Getting IPM Theory Into Practice

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Introduction

Making the transition from theory to field practices, that reflect an IPM system is not simply the changing a management operation. It involves a holistic management approach, which only comes from you developing personal confidence and belief in the system. Changing to a soft chemistry approach is an aspect of IPM. However, it is not the only aspect. Growers should understand the principles behind IPM and then start to develop the system that is suitable for your operation gradually. An understanding of the principles of IPM is essential. As the principles of the system do not change; it is how you blend the components that give you the best results.

Growers wishing to adopt more IPM practices on their farm are doing so by building on the knowledge they have gained from previous experiences. Reflecting on the different management strategies they have employed before allows them to grow in confidence to get a "sense" or "feel " for how the system best works in their fields. As this continuum of learning occurs, growers develop a willingness to accept a little more educational risk than they originally would of.

A metaphor for this process could be building of a stairwell with small building blocks. Each time you add a layer it symbolises a new component added to the system. To move up the stairwell, you need to add a block to the foundation layer to support the new layer above. This then allows you to move up and forward. This extra building block placed on the foundation of the stair well is the reinforcing of knowledge and confidence in the system.

The purpose of this paper is to investigate the way growers are learning about IPM. Some growers are learning through their experiences with the Australian Cotton CRC IPM Short Course. Others are using the benefit of local area wide management groups. Some may be accessing the technical knowledge of the local Industry Development Officers (IDO). In

most cases people are able to access all three sources. This paper will provide insight to these three areas. As well as explore the interaction between IPM and the industry's resistance management strategy, and finally, the benefits of being involved in IPM

Integrated Pest Management (IPM) Short Course

"Practical, hands on information", "the course is a window to knowledge" these are just two grower comments used to describe the course. The purpose of the course is to achieve exactly what this tittle suggests, taking theory and implementing it into the field. The course program involves 5 days conducted over a 12 month period. Within this period growers learn about the components of an IPM system. Then growers have the opportunity to develop a plan for their farm. The first 2 days are conducted during the winter and the purpose is to outline the latest research in IPM and establish the foundations of knowledge. The next 2 workshops are 100% field based, which deals with the practical implementation of the theory. The 5th day is a reflective workshop. Where growers discuss their IPM experiences from the previous 12 months with the group. The course is not designed to give a recipe of IPM for growers to follow, rather the tools for them to develop a system.

Over the past 2 seasons a total of 169 people have completed the 5 days of training. Growers represent 72% of participants enrolled, with NSW representing 46% and QLD representing 56% of attendees. A simple evaluation sheet completed during this time period has provided the following findings. Values shown in figure 1, are averages of respondents for the last two seasons of courses. Participants expectations when attending the course were met by the end of the course, and the amount of information discussed was regarded

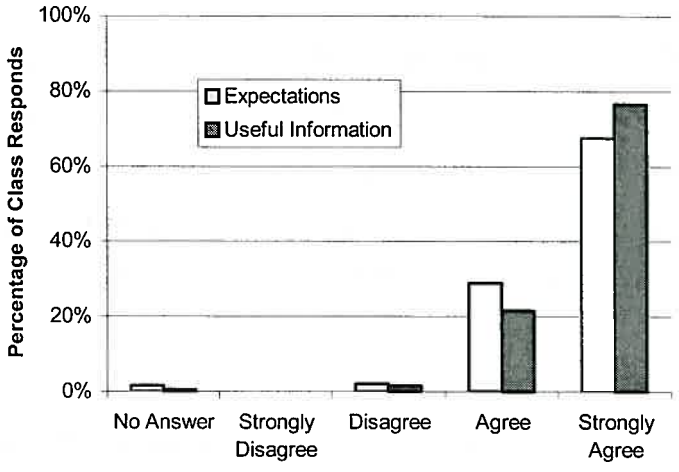


Figure 1: Class Expectations and Opinion on the level of useful information, Average Figures 200 to 2004.

as useful to their needs. One question asked on the survey stated "do you think what you have learnt, will change you farming practices?"

