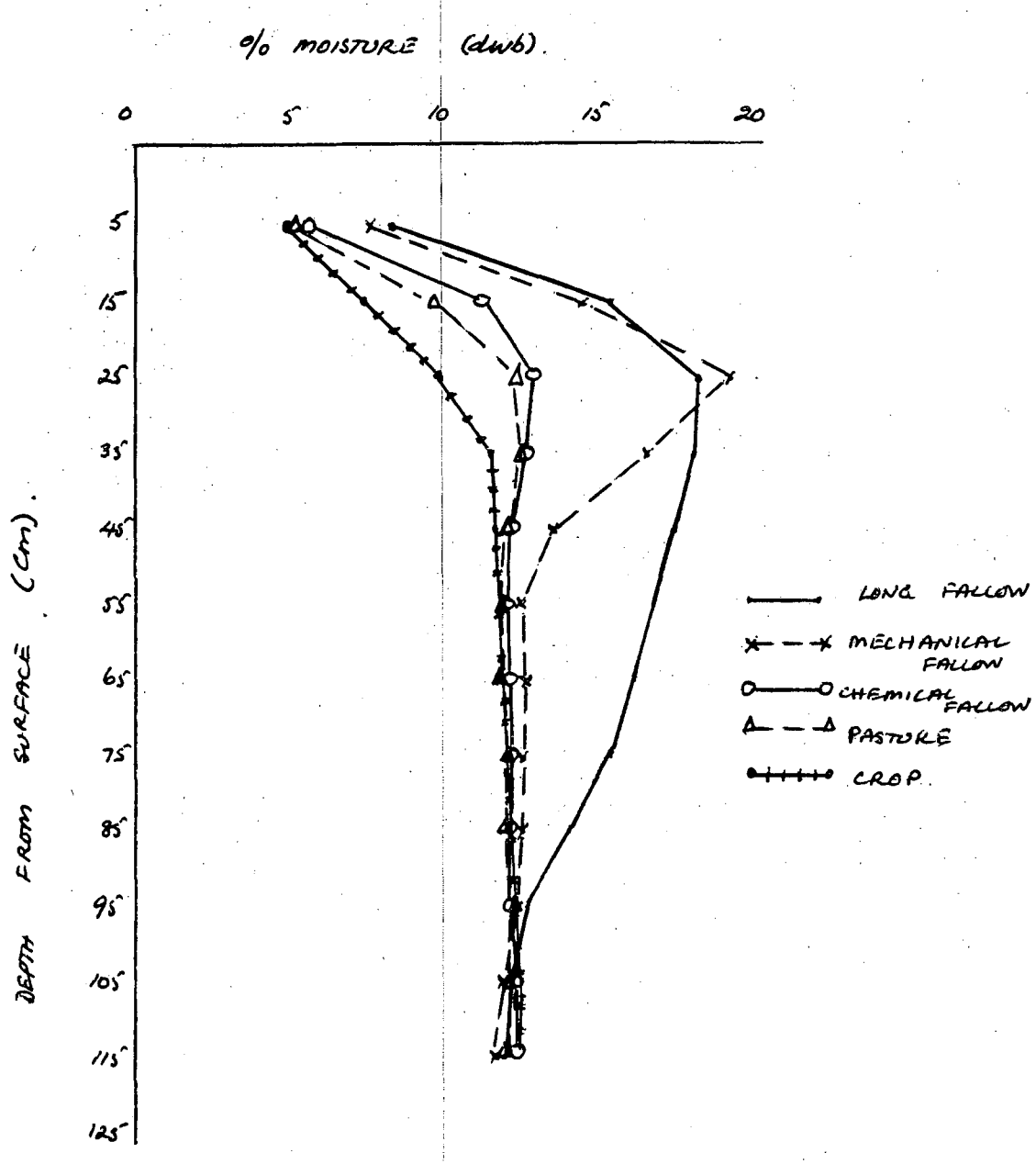
FIGURE 1. MOISTURE PROFILE IN DECEMBER 1973 FOLLOWING TREATMENT IN 1973. SECOND ESTABLISHMENT AREA.



