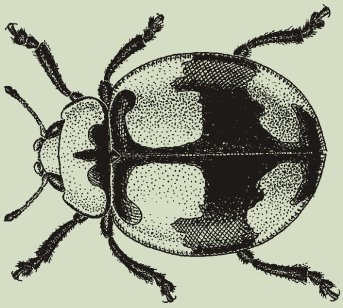
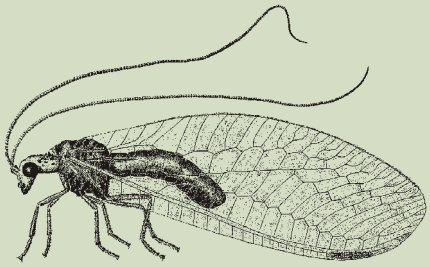
Department of **Employment, Economic Development and Innovation**

Identification of insects, spiders and mites in vegetable crops

Trainer's handbook

Sue Heisswolf, Bronwyn Walsh and Larissa Bilston





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Using this handbook

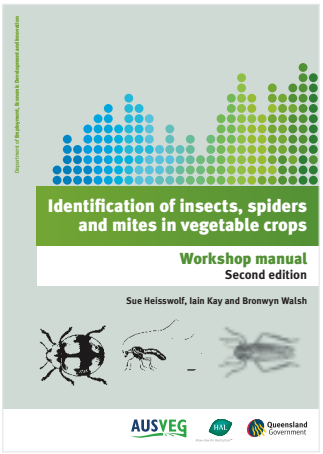
This handbook is designed to accompany the workshop manual—*Identification of insects, spiders and mites in vegetable crops*. The trainer's handbook contains background theory, guidance, tips and practical advice for workshop trainers and facilitators wanting to conduct 'Pest and beneficials identification' workshops for vegetable growers.

The Department of Employment, Economic Development and Innovation makes this handbook freely available to workshop trainers and facilitators provided the handbook remains intact and rightful acknowledgment is given.

Contents

Acknowledgements

The second edition of the workshop manual *Identification of insects, spiders and mites in vegetable crops* and this accompanying trainer's handbook are outcomes of the Horticulture Australia Limited (HAL) project, 'Provision of western flower thrips technology transfer services in Bundaberg and Bowen' (project number VG03099). This project was facilitated by HAL in partnership with AUSVEG and was funded by the vegetable levy. The Australian Government provides matched funding for all HAL's research and development activities. State government funding for the project has been provided through the Department of Employment, Economic Development and Innovation (DEEDI). We gratefully acknowledge their support.



This trainer's handbook is designed to accompany the workshop manual *Identification of insects, spiders and mites in vegetable crops* for use in the delivery of 'Pest and beneficials identification' workshops for vegetable growers, their key staff, farm advisers and other service providers.

The first edition of the workshop manual and piloting of the training program, on which the trainer's handbook is based, are an outcome from an earlier HAL project. Details are reported in:

Heisswolf, S, Jordan, A, Brown, E, Page, F, Houlding, B, Nimmo, P & Duff, J 1999, *Training program for growers on pests and natural enemies in vegetable crops*, final report for HRDC project VG503, Horticultural Research & Development Corporation, Gordon, New South Wales, Australia.

The training process was further refined for a train-the-trainer course 'Extension tools for IPM in vegetable crops' held in Hangzhou, China in 1999 as part of ACIAR project PN9213 'Improving pest management in brassica vegetable crops in China and Australia'. We also gratefully acknowledge the role of the Rural Extension Centre (Gatton, Queensland) in shaping our approach to training and extension practice.

We would like, in particular, to thank Iain Kay (Senior Entomologist, DEEDI), Deborah Atkins (Senior Training Officer, CRC for Irrigation Futures), Cindy Benjamin (Information Extension Officer, DEEDI), Danielle Jones (Editor, DEEDI) and Matt Curr (Graphic Designer, DEEDI) for their constructive comments, practical suggestions and editorial/design assistance with the production of this handbook.

Introduction

Vegetable growers are under increasing pressure to reduce pesticide use in crops due to insecticide resistance problems, environmental concerns and marketing pressures. Insecticide resistance in particular is a major issue for the vegetable industry, with pests such as the silverleaf whitefly, heliothis, cabbage moth (diamondback moth), green peach aphid, spider mites and the western flower thrips becoming increasingly difficult to manage successfully with insecticides alone.

Apart from reducing insecticide resistance problems, other benefits of minimising insecticide use include:

- less risk to the environment and rural communities
- a more stable and resilient farm ecosystem that utilises species diversity both in and around the crop to help buffer the crop against pest outbreaks
- a safer working environment for farmers and their staff
- reduced risks of pesticide residues on produce
- improved access to export markets that have residue restrictions.

The preferred approach for reducing reliance on insecticides is to implement an integrated pest management (IPM) program. IPM involves using a combination of various pest management techniques to keep pests below economic damage levels. In an IPM program, insecticides are used strategically for managing specific pest problems.

A critical first step for implementing any IPM program is correct identification of pests and their natural enemies. This includes an understanding of which pests are likely to cause problems and which natural enemies may be useful for keeping pests at manageable levels.

We use the terms 'beneficial insects', 'beneficials' or 'natural enemies' to describe insects and arachnids that kill pests in crops. These include predators such as spiders, predatory mites, lacewings and ladybirds, and insect parasites such as wasps and flies.

Workshop summary

Objectives

The goal of the workshop program is to build on the ability of growers, their key staff, farm advisers and other service providers to identify pests and natural enemies in vegetable crops so they can make sound pest management decisions. By the end of the workshop program, participants should have:

- increased their level of skills and knowledge about pests and their natural enemies
- a more flexible attitude towards pests and the role of natural enemies
- a plan to improve the way pests are managed around the farm.

This workshop is not about replacing a professional crop consultant or about IPM training. The program aims to equip participants with the basics to get started on identifying pests and natural enemies in the field. At the end of this training, participants should be better placed to:

- utilise the services of a consultant and more fully appreciate how to best implement a consultant's advice
- make sound decisions on the level of time and energy required to successfully monitor vegetable crops for pests and natural enemies.

Structure

The intention is to deliver a workshop program in training sessions that can be adjusted to suit the learning needs of participants.

This involves:

- delivering a structured workshop program based on adult learning principles and the action learning cycle
- providing a full colour workshop manual to complement the workshop program
- supplying tools and materials for completing insect collections (optional).

The workshop program consists of four training sessions, each 2–2½ hours long. Two sessions are designed for the field and two for the laboratory. The main focus of each session is:

- Field session 1—finding and collecting pests and natural enemies
- Laboratory session 1—introducing insect groups (orders)
- Field session 2—concepts of crop scouting
- Laboratory session 2—relating crop damage, life cycles and mouthparts to insect identification.

Leave no more than 2 weeks between training sessions. Maximum participant numbers for the workshop program depends on the venues, facilities and trainers available. Three experienced trainers with a large, well–set up laboratory and varied field sites close by should aim for 14 to 16 participants (no more than 20 or less than 10).

Information for running optional activities such as pre-workshop awareness activities, a post-workshop evaluation and a short refresher course are included in this handbook.

Skills required

This trainer's handbook aims to provide ideas and guidance for delivering the training sessions. It includes:

- a summary of some of the basic agricultural extension and learning theory underpinning the structure of the workshop program in Section 1
- an overview of the workshop program and detailed session plans in Section 2
- detailed delivery instructions that expand on session plans, training tips and training materials for copying and modifying in Section 3.

The structure of the workshop program encourages participants to maximise learning through an adult learning framework. The skills required to successfully offer this training include:

- entomological skills
- extension process skills
- practical skills and experience in local pest management.

Therefore, we recommend that the training team includes an entomologist, an extension specialist and a local crop consultant. As for any successful team, we suggest you allocate clear responsibilities to team members for presentations, leading discussions, participation and assistance during field and laboratory sessions, registration, organising materials, catering, reporting and collecting specimens.

