A PARTICIPATORY APPROACH TO WEED MANAGEMENT

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Summary To achieve sustainable improvements in pest management, a high quality interaction is required between key players. A corner-stone activity of the CRC for Tropical Pest Management is the facilitation of problem specification workshops, bringing together farmers, advisors, research scientists, chemical industry scientists and other relevant stake-holders. During one or two day workshops, participants are actively involved in three inter-related processes—problem definition, identifying opportunities and constraints to improving pest management, and needs analysis and the formulation of action plans.

The Centre has facilitated over 20 workshops in the past four years, two of them focusing on weed problems-parthenium and groundsel bush. This paper describes the practice of problem specification workshops and their role in achieving a high quality participatory approach that is critical to the 'transfer of technology' process and to achieving sustainable weed suppression.

INTRODUCTION

Integrated pest management (IPM) has been promoted as a means of reducing the problems associated with over-reliance on chemical pesticides as a means of managing pests. IPM involves the use of monitoring and forecasting techniques, the introduction and enhancement of biocontrol agents, selective chemical and bio-pesticides, other non-chemical methods, and the implementation of area-wide strategies. The problems IPM addresses include the development of pesticide resistance, environmental and health risks, and meeting the quality requirements of export markets.

In the case of insect pests, there is strong evidence that many research projects concerned with the development of IPM strategies have not been successful in achieving practical implementation by farmers (Aitken *et al.* 1995). A more co-operative and participatory approach to improving weed management is required, involving the participation of growers, scientists, advisors, and policy-makers in the range of research, development, extension and implementation activities required to achieve successful outcomes.

This paper provides support for this argument and indicates how the role and practice of problem specification workshops within the CRC for Tropical Pest Management is achieving a more participatory approach. It consists of five sections:

- A brief review of the factors influencing successful IPM.
- The four corner-stone strategy of the CRC for Tropical Pest Management.
- The role and practice of pest problem specification workshops.
- A summary of the workshop on parthenium.
- Conclusions.

A BRIEF REVIEW OF THE FACTORS INFLUENCING SUCCESSFUL IPM

My purpose in this section is to illustrate how the success or failure of IPM is influenced by a range of factors. Although the two examples described involve insect pests, I would suggest that similar factors will determine the success or failure of weed IPM.

The first example concerns supervised control of insect pests in apples; farmers monitor insect pests and only apply pesticides when the level of pest attack is above a threshold level. In practice, there are four major constraints to the adoption of supervised control (Fenemore and Norton 1985):

- Insect pests are not the key pests of apples in many situations. Apple scab and apple mildew are often far more important and there is no means at present for supervised control of these diseases. Farmers calendar treat with fungicides against these diseases and can easily protect against insects by tank-mixing insecticides with the fungicides.
- The cost and difficulty of monitoring can be a major constraint. Identifying the complex of insect pests that can be found on apples and then counting them to determine whether an action threshold has been reached involves intensive labour which is extremely costly.
- The practical difficulty of determining economic thresholds for a complex of pest problems and fitting this strategy into a cropping system where there is often a lack of management flexibility and an inability to respond to thresholds.
- Apples are a high quality product and even slight pest damage can cause a serious reduction in revenue by reducing the quality of the apples.

Because of these factors, many farmers have not adopted supervised control but continue to calendar treat. If

growers are to switch from calendar treatment to supervised control, these four major constraints have to be dealt with.

Now let us turn to an IPM success story. In Queensland, 80% of citrus growers have adopted IPM in the form of monitoring and only spraying when insect pests are above a threshold, classical biological control, and the use of beneficials that are purchased and released in the orchard (Smith 1990).

What factors have been responsible for this success? First, there needed to be a good scientific basis for IPM, understanding the population dynamics of the pest complex and bringing in classical biocontrol agents for the major pest red scale. This work was done by Dan Smith of Queensland Department of Primary Industries. Second, the implementation of this IPM system in orchards was achieved through a private crop consultant—Dan Papacek—working closely with Dan Smith to further develop the system and provide a commercial service to growers. Consequently, after the initial stimulus to implement IPM provided by insecticide resistance, the continued success of this program has relied on a good support system, both scientific support and good decision support on the ground.

What about IPM more generally? Recently, Aitken *et al.* (1995), at the CRC for Tropical Pest Management, reviewed the successes and failures of IPM world wide. From this review we conclude that major factors affecting the success of IPM are:

- a policy environment that encourages IPM,
- the participation of growers and other end users, such as crop consultants, in the whole research and development process, and
- a system that provides research and decision support to facilitate adaptation of IPM to changes in production practices, pest status and control technology.

A major conclusion from this work is that the key factor affecting the success of IPM is the quality of the dynamic interaction between the technical and scientific components of the problem and the social, economic and political system. Indeed, if the success rate of IPM is to be improved we need to have a paradigm shift towards this philosophy. The four corner-stone approach of the CRC for Tropical Pest Management is the way in which we are putting this philosophy into practice.