Figure 2, shows the strong respond to that question. In 2003-04, in addition to the previous question I asked "if yes, what are these changes?" The overwhelming respondents to this section were determined as management aspects. In categorizing these comments, the top 5 areas of management are listed in Table 1.

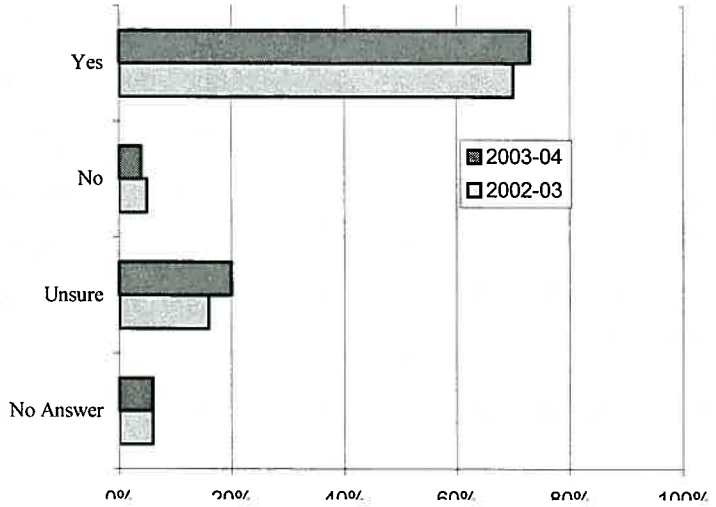
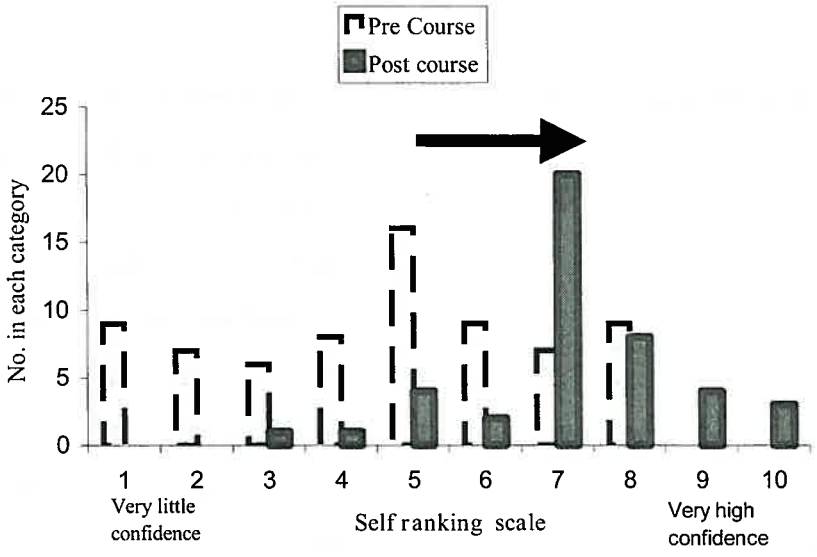


Figure 2: Potential Practice Change Resulting From The Course

Table 1: Practice Changes participates acknowledge they would expect to change after the course.

Ranking	Aspects of management that is expected to change due to the course
1st	Communication / interaction with consultants
	Monitoring with plant mapping
2nd	*Pesticide selection*
3rd	Managing to enhance the role of beneficials insects within the system
	Increase in general IPM Knowledge
4th	*Increase the level of personal monitoring in the crop*
5th	Adopt monitoring and sampling techniques for beneficials insects (especially the beat sheet technique)
	Amount of information used to make a spray decision

A strength of the course is the fostering and development of confidence with an IPM system. Figure 3, reveals the self imposed ranking of what knowledge and confidence the



individual had before and after the course. This figure illustrates that on average, across all sites, the bulk of the attendees (group peak) moved towards the right. This means that on average, there was, growth in confidence within the group. It is true to say, that the course is only one aspect that would contribute to improving their confidence and knowledge within that 12 month period. However, as one grower commented after a 2002-03 course, "I realise what we are currently doing is close to an IPM system and what the course did is provide some alternative options." This highlights the IPM short course is about giving the participants the tools to develop a system that works for them.