Section 1: Theories behind the program

Adult learning principles and the action learning cycle are the main theories used to develop and deliver the workshop program. Other educational strategies incorporated into the training sessions cater for a range of learning preferences and provide a logical sequence for the individual training sessions and the workshop program as a whole. This approach aims to maximise the participant's learning opportunities.

Brief summaries of these theories, as we have applied them to the workshop program and training sessions, are provided as background information in this section. We feel this is important as a refresher for experienced trainers and facilitators and as an introduction to those new to delivering training based on adult learning principles and the action leaning cycle. We encourage you to make use of the list of further reading given at the end of each main section of theory. These references are by no means complete; however, they provide a good starting point for each particular area of extension theory.

1.1 Adult learning principles

Learning can be fun. Keep the following adult learning concepts in mind to ensure training sessions are interesting, active, social, varied in their presentation and designed to encourage participants to learn in a way most suitable to them:

- **Participation and self-direction** is about involving participants in planning the training sessions. This can include being flexible about the time and place for the training, the best way of combining the laboratory and field sessions, and taking on board suggestions from participants (e.g. having industry-sponsored workshop breaks, changing crop focus halfway through the program or spending more time on one part of the training than another).
- **Build on experience and use existing knowledge** within the group and individuals (e.g. working in small groups to encourage sharing of information and learning from peers, and spending a significant amount of training time in the field).
- **Avoid the traditional 'chalk and talk' classroom approach** whenever possible. Make sessions active and interactive through practical exercises. Encourage and make time for questions and discussion.
- **Incorporate time for reflection and discussion** to allow learners to think through new or more difficult material.
- **Provide a comfortable learning environment** to encourage participation. Positive feedback gives learners a sense of progress.
- **Make sessions problem-based** rather than subject-based to encourage practical application of learning, making it immediately relevant.

Further reading

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Knowles, MS 1990, *The adult learner—a neglected species*, Gulf Publishing Company, Houston, USA.

Knowles, MS, Holton, EF & Swanson, RA 2005, *The adult learner: the definitive classic in adult education and human resource development*, 6th edn. Elsevier Inc.

1.2 The action learning cycle

The action (or Kolb experiential) learning cycle provides structure to each training session within the workshop program. When you actively visit each stage of the action learning cycle during each training session, you cater for different preferred learning styles of participants. Our interpretation of the action learning cycle is shown in Figure 1.

The action learning cycle is a useful framework for incorporating adult education principles into training activities. Moving through different phases of the learning cycle encourages adults to:

- reflect on learning experiences
- decide how learning relates to their own situation
- plan how to use the learning to solve real problems
- apply this learning.

This process helps adults assimilate learning because it builds on their own experience.

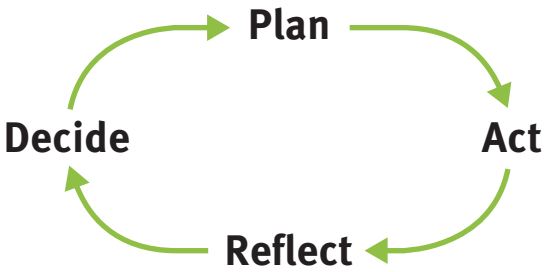

Figure 1: Components of the action learning cycle (adapted from McGill & Beaty 1995)

Preferred learning styles

Preferred learning styles can be aligned to the four phases of the action learning cycle, with most people tending to identify strongly with one or two learning styles. An appreciation of which learning style a person prefers can help learners choose a learning activity or environment to optimise their learning. An awareness of learning styles helps trainers and facilitators design activities to accommodate different styles. Likewise, with an understanding of learning styles, participants are more likely to take part in activities that they are less comfortable with in order to complete the action learning cycle and so maximise their learning.

Table 1 gives a brief description of the four learning styles and some examples on how they can be applied in the workshop program.

Table 1: Learning styles and strategies

Learning style	Workshop strategies
Activists are open-minded, uncomfortable with restrictions and become bored with long-term considerations and tedium.	Keep formal presentations short; vary training delivery styles, presenters and locations; and encourage discussion.
Reflectors need to think about experiences, analyse situations, delay making decisions and are cautious.	Allow time to 'think', with spare time between training sessions, and encourage discussion.
Theorists are objective and rational, need to know why, dislike uncertainty and need to see patterns.	Encourage questions and place ideas into context.
Pragmatists like to try out ideas and techniques, are practical, realistic and dislike unresolved discussions.	Use field sessions, problem-based examples and hands-on activities.

Completing the action learning cycle

For many of us, our hectic lifestyles encourage us to 'plan' and 'do' things without making time to stop and 'reflect' on how things are going, then 'decide' on what changes may be needed to improve, before heading off into the next round of planning and doing.

Section 3.6 contains some facilitation techniques that you can incorporate into sessions to guide participants through all four stages of the cycle. Individual learning logs and group reflection or evaluation activities can be powerful methods for completing the action learning cycle at the end of a training session.

BEWARE: Avoid favouring *your* preferred learning style

It can be tempting to run a workshop using activities that you, the trainer, are most comfortable with. Workshop participants may have different learning styles and therefore need other learning activities.

It may be useful to share some of the theory on action learning and learning styles with participants early on in the workshop program, for example, by asking participants (and trainers) to guess their favourite learning style at the start of the first end-of-session debrief.

Further reading

Kolb, D 1984, *Experiential learning: experience as the source of learning and development*, Prentice-Hall, Englewood Cliffs, NJ.

McGill, I & Beaty, L 1995, *Action learning: a guide for professional, management and educational development*, 2nd edn, Kogan Page, London.

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1.3 Other learning theories

Perceptual modalities

Perceptual modalities are the ways people extract information from the environment. The four different types of perceptual modalities are:

- visual—learning through reading, pictures and drawings
- aural—learning through sound
- interactive—learning with others
- haptic—learning through hands-on experience.

As with preferred learning styles, the perceptual modalities concept deals with an individual's preference for learning. This concept is useful for checking that you are using different methods of delivery during training sessions.

Building on past experience

'Chunking', or combining new bits of information with what is already known, can facilitate learning. Chunking helps the individual learner to store new information in their long-term memory and also determines what importance an individual places on new information.

You can improve the learner's understanding of new concepts if you link new ideas, information and skills with the individual's way of organising different aspects of the world (i.e. build on their past experiences).

Some chunking examples used in this workshop are:

- **flashcards, where participants sort pictures of insects and arachnids according to physical characteristics that are linked to insect orders (pages 36–38)**
- **insect damage activity, where participants are asked to identify vegetable damage according to insect mouthparts or life cycle (pages 40–42).**

Less is more

Critically appraise the material to be presented in the workshop with the view of building extra time into each training session. Consider the following:

- Does it add something essential?
- What is the main message in each PowerPoint slide?
- Does the information help achieve the session's objectives?

If you are having difficulty letting go of a piece of information or slide that is not really essential, then perhaps keep it in reserve in case the topic comes up in discussion or there is spare time.

Over-allocate time to each training session so there is a buffer if you get behind. This can easily happen with guest speakers. It is better to have time spare to allow for questions and discussion than to run out of time.

Also refer to the concept 'Essential, good or nice to have' in Section 1.4 below.

Further reading

Wislock, RF 1993, 'What are perceptual modalities and how do they contribute to learning?' in D Flannery (ed), *Applying cognitive learning theory to adult learning*, Jossey–Bass Inc., San Francisco, pp. 4–6.

Huber, KL 1993, 'Memory is not only about storage' in *New directions for adult and continuing education*, vol. 59, pp. 35–46.

1.4 Evaluation

Evaluation is the systematic collection of information to assist in decision-making. It is about assessing what targeted results and improvements you can attribute to a specific program or intervention. Evaluation requires baseline data against which you can measure changes. In contrast, monitoring is the routine tracking of key elements used to measure the impact of a program or an activity. Monitoring tends to focus on inputs, outputs and other indicators of project progress and can help to explain evaluation results.

There are two reasons for embedding evaluation processes into the workshop program. Firstly, it allows trainers to quantify the effectiveness of the training and secondly, the evaluation process helps both participants and trainers to complete the action learning cycle. At a minimum, there needs to be an evaluation at the start and at the end of the workshop program to assess the impact of the training. There is also scope to include monitoring and evaluation components at the conclusion of each training session to reinforce the reflection and decision-making part of the action learning cycle. Some ideas on how to do this are provided in Section 3.3 on pages 35 and 36.

