

Asking the hard questions – has our extension approach had impact on Integrated Pest Management implementation?

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Setting the scene

Critical reflection is integral to the action learning cycle (Kolb 1984) which underpins much present day extension theory. How often, however, do extension programs conduct an impact analysis to formally evaluate achievements against desired outcomes and so gain insights into the effectiveness of different extension strategies used? In 2008, two Integrated Pest Management (IPM) project teams working in the Queensland vegetable industry commissioned an external consultancy to evaluate project impact. By subcontracting independent evaluators, the project teams hoped to improve the quality and rigor of data obtained, make more efficient use of time and resources, and provide a more objective measure of how to improve future IPM project work. Needs analyses conducted at the start of both projects helped shape the extension approach for achieving project objectives. Both projects included a research component.

Western Flower Thrips (WFT) (*Frankliniella occidentalis*) This project aimed to transfer technology and information gained from research projects based in southern Australia to two vegetable production regions in Queensland. WFT had caused significant damage in one locality (Gumlu) and crop (capsicum) in 2002 but was not considered a major threat to crop production. The research component aimed to modify technology and information to suit regional conditions. Extension strategies were based on a regular newsletter and other information products as well as seminars, workshops and farm walks. Two established crop consultancy firms were included in the project team to fast-track the commercialisation process. One of these serviced growers in the target region of Bowen/Gumlu/Burdekin in North Queensland, the other serviced growers in the target districts of Bundaberg in SE Queensland.

Silverleaf Whitefly (SLW) (*Bemisia tabaci* Biotype B) This project focused on developing and promoting systems, technology and information to assist industry with effective management of an insect pest that had been causing significant damage to crops in some regions of Queensland. It included a substantial research and development program. Extension strategies were based on a regular newsletter, leaflets, seminars and research station farm walks as well as intensive IPM systems development work on a number of North Queensland farms by Queensland Primary Industries and Fisheries (QPIF) entomologists. This consisted of regular farm visits, advisory support and targeted parasitoid releases.

Getting started

The consultants and project teams negotiated a set of key questions for each project from which to develop the survey questionnaires. We chose to use a telephone survey to collect data as we wanted to obtain a statistical sample but had large distances to cover with limited resources and time for travel. Getting the questions right and setting up good contact lists from which to sample the population was therefore critical to obtaining quality information.

Key questions

The key evaluation questions for the WFT project were: What level of commercialisation was achieved? Which strategies achieved technology transfer? What didn't work so well? Are growers and their service providers using the tactics promoted by the project?

For the SLW project the key questions were: Was there a change in SLW damage to crops compared to previous years? What level of IPM practice had been achieved to reduce chemical inputs? What chemicals were being used? Which chemicals does industry most rely on? Are growers managing insecticide resistance? What is the attitude to natural enemies?

The questionnaire Questions were arranged in sets to produce four distinct modules (i) background information, (ii) preferred sources of information for managing pests and diseases, (iii) specific questions on WFT, and (iv) specific questions on SLW. The modules on WFT and SLW were structured to explore awareness and understanding of key messages of the extension campaign, determine if practice change had occurred and what factors may have influenced this change in practice. Questions were either prompted (closed questions) or unprompted (open questions) depending on the type of data we were aiming to collect. Two separate but similar questionnaires were developed – one for growers, the other for service providers (agribusiness).

The sample We used existing QPIF lists of growers, agribusiness and agency contacts (recipients of newsletters and seminar notices) from which we took a stratified sample based on regions, crops (growers), and occupation (service providers) to generate 328 potential respondents. The focus of the survey was to obtain information across a variety of categories rather than to proportionally sample the population across categories.

