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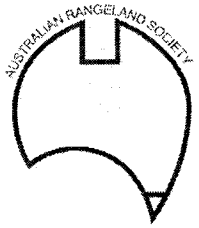

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VEGMACHINE©: REMOTE SENSING FOR PROPERTY MANAGEMENT

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ABSTRACT

VegMachine© is a monitoring tool that allows pastoralists to view satellite-based long-term cover change maps on property and extract this information to a graphical format. This paper discusses the use of VegMachine© by pastoralists in Queensland, Northern Territory and Western Australia and their ideas for its future use. Overall pastoralist opinion of VegMachine© was positive and the software and satellite derived data products provided them with relevant information in a format that was easy to understand and use, with minimal training. Pastoralist feedback revealed enthusiasm to use VegMachine© as a tool to enable better informed, property management decisions.

INTRODUCTION

Research in recent decades has demonstrated the value of satellites for monitoring change in rangelands (Wallace *et al.* 2004, Karfs *et al.* 2000). While a multiplicity of monitoring schemes have been developed for landholders at the property scale, relatively few have been maintained long-term without agency support (Pickup *et al.* 1998). Ironically, such property level monitoring tools can contribute significantly to local decisions about stock, infrastructure and sustainability.

The VegMachine pilot project was commenced to realise the benefits of satellite based monitoring for pastoralists. VegMachine was funded by Meat & Livestock Australia (MLA) from 2002 to 2006. It included as partners NT Department of Natural Resources Environment and the Arts (NRETA), Queensland Department of Primary Industries and Fisheries (DPI&F), and CSIRO Mathematical and Information Sciences. The extension project areas were multi-jurisdictional, covering the Victoria River District-East Kimberley (NT-WA), and the Quilpie area of south west Queensland (Beutel *et al.* 2005).

VegMachine© is a simple computer based viewing tool that enables pastoralists to extract cover information from data derived from satellite indices. With minimal training, pastoralists were able to interrogate this data by selecting key areas of their property. VegMachine© provides feedback in two ways, firstly through colour coded property images showing cover trend and level and secondly by graphing time series of average cover on selected areas of the property. Cover indices for much of the NT-WA area of the project were developed and tested by Karfs (2002). In Queensland, pastoralists trialled a variety of cover indices including experimental tree and ground cover indices developed by the Department of Natural Resources Mines and Water.

The main focus of this investigation was to understand how pastoralists used VegMachine© on property, if their needs were met and how they would like to use VegMachine© in the future.

METHODS

Producers were provided with the VegMachine© software, data products and training in a rollout beginning in 2003. Feedback about the software was collected during April/May 2005 and again in April/May 2006. Surveys in both regions were conducted by phone or property visits, with the exception of the 2006 Quilpie feedback, which occurred at a meeting of all local participants. Surveys aimed to provide an insight into pastoralist's use of VegMachine© and how it could be improved. The second survey was particularly important given the experience developed by the pastoralists over the life of the project. A great deal of informal feedback was also provided by pastoralists during property visits. These visits generally involved VegMachine staff and pastoralists using the software and data products together and often prompted pastoralists to offer opinions and experiences that helped the team to develop the software and data products. Feedback was compiled and analysed for consistent themes.

RESULTS

Overall, pastoralists felt that VegMachine© delivered on their expectations and many agreed that VegMachine© offered them a number of practical benefits. The majority of pastoralists said that VegMachine© added valuable information to their knowledge and experience, helped to formulate plans, and 'took the guess work out' of management decisions. Some documented uses and outcomes from the use of VegMachine© are identified in Table 1.

Table 1: Documented examples of how pastoralists have used VegMachine©

Property	Pastoralist's interest	Outcome
1	Understand historical impacts of stock placement decisions, and validity of recent changes in stock placement.	VegMachine© confirmed manager's suspicion that flood-out country has steadily declined, supporting recent decisions to adjust stock numbers there.
2	Monitor tree and ground cover changes as part of the property's Environmental Management System.	VegMachine© has been written into the property EMS for annual monitoring of tree and ground cover and thus subsequently inform stocking decisions.
3	Place new fences and waters to optimise the potential land types and prevent overgrazing of sweeter country.	Single large paddock (150km^2) was split along land types using VegMachine© to determine fence positioning.
4	Test the sustainability of cell grazing on highly productive grassland country after conversion from a single paddock/single water design.	VegMachine© analysis of each cell showed that cover levels were maintained despite a productivity increase of 200%.
5	Quickly learn about property layout and changes in cover after recently acquiring a property.	Manager was able to view property in VegMachine©, and quickly appraise healthy and poor areas, distribution of different land types and placement of fence, road and water infrastructure.
6	Map and measure area for fodder harvesting.	Manager was able to acquire coordinates and extent of area in which mulga was to be harvested for fodder. Information used in fodder harvesting application.

Throughout the project pastoralists expressed enthusiasm for VegMachine© to be developed into a tool that will continue to aid their property management decisions. Pastoralists also identified a number of future applications for VegMachine© that included the following.

- As a tool to demonstrate sustainable stewardship to outside parties. VegMachine's© capacity to link producer knowledge and experience with the technological value of satellite measurements is viewed by producers as a useful way to assist their participation in current debates around pastoral land management.
- As mapping software, rather than just viewing/interrogation software. This would allow pastoralists to input their own data, such as new fence lines and water points and also print maps for various purposes.
- To estimate feed biomass and so inform feed budgeting decisions. Pastoralists are very interested in near real-time imagery that provides up to date information on grazing patterns, to help determine stocking rates and placement within a season, especially during major property management decision times.
- As a tool to access other spatial data or link with ancillary data sets such as fire and weed mapping, and management packages such as Grazing Land Management (GLM) or Environmental Management Systems.

DISCUSSION

On property application of VegMachine© offers significant insight into long-term cover change on property and allows pastoralists to make better informed management decisions. While VegMachine© is not a substitute for experience and active management, all pastoralists agree that VegMachine© is a useful tool for use in conjunction with current decision making processes. Pastoralists also indicated that VegMachine© allowed access to difficult to reach places on their property, and allowed quick, easy and accurate monitoring of long-term cover change on property.

Pastoralists demonstrated a number of innovative applications for VegMachine© on their properties, but importantly also identified a number of potential future uses that would increase its relevance. These future uses involve additional functionality in the software such as a print facility, and better integration with complementary property management tools such as GLM. Broadening the uses of VegMachine©, will have the dual benefit of enhancing the value of the software within the enterprise, and maintaining pastoralist's skills in the use of the software. Future work on this or similar systems should take this finding into account.

CONCLUSION

Rangeland monitoring has traditionally presented a number of problems for land managers, and these have greatly impeded the assessment of resource condition and trends, particularly at the property scale. VegMachine© is an innovative and efficient attempt to overcome many of these difficulties by providing pastoralists with resources to assess changes on their land using satellite derived products in a user friendly format. Pastoralists are using the package to address a range of issues on their properties and pastoralist response to VegMachine© has been positive, indicating a strong interest in the further development of VegMachine©. Pastoralists have contributed valuable information for development and future directions of VegMachine© while providing feedback on the effectiveness of the project outputs. Pastoralist suggestions indicate that for VegMachine© to develop into a successful property monitoring and management tool it will need to be multi-functional and receive a number of data updates per year.

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