Make a point of spending at least five minutes with each person to check how they are going with the workshop material. This is a good informal evaluation method and helps to build relationships.

Essential, good or nice to have?

Perfect evaluation would be a lengthy and costly exercise, so a compromise is usually needed between the resources allocated for evaluation, the level of evidence required to make reliable decisions about the effectiveness of the training and the rigour of data that you can obtain within your budget and time constraints.

Keep in mind that the individuals providing information for evaluation—in our case the workshop participants—will quickly tire of being tested and asked frequent questions about how things are going unless they can see a purpose to it.

Developing key questions can help to sort through what data you need to collect. You will need to decide what is:

- essential to have
- good to have
- nice to have (i.e. not really needed).

Figure 2. Evaluation triangle

A review of the program's stated objectives in conjunction with an evaluation framework such as Bennett's hierarchy (outlined below) can help clarify the key questions for evaluating the impact of training.

As an example, we used the following key questions to evaluate the original workshop program:

- What level of skills and knowledge have participants gained?
- Does taking part in the workshop change participants' attitudes towards pests and beneficials?
- Has there been a change in the way pests are managed around the farm?
- Are there any changes needed to the workshop process and manual to better achieve the project objectives?

These questions are directly linked to the key outcomes the workshop program is designed to achieve (see Section 2 on page 13).

Bennett's hierarchy

While there are other evaluation frameworks, the original workshop evaluation was based on the rationale of Bennett's seven-tiered hierarchy for assessing training effectiveness and planning for future improvements. Bennett's first three levels deal with inputs, activities and people involvement (things we can easily monitor), while levels four to seven focus on outcomes of these inputs and activities—participants' reactions, their learnings, changes in attitude, aspirations and practice, and the end results (see Table 2). Evaluations usually set out to demonstrate that the program had level four to seven impacts.

Bennett sees the seven levels as interlinked, with a lower level generally being an indicator for impact on the next level of evaluation criteria. For instance, if participants' reactions (level 4) to an extension activity are unfavourable, then they are less likely to learn new skills (level 5) that enable a change in practice (level 6). You can apply this concept of linkages between different levels of evaluation criteria to help:

- track the direct impact of a particular activity on higher levels of evaluation criteria (i.e. to help screen out external impacts)
- decide at which level data needs to be collected to evaluate the impact of a particular activity.

These two ideas are useful for deciding between information that must be obtained, would be good to have or would be nice to have. In general, it becomes more difficult to obtain reliable information of extension impact as you move up the hierarchy.

Table 2. Bennett's seven-tiered hierarchy of evaluation criteria with workshop examples

Level of evidence	Evidence of impact	Data collection tools
7. End result	A reduction in pesticide use or pest outbreaks	Spray records, level and type of pesticides used in a region
6. Practice change	An increase in crop monitoring or use of crop consultants, more judicious use of broad spectrum insecticides	Follow up focus groups or survey to explore changes made on farm or in the workplace
5. Change in KASA (**K**nowledge, **A**ttitudes, **S**kills and **A**spirations)	Participants able to classify pests and natural enemies into groups, able to use a hand lens, aiming to protect natural enemies, intending to implement IPM	Requires start and end of program data collection such as questionnaires, practical exams, discussions (ORID*, focus group)
4. Reactions	Participants report favourably on the training program	Insect collections, brief tick and flick surveys, end-of-session questions
3. People involvement	Number of people completing training	Registration and attendance records
2. Activities	Eight to 10 hours of structured training	Session plans
1. Inputs	Number of people involved, materials and infrastructure used	Budget or funding proposal

*Refer to 'Running an ORID discussion' in Section 1.5 on page 11.

While quantitative data is often more expensive to obtain, qualitative data may be more difficult to interpret confidently and links between an activity and its impact become more difficult to attribute to that specific activity. In other words, the higher up Bennett's hierarchy you move, the more meaningful the result, but the more time and resources are usually needed to measure these outcomes. A good evaluation achieves a balance between the collection of data that is relatively cheap and easy to obtain, with data that is harder or takes longer to obtain but provides much stronger evidence that the work has had a positive impact.

We have included various options for collecting data to monitor and evaluate the workshop program. These techniques are briefly outlined below. They are described in more detail in Section 3 and Appendix 1, and include:

- evaluations at the start and end of the workshop program
- various structured discussion techniques for use during and at the end of training sessions (e.g. focus groups interviews and ORID discussions)
- insect collections as an indicator of skills improvement
- good record keeping of resources used, attendance sheets and registration forms (and receipts if fee-for-service).

Questionnaire design

A wealth of literature exists regarding question design and order. There is an art to questionnaire design, but with practice and adequate pilot testing anyone can become good at it. Some general 'rules' include the following:

- Do not include leading questions.
- Use a mixture of open-ended, multiple-choice and yes/no questions.
- Only ask one question at a time (i.e. not two questions in one).
- Keep questions relatively short and unambiguous.
- Make sure the questions flow in a logical sequence.
- Use clear language that your audience can understand.
- Pilot test the questionnaire.

The importance of pilot testing cannot be overestimated. Questions that made perfect sense as you wrote them can seem unclear, out of place or repetitive when talking to real respondents.

In addition to these guidelines, there are ethical requirements to address when conducting surveys. Participants have a right to privacy, the right to know how long the survey will take and where and how the data will be used.

Further reading

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Dick, B 1992, *Qualitative evaluation for program improvement*, prepared for and distributed at the IIR Conference on Evaluation, Brisbane.

Elson, WR 1981, *The design and understanding of survey questions*, Gower, Aldershot, England.

Sudman, S & Bradburn, M 1982, *Asking questions: a practical guide to questionnaire design*, Jossey–Bass, San Francisco.

1.5 Group facilitation

Facilitating groups

Running successful group activities is a considerable skill that develops over time. If you are naturally inquisitive about what makes people tick, then you may find facilitating groups quite straightforward. If you tend to be task-focused, it may take a little longer for you to feel comfortable in the facilitation role.

When working with groups, two different things are in operation at the same time. One of these is content—the issues, problems, technology and information that the group is discussing or dealing with. This is usually the most obvious part of the group's activities. The other is process—how the group operates in order to deal with the content in a constructive way. This is the less obvious part of group facilitation. Group facilitation is about focusing on the journey (process) as well as the destination (content).

Group facilitation techniques provide a framework for group process. The job of the facilitator is to:

- encourage participation and creativity
- ensure quieter people are involved in activities and discussions
- manage more dominant people so that they stay involved without taking over
- draw out ideas (asking rather than telling)
- suggest alternatives and new approaches
- reduce tensions and resolve difficulties
- manage difficult behaviours
- stay focused and keep to time.

We use several different discussion techniques in the workshop program to provide a framework for effective group facilitation. These techniques are summarised below. Detailed instructions on how to use these techniques are provided in Section 3.

Nominal group technique and round robin processes

Nominal group technique (NGT) provides a structured process for groups of all sizes to generate, discuss and evaluate ideas. The technique encourages broad participation and is particularly useful when the ideas of a few outspoken individuals tend to overshadow the group.

NGT is useful for identifying people's problems and views about an issue, and can also be used as a planning tool. The technique can include a rating or voting process to prioritise items.

Both NGT and round robin processes provide silent time for individuals to gather their thoughts in response to a request or question before they are asked to give one idea at a time. This can be a daunting prospect for people not used to speaking in front of crowds, so breaking large groups into smaller, more intimate groups can help.

The major difference between the two techniques is that during a round-robin process, all ideas are recorded without discussion or analysis. NGT incorporates an element of clustering like ideas and ranking them in order of importance.

The expectations activity at the start of the first training session is based on the NGT. Guidelines explaining how to run this activity are provided in Section 3.3 on page 33. The less formal round robin process is used fairly frequently throughout the workshop, particularly in small groups to ensure that everyone is encouraged to contribute ideas.

