

Residual water in sandy soils after various rotations and agronomic treatments

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The residual value of a crop or pasture for following crops is usually associated with such factors as increased soil nitrogen, reduced disease burden, improved soil structure, etc. However, crops and pastures differ in rooting depth and use different amounts of water. This differential water use may influence the residual value of crops in rotation. At a low rainfall site in 1985 wheat yield was negatively correlated ($r=0.82^*$) with 1984 lupin biological yield (1). There was so little rain in 1985 that the residual moisture from the 1984 lupin plots was a major determinant of differences in yield. The amount of stored moisture at the start of the season may influence the farmers decision as to what land to crop to wheat. It has been shown on the Geraldton sandplain that legume pastures are shallower rooted than lupins (2). If the previous season was wet it is likely that pastures will leave more water in the rooting zone than lupins. If this is followed by little summer rain and below average growing season rainfall (water liable to be limiting) then cereal after pasture may out-yield cereal after lupins as more water will be available. If, on the other hand, the previous season was dry or if there was considerable summer rain, then it is likely that crops on lupin stubble will have as much water available to them as crops on pasture land. In this situation cereals following lupins will normally out-yield cereals following pasture. We are testing this hypothesis to help farmers in low rainfall areas make better cropping decisions.

Methods

In 1986 a trial was set up that involves 4 species (wheat, barley, lupins and medic pasture and includes plots which have been deep cultivated to 30cm. using an Agroplow (ripped).

Results and discussion

The treatments generated different rooting depths, total growth and water use (Table 1). Lupins did not respond to ripping but all the other species used more water when the soil was ripped (Table 1). Pastures used much less water than lupins (22mm on average). Water use approximated to rooting depth ($r=0.82^*$). This trial has established suitable differences to test the hypothesis that the residual value of one species for a following crop may be related to the water use of the previous species in the rotation.

Table 1: Effect of ripping on growth (t/ha.), relative water use (mm) and rooting depth (cm) of wheat, barley, lupins and medic.

		BY Anthesis	Rooting Depth	Relative Water Use *
Wheat	-Rip	3.89	177	-24
	+Rip	5.91	210	0
Barley	-Rip	4.47	177	-28
	+Rip	5.45	210	-20
Lupins	-Rip	3.47	217	-5
	+Rip	3.18	223	-6
Medic	-Rip	2.50	127	-31
	+Rip	3.29	180	-26

* water (mm) used relative to the treatment that used most water

1. Delane, R. and Hamblin, J. 1986. Proc. 4th Intern. Lupin Conf., 312.
2. Hamblin, A.P. and Hamblin, J. 1985. Aust. J. Agric. Res. 36, 63-72.