IPM : The Role Of The Local Cotton Industry Development Officers (IDO)

These positions progress the adoption of IPM through on farm demonstrations, field days and technical seminars as well as assisting local area wide management groups in forming and identifying the groups objectives. In many cases, the IDO's role within the group is to collect relevant technical information between meetings, organise invited speakers and ensuring the background administration of a meeting is completed. During the meeting their role can be varied. Often it is, to facilitate the group. In many cases they are seen as part of that groups nucleus.

In the case of an area wide group that has a strong grower leader as the central figure the role of the IDO changes. The IDO takes on a much more supporter role. This was highlighted in an evaluation report on AWM groups conducted in the Border Rivers region. The following is a quote from this report. "The Industry Development Officer

(IDO) role is seen as an essential role in keeping the groups motivated and operating smoothly. However, the directions and issues for the group must be determined by the growers within the group for the group to be successful", (Cotton Extension Team, 2002). In both cases the IDO position can play a vital role in assisting growers to develop their IPM system.

IPM : The Role Of Area Wide Management Groups

Initially, the driving force behind the formation of area wide management groups was reducing insecticide costs to remain profitable. To achieve this target, the focus was to reduce the helicovpera population within a region. Area wide methods used included trap cropping to lure helicovpera within a region to a point source and then destroy them culturally. The use of pupal busting for overwintering populations, delaying synthetic pyrethroids (SP's), to foster beneficial insects and more recently investigated, the use of either Magnet® or GM crops (Bollgard II) to lower a population.

Growers that are part of a functioning area wide group find it rewarding and an excellent process to build relationships and increase confidence in IPM. Within the group, growers share their knowledge and experiences on various insect topics. The purpose of sharing experiences and insight is to assist fellow growers of the group with their management knowing that this sharing of knowledge will provide benefits to the entire region.

The role of area wide groups in the Darling Downs is well documented. Initially, the area wide group was established as part of a research project. Consequently they received a strong level of entomology support. This support in addition to a series of groups with a focused mission allowed a framework to be developed and adapted to other production valleys. As part of the research project, an evaluation of the groups performance was completed. Researchers found aspiration and knowledge levels of the participants changed. This change then translated into changes in farming practices. An example is the wide spread adoption of pupae busting within the region. Comments from the researchers and extension personal involved in the process recorded at the start of the project growers were stating "beneficial aren't important and we don't have any beneficials on the Downs". At the end of the project growers wanted to know information like "pyrethroids

were used in winter cereals (a good host for beneficials), will the beneficials come back". Also " barley and sorghum will contribute to beneficials". This demonstrates a significant change in attitude an acknowledgment the importance of beneficials insects in the system, (Ferguson, Miles 2002, Murray et al 2001)

In recent years some area wide groups have shifted in terms of the driving forces of the group existance. These groups are succeeding economically with reduction of SP's and the overall reduction in input costs. It other words, the challenge of the initial issue has faded. Some groups are referring to themselves as grower groups rather than IPM groups. The change of name acknowledging the group's move away from considering just focusing on insects when discussing IPM. Issues relating to the whole farm management such as water use efficiency, weeds, diseases and even soil health are now being addressed. In general, there is a wide distribution of group activities and purposes.

IPM Vs Resistance Management: conflict or synergist?

There are predominantly 2 views on this topic. One view states the principles of an IPM system are built into the insect resistance management strategy (IRMS). Components such as the need to rotate chemistry, the use application windows, limitations on the consecutive use of a product, employment of dynamic thresholds, pupae bust and the pesticide selection are all aspects of the IPM system. The use of late season trap crops, farm planning to encourage parasitiod activity, mapping of plants to match fruit load / thresholds and seasonal influence are all strategies that can be done within the current IRMS restriction.

