Plant Root Depth of Tropical Perennial Grasses in a Temperate Environment

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Introduction The influence of perennial grasses on the soil water balance has been determined by measuring the pattern and depth of soil drying achieved by plant roots (Murphy and Lodge 2006). Pasture species having a greater plant root depth and an increased ability to use available soil water may produce more herbage mass, and so increase livestock production. The North-West Slopes region of New South Wales (NSW) is classed as a temperate environment, but it has warm to hot summers and a summer dominant rainfall distribution. Summer active species, such as tropical perennial grasses, may be suited to this environment to utilise available soil water during the summer season.

Materials and methods An experimental site was established on a red chromosol on the North-West Slopes of NSW (31°16′S, 150°52′E, 490 m alt., 671 mm AAR) to compare soil drying and plant root depth of some introduced and endemic perennial grasses. Four treatments including three tropical species (*Digitaria eriantha* cv. Premier; *Chloris gayana* cv. Katambora; *Bothriochloa bladii* cv. Swann) and a mix of native species (*Austrodanthonia bipartita* cv. Bunderra; *B. macra*; *Dicanthium sericeum*; *C. truncata*) were randomly allocated to plots (6 x 9 m) across three replicates. Treatments were established in December 2005 by seeding at a rate of 2 kg/ha of germinable seed into a prepared bed at a depth of 10 mm. A single aluminium access tube was installed in the centre of each plot to a maximum depth of 1.7 m and a calibrated neutron moisture meter was used to measure volumetric soil water content (m^3/m^3) at 0.2 m depth intervals. Soil water content was measured through the growing season at 3-week intervals from 1 September 2006 to 31 May 2007. Maximum depth of drying and subsequently plant root depth was interpreted as the depth where drying of >0.02 m^3/m^3 was achieved (Murphy and Lodge 2006).

Results and discussion Soil water content at the start of the growing season was near to field capacity, with a mean value of 551 mm ensuring a high amount of plant available water for each treatment. By May 2007, Katambora dried the soil to a depth of 1.6 m (Figure 1). Swann and Premier showed drying to lesser depths of 1.4 and 1.2 m, respectively (Figure 1). Depth of drying under native grasses was considerably shallower at 1.0 m. These data indicated that plant root depth was at least 1.6 m for Katambora, 1.4 m for Swann, 1.2 m for Premier and 1.0 m for native grasses.

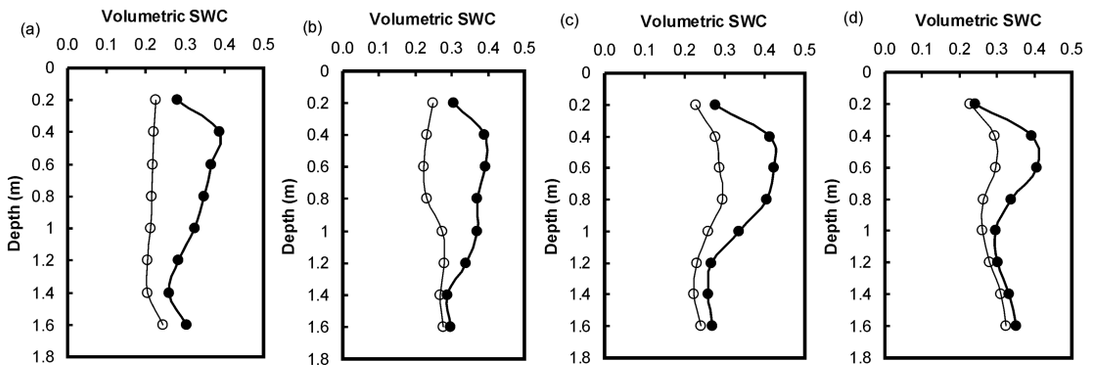

Figure 1 *Volumetric soil water content (SWC) at the start (1 September 2006, ●) and end (31 May 2007, ○) of the growing season for (a) Katambora, (b) Premier, (c) Swann and (d) native grasses.*

Conclusions In the temperate environment of the North-West Slopes of NSW, three introduced tropical grasses extracted soil water through the growing season to a greater depth than a mix of native perennial grasses. These preliminary results indicate that the tropical species are potentially well suited to make use of available water in summer in this environment.

Reference

Murphy, S.R., Lodge, G.M. (2006). Root depth of sown and native perennial grass-based pastures, North-West Slopes New South Wales. 2. Estimates from changes in soil water content. *Aust. J. Exp. Agric.* 46, 347-359.