

Linking Soil, Pastures and Livestock in Pasture Management

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Pastures and soil are the basis of our grazing system. If properly managed, these resources can not only be used for benefit and profit, but can also be improved. However, too often a lack of knowledge and understanding has resulted in management practices that are not based on solid fundamentals. For example, pastures grazed until they are "chewed out" will cause pastures to deteriorate and soils to degrade. Livestock performance will probably also suffer, as will profits.

Research has helped identify how management practices can affect the stability of both soils and pastures, and also stock performance. Unfortunately, this information is not necessarily linked together so that managers can consider all those resources as a total system. Research at Gunnedah is attempting to identify some of those links.

SOILS

Erosion on hillslopes can be controlled by maintaining at least 70% ground cover (Lang, 1990). Adequate vegetative cover will also maintain high soil infiltration rates, which will reduce runoff and provide more water for plant growth. Organic matter added to the soil by an adequate plant cover will encourage soil biological activity, build up soil structure, and increase the water holding and nutrient

capacity of the soil. Soil compaction due to stock and vehicular traffic will be minimised by the cushioning effect of plant material.

PASTURES

Pasture management (grazing pressures, time of grazing and fertiliser practices) can change pasture composition by suppressing some species and encouraging others (Williams, 1970). Pasture management therefore can be used to encourage perennial species, maintain a balanced grass-legume mixture (Pott and Humphreys, 1983) and suppress weed species (Michael, 1968). A stable, productive, perennial based pasture will protect the soil against the erosive forces of raindrop impact action and flowing water, and will provide a more stable and uniform feed supply for livestock. In addition, the permanent root and crown system can respond rapidly to rainfall and utilise the available soil moisture. This not only increases productivity, but also tends to limit the movement (and loss) of water and nutrients, especially nitrates, beyond the root zone, thereby retarding associated soil acidification processes (Helyar, 1991).

Fortunately, those management practices which should provide a stable, permanent pasture system will also tend to

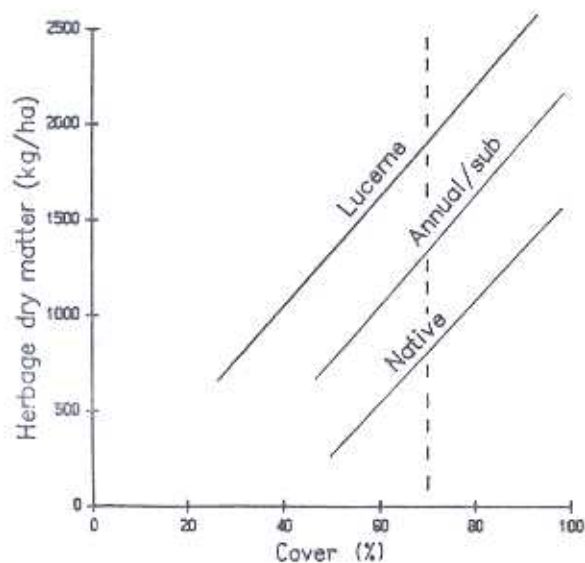


Figure 1: Relationship between herbage dry matter yield (kg/ha) and per cent cover for three pasture types (--- 70% cover limit for erosion control).

improve the chemical and physical state of the soil. Pasture grazing rates which are designed to encourage desirable perennial species will not usually cause soil erosion or other degradation problems. Those practices which should improve the soils physical, chemical and biological activity will also tend to increase plant production and pasture stability. However there are some exceptions, as the acidifying effect of long term applications of superphosphate on annual sub clover pastures will testify.

LIVESTOCK

Livestock production efficiencies can be improved by using results from the NSW Agriculture's PAAP Program in which livestock performance has been related to available herbage dry matter. However, optimum animal production does not necessarily equate to a stable soil or pasture base. One difficulty in linking animal production to soil and pasture effects is terminology. Available herbage (kg/ha), as related to animal performance, needs to be translated into ground cover units (%), an expression which is most rele-

vant to those interested in a stable soil or pasture. Due to different structure of plant species, some are prostrate while others are erect, any such linkage needs to also consider the effect of pasture type.

LINKING GRAZING MANAGEMENT TO SOILS

Recent research at Gunnedah (Figure 1) has defined the relationships between ground cover (%) and herbage availability (kg/ha) for:

- a lucerne pasture
- an annual grass/clover mix
- a native pasture

These relationships (Figure 1) show that, with grazing, some pastures will pose a serious erosion hazard long before stock performance is affected. Therefore careful planning, such as restricting those pastures to low slope paddocks or installing graded banks, will be needed to prevent soil erosion. For other pasture types, the minimum ground cover and herbage availability values more or less coincide. If these pastures are overgrazed, the pasture, soil, stock and profits will all suffer together.

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