The other view refers to the IRMS not being flexible enough to allow IPM producers to go soft all season. Options towards the mid and end of the season are non existent. This limitation creates an isolation factor for the grower attempting to be soft given the availability and wide spread use of harder chemistry.

There is an increasing demand by growers to establish an IRMS that marries the concept of IPM with resistance management to a larger degree. Growers need to think of product positioning in terms of impacts on the IPM system. As an example, on the Darling Downs,

the positioning of Spinosad (Tracer®) and fostering of trichogramma wasp is a good case. In most valleys, Spinosad is desired in later stages of the IRMS (stage 2-3). In the Downs, the thought is to place it in the earlier part of the season (stage 1-2). The rationale is, that trichogramma have proven a very effective parasotoid of helicovpera eggs from mid January onwards in this mix cropping system. Supporting document 01 in the IPM Guidelines (Australian Cotton CRC, 2004), shows Spinosad to be lethal to trichogramma, hence to limit the exposure the application window for the product is brought forward.

IRMS developments in recent years, has seen the inclusion of product use windows that have been determined by use in non cotton crops. The current example is the Indoxcarb (Steward ®) used on pulse crops. Effectively exposing the first generation of helicovpera to Indoxacarb (Steward®) selection pressure before it is used in cotton. Spinosad (Tracer®) is another product that is following the same registration pattern.

What is the future of Bollgard II cotton in relation to the IRMS? One suggested argument is the abolishment of the IRMS. To investigate this issue, we need to look at how resistance is generated. Resistance is based on the genes' frequency and expression within the insect population. The exposure or selection pressure of that product on the insect population then affects the rate of resistance. If we say the bulk of the industry is planted to Bollgard II cotton, and refuges in place are effectivly controlling resistance generated from the Bollgard II. Therefore, the amount of conventional cotton planted would be drastically reduced and the volume of helicovpera products applied regionally will also be drastically reduced. This approach could translated into reduced selection pressure and possibly no reason for the need of strategic IRMS windows for products. Growers could then apply their own judgement for when to use a product. Allowing the softer option producers to use a product of their choice. In fact, the Bollgard II could become a major helicovpera sink for conventional cotton.

In the future, the IRMS may focus on sucking pest such as the mirid and green vegetable bug. Developing a strategy for these pest will require detailed knowledge of the ecology and in particular the level of over- wintering potential within regions. Consideration will have to be given to off target impacts also. As an example the resistance impact on whitefly if SPs are used for mirid control.

Benefits of IPM

BDA Group (2004) conducted an economic evaluation of the Australian Cotton industry, and have reported a saving over the last 5 years of $250 m due to the reduced use of pesticides. The IPM adoption within the industry was regarded as a significant contributor along with transgenic cotton in reaching this figure. The benefit of delaying the resistance to pesticide was reported be $53 m.

The adoption of IPM has benefits for not only the wider environment, but also for workers on the farm by increasing occupational health and safety. BDA Group (2004) has reported a significant reduction in the amount of active ingredient within the industry in both conventional and Ingard® cotton. For conventional cotton it has been reduced from 8 kg active ingredient (ai) / ha in 1998-99, to < 2 kg ai/ha in 2002-03. Ingard® had a similar reduction during 1998-99 recording 6 kg ai/ha and in 2002-03 < 1 kg ai /ha. These figures would represent both a reformulation of some products and a reduction in volume used. Figure 4, represents the reduction in volumes applied. This figure and the reports from the CCA confirm the above figures.

