WOODY WEED ADAPTIVE MANAGEMENT – A NEW PERSPECTIVE

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Abstract Adoption of control techniques currently available for the woody weeds rubber vine (*Cryptostegia grandiflora*) and prickly acacia (*Acacia nilotica* sub species *indica*) by land managers has been relatively slow. To help overcome this problem, an adaptive management program will be developed for these weeds. Adaptive management is the process of 'learning by doing'. It follows a simple adult/scientific learning cycle, where the problem is identified, the options assessed, the options implemented and the results documented and reviewed.

The projects developed to implement this process will primarily consist of landholders, members of the community and research staff interacting together to formulate strategies for weed management. These strategies will then be incorporated into the overall property management plan. The different strategies will be trialed on large-scale field sites to provide a best practice model. As a process it aims to place the emphasis on the landholders learning to manage their woody weed problems by responding to the outcomes of strategies developed. The successful strategies will then become 'best practice management' and hopefully be adopted through the region suffering the problem and by future generations of landholders.

Landholders subconsciously use the process of adaptive management, as they manipulate the natural resources on their properties (ecosystems) to achieve sustainable production levels. That is, landholders implement changes to the ecosystem and respond to the outcomes and continually gain new information (data) on how best to manage their land.

It is anticipated that the framework for woody weed management defined in this project could be applied to manage future weed problems.

INTRODUCTION

For most of the woody weeds currently threatening the grazing lands of northern Queensland there are a range of techniques available for their control (March 1995). Despite this, the amount of on-ground work being undertaken by landholders to control these weeds is less than was anticipated by scientists and extension staff. There are a number of possible explanations for this, including a lack of awareness of the techniques available, a belief that the recommended techniques are not practical or applicable to their area and economic constraints.

Many of the control techniques available for woody weeds have been developed by the science community in isolation from the potential end users (predominantly graziers). Furthermore, experimentation has usually been restricted to one location with the belief being that the results should be applicable at the broader scale. However changes in soil types and environmental conditions could play a major part in determining the efficacy of certain techniques. In order to overcome some of the deficiencies recognised in the current system used for developing control strategies for woody weeds, the use of an "Adaptive Management Approach" has been proposed. The Queensland Department of Natural Resources will apply the process of adaptive management to two of the worst woody weeds currently threatening the rangelands of northern Australia; prickly acacia and rubber vine. If successful, a similar process may be used on other woody and herbaceous weeds currently invading this region.

Adaptive management provides the conduit to develop a cooperative approach to woody weed control, thereby involving all relevant stakeholders from the beginning. It is often referred to as the process of 'learning by doing'. Indirectly, many landholders are applying the concepts of adaptive management on a day to day basis. They manipulate the natural resources on their properties (ecosystems) to achieve the highest possible productivity levels. In doing so, they are implementing changes to the ecosystem and responding to the outcomes and continually gaining new information (data) on how best to manage their land.

The adaptive management process will bring together individual landholders into a group environment along with scientists so that ideas can be shared and control strategies developed which are applicable to all concerned. Adaptive management allows the integration of all components, which make up society, including science, politics, economic and social aspects. This enables flexibility to be given to management strate-

gies, for each area or property may have a stronger need for one aspect over another. This process will also permit the incorporation of other key issues, related to woody weed control, into the management strategy. For example, land rehabilitation is an issue which can be incorporated, because a general aim of woody weed management is to return the land to a level where sustainable land practices can be achieved.

The management strategies to be used will be a mixture of passive and active adaptive management. Passive adaptive management uses the method, which is on current findings, the most effective way to manage the problem. Active adaptive management allows the investigation of all techniques that are relevant to the problem. This provides opportunity to explore innovative techniques and alternative options by generating well designed management experiments that accommodate uncertainty, and delineate management and environmental effects (Hynes *et al*. 1994).

Once effective strategies have been developed within groups they will be distributed to other landholders so that they too can benefit from the productive relationship between landholder and scientist.

This paper outlines the process of adaptive management and how we intend to apply it to woody weed control. It will also explore the possible integrated techniques and other innovative techniques, which could be used for the control of prickly acacia and rubber vine.

OBJECTIVES OF ADAPTIVE MANAGEMENT

If adaptive management is to be successful for woody weed control six key objectives must be met:

1. Define management strategies to control woody weeds and achieve sustainable land use practices through the consultation of landholders, Landcare groups and other interested parties.