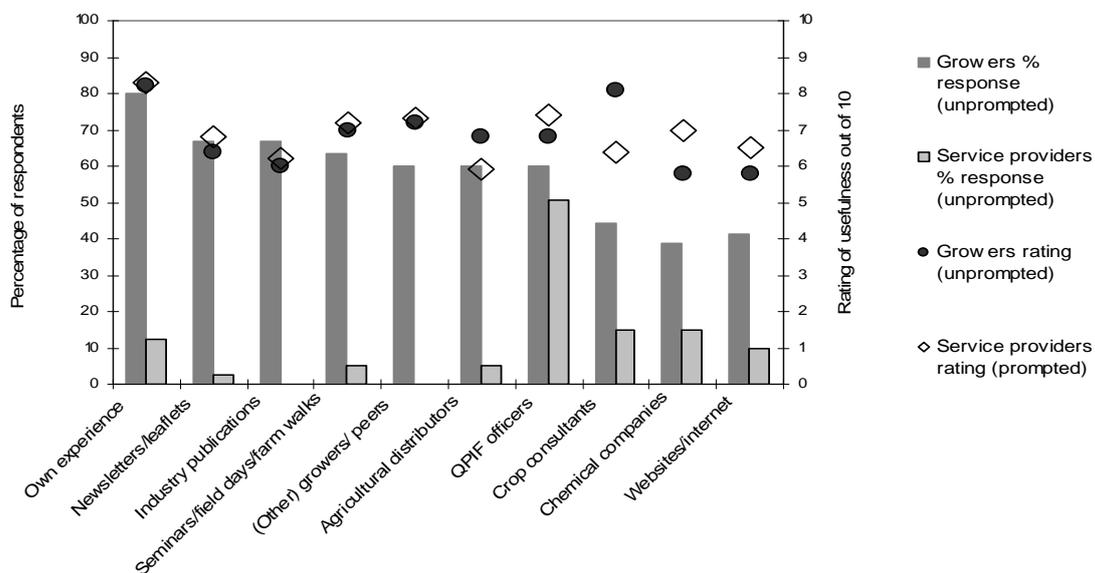
We achieved an interview success rate of 38% for growers and 43% for service providers. Just over 40% of non-respondents were not interested in completing the survey, were not affected by SLW or WFT (growers) or not involved in either project (agribusiness). About 15% of potential respondents could not be contacted. A total of 90 vegetable growers and 40 agribusiness contacts were interviewed. Of these, 72 vegetable growers and 35 agribusiness contacts took part in the SLW module and 24 growers and 23 agribusiness contacts took part in the WFT module. Some respondents were interviewed for both SLW and WFT.

The interview A professional interviewer with experience in agriculture conducted all interviews. A notice about the survey and what it was aiming to achieve was sent to potential respondents (by email, fax or post) at least a week prior to the interviewer making first contact. Questionnaires took 15-20 minutes to complete on average.

Main sources of information

The graph summarises the main sources of information on pest and disease management for respondents (Figure 1).

Figure 1. Sources of information about managing pests and diseases.



Agribusiness respondents rated their own experience, QPIF officers and crop consultants as most important. There were some minor differences between regions with QPIF officers and chemical companies rating more highly in North Queensland; seminars/farm walks and websites/internet featuring more strongly in the Bundaberg district; and growers/peers (particularly for WFT) and chemical companies important in the Lockyer Valley.

For grower respondents, their own experience featured strongly. This is similar to the result from the WFT needs analysis three years earlier (Heisswolf and Kay 2007). Crop consultants, when mentioned, rated highly indicating that they were a valuable primary source of information for some growers. QPIF officers, agricultural distributors, other growers, seminars/farmwalks and newsletters/leaflets were mentioned frequently but growers rated them as only moderately useful. They are perhaps a primary source of information for those growers that do not use crop consultants. In general terms, industry publications, websites, the internet and chemical companies featured least strongly as sources of information for growers. In the Bundaberg district, seminars/farmwalks and industry publications rated more highly than elsewhere.

The project newsletters (SLW and WFT Updates) were well received, particularly by agribusiness and appear to be an important communication mechanism. It is clear that growers continue to prefer post for written information while agribusiness is content with e-mail. Only 15% of respondents had visited the SLW website; although respondents frequently mentioned websites/the internet as a moderately useful source of information. Perhaps this reflects the

type of information respondents look for on the internet with up to date specific information on an insecticide registration being a good example.

Over half of respondents had attended one or more pest and disease management seminars run by QPIF with no significant differences between growers and agribusiness respondents or localities. These activities clearly play an important role in information sharing and skill development.

What works for IPM implementation?