Focus group interviews

Focus groups bring together small numbers of people to discuss topics on which broad, contextual information is required. The facilitator manages the process and is responsible for ensuring an extensive 'exchange of ideas' through a 'steered conversation'. This process usually lasts between 1 and 3 hours.

Focus groups are relatively cheap and fast to run, although data analysis and interpretation can be time-consuming. They are excellent tools for gathering information where social context is important, and where understanding and deep analysis are required. They can also be used to generate ideas for planning activities or to explore issues prior to designing a survey. An advantage of focus groups over NGT or surveys is that participants are able to respond to the ideas and stimuli that others provide. The aim is not to reach consensus but to explore many facets of an issue.

Running successful focus group interviews requires considerable planning and skill. Groups should be relatively small (no more than 10) and questions need to be carefully thought out. Much of the history of focus groups lies in market research, where they are used to gauge people's responses to a product or consumer need.

Section 3.7 on page 43 contains guidelines for conducting focus group meetings.

Running an ORID discussion

The Institute of Cultural Affairs developed the focused conversation method as part of its *Technology of participation framework*. The method is also known as the ORID technique because it is based on guiding discussions through four areas, which are:

- **O**bjective—fact finding, data, uses the senses (see, hear, touch, taste and smell)
- **R**eflective—how we react to data, connect facts with our reality, to do with the heart (emotions, memories and associations)
- **I**nterpretive—deeper level of reaction, critical thinking, to do with the head (giving data and facts meaning, value and significance)
- **D**ecisional—take action, come to a resolution, opinion, make a decision about the future.

This process fits well within an action learning cycle, so running an ORID discussion in a training session helps to guide participants through the reflect/decide part of the action learning cycle. ORID discussions can be quick or more detailed depending on the purpose and time available. See Section 3.6 on page 42 for tips on how to run an ORID discussion.

Further reading

Carman, K & Keith, K 1994, *Community consultation techniques: purposes, processes and pitfalls*, Queensland Department of Primary Industries, Brisbane.

Chamala, S & Mortiss, PD 1990, *Working together for Land Care: group management skills and strategies*, Australian Academic Press, Brisbane.

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Morgan, DL 1993, *Successful focus groups: advancing the state of the art*, Sage: Newbury Park, Calif.

Spencer, LJ 1989, *Winning through participation: meeting the challenge of corporate change with the technology of participation*, Kendall/Hunt Publishing, Iowa, USA.

Stanfield, B 2000, *The art of focused conversation*, The Canadian Institute of Cultural Affairs, Toronto.

Section 2: Designing and delivering your workshop

The workshop program is based on the principles of adult learning and the action learning cycle described in detail in Section 1. These principles underpin the structure of each training session, which are designed to be practical, interactive and involve extensive use of living and preserved specimens for identification.

In this section of the trainer's handbook, we provide guidelines and ideas for structuring and delivering the training program in a way best suited to your audience.

The aim is to allow participants to build on their existing knowledge. This approach helps the participants gain the most from the experience and increases their ability to confidently apply what they have learned to their own situation.

By the end of the workshop program participants should have:

- improved skills in identifying pests and natural enemies commonly found in vegetable crops
- a better understanding of the life cycles of pest and natural enemies, and their relevance to crop monitoring and management of pests
- learned how to collect insects, spiders and mites for later identification
- a basic understanding of pest levels and pest control options, and their effect on parasite and predator levels.

These outcomes focus on improving 'knowledge' and 'skills' leading to a positive impact on participants' 'attitude' to pest management and their 'aspirations' to better manage pests on farm (see Bennett's hierarchy in Table 2, Section 1.4 on page 9).

The workshop manual contains enough material to deliver at least 8 hours of basic training. The program consists of four individual training sessions that can be run at times convenient to participants. Each training session has clear objectives and builds on material covered in other sessions.

Two training sessions are based in the field and two training sessions are based in the laboratory. We also recommend some type of awareness activity prior to starting the training and an evaluation activity at the end of the training to complete the action learning cycle. These six components are outlined in Table 3 overleaf.

There is some flexibility in the order in which the sessions are delivered, although the collection of baseline evaluation data needs to be included in the first session whether it is held in the field or classroom.

Before you start the workshop program, the training team needs to consider and decide:

- whether to hold an awareness meeting
- how much flexibility they have to respond to participants' needs, such as mixing and matching training sessions and changing locations, timing and crops to suit
- whether to aim for individual insect collections as part of the workshop program and, if yes, whether submitting a completed insect collection is optional or mandatory
- the level and type of evaluation if the workshop program is free or fee-for-service.

Table 3. Overview of the workshop program

Training session	Objectives and aims	Options for delivery
Awareness meeting 1–2 hours (optional)	Generate interest in the workshop program Outline benefits of taking part in the training Assess specific needs of the likely target audience Negotiate dates and times to suit	A short meeting is ideal Alternatives include farm visits, phone calls, emails or a combination of these Do 3–4 weeks before training is likely to commence
Field session 1 2–2½ hours	Introduce how to find and collect pests and beneficials in the field Collect baseline data for workshop evaluation purposes	Interactive—need vegetable crops relevant to participants' businesses Ideally use unsprayed or minimally sprayed (IPM) crops to maximise species diversity Aim to have the four training sessions completed within 6 weeks
Laboratory session 1 2–2½ hours	Build on participants' existing knowledge of grouping pests and natural enemies into orders Provide opportunities for practicing skills in identifying pests and beneficials into groups, and preserving insects	Could be delivered on same day as Field session 1 Combination of presentations, group work and practical activities
Field session 2 2–2½ hours	Introduce the concepts of crop scouting and how to apply these principles in the field	Interactive—need vegetable crops relevant to participants, could go back to one of same fields as for Field session 1 to observe change over time Run a week or two after Field session 1
Laboratory session 2 2–2½ hours	Introduce the concepts of life cycles, mouthparts and other characteristics of different groups Apply these concepts to identify crop damage Collect data for end-of-workshop evaluation Determine if follow-up evaluation meeting is an option	Could be delivered on same day as Field session 2 Use materials collected during field sessions and for individual collection kits to expand variety
Follow-up evaluation Up to 2½ hours depending on technique used (optional)	Feedback on positive and negative aspects of the training Evaluate workshop impact Develop and improve future workshops	Could use ORID discussion, focus group meeting Do 2–3 weeks after the last training session

2.1 Awareness meeting or activities

Running an awareness activity caters to several adult learning principles, such as building on previous experience, involving participants in workshop design and taking a problem-based rather than subject-based approach. Ideally, this activity is run at an awareness meeting. However, if this is difficult because of time or distance constraints, then phone calls, emails or farm/business visits to interested individuals may replace the awareness meeting.

Objectives of the awareness activities are to:

- create interest in the proposed 'Pest and beneficials identification' workshop program
- clarify the objectives of the proposed workshop (i.e. what the training will and will not cover)
- assess current pest identification skills of the potential participants
- assess the level of interest and obtain commitment to the training
- negotiate the best time, place and structure for the training
- help determine the level of evaluation to conduct
- determine whether individual insect collections are preferred as optional or mandatory for completing the program.

You will need:

- a session plan for the workshop (see Table 4)
- a sheltered meeting place suitable for presenting PowerPoint slides and other visual aids
- a whiteboard or flip chart, computer and data projector
- 10 specimens (some difficult or unusual ones) and/or images of pests and beneficials of vegetable crops at different stages of their life cycle
- sheets for recording answers
- an attendance sheet for recording contact details
- a registration sheet (and receipt book for taking money if fee-for-service)
- refreshments—at least coffee and tea facilities.

