# A Decision Support System for Rangeland Management in Degrading Environments

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**The XX International Grassland Congress took place in Ireland and the UK in June-July 2005. The main congress took place in Dublin from 26 June to 1 July and was followed by post congress satellite workshops in Aberystwyth, Belfast, Cork, Glasgow and Oxford. The meeting was hosted by the Irish Grassland Association and the British Grassland Society.**

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**Introduction** The continued viability and productivity of commercial and emerging agriculture in KwaZulu-Natal Province, South Africa, depends on the accurate assessment and sustainable utilization of available natural resources. Sustainability implies that growth and development must take place, and be maintained over time, within the limits set by natural ecosystems. Utilizing an extensive GIS database, field surveys and remote sensing technology, a land assessment decision support system (LADSS) has been developed in an attempt to define these limits for the Province. This system has been developed to assess the appropriate use of existing resources as well as the suitability of current land use practices. LADSS includes a predictive tool which allows the impact of a proposed change in land use to be forecast within 590 agro-ecological zones of the Province.

**Materials and Methods** Two case study areas were selected which represented widely varying agricultural potential. The northern area, suited to extensive farming practices such as beef and game, is restricted by shallow erodible soils and low rainfall. The southern area, with a higher production potential including intensive cultivation, has deeper fertile soils and higher rainfall. Both areas encompass a wide variety of range management policies from multi-species game or conservation areas, highly managed commercial beef and dairy enterprises to areas which are heavily stocked, continuously grazed and communally managed (Table 1). An existing natural resource classification system, unique to the Province, combined with remote sensing data is utilized to provide an accurate assessment of (i) the extent of cultivation including fodder crops, (ii) extent and severity of degradation, (iii) areas of high biodiversity, (iv) loss of production potential and (v) areas requiring rehabilitation. Soil, climate and crop model information is used to determine optimum land use options and productivity of rangeland and cultivated land.

**Results** Resource plans, using LADDS, were developed to assist planners in determining appropriate land uses and to develop an agricultural strategy for each agro-ecological zone, based on GIS, land assessments and remote sensing data.

**Table 1** Comparison of Land Use Patterns between two study areas

| Land Cover | Northern Area (%) | Southern Area (%) |
|---|---|---|
| Indigenous forest | 0 | 3.2 |
| Bushland thicket | 31.5 | 23.5 |
| Natural grassland | 21.5 | 20.5 |
| Exotic Plantations | 5.6 | 16.4 |
| Wetlands/waterbodies | 0.2 | 3.2 |
| Degraded land /eroded areas | 30.2 | 9.4 |
| Cultivated land and pastures | 10.0 | 17.0 |
| Urban areas/communal settlements | 1.0 | 6.8 |

Mentoring and training in natural resource management were undertaken to limit further degradation and to encourage community-driven sustainable strategies to be formulated and adopted. The gap between potential production and current land uses enabled the identification of areas which offer an opportunity to improve livelihoods, reduce risk and apply integrated intervention strategies which might ensure sustainable managed systems.

**Conclusions** The "best practice" approach was identified, intervention strategies were implemented and assistance with emerging farmer settlement schemes was provided. LADSS was found to assist land users and planners with information which is fundamental to the requirements of sustainable agricultural practices and allows for monitoring future changes in land use. Strategies, which were identified from the derived data, included community-driven approaches, participatory approaches to prioritize community needs, and the identification of drivers to ensure adoption and successful implementation of the strategy.