Both projects used regular newsletters, leaflets, booklets, other information products (Plate 1a) and a series of seminars, workshops and field walks to promote best practice. Newsletters were either posted or emailed. Their primary aim was to raise awareness and build understanding of improved practices for SLW and WFT. They also served to maintain a profile of the projects within the industry.

Seminars provided a venue for discussion and information sharing amongst service providers, agribusiness, the project team and interested growers. They were not designed as a primary source of information for busy vegetable growers but as a support for the commercialisation process. News on other key pests and diseases was often included to add value.

Two crop consultancy firms provided more intensive interaction with growers for the WFT project as part of the project team while on-farm IPM development work by QPIF entomologists provided it for the SLW project. An effort was made to involve agricultural distributors and other service providers in activities, not always successfully. The aim of these strategies was to achieve practice change.

Western Flower Thrips project

Awareness and understanding Overall 78% of respondents were aware of the WFT project and 74% had seen the newsletter 'Western Flower Thrips Update' giving it a usefulness rating of 5.9 out of 10. After reading the newsletters, 90% of agribusiness respondents filed them away with just under half referring to them regularly and just under a quarter taking them out to growers as a business tool.

Overall 57% of respondents said they were aware of a 3-spray insecticide strategy for managing WFT, a cornerstone for managing WFT insecticide resistance. Most were able to describe the strategy in some detail. The top three descriptions for keeping WFT at low levels were good farm hygiene (96%), monitor/check crops on a regular basis (93%) and spray with insecticide (67%). To a specific question for agribusiness, 57% of respondents said they were aware of the broadleaf weeds that harboured WFT.

Practice change and commercialisation Thirty percent of enterprises now use a 3 spray strategy on detection of WFT, 40% monitor for WFT and 26% rotate insecticides to reduce resistance. Good farm hygiene (controlling weeds, getting rid of old crop) and planting strategically (avoiding hot spots, no new crop next to or downwind of old) were also mentioned. Sixty percent of respondents had not made a change in how they manage or recommend management of WFT over the last few years.

Both agribusiness and grower respondents, on average, rated their own research/information seeking/trials (agribusiness 8.1, growers 8.3 out of 10) and experience (agribusiness 8.1, growers 8.3) as the top two factors prompting practice change for WFT management. Agribusiness respondents next nominated information about WFT that arrived on the farm from QPIF (8.1) and discussions with crop consultants (7.4) as prompters of change while growers next rated Pest and Disease seminars (7.8) and discussions with crop consultants (7.4) as reasons for making a change.

Silverleaf whitefly project

Awareness and understanding For SLW, 87% of respondents said they were aware of the project run by QPIF. Three-quarters of respondents had seen the newsletter 'SLW Update' giving it an average rating of 6 out of 10 for usefulness. In contrast, only 10% of growers and 17% of agribusiness contacts interviewed had visited the web site at least once. Three percent had visited it more than twice and no-one had used the web site more than five times.

Sixty percent of respondents said they were aware of the insecticide resistance management strategy for SLW with those that use it able to describe its requirements in some detail. Almost 50% of the respondents were aware of the SLW clean up strategy (70% in North Queensland). However, of those who used the strategy only about half described options within the strategy in detail. The top three strategies most often identified by respondents as important for slowing down SLW movement from crop to crop were:

- spraying with insecticides (53%)
- monitoring/checking crops on a regular basis (37%)
- getting rid of/slash off/chop in crop straight after harvest (35%).

Overall 83% of grower and agribusiness respondents were aware of a program to release parasitic wasps that attack SLW in their district. Unprompted responses on how to protect and preserve them on farm were to avoid use of broad-spectrum insecticides (56%), only spray at risk planting not the whole crop (16%), plant a small refuge area to allow them to breed and disperse within the farm (14%) and accept a low level of crop damage (9%).

Practice change and commercialisation The top four ways that growers and agribusiness respondents said they have changed how they manage or recommend management of SLW in the last two or three years are:

- Use of softer chemicals to protect parasitoids (27%).
- Monitoring crops for SLW levels/employ a consultant to monitor (17%).
- Injecting or drenching Confidor at planting (as a preventative approach) (16%).
- Good farm hygiene: control weeds around the farm (14%).