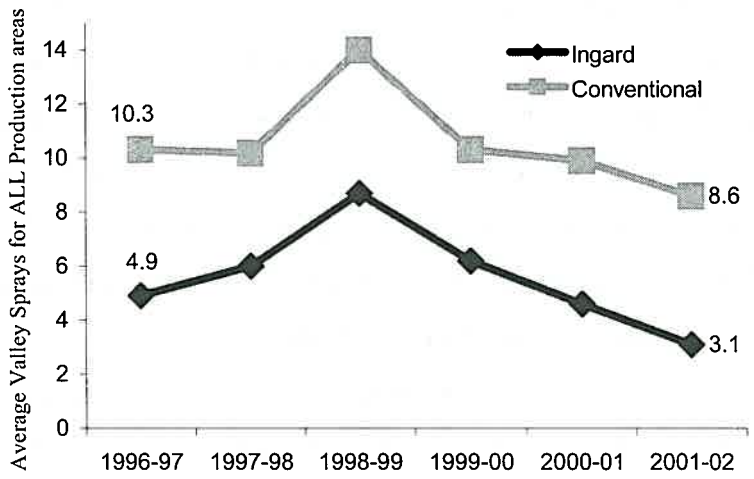


Figure 4: Average Number of sprays per season across all valleys

Doyle et al. (2002), reported the MacIntrye valley to have a lower number of average spray compared to the whole production valley district average. Ingard® was 13% lower and Conventional was 29% lower. Dillion per com. (2004) assessed the number of Ingard® and conventional sprays for the MacIntyre , Gwydir and Namoi valleys. Results showed a trend of less spraying in the MacIntrye valley, see figure 5.

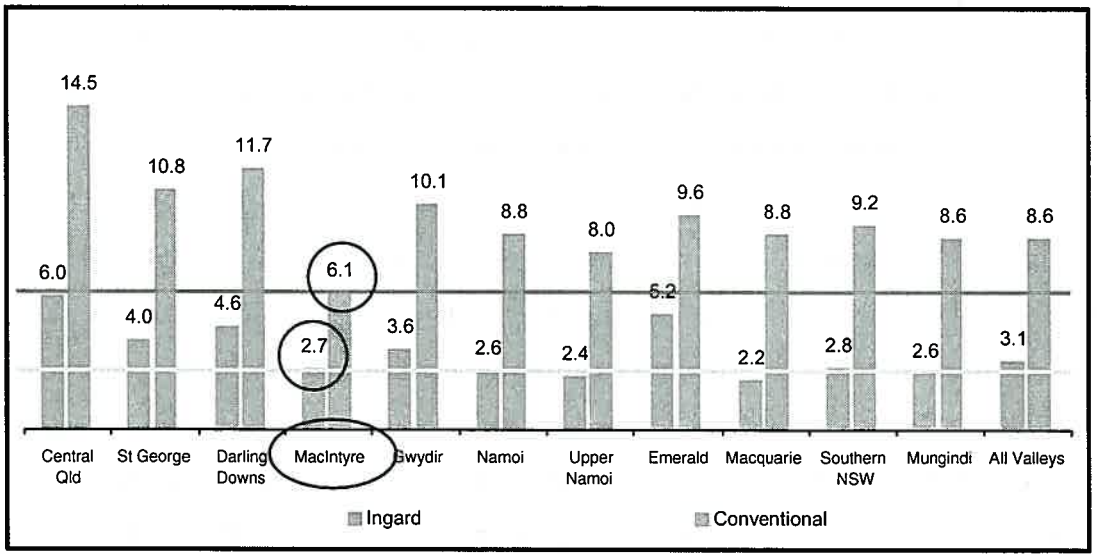


Figure 5: Average Sprays for 2001-02

Dillon pers com (2004) compared soft and hard approaches in terms of gross margin. As seen in figure 6 and 7 both Ingard® and conventional cotton systems were comparable.