2. Determine which of the trialed management strategies best fits each individual land system.

3. Investigate innovative techniques used by landholders to manage woody weed infestations.

4. Encourage community involvement and provide resources to improve awareness and knowledge on issues related to weed management.

5. Facilitate adoption of best practice management

strategies to create a network of people whose primary goal is to manage (as a part of overall property management) the woody weeds, rubber vine and prickly acacia.

ADAPTIVE MANAGEMENT PROCESS

The first step will be the formation of working groups. These groups will comprise mainly landholders directly affected by the respective weeds and scientists who have knowledge of control techniques and sustainable land management. Other members of the community affected by these weeds will be welcome to join groups, particularly those involved in Landcare and Local Government. Existing groups such as Landcare may form the nucleus of a group in an area, provided the majority of members are directly affected by one of the nominated weeds. If no existing suitable groups exist in an area where an adaptive management site is to be developed a new group will be formed.

Establishing the groups involves identifying key landholders in the target areas and forming groups around them. A key landholder is defined as a landholder that is actively managing their weeds, with the enthusiasm to learn more and encourage other landholders to become involved. The aim is to form groups of 4-8 landholders, combining their knowledge and experience with that of the scientist to develop and implement management strategies for woody weed control.

Once groups are established a six-step framework will be implemented for each group (Figure 1). The steps involved include:

1. Assessment of problem

2. Design of management strategies (action plans)

3. Implementation of action plans

4. Monitoring

5. Evaluation

6. Revision

Assessment of Problem The assessment phase will involve identifying the extent of the weed problem that the group faces. Questions such as the size of infestations, densities and impacts will be discussed. Methods that landholders have used to control these weeds will then be identified, with successes and failures noted. Scientists will outline all relevant research findings on the respective weeds including an understanding of the ecology of the plant. Afterwards,

discussion will focus on what the group sees as being the best options for controlling these weeds based on the facts presented.

Design of Management Strategies This step involves designing management strategy/s (with accompanying action plans) for managing the respective weed, which the group can then go out and test in the field. The management strategies will be a "living document" which can be amended and revised at any time.

Implementation This step of the process implements the proposed management strategy with the focus on initiating the control techniques to be used. The important part of this step is to make sure that the action plan is followed precisely and that what is implemented is implemented and accurately recorded.

Monitoring The effectiveness of the control technique employed will be monitored in relation to economic and percentage kill rates of the weed.

Evaluation This is a critical phase of the adaptive management process which aims to quantify the increase in levels of knowledge, and control activity, as well as the adoption of management techniques for woody weed control.

Revision This step gives the process the ability to continue the cycle of learning by revising management strategies and adjusting them to trial different techniques for woody weed control.

The benefit adaptive management brings to woody weed management is flexibility and adoption. Flexible management means utilising a system of management, which can accommodate change by reacting to problems which may arise. The way this is used in adaptive management is it provides the researchers with opportunity to implement new management strategies without stopping research procedures.

Adoption is the penultimate goal and its success will be higher through employing the process of adaptive management. It is anticipated that this will be achieved by landholder groups who follow the learning cycle of adaptive management and devise their own techniques for woody weed control best suited for their region. As the group develops the strategy specific to their region, they gain ownership, which will hopefully promote adoption through future generations.
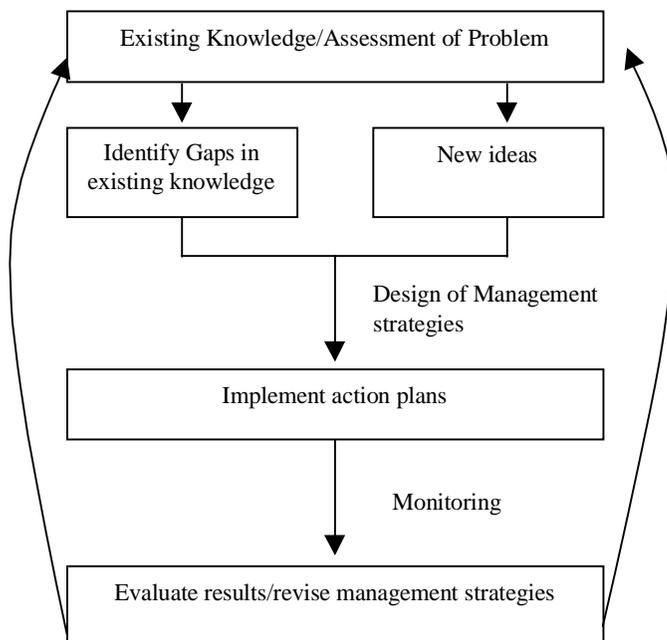

