

Pasture response to amelioration of exposed subsoils II.

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In Part 1 of this experiment (Kelly et al., this conference), various methods of improving the yield of irrigated white clover/ryegrass pasture growing on exposed subsoil were assessed. In this experiment the two soil tillage methods, paraplowing and gypsum slots, were more intensively examined during the period between irrigations in early 1986. These treatments were selected because they had improved DM yield.

Methods

Treatments included 1. control, 2. paraplow and 3. gypsum slots in which the soil excavated from a narrow trench 0.4m deep and running the length of the plot was mixed with a high rate of gypsum and replaced. A fourth, unreplicated treatment was identical to the control except that it was watered by hand each day to replace Class A pan evaporation. All plots had received high rates of P and N fertilizer. Measurements were made each day during the 11 day (76 mm E-R) irrigation cycle and included midday leaf water potential, leaf elongation rate, canopy net photosynthetic rate and evapotranspiration. Light interception by all canopies was 70-80%.

Results and discussion

Figure 1 shows daily photosynthetic efficiency (g CO₂/MJ) of treatment canopies as a percentage of the well-watered treatment as soil water deficit increased. Control treatment values were initially well below all other treatments; the cause of the difference is unknown. After 43 mm E-R the efficiency of the control rapidly declined to 19% of the well-watered after 72 mm E-R. Over the same period the paraplow treatment canopy was reduced to 54% while the efficiency of the slot treatment canopy remained above 90% of the well-watered throughout. The effects of soil treatments on photosynthetic efficiency were reflected in the parameters of plant water status, with the superior performance of the gypsum slot treatment being related to the very good water relations of the plants growing in the slot. These results confirm that the availability of water is a major limitation to the productivity of pastures on exposed subsoils and that some form of soil amelioration is needed to improve water availability and thus pasture yield on exposed subsoil.

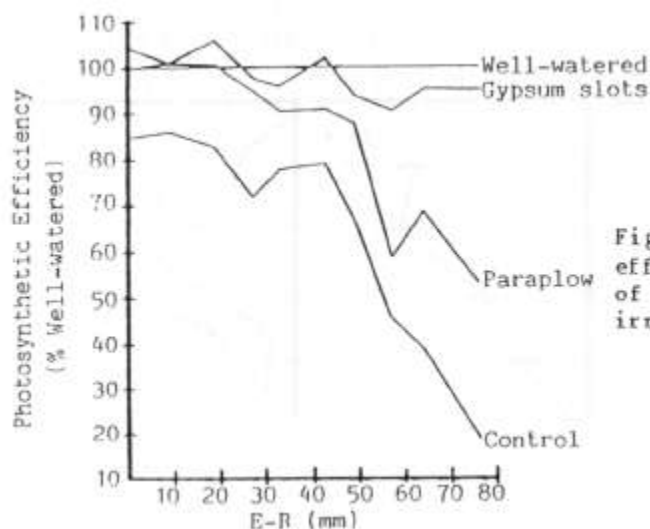


Figure 1. Photosynthetic efficiency as a percentage of well-watered during an irrigation cycle.