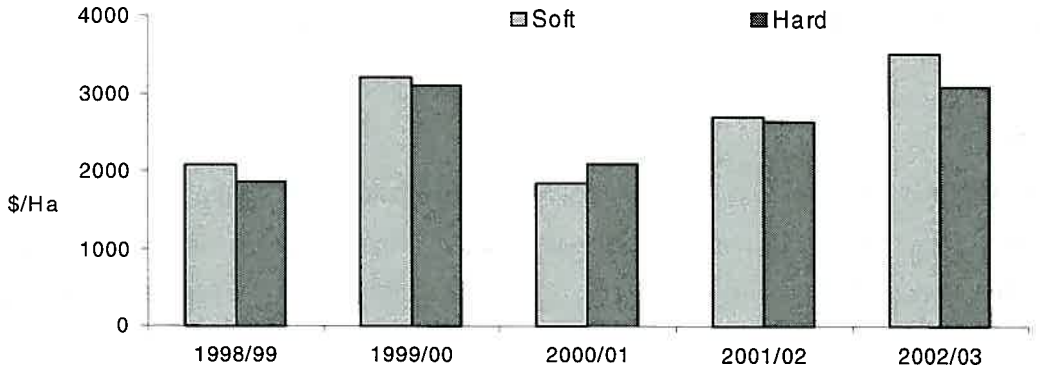


Figure 6: MacIntyre Valley Gross Margin Conventional Cotton

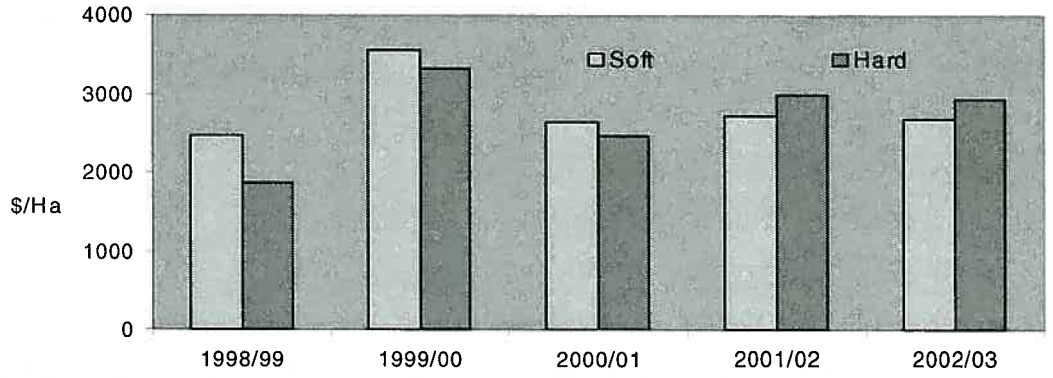


Figure 7: MacIntyre Valley Gross Margins Ingard Cotton

Conclusion:

Extension methods used to promote the IPM adoption are wide spread and do not rely on of single method. As outlined in this paper, the IPM short course or activities of area wide management groups are two examples. To implement the theory behind IPM in the field, requires a grower to identify with the various components of an IPM system. The next challenge is more personal, how do they then integrate these components in their farming system? At the end of the day, there are only guidelines available for growers wishing to implement IPM not recipes. A major challenge the producer faces is the balance between IPM and the industry's IRMS. Although this challenge is achievable as illustrated by the economic and OHS benefits reported the BDA economic evaluation recently conducted. Growers should start small and gain confidence and understanding of their system before trying to convert the whole operation overnight.

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Abstract

Making the transition from theory to field practices, that reflect an IPM system is not simply the changing a management operation. It involves a holistic management approach, which only comes from you developing personal confidence and belief in the system. Changing to a soft chemistry approach is an aspect of IPM. However, it is not the only aspect. Growers should understand the principles behind IPM and then start to develop the system that is suitable for your operation gradually. An understanding of the principles of IPM is essential. As the principles of the system do not change; it is how you blend the components that give you the best results.

The paper investigates the practice change stimulated by the Australian Cotton CRC Integrated Pest Short Course, local Industry Development Officers and the role of grower groups. Evaluation of the IPM short course has identified 72% of participants that finished the course were expecting to implement practice change as a result of the course. These areas of changed focused around relationships with consultants, beneficial insects, plant mapping and a higher presence in the crop. The paper outlines the various benefits of IPM adoption, with economic data showing a comparable or slightly better return for soft chemical approaches.

Keywords:

IPM, Short Course, Area wide, Practice change, Soft chemistry, Adoption, Extension, Education, Integrated Pest Management