Toolbox

- **Presentation of a topic of interest (page 31)**
- **Pest identification recording sheet exercise (page 31)**
- **Sample registration form (page 47)**

Table 4. Suggested session plan for an awareness meeting

Activity	Time allowed	Objective	Process and resources
Introduction	10 min	To get the meeting started	Overview of meeting
Presentation on topic of general interest	30 min	To act as a drawcard, using a timely, topical issue (e.g. new pest outbreak)	PowerPoint presentation for 15 mins (could bring a guest speaker) followed by general questions and answers Supply live material of subject matter if possible
Pest identification activity	15 min	To create interest in workshops—link with topical issue To assess level of knowledge	Individual or small groups to identify insect specimens Can include a checklist (example on page 46)
Discuss and finalise workshop planning	20 min	To encourage potential participants to get involved in structuring training to meet their needs To get some consensus on the best timing, locations and content matter	How would better identification skills help you deal with the topical issue? Large or small group work with facilitator
Meeting close and refreshments	As required	To encourage informal discussions	Refreshments as required, could be provided by a sponsor

Publicise the workshop program through local papers, newsletters, industry publications and direct invitations. Use industry networks and ask local grower organisations, consultants, agricultural distributors and key growers to assist. They are a valuable resource for sorting out the best time, place and format for the awareness meeting. These can vary with season, district and target audience. For example, growers may prefer late afternoon or early evening, while agribusiness may prefer a breakfast meeting.

Aim to run the awareness meeting about a month prior to the training. This gives trainers some time to adapt the course to best suit the needs and interests of participants and ensures that material covered in the training is as relevant as possible. Table 4 (above) outlines a suggested plan for the workshop program. Workshop adaptations could be of a content or structural nature—for example, using pests for a crop of particular interest (content), or running evening or daytime sessions to maximise accessibility for participants (structure). Also discuss options for completing individual insect collections and awarding of certificates.

Plan the meeting to run for about 2 hours and include a presentation on a current topical issue. This acts as a complementary drawcard to supplement your presentation on the future workshop you are offering. Use a guest speaker and/or live examples of the subject matter to add further interest.

The second activity for the meeting is based around pest identification. This activity will provide you with information about the knowledge and skills of the likely participants and give the audience a taste of what will be in the workshop. More information on both these activities is in Section 3.2 on page 31.

Involving participants in planning the training

This depends on how comfortable the trainers and participants are with each other and the size of the group. Asking a question such as ‘How would better identification skills help you to deal with the topical issue?’ can improve the link between the two stages of the meeting. It will also help participants focus on the real-life applications of the potential training.

If participants know each other well or for groups of less than 12, an open discussion will usually allow everyone to comment on the training content or particular subjects they would like to cover as well as the times, dates and locations for the training. For larger groups or where participants do not know each other well, the nominal group technique (see Section 1.5 on page 11) or splitting the large group into smaller groups

can help encourage the less extroverted to contribute ideas. Occasionally, voting methods are required to reach decisions. Be prepared with a voting technique that is easy to use.

As soon as training times and locations are finalised, notify the participants. A formal registration process and charging a fee-for-service tends to increase participants' commitment to attend training sessions. Registration can also serve as a further opportunity to tailor the content of the training to participants' needs. Asking for background information on interests, skills and knowledge levels could highlight that changes in content are needed, or provide trainers with an opportunity to suggest working groups based on common interests or mixing beginners with more experienced participants.

It may also highlight the need to include additional, more difficult activities in the program for more advanced participants.

A sample registration form is included in Appendix 1 on page 47. In our experience, participants often prefer to have the first session run in the field. In-field work provides a more relaxed learning environment during the early stages of training when individuals in the group are getting to know and feel comfortable around each other. It also allows trainers to form a better understanding of participants' existing knowledge and how to best link with material to be covered in the laboratory sessions. However, session order could be changed to suit the preferences of participants.

2.2 Field session 1

When planning field sessions, consider the time of day and season that pests and natural enemies will be active in the field. For example, you could hold one of the sessions at night. Having live material available enhances the learning experience and helps participants stay interested. Use unsprayed crops to provide the biggest range of species and conduct some training in commercial crops to mimic more realistic crop monitoring conditions. Crops managed under different levels of IPM can provide an interesting contrast.

Time and place

Provide very clear directions to field sites and give a definite time frame and place for reconvening. If you are meeting directly on farm, remind participants not to go to the laboratory first. Hand out a mud map if possible. Another option is to carpool or hire a bus to take participants to field sites.

It is also a good idea to have some extra specimens on hand in case there is less activity in crops than expected, or participants miss key order representatives because they are very small, low in number or too fast to catch.

The objectives of Field session 1 are to:

- collect baseline information for workshop evaluation purposes (if this is the first training session)
- demonstrate how to find and collect pests and natural enemies in the field
- allow individuals to set their own learning and implementation goals.

You will need:

- a session plan for the workshop (see Table 5)
- an initial meeting place, somewhere sheltered where you can offer refreshments
- spare copies of the registration form
- a whiteboard or flip chart, computer, data projector, portable screen, power board and extension cord
- visual aids for presentations
- a camera to record images for reporting and use in later training sessions
- insect collection kits for all participants if these are to be completed or a hand lens for each participant and some collection bottles and bags
- easy access to appropriate fields or plantings for collecting insects
- baseline evaluation forms
- workshop manuals (to hand out at the end of the session)

- pre-collected specimens to add to diversity of specimens found during the session, particularly of difficult-to-find species
- drinking water, first aid kit and sunscreen
- hygiene booties
- microphone and speakers if required.

Toolbox

- **Baseline evaluation form (page 48)**
- **Ideas for the introduction (page 32) and expectations exercises (page 33)**
- **Ideas for the insect collection kits (page 33)**
- **End-of-session debrief options (page 35)**

Table 5. Suggested session plan for Field session 1

Activity	Time allowed	Objective	Process and resources
Welcome and sign up	As participants arrive 10 min for evaluation	To ensure baseline data is collected from all participants	Individuals complete baseline evaluation on arrival if not done before the first training session Refreshments provided depending on time of day
Introduction Expectations and outline of agenda	15 min	To encourage participants to contribute and link expectations to workshop contents	Group discussion to collect individual's expectations of the workshop
Introduction to and handing out of insect collection kits	15 min	To familiarise participants with contents of the collection kit and explain its role in workshops	Demonstrate use of equipment Require one collection kit per participant
Using collection kits in the field	60 min	To develop skills in insect collecting	Small group work in different crops, suggest no more than six participants per trainer
Discussion on what was found in different crops	20 min	To expand knowledge on variety of pests and beneficials identified	Large group discussion leading into possible management strategies
End-of-session debrief	10 min	To reflect on the day's learning	Various options (e.g. tick and flick sheet, large group discussion, learning log, debrief buddy)

Registration and collecting baseline data

If you intend to objectively measure workshop impact, it is essential to collect baseline data before the start of the first training session—whether this session is in the field or laboratory. The effort you put into collecting this data depends on the end use of the information.

Start-up activities

The registration and baseline data collection, the introduction and the expectations activity are the introductory components of the workshop program. These need to be held at the start of the first training session, whether it is in the field or laboratory.

We recommend using a confidential evaluation of some type that is completed individually (see Appendix 1 on page 48 for an example). The easiest option is to make baseline data collection a part of the registration process, as this streamlines the process and achieves the best return rate of the evaluation forms.

Some options to choose from include the following:

- Registration prior to the first training session avoids starting the session with a 'form filling in' exercise that may deflate energy levels. You can ask those who are not registered prior to the first training session to arrive 15 minutes early to complete the process.
- If registration is at the start of the first training session, it is important to explain the reason for starting the training with what may feel like a test.
- Use an online survey to register participants and collect baseline data if the majority of participants are computer literate and check their email regularly. The online survey software also reminds participants to complete the baseline evaluation and collates responses, saving the trainers' time.

Introduction and expectations

Asking each participant to state their name and where they are from before they contribute their first training expectation is a straightforward way to break the ice and help the group members feel comfortable with each other.

Gathering and discussing participants' expectations of the training at the outset is useful for several reasons. Firstly, it begins the action learning cycle with a participatory planning phase that acknowledges adults as self-directed learners who learn best when they are involved, can see the need for the activity and have had input into the agenda. It also acts as an icebreaker, giving everyone an opportunity to contribute and bring a broad perspective to what the training might achieve. The discussion can alert the trainers to any unrealistic expectations and provides an opportunity to renegotiate, thereby avoiding later disappointment. Finally, an agreed list of expectations can become an evaluation tool, as participants can review these expectations at the end of the workshop program to check if, and how well, they have been met.

