Limits to pasture performance in an area where extra soil was added during the land forming process

K.B. Kelly, S.J. Blaikie and W.K. Mason

Kyabram Research Institute, R.M.B. 3010, Kyabram, Vic. 3620

Landforming requires removal of soil from some areas (cut) and deposition in other areas (fill) to provide a uniform slope for flood irrigation. Although cut areas are known to cause yield decreases, some fill areas also have poor pasture yields despite the extra depth of topsoil added during landforming. During the irrigation season these fill areas often contain weeds symptomatic of waterlogging even though surface drainage is rapid. This paper presents a range of measurements taken from a four year old pasture growing on a site with 20-30 cm of fill that explain the poor productivity of pastures in fill areas.

Following irrigation, net daily photosynthesis declined from 100% of a well watered control to 80% after 30-40 mm E--R (evaporation less rainfall) and further declined to 50% by 90 mm E-R. This was accompanied by the extraction of only 45-50 mm of soil water (Fig Ia) with all water being extracted from the top 40 cm of soil. Root density (Fig. Ib) declined rapidly between 20 and 30 cm below the surface which corresponded to the depth of extra soil added. The day after irrigation there was a proliferation of new roots above the old soil surface (pre landforming), with little root penetration into what was previously the soil profile at this site. Although air filled pore space (Fig Ic) was calculated to be greater than 10% after irrigation at a depth of 20-30 cm, reducing conditions were evident. Significant amounts of dead plant material were present in this layer and its decomposition may have caused low soil oxygen status and inhibition of root growth. The measurement of soil oxygen is currently in progress.

To solve this problem it appears that some method must be used to improve soil aeration after landforming to increase the rate of breakdown of the organic matter built up over 50-80 years of perennial

Fig 1. (a)Volumetric soil water (mm³/mm³), (b) root density (no. of intercepts/cm²), (c)air filled pore space (mm³/mm³) at the day after irrigation (__), at 50 mm E-R (....) and 90 mm E-R (---). Horizontal bars are standard error (n=36).