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2. Root Penetration and Distribution in Wheat.

Aims: i) To confirm consistency in pattern of root penetration to depth.
ii) To analyse yields in respest of available moisture and rainfall.
iii) To add to root distribution root density and root diameter data already available.

Locations: Lancelin - 73MO41, Wyalkatchem 73NO38, Bering Siding - 73NO40 (2), Tammin - 73NO41, Cunderdin - 73NO42, Meckering - 73NO43, Bodallin - 73ME26, Walgoolan - 73ME27, Ulva Siding - 73ME29, Shackleton - 73ME30, Yelbeni - 73ME31 (3).

Soil Type: Deep sands.

History: First year crop after pasture phases of variable length.

Comments: Moisture profile data were obtained at seeding and at around 4, 8, 12, and 16 weeks after seeding. Root samples were obtained at each of these growth stages to describe root penetration, root distribution root density and root diameter. Yield date are available for each site.

1. Data obtained in 1972 were reported as being disquieting in that roots of 19 varieties of wheat achieved maximum depths of penetration. of the order of 120 cm. as compared to the 180 cm. normally expected for deep sands. Site location in a relatively high rainfall area was thought to contribute. Current investigations supported this observation. Sites having the lowest rainfall clearly showed root penetration to 180 cm. Depths of root penetration in the relatively 'higher' rainfall sites were of the order of 120-150 cm. Differences were also apparent between farmer classified 'poor' and 'good' yellow sands. Soil physical data are being derived with a view to quantifying this effect.

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2. The previously established pattern of root penetration to depth was evident at all sites. To reiterate from previous reports, two stages of root penetration are recognisable:

   i) After germination, primary seminal roots penetrate rapidly over the first week of growth to depths of the order 5 to 10 cm. Subsequent penetration was slow to 6 weeks from planting. Depending on soil type, depth of root penetration at this stage is around 15 to 30 cm.

   ii) After 6 weeks from planting rates of penetration increased to give maximum rates over the 8-13 week period from planting. Effective maximum depths were achieved around 13 and 14 weeks from planting. Only slight penetration occurred subsequently.

3. Yield data are yet to be analysed in respect of available moisture and rainfall over relevant intervals in the period from seeding to crop maturity.

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3. Moisture Use by Lupins, Rape and Wheat - 73M041.

Aim: Collaborative trial: To provide moisture use data as background to growth analyses carried out by R.N. Weir.

Location: Lancelin.

Soil Type: Deep yellow sand.

History: Mixed legume pasture for 5 years.

Moisture profile data were collected throughout the growing season under Gamenya wheat, Unicrop and Uniharvest lupins and Span and Zephyr rape. Through drainage component has as yet to be estimated before profile data can be converted to consumptive moisture use.

Comments on profile data:

1. Moisture extraction patterns suggested root penetration to 60-90 cm for rape, 120-150 cm. for wheat and 270-300 cm. for lupins.
2. Moisture profiles significantly different between species but little difference between varieties within species. Figure 2 shows a moisture profile in mid October.