The nominal group technique (instructions on page 33) is a good way to conduct the expectations session. It results in a computer or whiteboard record of the discussion that is visible to all and can be revisited in the final evaluation. An agreed list of expectations can be reorganised to match up with the workshop program. This 'road map' is a handy tool for measuring progress against expectations and refocusing participants at the start of each training session.

Provide a few minutes private work time so that participants can record their own learning goals as well as implementation goals (i.e. what they would like to use or change on farm as a result of their learning). There are several blank pages at the back of the workshop manual that participants can use to record this information. These pages can also be set-up as a 'learning log' (see page 36 for suggestions on how to do this).

It is important to outline the criteria you will use for marking individual insect collections. Tell participants whether completing the individual insect collections is an option, or if it is a mandatory requirement for completion of the training program and awarding of certificates at the end of the workshop. Ideally, these options were discussed and agreed during the awareness meeting.

Workshop manual and insect collection kits

A detailed step-by-step process for introducing the workshop manual, demonstrating the insect collection kits and running the practical field activity are provided in Section 3.3 from page 33 onwards.

Including an insect collection as part of the workshop program is optional. However, having participants complete an insect collection has several benefits including:

- getting participants involved and looking more closely at crops and specimens
- providing a broader diversity of specimens for use during the training sessions
- giving hands-on training about how to prepare specimens for identification
- providing keen participants with a 'starter' reference collection for their farm
- forming part of the evaluation process (and maybe offering prizes for the best collections).

Putting together individual insect collections requires extra time and effort from both trainers and participants. Usually only those participants with a particular interest will welcome this activity, although the incentive of receiving a certificate or prize for completing the collection can help make the task look more attractive. The collection is especially useful if it is to be kept as a farm or business reference and if it contains relevant specimens.

The workshop manual includes a summary and references outlining how to collect and preserve pests and beneficials (see pages 3–5 in the workshop manual).

End-of-session debrief

This last activity is important to close the action learning cycle and encourage participants to reflect on the day's training. Reflection tools can include tick and flick sheets, a large group discussion, learning logs or debriefing with a buddy. Often these activities stimulate learners to investigate some things further, thereby enhancing the learning experience. For details on how to run these different options see Section 3.3 on pages 35 and 36. To conclude the session, give a short overview of the next training session and remind participants to bring along their workshop manual.

2.3 Laboratory session 1

If you decide to start the workshop program with Laboratory session 1, transfer the introductory components described in the first field session to the start of the first laboratory session. These are registration and baseline data collection, and the introduction and the expectations activities. You will also need to introduce the workshop manual and insect collection kits. This is best done after the flashcard session. Introduce the workshop manual before demonstrating the use of microscopes and the insect collection kit as part of the preserving insects activity.

The objectives of this session are to:

- collect baseline information for workshop evaluation purposes (if this is the first training session)
- build on participants' existing knowledge in grouping pests and beneficials
- provide opportunities for practicing skills, including identifying pests and beneficials into groups, using microscopes and hand lenses, and preserving insects.

You will need:

- a session plan for the workshop (see Table 6)
- an initial meeting place either in or close to the laboratory where you can offer refreshments
- a whiteboard or flip chart, computer and data projector
- flashcards—one set per small group (see page 36)
- microscopes and hand lenses—one each or enough for pairs or groups of three
- visual aids for presentations

- copies of the workshop manual, one for each participant (if not already handed out during Field session 1)
- insect specimens for identification—see the list in Table 11 on page 39 and samples collected during Field session 1 if applicable
- insect collection kits (if not already handed out during Field session 1)
- materials for pinning and preserving insects (including enough butterflies, grasshoppers or other large insect for participants to practice their preservation techniques) and Petri dishes for displaying specimens
- tables and chairs
- first aid kit.

Toolbox

- **Start-of-session warm-up ideas (page 19)**
- **Making flashcards and running a flashcards session (pages 36 and 37)**
- **Tips for using microscopes (page 38)**
- **End-of-session debrief options (page 35)**

Table 6. Suggested session plan for Laboratory session 1

Activity	Time allowed	Objective	Process and resources
Warm-up	10 min	To link with previous session and help participants focus	Large group discussion
Flashcards	30 min	To link what participants already know with the concept of insect orders To reintroduce the workshop manual	Small group work followed by facilitated whiteboard session and introduction to the workshop manual Flashcards Workshop manuals for all participants
Use of microscopes and hand lenses	20 min	To develop skills in using identification tools	Trainer (entomologist) leads participants through the use of these tools Sufficient microscopes and hand lenses
Identification of specimens and discussion of results	50 min	To develop skills in grouping pests and beneficials into different insect orders	Insect identification in pairs Specimens for identification set-up around the room Recording sheet for each pair Facilitated large group discussion of results
Preserving specimens	20 min	To reintroduce the insect collection kit To start developing skills in preserving pests and beneficials	Demonstration of how to preserve an insect (individuals to pin their own for practice)
End-of-session debrief	10 min	To reflect To remind participants about the insect collection	Various options (e.g. tick and flick sheet, large group discussion, learning log, debrief buddy)

Starting the session

It is a good idea to spend a few minutes thinking back over what happened at the previous training session and briefly outlining of the aims for the day. Section 3.4 on page 36 explains these 'warm-up' activities in more detail.

Flashcard activity

Flashcards are sets of a dozen or more laminated images of different pests and beneficials at different stages of their life cycle. The purpose of the flashcards session is twofold. Firstly, it is about linking new information (insect orders) with information the participants already know. Secondly, it is about setting the tone for the remainder of the workshop program—that learning can be fun and that participants' existing knowledge is of value.

This session is run in small groups and concludes with a facilitated large group discussion. Detailed facilitation guidelines are contained in Section 3.4 on pages 36 and 37.

If this is the first training session, hand out the workshop manual and explain its use and structure.

Using microscopes and preserving specimens

The use of a microscope and techniques for preserving specimens comes as second nature for entomologically trained practitioners. However, it is likely that workshop participants have never had to develop such skills, so it is important to allocate time to helping them feel comfortable with these tools.

Pages 4–5 in the workshop manual contain instructions and references on how to collect and preserve insects in field collections.

For the activity on preserving specimens, you will need to have collected enough specimens of the same species (butterflies are good) for all participants ahead of time.

Identifying specimens to order

As with use of microscopes, the concept of using a type of key to identify specimens can be a very new experience for participants. It is helpful to work through an example to demonstrate the use of the 'Identification of the major orders' section in the workshop manual (pages 15 to 21) and explain the logic of the process. Illustrating that insect orders are not an entirely foreign concept is one of the main reasons behind the interactive flashcards activity at the start of this training session.

You will need to set up specimens at 'stations' around the room before the training session starts. Participants work in pairs using a recording sheet and move around each of the stations in turn. Close the activity with a facilitated large group discussion about the results. Section 3.4 on page 39 provides ideas to help you select the best specimens to use in this activity.

Ending the session

Use one of the debriefing options to conclude the training session (page 35).

Give a short overview of the next training session and remind participants to bring their completed insect collections, as well as workshop manual and hand lens, to the next session.

2.4 Field session 2

The objective of this session is to introduce the concept of crop scouting and apply these principles in the field.

You will need:

- a session plan for the workshop (see Table 7)
- an initial meeting place, somewhere sheltered and where refreshments can be offered
- a local crop consultant with visual aids prepared for a presentation on crop monitoring
- a whiteboard or flip chart, computer, data projector, portable screen, power board and extension cord
- clipboards, pencils and monitoring sheets for all participants

- visual aids for presentations on action thresholds
- easy access to appropriate fields or plantings for the crop scouting exercise
- monitoring sheets—one for each participant (more if running the monitoring challenge)
- a camera to record images for reporting and use in later training sessions
- equipment for collecting any unknown insects found, including plastic bags, phials, tweezers and paintbrushes
- drinking water, first aid kit and sunscreen
- hygiene booties
- microphone and speakers if required.

