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DEVELOPMENT OF LONG TERM CARRYING CAPACITY MODELS FOR THE DESERT UPLANDS

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ABSTRACT

A process for estimating long term carrying capacities (LCC) for the land types of the Desert Uplands (DU) has been developed. This project has married the practical wisdom of long term land managers with the technical knowledge of officers from three Queensland Government agencies to calibrate pasture growth models. Case studies, involving use of the LCC in business planning were worked through with several properties. This information has been very useful for the implementation of a Grazing Land Management training program.

We have worked with the Desert Uplands Build-up and Development Strategy (DUBDSC) to begin to address grazing land management issues. DUBDSC has documented viability and sustainability issues for the population and land within the DU, and the need for LCC information and property management planning.

INTRODUCTION

The aim of the DUBDSC is to increase the viability and sustainability of the population and land within the Desert Uplands (DU) region. It has done this through encouraging sustainable management practices and facilitating property build-up (as many properties areas are unviable).

The DU bioregion is bounded by the Mitchell grass to the west and the Brigalow belt to the east. Spinifex (*Triodia* spp.) is abundant and the soils are generally sandy and low fertility. The DU is a key bioregion as much of the woodland is intact and so provides a corridor between the western grasslands and the eastern woodlands. However estimates indicate that up to 70% of the DU is displaying a decline in land condition (loss of perennial grasses, soil erosion), and this compromises both its conservation value and long-term grazing value (DUBDSC, 1996).

Sustainable management of grazing lands requires an objective and dynamic means of assessing LCC. Use of the procedure for the land types of the DU requires calibration work with the GRASP model and on-farm testing. An LCC procedure customised to the DU will provide beef producers with an integrated measure, or benchmark, of the property's likely capacity to support grazing on a paddock by paddock basis. This will benefit producers by providing a tool that implicitly accounts for variation in rainfall and land type.

METHODS

1. Create awareness, encourage participation and report results

Land management field days and public meetings were held across the region. Together with colour brochures and media interviews, the project objectives were promoted and explained. Workshops were held across the region to report results.

2. Development and testing of the procedure

Development of a Land Type Framework

Development of a land type framework (LTF) for the DU is a necessary basis for the LCC procedure. Land types are manageable units of land, readily recognised by land managers as having distinct soil, vegetation, landform and productive capacity. Physical description and identification of the land types was based on land unit mapping (Lorimer, 2003), and consultation with industry and land management agencies.

Calibration of pasture growth models

Calibration of the core models in the GRASP pasture production models (McKeon *et al.* 1990) for representative land types involved on-property refining using the wisdom of experienced land managers in the area. The promotional work and proactive talks with the DUBDSC led to a comprehensive list of co-operator properties, which was later refined down to 9. The calibration process involved these properties (Figure 1), which had land types representing the majority of the DU.

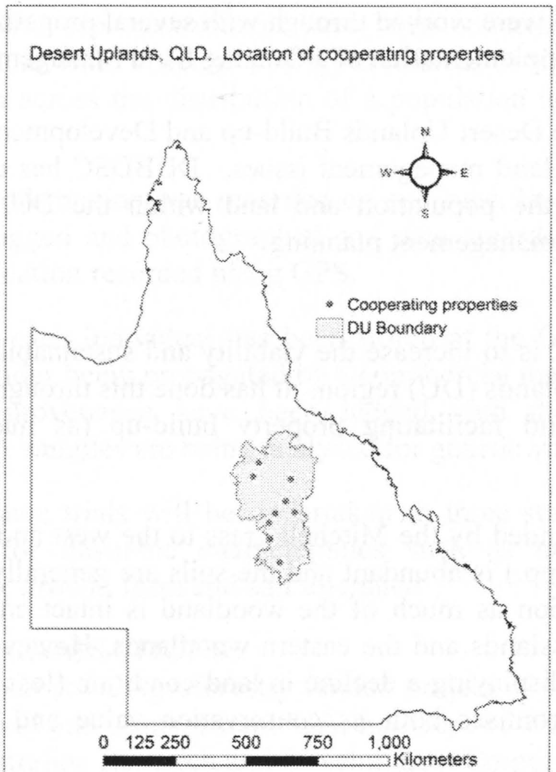

Figure 1: Location of co-operator properties in the DU, QLD

Cooperating properties were visited and land types, paddocks, permanent water points, tree density and land condition were mapped. Land condition was based on the definitions of Chilcott *et al.* (2004). LCC was calculated with a safe utilisation level for the land type pasture growth for a given tree density, discounted for declining land condition and distance to water. Comprehensive interviews are then conducted with the owner on their estimates of LCC and supporting information. Implementation of the LCC information within property management planning framework will be demonstrated with case study properties demonstrating strategic decision making in grazing management and infrastructure development. The LCCs, land type framework and case studies will be of critical importance for the development of a collaborative project where a Grazing Land Management education program is being developed specifically for the DU region (Quirk *et al.* 2002).

RESULTS

1. Create awareness, encourage participation and report results

The promotional work and proactive talks with the DUBDSC led to a comprehensive list of co-operator properties, which was later refined down to 9. The promotional work also helped to address potential sensitivities with government agencies being involved with LCC procedures. The quality of the field days and the usefulness of the information were given a very high ranking by attendees who completed a written evaluation. All participants thought that long term carrying capacity assessment would assist with property planning and management.

2. Development and testing of the procedure

Development of a Land Type Framework

The LTF was found to be appropriate to the 9 cooperating properties, and was also consistent with Local Best Practice information (Clarke *et al.* 1992). Thirteen land types were developed. The 9 properties comprised the dominant land types in the DU. Land condition across the 9 properties for the A, B, C and D condition was 46, 39, 14 and 1% respectively.

Calibration of pasture growth models

Models were generated for each land type and LCCs were calculated and checked against the owner estimates (Table 2.). LCCs are expressed in hectares per Adult Equivalent (ha/AE). Property D and H had a considerably higher estimate of LCC than the calculated value. This may be due to the areas of C and D condition land that the owner has not discounted the estimate of LCC to account for.

Table 2: Owner estimates and calculated LCCs

Property	Owner estimate of LCC (HA/AE)	Calculated LCC (HA/AE)
A	20	19
B	21	28
C	23	26
D	13	31
E	10	14
F	18	25
G	11	13
H	20	35
I	9	10

DISCUSSION

The large area of declining land condition in the DU (DUBDSC, 1996) is an area where considerable gains could be made in both the conservation and long term grazing value. Grazier estimates of LCC may not be accounting for poor land condition. Additionally, it may take several wet seasons and spelling to recover land condition. Substantial benefits from the LCC procedure could be obtained by the use of this information to plan for rotational grazing practices incorporating wet and dry season spells.

LCC has been shown to be directly related to average pasture growth. However, the climate variability experienced in the past may not be representative of the future (McKeon *et al.* 2004). A major challenge for grazing management in the future is climate change, particularly the variability in growing conditions. While the effects are still largely unknown, this issue highlights the need for benchmark LCC information as a sound basis for grazing management decisions.

CONCLUSION

A process for estimating LCC for the land types of the DU has been developed. The LCC procedure will provide beef producers with a benchmark of the property's' likely capacity to support grazing on a paddock by paddock basis, and a sound basis for business planning.

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