THE FOUR CORNER-STONE STRATEGY OF THE CRC FOR TROPICAL PEST MANAGEMENT

The joint venture of the CRC for Tropical Pest Management (CTPM) consists of over 80 staff across range of disciplines, including ecologists, working on the population dynamics of pests; a large group working on the biocontrol of tropical weeds, particularly rangeland weeds; molecular biologists, investigating the genetic identity of pest and biocontrol agents; social scientists and extension scientists; and computer scientists, working on a range of software for research, decision support and training.

How do we put this expertise together to solve pest problems? The traditional approach is the linear model, where basic research leads to applied research which is then handed on to extension agencies for adoption by the farmer. Along with many other scientists, we have rejected this as inappropriate for the changes we are attempting to achieve. Rather, we have adopted a four

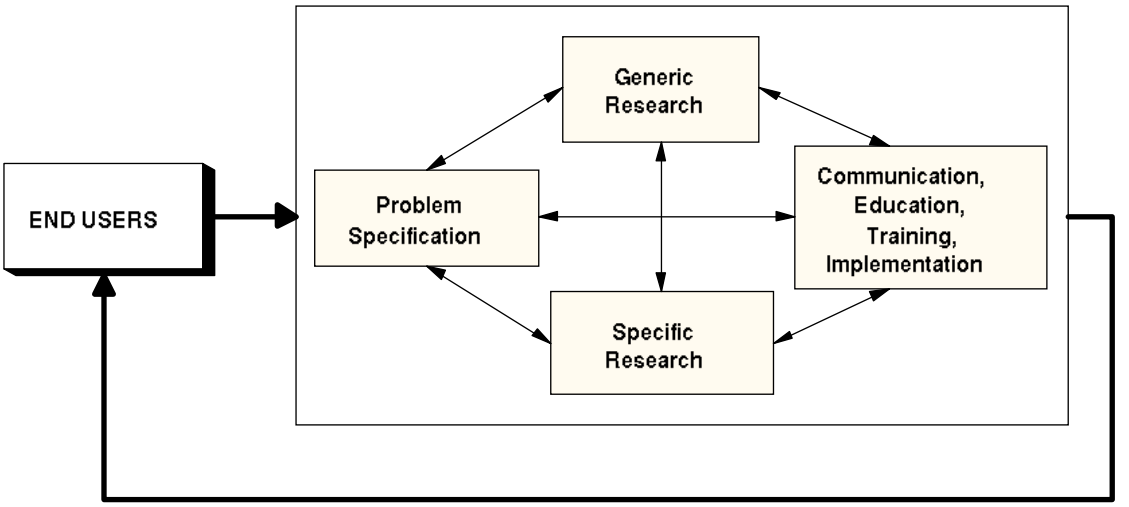

Figure 1. The Centre's four corner-stone strategy.

corner-stone model, involving four areas of activity that interact with each other (Figure 1):

Specific research activities on specific insect pests or weeds, such as heliothis, parthenium or prickly acacia, or IPM in specific crops, such as brassicas and other fruit and vegetable crops.

Problem specification which will be dealt with below.

Generic research which involves studies, such as that mentioned above, concerning the factors affecting IPM success and failure, molecular techniques, host specificity—which is an area that is relevant to many of the pest problems that we are working on—and generic software, including modelling, computer aided-learning and decision support.

Communication, education, training and implementation is the fourth area of activity, concerned with delivering our science to end users. These activities involve international training courses, industry training courses, the production of videos, cartoon booklets, software for training and decision support and our involvement in field days and open days.

THE ROLE AND PRACTICE OF PEST PROBLEM SPECIFICATION WORKSHOPS

Before looking at what pest problem specification workshops are about let us first go back to the earlier, brief review of IPM. The two examples I gave illustrated that a number of factors can influence whether IPM is successful or not. First of all, the IPM strategy needs to be technically possible. In other words when it is trialled in the field it achieves an acceptable level of pest management. However, there are other conditions that also need to be met, such as the feasibility with which the strategy can be implemented on particular farms or at a regional level, the costs and benefits of the strategy compared with the practices that farmers are presently using, and the existence of a support system that will enable farmers to modify their IPM strategies as conditions change. If IPM is to be implemented, then all of these factors need to be met. Failure can be due to not meeting just one of these factors.

Table 1. Selected workshops recently facilitated by the CRC for Tropical Pest Management.