Figure 1. Adaptive Management Process (Lowe, unpublished)

THE WEEDS AND THEIR MANAGEMENT

Prickly acacia occurs as scattered populations throughout Queensland with the major infestations (covering approximately 6.6M ha) occurring on the Mitchell grass downs in central west Queensland. The plant was first introduced into Queensland in the 1890's (Bolton 1989) as a shade and ornamental tree. In 1926 it was recommended by the Department of Agriculture and Stock as a suitable shade tree for sheep in western Queensland (Mackey 1996) and thus was extensively planted and so began the problem of prickly acacia.

Rubber vine is scattered throughout Queensland with the main infestations occurring in the Gulf region of North Queensland. The infestations are predominantly found along the major watercourses and rivers in these areas. The first official record of rubber vine was in 1875 in the Queensland Botanic Gardens (Dale 1980). The spread of rubber vine (in the early days) can be mainly attributed to its use as an ornamental plant in mining towns, hence the perceived origin of rubber vine was in towns like Charters Towers and Georgetown in North Queensland. In 1955 the plant was declared noxious. Rubber vine has encroached on native vegetation and rendered much of the quality grazing lands useless, with an estimated cost to the grazing industry (production only) of $20 million/year (Mackey 1996). With the inclusion of cost of control and management this figure could be doubled.

Due to prickly acacia and rubber vine covering vast areas of land and also demonstrating the potential to encroach further on native vegetation, there has been a growing urgency to confront the problem of containment and control. Hence, the development of National Strategies for the two weeds and their listing as "Weeds of National Significance". The concern over the spread of these two particular weeds, does not just lie with the Queensland Department of Natural Resources, but also with the community and other states and territories. The formation of the Prickly Acacia Management and Rubber Vine Management groups, which consist of landholders, Landcare representative, local government and staff of the Queensland Department of Natural Resources support this. The function of these groups is to provide a voice for all landholders that are affected by prickly acacia and rubber vine. Other examples of community concern, are the growing number of landholders who have been actively working to remove the weed by themselves and within groups.

Management Strategies The approach we intend to use is an integrated system of weed management i.e. our focus will not be on one particular method of control but on using an integration (mixture) of control methods to manage the weed problem. These options will be devised through consultation with landholders and scientists to provide the best possible option for each land system.

Probable techniques to be used include:

Prickly Acacia

- stick raking, chain pulling, grubbing or other mechanical methods

- soil applied chemicals or chemical treatments for adult plants and the control of seedlings

- alternative grazing management (camels and goats)

- fire (pasture regeneration and seedling control)

- managing prickly acacia for its benefits

Rubber Vine

- fire integrated with the success of the rust biocontrol agent (*Maravalia cryptostegiae*) is the best management strategy for control

- application of direct heat to the base of individual plants

- mechanical methods e.g. stick raking, slashing to create a fuel load and pasture establishment for future fires

CONCLUSION

Why adaptive management?

Answer: People (landholders) have more commitment to strategies they have helped developed.

Adaptive management offers to landholders the chance to participate in developing strategies, as well as adding to the knowledge base of how to control woody weeds. It will also increase the learning capacities of landholders and improve their property management on a whole.

For the above reasons adaptive management will provide a process whereby:

- Uncertainty and surprising results can be accommodated and used to develop better management techniques.

- Practical experience of weed management will educate landholders and become a part of their property management which then can be passed onto future landholders (adoption).

- Shared strategies will be developed for woody weed control within and across geographic regions.

- All levels of the scale are included-paddock, property, catchment.

- Landholders will feel ownership of the strategy.

- All aspects of society have been addressed.

This project applies the principles and practices of adaptive management to control two woody weed problems in central and north Queensland, prickly acacia and rubber vine. The success of applying adaptive management to these woody weed problems may establish a protocol for management of other weed problems and pests in general.

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