However, 42% indicated that they had not changed practices. Years of experience was the most important factor given by respondents for prompting them to make a change (average rating of 7.8 out of 10 for both growers and agribusiness). Respondent's own research/information seeking (growers 7.4, agribusiness 7.2) also featured strongly. For agribusiness respondents information arriving on the farm from QPIF (7.4) also made an impact while growers said discussions with crop consultants (7.3) and direct contact with QPIF (6.7) prompted practice change.

The end result

The set of interrelated extension strategies used to promote IPM was successful in achieving practice change. We achieved a high level of awareness and good level of understanding of the key messages for each project and this led to a very credible level of improved IPM practice. This is particularly gratifying for WFT as this pest has not been a management problem since 2003 in the target districts and so placed no pressure on growers to change practices. There was high degree of congruency between the factors which led to practice change and the main sources of information for growers and service providers on pest and disease management. During the life of both projects, there has been a perceived decrease in damage caused by SLW and WFT across susceptible vegetable crops in Queensland. When compared to data for other crops and districts, insecticide resistance levels in SLW (biotype B) and WFT have been largely contained.

The evaluation highlighted several areas where further improvements could be made. For WFT, more could be done to increase the uptake of the 3 spray strategy by growers from the gains already made. However, a lack of realistic insecticide rotation options make this difficult. There was a low level of awareness and adoption of strategic planting and farm planning as an IPM tool and more could be done to promote the messages of "no new crops next to old, new crop upwind of old, avoid hot spots".

For SLW, collaborative work with chemical companies to include project recommendations on product labels worked well for Confidor soil applications. This is perhaps one avenue for promoting specific IPM information that could be better utilised. More could be done to clarify and promote messages for the SLW insecticide resistance management and "end of crop" clean up strategies, however, SLW migration from weeds and old crops has become somewhat less critical as the impact of parasitoids on SLW populations has increased. Spraying out old crop with broadspectrum insecticides may in fact be detrimental to local parasitoid populations illustrating that extension messages need to change as the situation evolves and changes.

In general terms, the WFT project achieved a higher level of awareness and understanding of the key messages the project was trying to convey (e.g. "Get mean, keep clean") than the SLW project. Perhaps the messages from the SLW project were not as clear and consistent. However the SLW project achieved a higher adoption rate than the WFT project and this may reflect the greater risk of crop losses through SLW when compared to WFT as well as the substantial on farm R&D program contained in the SLW project.

The WFT needs analysis (Heisswolf and Kay 2007) and follow up monitoring confirmed that activities and newsletters needed to be short, relevant and timely. It also confirmed that growers preferred one-on-one contact to access information on pest and disease management hence working with growers, either directly or indirectly, was an important part of the technology transfer strategy. This occurred via several key service providers: consultants,

agricultural distributors or a QPIF staff member, the mix of which was probably influenced by the specific individuals available within a district, and the relationships formed to access timely information for day to day decision making.

It is clear that personal experience and observation are major factors in prompting change by both growers and agribusiness. This is particularly true in the absence of a pest management crisis. Growers continue to rely on personal interaction with key people to obtain information and advice for day to day decision making on managing pests. This advice comes from a number of avenues and directly influences how growers integrate new approaches into their own experience.

QPIF officers remain a significant source of pest and disease management information for agribusiness and continue to play a critical role in the information system. Growers rely more on crop consultants as their primary information source and this highlights the impact of the commercialisation route. On some larger farms, in house agronomists fill this role while QPIF entomologists supply consultancy type support when developing IPM systems on farm with grower co-operators. Agricultural distributors continue to play a role in influencing decisions.

Both growers and agribusiness highlight the importance of field demonstrations, on farm trials and local case studies for individuals – growers and service providers - to gain confidence in new approaches for managing pests so adapting research and information to local conditions, systems and situations. This extension strategy, however, is time and resource intensive.

What have we learnt from the evaluation experience?

There is little doubt that the external evaluation process added value to both projects. It provided sound data on the level of awareness, understanding and practice change that each project is likely to have achieved in the field. It also supplied some very practical suggestions on how to improve in the future. There were some unexpected benefits, some insights and also a couple of concerns that an in-house evaluation may not have unearthed.