Toolbox

- **Brief for the consultant (page 39)**
- **Monitoring sheets (page 52)**
- **Questions for the crop scouting exercise and discussion (page 40)**
- **Monitoring challenge (page 40)**

Table 7. Suggested session plan for Field session 2

Activity	Time allowed	Objective	Process and resources
Warm-up	10 min	To recall previous session and help participants focus on task for today	Large group discussion
Introduction to crop scouting	15 min	To put crop monitoring in context as a crop management tool and decision-making aid	Consultant's presentation
Crop scouting exercise	45 min	To broaden skills in finding insects and arachnids in crops	In pairs or groups of three, ask participants to check 10 plants and record what they find on their monitoring sheet
Discussion of crop scouting results and possible actions	45 min	To develop skills in interpreting crop scouting results To link orders to life cycles and damage potential	Facilitated large group discussion
Monitoring challenge (optional)	15 min	To reinforce monitoring skills and consolidate learning To collect data for evaluation purposes	Individual exercise
End-of-session debrief	10 min	To reflect To remind participants about the insect collection	Various options (e.g. tick and flick sheet, large group discussion, learning log, debrief buddy)

Starting the session

Spend a few minutes on 'warm-up' activities. Ask participants to think back over what happened at the previous training session and then briefly explain the aims and format for today's session (page 36).

Consultant presentation

Ask the crop consultant to deliver a talk on the basic concepts of crop scouting and how they are applied, then demonstrate crop monitoring in the field. The idea is to provide an overview of sound crop monitoring practice and some instructions on how to go about monitoring a crop. A 'brief' for the consultant is outlined in Section 3.5 on page 39.

Crop scouting activity

For this practical exercise, ask participants to pair up or form groups of three to check 10 plants in the crop, recording what they find on a crop monitoring sheet (each person to do at least three plants). A crop monitoring sheet for copying is supplied in Appendix 1 on page 52. Ask each group to also think about and discuss what decisions they might make as a result of what they have found. Provide plastic bags for collecting and have trainers and the consultant circulating among the groups to assist with the task. Come back together as a large group to discuss the results and decisions from each group.

If there is time you could include a monitoring challenge to reinforce learning. Use a different crop from the first and challenge participants to come up with a similar result to the professional crop consultant.

Section 3.5 on page 40 describes these activities in a little more detail.

Ending the session

Use one of the debriefing options to conclude the training session (page 35).

Remind participants to bring their workshop manual, hand lens and completed insect collection (if they have not already done so) to the next training session.

2.5 Laboratory session 2

The objectives of this session are to:

- explain how life cycles, mouthparts and other characteristics of different groups or orders relate to crop damage and pest management
- apply these concepts to identify crop damage
- reinforce concepts and collect end-of-workshop evaluation data
- conclude the insect collection activity.

You will need:

- a session plan for the workshop (see Table 8)
- an initial meeting place either in or close to the laboratory where refreshments can be offered
- a whiteboard or flip chart, computer, data projector and screen
- specimens of plant symptoms and plant damage—see Table 12 on page 42 for suggestions
- samples of each life stage for different orders
- microscopes (ideally one per two to three participants and spare hand lenses)
- visual aids for presentations
- insect collections—participants' and some generic ones
- end-of-workshop evaluation form and specimens
- certificates and prizes for participants—if you are not holding a follow-up evaluation meeting
- flashcards (optional)—may be useful for small group work or for illustrating life cycles
- tables and chairs
- first aid kit.

Toolbox

- **Tips for presentations on life cycles, mouthparts and damage (page 40)**
- **Tips for running the practical on identifying damage (page 41)**
- **Running an ORID discussion (page 42)**
- **End-of-workshop evaluation (page 43)**

Table 8. Suggested session plan for Laboratory session 2

Activity	Time allowed	Objective	Process and resources
Warm-up	10 min	To recall previous session and help participants focus on today's task	Large group discussion
Introduction to life cycles, mouthparts, symptoms/damage	15 min	To relate orders and their life cycles, mouthparts etc. to damage caused in the field	Presentation with visual aids
Practical exercise in identification of symptoms and possible causal agents	50 min	To consolidate learning about how different species cause damage and to link with existing knowledge of crop damage	Work in pairs or groups of three to identify specimens Group discussion of results
Share individual insect collections	30 min	To encourage group learning (learning from peers) To introduce a wider range of specimens	Small group work
End-of-workshop evaluation	15 min	To reinforce learning To measure change from baseline data collected at start of the workshop program	Individual exercise to complete the end-of-workshop evaluation with specimens
Workshop closure and planning for the follow-up/evaluation meeting	15 min plus	To involve participants in planning for a possible follow-up meeting	Short presentation followed by large group discussion

Starting the session

Spend a few minutes reviewing the previous training session with participants before briefly explaining the aims and format for today's session (page 36).

Introduction to life cycles, mouthparts and plant damage

The aim is to present some facts on the three topics so participants can complete the practical exercise. Detailed tips on what to include in this presentation are provided in Section 3.6 on page 40.

Identifying damage and its cause

This session links the monitoring and identification sessions together and also connects to participants' existing knowledge. Section 3.6 on page 41 contains details on what you could include in a presentation and ideas for running the activity on identifying plant damage. Note that it is important to include a range of damaged specimens, from easy to difficult to identify. See Table 12 on page 42 for suggestions.

Individual collections

Return collections to their owners with comments and corrections made as needed. If the collection is compulsory for completing the workshop program, then they need to be graded in some way. Some criteria to use are:

- good presentation and preservations of specimens, meaning that that the collection can be used as a reference collection for identifying specimens in the future
- diversity of orders represented.

Check with owners of the specific collections first to see if they are willing to share any unusual specimens with rest of the group. Invite participants to talk about their experiences of collecting and preparing the specimens.

Individual end-of-workshop evaluation

This is an individual exercise and links in with the baseline data collection at the start of the workshop program. The aim is to obtain some idea of what impact the workshop has had on each participant's ability to identify pests and beneficials, their understanding of pest and beneficial orders and life cycles, and their ability to relate this information to pest management decisions (see also page 43).

The baseline and end-of-workshop evaluations are formulated around measuring impact against the four main workshop outcomes listed at the start of Section 2 on page 13.

You can copy or adapt the end-of-workshop evaluation in Appendix 1 on page 53. If you use the evaluation as it is, you will need at least five different specimens set up in stations. Have enough stations to enable participants to move around in groups of two to three. It is up to you (and the participants) to decide if talking is allowed during this activity.

Workshop closure

The individual evaluations are mainly about collecting data to measure changes in skills, knowledge, attitudes and aspirations (see Bennett's KASA in Table 2 on page 9). In contrast, the workshop closure activities are about:

- reflecting on what worked well during the training and what could be improved
- discussing and deciding about any follow-up meetings or activities.

Together, these activities help to complete the action learning cycle for facilitators and participants. The process can be relatively simple or more involved depending on what the facilitators and participants prefer.

The first step is to determine if participants are willing to get together for a follow-up evaluation meeting. Offer to hold this meeting in 2 or 3 week's time. The objective would be to discuss how everyone is going with their implementation goals and to obtain further feedback on the impact of the training. Mention that there is also an opportunity to bring in any additional specimens collected for identification.

If participants decide on a follow-up evaluation meeting, then an end-of-session debrief of some type is adequate for ending the fourth training session and formal workshop program. If no follow-up activity is planned, ask participants for an extra 10 or 15 minutes of their time to obtain feedback on the workshop program as a whole using the ORID discussion method (see Section 3 on page 42).

Make sure you revisit the list of expectations from the first training session for comment and discussion towards the end of the activity. If you asked participants to use a learning log, then allow time for them to review their individual expectations and implementation goals.

It is useful for trainers to take some time out after the last training session to think about and discuss their experience of the workshop program overall and its effectiveness. This is best done once results from the individual evaluations are available for discussion. Some questions for trainers to consider are provided in Section 3.7 on page 44.

Awarding certificates

Ideally, preferences for awarding certificates were negotiated with participants at the start of the workshop program. Certificates are best given out at the very end of the last training session or at the end of the follow-up evaluation meeting. Certificates can be awarded for:

- taking part in the workshop program (e.g. participating in at least three out of the four training sessions)
- fulfilling specific requirements of the workshop program (e.g. putting together an adequate insect collection and answering 70% of the end-of-workshop evaluation questions correctly)
- humorous awards (e.g. 'best joke teller' or 'most unique insect catching technique').