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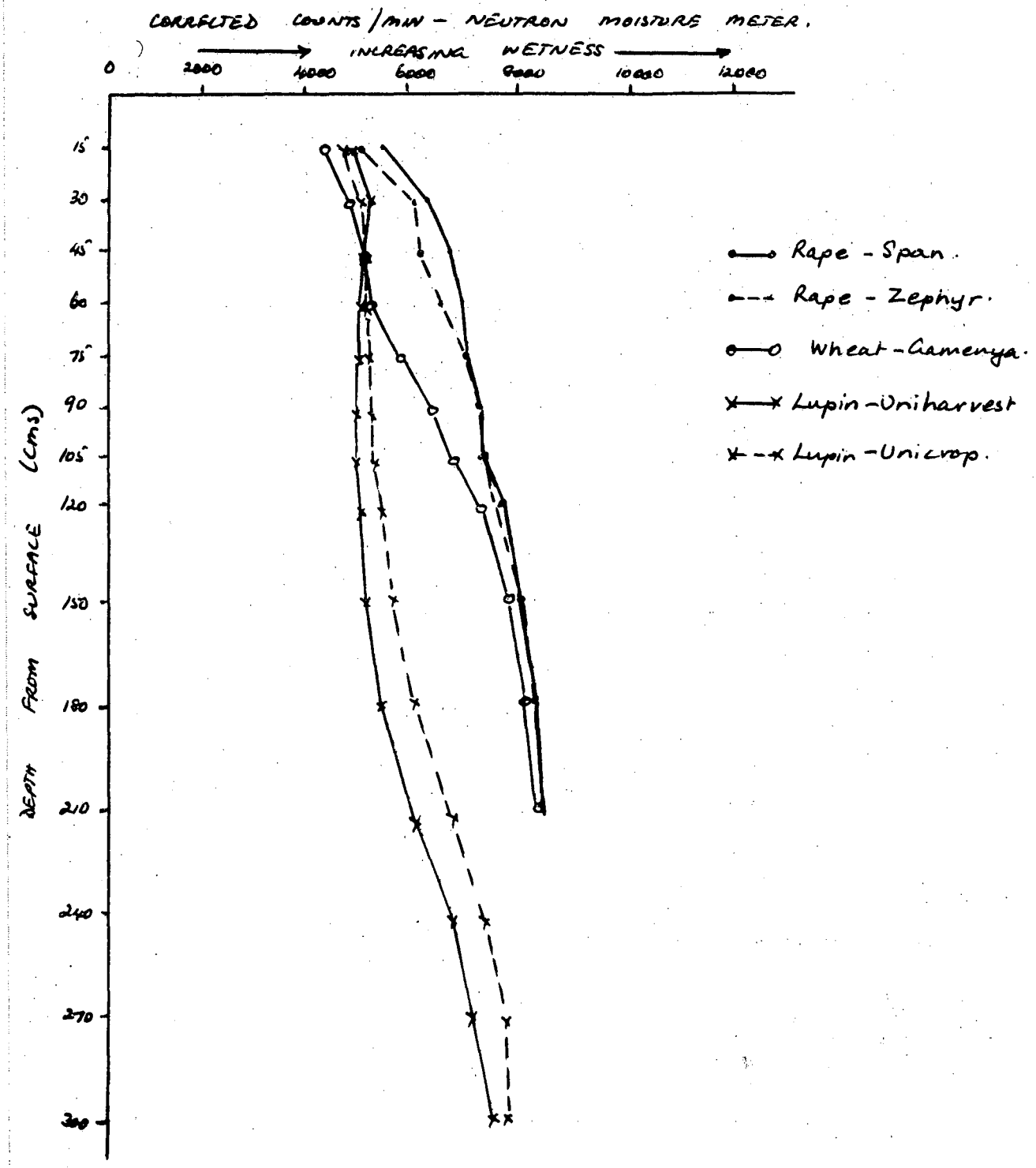
FIGURE 2. MOISTURE PROFILE 22nd OCTOBER 1973

LANCELIN.



4. Variety investigations in respect of Root Growth.

Aim: To demonstrate variety differences in root penetration, root distribution and early root growth.

Location: South Perth and Wongan Hills.
Soil Type: Deep sands.

Two investigations were carried out over 1973.

i) Ten commercial varieties were sorted for seed size and sown at South Perth. As in previous years, variety differences were minimal.

ii) During 1973 a number of diverse wheat varieties were made available for study by Dr. N.N. Roy of the Wheat and Sheep Division. Through continued selection, Dr. Roy had established variety groups of high and low growth vigour which included high and low yielding varieties within each. Sampling was initiated during 1973. To date there has been little difference between the root penetration data. The root number and length per plant material have as yet to be processed.