PASTURE MANAGEMENT FOR BOTH PRODUCTION AND STABILITY

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Abstract

Studies were conducted in northern NSW to determine the role of vegetative cover in generating runoff and erosion, and to examine the links between ground cover and herbage availability. A non-linear relationship was obtained between the amount of ground cover and both runoff and erosion, with a critical cover value of 70 %. A second study revealed well-defined linear relationships between available herbage and ground cover for three contrasting pasture types - lucerne, native pasture, and annual subclover and ryegrass. Implications for water and nutrient use, plant productivity and use, soil stability and pasture management are discussed.

Keywords: Ground cover, herbage availability, runoff, erosion, pasture management, sustainability.

A stable soil and pasture system is fundamental to a productive and sustainable grazing industry. Preliminary studies in NSW (2,3) have indicated that objective ground cover criteria can underpin integrated grazing strategies which address both soil degradation and pasture productivity issues. Studies were commenced in the wheat-sheep-belt of northern NSW to confirm the preliminary studies, specifically to (a) determine the effect of pasture on infiltration, runoff and erosion control; and (b) to investigate the links between soil production requirements and herbage availability for three contrasting pasture types.

Methods

A range of ground cover conditions, from zero to complete cover, were maintained for eight years on standard Soil Conservation Service runoff and soil loss plots on a fine-textured soil at Scone in the Upper Hunter Valley of NSW. Rainfall, soil moisture, per cent ground cover, runoff, and sediment loss were measured. In a second study the amount of ground cover and available herbage were measured in replicated 1 m^2 quadrats for three contrasting pasture types at Cowra and Gunnedah.