Developing the survey was a balance between:

- The information required and the size of the questionnaire - governed by the length of time a professional interviewer could reasonably ask for input from a respondent via the telephone.
- The quality and accessibility of contacts used (the frame) impacted on the time it took to complete the survey as well as how well the survey represents the target population. There is likely to be some bias in the data due to non-responses and individuals not captured by our contacts lists. This needs to be kept in mind when interpreting the data.
- The budget and time available – there is potential to augment survey results with focus group interviews, in-depth interviews with key informants, secondary data (for example, insecticide use data) and other mechanisms to tease out and better understand survey results.

It quickly became obvious that good planning is essential for maximising survey effectiveness. This starts with clarifying what information is wanted, developing the questions so they are easy to answer, summarise and interpret and the drawing up of a sampling schedule. The project leaders had little experience in evaluating extension impact and were a little surprised by the level of thinking and detail required to complete the planning process for the surveys. Two issues stand out:

- The project teams were perhaps not as clear as they had assumed in the key messages and practices that had been promoted and some lively discussions took place prior to finalising the questionnaire.
- There is some concern that several of the survey questions may have been misunderstood by the respondents and that the interviewer may not have picked up on this and clarified the question sufficiently. This is a limitation of the external evaluation process that could be minimised by the interviewer “piloting” the survey tool with team members.

A structured, independent evaluation can provide defensible results, clear trends and greater confidence to act on findings. Some other benefits are a different perspective and discipline for working out project aims, messages and practices that are to be implemented. We highly recommend thinking about evaluation at the project planning stage and to use it as a project management tool by periodically asking: What is it that we are trying to achieve? What are the messages we are trying to send out?

Designing future IPM extension strategies

The evaluation results highlight and reinforce some key learnings for IPM extension. They are:

You can't beat experience

When it comes to pest and disease management, one on one interaction with service providers remains important for day-to-day decision making and directly influences how growers integrate new approaches into their existing production system. Extension strategies that build on the experience of growers and target agribusiness through practical on-farm research and demonstrations are likely to be the most effective. However, this approach is very resource intensive. One way of overcoming this constraint is to design strategies that involve crop consultants, agricultural distributors, key farm staff and other service providers alongside growers in the testing and trialling process.

Targeting relevant service providers

Public extension is only one player in the information landscape and, with vegetable farming enterprises becoming larger and ever busier, private "extension" in its various forms is filling the gaps. It makes sense to shift focus by firmly including service providers alongside growers as the extension target. Some points to consider in this approach are:

- Develop consistently clear and unambiguous "messages" for distribution within the industry network. This is an interesting task as the project team itself first needs to ensure it agrees on what specific IPM practices it wants the industry to adopt so that individual team members are more likely to promote the same clear and unambiguous messages to growers and service providers - or at least not conflicting messages
- Engage agribusiness. What are their needs? How can your message add value to their business?
- Consider including service providers as collaborators in projects as this provides ownership, formalises interactions, recognises their importance and provides another perspective – all part of a sound adult education approach.

Walk the tight rope

Finding the right balance between resource intensive and broad brush approaches can be difficult. A good first step is to be realistic about what different extension strategies might achieve. While newsletters and seminars are useful for raising awareness and understanding; to achieve practice change, projects need adequate resourcing for on farm collaborative trial work. Timing is also important. A crisis tends to help the change process along. Use the 80:20 rule – 100% impact is not needed for the program to be highly effective.

Does it work?

Does a robust collection of IPM strategies exist for the crop in question? Have they been thoroughly tested on farm in your locality? Do they increase or decrease risks, costs or complexity for the farmer? Is local, timely expertise available at a reasonable price to support the testing and implementation process? Is a big gun available in case things go wrong? Would you put your house on it? The best way to answer these questions is to demonstrate the IPM system on farm under commercial situations.

Acknowledgements

Many thanks to respondents for their time and cooperation in completing the questionnaires. Our thanks also to Amy Samson for organising contacts and Barbara Simes for contacting individuals for sampling and completing the questionnaires with eligible respondents. The SLW and WFT projects were facilitated by Horticulture Australia Ltd, in partnership with AUSVEG and funded by the vegetable levy. The Australian government provides matched funding for all HAL's R&D activities. State government funding was provided through Queensland Primary Industries and Fisheries.

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