SOIL WATER STORAGE AND EXTRACTION FOR IRRIGATED LUCERNE PRODUCTION ON A GREY CRACKING CLAY

Kevin Morthorpe
NSW Agriculture & Fisheries, Trangie

The roots of lucerne penetrate the soil deeper than the roots of most other crops. However some soils confine root growth and diminish the ability of lucerne to withstand water stress.

Stands of lucerne (Medicago sativa L.) six months old and three years old were flood irrigated at four frequencies on a grey cracking clay (Ug 6.1). This is a typical soil used for lucerne production in the Macquarie Valley. Soil moisture was measured with a neutron probe. The mean wettest and driest measured profiles and a typical profile 12 days after irrigation, are shown in Figure 1. Extractable soil water (ESW) is the difference between the wettest and driest profile. Available water has been defined using the - 1.5 MPa potential profile as the estimated permanent wilting point (PWP).

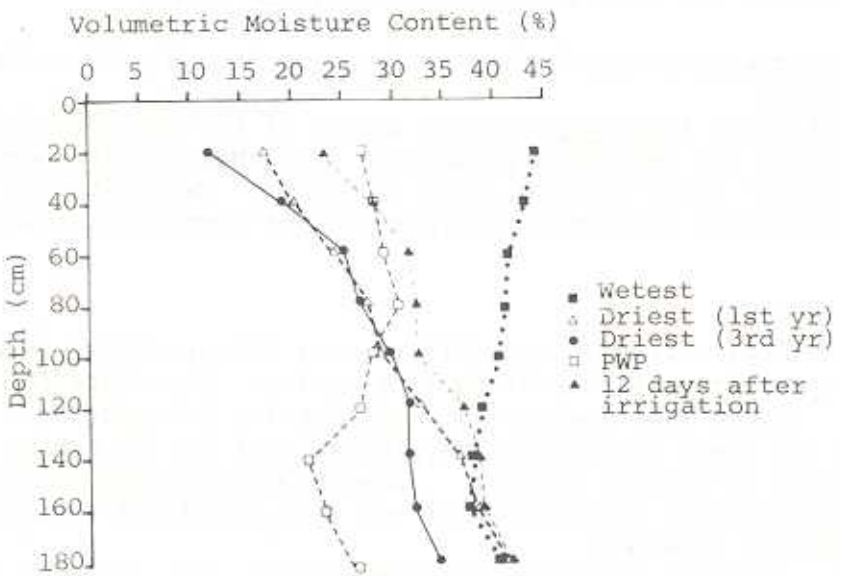

Figure 1: Soil water extraction patterns for first year and established lucerne.

Negligible soil water was used below 1.8 m during the experiment. As the stand aged, a greater root mass developed below 1.2 m so that the three year old stand was able to extract 50.8 mm more water than the first year stand. Even so, the established crop failed to use 55% of the available water in the 1.2 - 1.8 m depth. Over 80% of the crop water requirement was extracted from the surface 0.6 m during regular irrigation. Plants were able to dry the soil profile beyond PWP moisture potential to a depth of 1.0 m over a 38 day drying period and about 40% of ESW was used within 12 days after irrigation.

Frequent, small irrigations optimised the use of applied water because the crop water requirements were available from the surface 0.6 m, and lucerne production was increased in both wet and dry seasons as a result.