Results

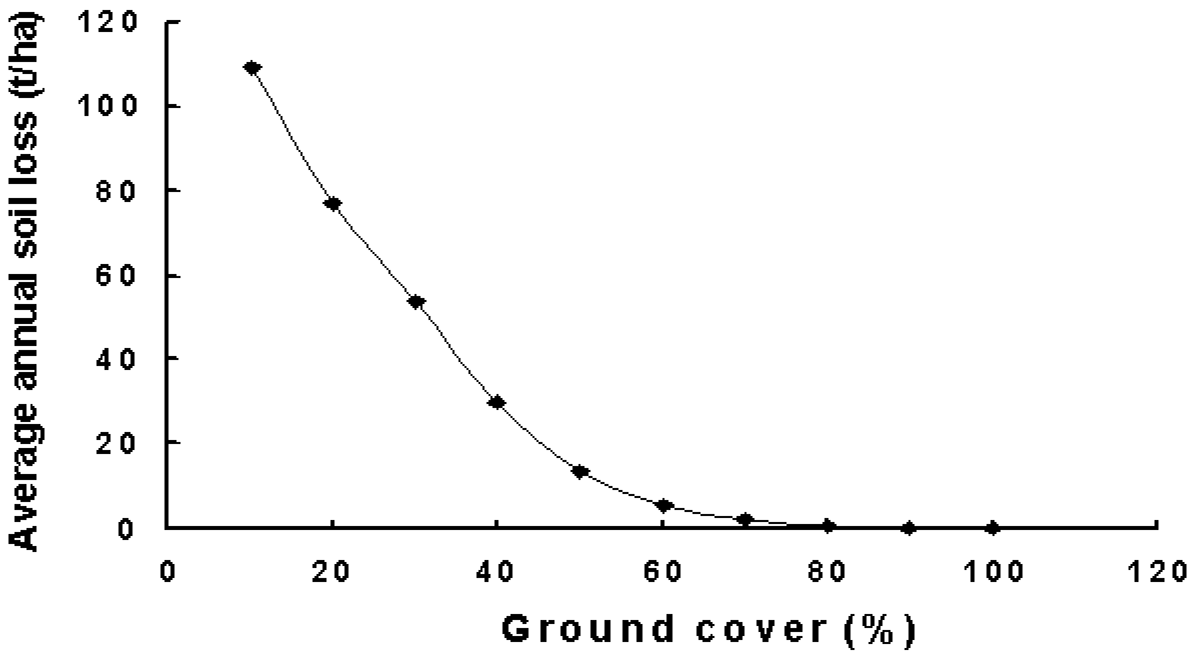

Figure 1

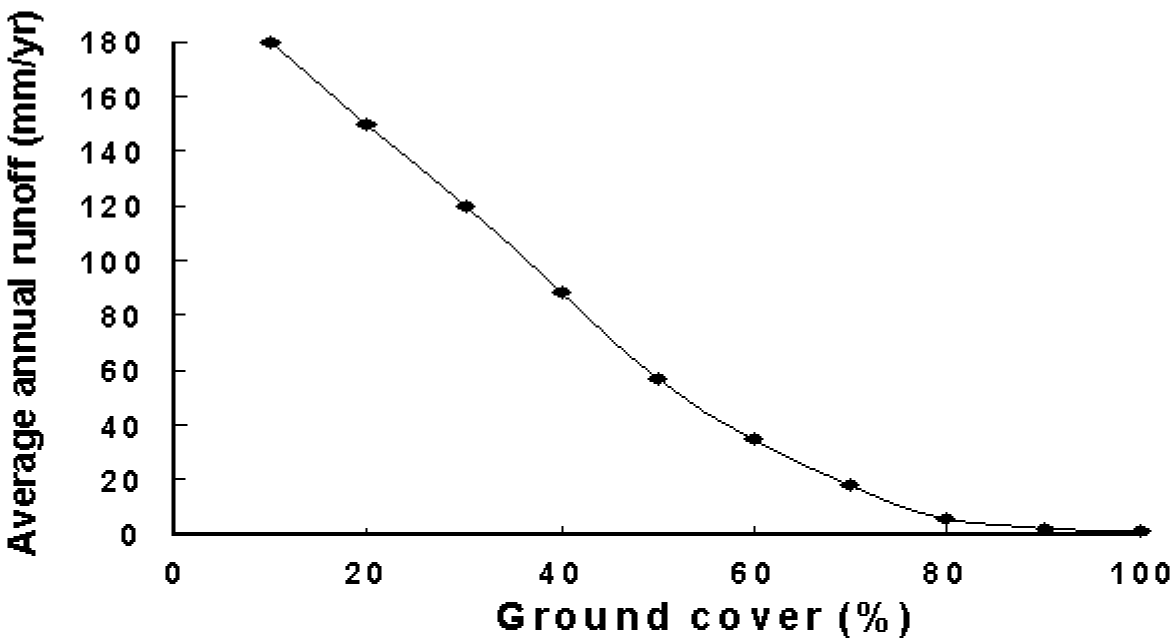

Figure 2

Non-linear relationships were found between per cent ground cover and both runoff and erosion, with a critical cover value of about 70 % (Fig. 1 and 2). Where ground cover exceeded 70 %, infiltration rates were high and runoff was generated only by high rainfall events which saturated the soil. This runoff was mostly sediment free. Where ground cover was sparse (less than 30 %), infiltration rates were generally low and most rainfall events produced runoff which invariably carried sediment.

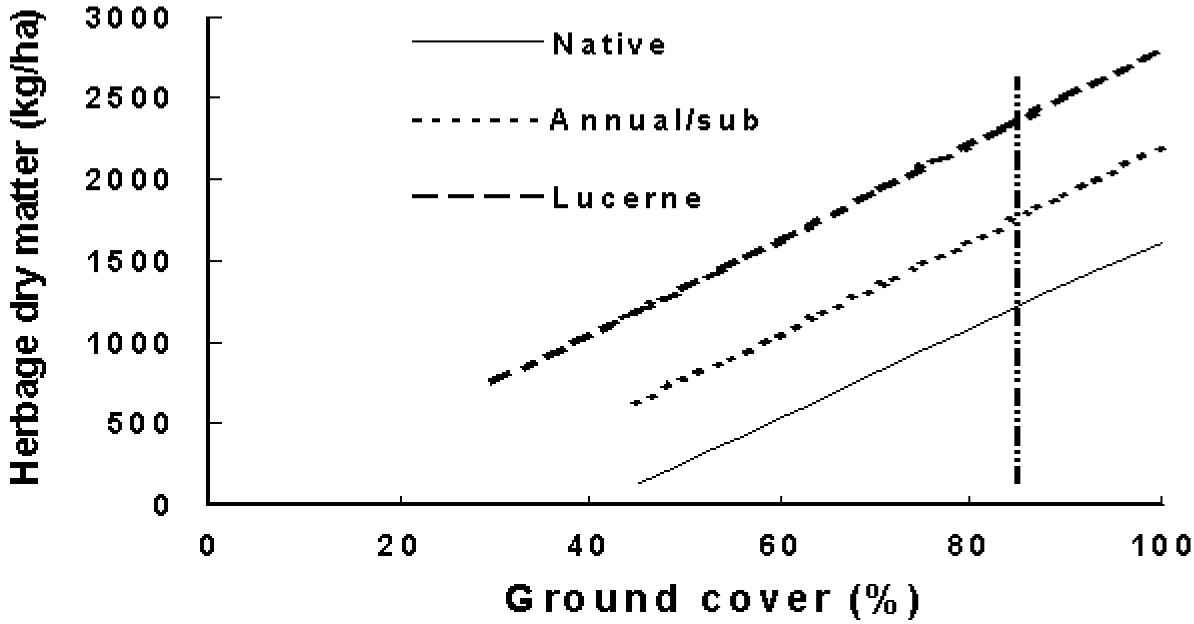

Figure 3

Linear relationships were found between herbage availability and ground cover (Fig. 3). Lucerne produced the least ground cover per unit of herbage availability while the native pasture provided the most ground cover.

Discussion

A minimum of 70 % ground cover was required to maximise infiltration of rainfall, and minimise runoff, nutrient and sediment loss. The results obtained are consistent with results from overseas studies (4). Soil loss rates appear to be approximately in balance with soil formation rates (1,3). In a country where water is the main limiting factor for agricultural production, excessive loss of rainfall by runoff must significantly limit potential plant production. In addition, preferential loss of organic matter and fine textured material in runoff will significantly reduce the soil?s nutrient and water holding capacity. Rainfall, slope and soil type are also important components in runoff and erosion control and, using erosion prediction technology (5), the effect of these factors can be conceptually visualised as moving the cover relationships along the axes. Thus, seasonal and long-term drought impacts can be accommodated for by identifying less susceptible, low slope and less erodible paddocks, and progressively using these as refuges and sacrificial areas. Such areas should support resilient or easily replaced pastures.

The three pasture types varied in their ability to provide soil cover for a given amount of available forage. Lucerne, with grazing, posed an erosion hazard before the available herbage limited stock growth. Careful planning, such as restricting such pastures to low slope country, installing graded banks or contour based strip grazing would be required to ensure a stable, productive system. In contrast, grazing of the native pasture by breeding stock resulted in a shortage of feed before excessive soil exposure.

Conclusion

Seventy per cent ground cover is a useful indicator of the minimum pasture cover required for soil protection, for efficient capture and use of rainfall and nutrients, and for sustainable long term production. Drought strategies can be formulated by classifying and using paddocks according to slope, soil erodibility and pasture characteristics. Pasture type and habit are important in managing the balance between pasture use and soil protection.

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