- Tomato pest management (Brisbane April 1994)
- Groundsel Bush (Brisbane October 1994)
- Brassica IPM (Brisbane March 1995)
- Brassica IPM (Hangzhou, China May 1995)
- Heliothis resistance management strategy in cotton (Moree June 1995)
- Apple IPM (Stanthorpe August 1995)

There are two implications of viewing the problem of IPM implementation in terms of meeting certain conditions (Norton and Mumford 1993). First, we can modify research and development strategies, to increase the chance of the pest management technology or practice being developed meeting all of the conditions. The second implication is that we can work on the constraints to implementation and reduce them. For instance, if the identification of weeds is a major constraint to the implementation of IPM then a training course or the production of a simple booklet for identification may reduce this constraint and allow greater implementation of the practice.

Problem specification workshops aim to address these issues for specific situations. In the last year the CRC for Tropical Pest Management has conducted a number of workshops (Table 1) that bring together key players involved in the particular problem – growers, crop consultants, extension agents, research scientists, representatives of industry and anyone else who has an important contribution to make to defining the problem and developing solutions.

The structured workshop process, which usually involves two days, consists of three stages: problem specification, the identification of major opportunities and constraints, and the development of needs analysis and action plans for future implementation. The key issues covered in each of these phases are outlined below:

Phase 1 (Problem definition – specification)

- What are the key factors and processes determining the overall problem?
- How are these factors and processes changing over time, and what is likely to happen in the future?
- What are the current controls practised, and why?
- What are the key biological relationships that determine the benefits and risks of management strategies?

Phase 2 (Opportunities and constraints: the search for solutions)

- What are the possible options for improved management strategies?
- What constraints and objectives affect the choice of these management options?
- How can options be modified to be more appropriate to on-farm cropping systems?
- What key knowledge and information do we need to obtain and disseminate in order to improve management practices?

Phase 3 (Needs analysis and action plans)
- Policy issues.
- Applied research priorities.
- Advisory/training proposals.
- Trials of 'best practice'.

To facilitate the workshop process we use a number of techniques that we have found extremely useful in encouraging group activity and focusing the groups' attention. For instance, in the problem specification phase we use historical profiles to illustrate the major factors that have influenced the problem to date and how they have changed over the past ten or twenty years. This not only helps all the group to understand the complex of factors surrounding the particular problem but also provides a basis for thinking about the changes that are likely to happen in the next three to five years that will have an influence on the options and the feasibility of IPM in the future.

Another technique that we use in the second phase of the workshop is pinboarding. Here individuals in the workshop put down their own ideas on to cards concerning the opportunities and the constraints for improving IPM for the particular weed problem. The participants put one idea per card. They are then split into groups and pin their cards on to a board. The participants in each group then cluster the cards according to their similarity. For instance whether they are concerned with monitoring, with aspects of pesticide resistance, with information dissemination, and so on. For each group of cards, the group then writes a header card that succinctly describes the essential ideas contained in the cards. These header cards are reported back to the whole group and provide a basis for determining the key issues to be considered in the third phase of the workshop.

In this third phase, participants are again split into groups to carry out a needs analysis for each of the key issues to provide the basis for developing action plans. A workshop on parthenium, held in Rockhampton on 12 and 13 October 1993 (White 1993), illustrates the issues on which action plans might be developed. Further information on this project is provided by Steve Adkin's paper (Adkins *et al.* 1996).

Parthenium is a major rangeland weed problem in Queensland, causing reduced productivity and posing a health problem to adjacent communities. Workshop participants included landholders, government policy makers, field operators, extension officers and scientists and representatives from research funding bodies. The objectives of the workshop were to:

i. review the parthenium problem
ii. define available management/control options
iii. make recommendations on policy, training, research and implementation of management/control options to improve the management of parthenium

The following top priority action plans were identified at the workshop: detailed action plans included in the full report (White 1993) are not described here:
- Prevent spread by livestock.
- Continue roadside inspection and treatment.
- Increase ability of the community to identify parthenium and increase knowledge of eradication procedures.
- Develop state and transition models of vegetation change for all at-risk areas defined by land types.
- Define and refine opportunities and strategies for use of herbicides.
- Study key aspects of the biology and ecology of parthenium and evaluate effects of established biocontrol agents.
- Review untested biological control agents and complete testing and field release of suitable agents.
- Evaluate costs and benefits of eradication of isolated infestations and issuing free herbicide by government.

CONCLUSION

At the outset, I suggested that we need to change the way we operate if we are to improve the implementation of IPM. In particular, we need to improve the quality of the dynamic interaction between technical and social systems that are an integral part of IPM. I have argued that a co-operative and participatory approach is essential in achieving this quality interaction and indicated how the CRC for Tropical Pest Management is implementing this approach in practice. Within the context of our overall approach (Figure 1), problem specification plays a major role in identifying key priorities for specific research as well as identifying key needs for training and communication. Other problem specification activities that follow the problem specification workshops include modelling (Kriticos 1996) and technical workshops. We are currently working on means of improving this whole process (Wilson *et al.* 1996).

The challenge for the future is to encourage industry and other organizations to become 'owners' of this process, providing an effective and focused dialogue that will produce practical action plans to achieve sustainable improvements in weed management.

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