A certificate of completion provides a sense of closure and achievement for participants. Prizes can be given out for superior insect collections or as awards to thank individuals for their humour, participation and other positive contributions they have made to the training sessions.

If certificates are awarded on test results and insect collections, both need to be marked (and graded) by the end of the last training session if a follow-on evaluation meeting is unlikely. Mark the tests during the workshop closure activity and make sure the insect collections are graded before handing them back to their owners during the last training session.

2.6 Optional follow-up evaluation meeting

The objectives of this meeting are to:

- collect data to evaluate the workshop program in some detail with a view to measuring impact as well as obtaining feedback on how to improve future workshops
- provide an opportunity for participants (and trainers) to reflect on their learning and decide how they can use their new skills in their work.

Aim to hold this meeting 2–3 weeks after the final training session.

You will need:

- a session plan for the workshop (see Table 9)
- external facilitators (preferably) experienced in running focus groups (one facilitator per six to eight participants)—if external facilitators are not available, the workshop trainers can facilitate this activity
- a question sheet for each facilitator and recorder (page 56)
- to choose a method of recording focus group comments (preferably a person to take notes and a voice recording method)
- a whiteboard or flip chart, computer and data projector
- visual aids for presentations
- certificates and prizes for participants
- catering for a BBQ (optional).

Toolbox

- **Focus group interview guidelines (page 43)**

Table 9. Suggested session plan for evaluation meeting

Activity	Time allowed	Objective	Process and resources
General introduction	10 min	To get the meeting started	Presentation
End of workshop evaluations	90 min	To obtain information to assess if the workshop program has achieved its objectives To consolidate learning for participants and trainers	Focus group interviews (participants in small groups using external facilitators if possible)
Explore potential for further activities with participants	20 min	To attempt to devise a post-workshop strategy to track practice change, provide further training support and continue to improve the training process	Large group discussion
Conclude formal part of the meeting	30 min plus	To encourage socialising To present certificates and prizes for collections	BBQ and drinks Tea and coffee

When organising this meeting, emphasise the value of everyone's contribution for maximising learning and evaluating the workshop program. Guidelines for running focus groups are provided in Section 3.7 on page 43, with a set of example focus group questions provided on page 56. Groups of six to eight are best, although groups of up to 10 can be successful if skilfully facilitated. Groups can be self-selected or predetermined, either at random or mixed for specific attributes (crops, locality, grower or agribusiness). It depends on the kind of discussion anticipated and personalities involved. You may want to negotiate some of these options with participants when introducing the process.

Consider bringing in external facilitators to lead the interviews. This encourages participants to express opinions more freely, especially any that might offend the trainers. This is also an opportunity for trainers to run their own workshop reflection activity if they have not already done so (Section 3.7 on page 44).

To conclude the formal part of the meeting, you may want to explore the participants' interest in any further training activities or support including peer support mechanisms. Presentations of certificates and prizes can signal the informal part of the meeting. This could include refreshments and a meal or BBQ, perhaps sponsored by a local agribusiness. This is a further enticement for good meeting attendance, an opportunity for participants and trainers to socialise, and can lead to valuable informal learning.

2.7 Refresher course

The refresher course is a quick version (2–4 hours) of the 'Pest and beneficials identification' workshop (8+ hours). It was developed in response to requests from growers and agricultural distributors (for several years after the initial workshop program was held) for a repeat version at the beginning of the season. Due to time constraints and the follow-up nature of the session, we condensed the content down to one 2–4 hour session.

The refresher course is based on the same adult education principles as the full workshop program and is designed to maximise hands-on activity, participation and discussion. The refresher course differs from the workshop in that it is less formal and more focused on discussion and 'recalling' of information learnt, with less emphasis on evaluation. This refresher course suits a maximum group size of 20 participants. At least two trainers are needed for the course to run smoothly. One trainer should be experienced in pests of vegetable crops and the other, or both, should have facilitating or training experience.

The objective is to briefly revise the content of the 'Pest and beneficials identification' workshop.

You will need:

- a session plan for the workshop (see Table 10)
- at least one unsprayed vegetable crop to visit
- an undercover area with tables, chairs and power

- catering for any breaks or a post-workshop meal
- ute guides and other reference books
- a whiteboard or flip chart, computer and data projector, power board and extension cord
- images of pests and beneficials, bingo cards and flashcards
- pre-collected specimens
- sweep nets, tweezers, plastic bags, phials and Petri dishes
- black marker pens.

Toolbox

- **Images, flashcards and bingo cards (page 36)**

Table 10. Suggested session plan for refresher course

Activity	Time allowed	Objective	Process and resources
General introduction	10 min	To get the meeting started	Presentation
Collecting specimens for identification	40–60 min	To learn or reinforce how and where live insects are collected in crops To learn or reinforce how to identify specimens	Field collection
Identifying specimens using life cycle, body parts, damage and mouthparts for identification	60 min	To build on shared knowledge and skills	Group work identifying specimens
Review session	15 min	To consolidate learning	Slide show, bingo game
End-of-session debrief	10 min	To reflect	Various options (e.g. tick and flick sheet, large group discussion, debrief buddy)

Introduction

Asking participants to introduce themselves and say where they are from is a quick icebreaking activity. You could also ask participants to briefly mention their expectations from the refresher course, their reasons for coming along and whether they have made any changes since completing the initial training. Go around the room asking each person to speak in turn. Follow this with a brief overview of the course structure and aims. Relate these to participants' expectations if you have asked for them.

Collecting and identifying specimens

Allow participants to form groups of three or four; provide them with plastic bags, phials, tweezers and a sweep net; and send them into the crop to collect pests and beneficials. More than one insect can go in a phial or bag. Trainers can monitor progress and provide advice on where to look (e.g. 'look under leaves' and 'try the growing points'). Answer any questions that come up.

After about 30 minutes, return to the undercover area or room. Ask participants to sort through insects, separating them into individual Petri dishes. Similar or identical insects can go into the one Petri dish. Ask participants to identify their specimens while sorting and to write results on each dish as they go. Trainers can assist with the more difficult specimens. Each group lists what they have found and how many of each, and where they found each specimen.

Ask groups to sort the specimens according to orders, life cycle and types of feeding damage. As a large group, discuss where the pests and beneficials were found on the crop and ask 'How would that information affect your pest management decisions?'.

Review session

A PowerPoint slide show of 10 to 15 images is a quick way of revisiting the key points, such as the use of life cycle, body parts and crop damage for identification of pests and beneficials. For each image, ask the group to call out the identification of the image, describing its order, feeding damage and life cycle stage. To add some fun and encourage participation from the group, toss lollies to those who shout out answers.

Play a game of bingo in small groups to revise the identification of pests and beneficials. A trainer selects a pest or beneficial life stage or feeding damage name from a bucket and calls it out. Groups then look for the image on their 'bingo card', placing a token onto the matching image. When they have matched all the images on their card, they shout out 'bingo'. Other trainers can roam the room checking that the correct images are identified. For instructions on how to make bingo cards and run this activity see Section 3.4 on pages 36–38.

Ending the session

As for training sessions in the workshop program, it is valuable to allow time for participants to reflect on their learnings at the end of the refresher course. Use one of the debriefing options described on page 35.

Section 3: Toolbox of training materials and resources

3.1 General tips for facilitating training sessions

The introduction of each training session needs to highlight the aims and structure of the day's session, and how these fit within the overall workshop program and the participants' expectations. Refer back to the 'road map' if one was developed at the start of the first training session to show progress (see Section 3.3 overleaf).

A warm-up exercise at the beginning of each session helps to focus people and can be as simple as asking participants to reflect on what happened at the last training session. Section 3.3 overleaf expands a little on this idea. Do this exercise before introducing the day's aims and activities.

A reflection or debriefing exercise at the end of each training session helps to close the action learning cycle and consolidate learning. Section 3.3 overleaf describes several different options for achieving this.

In addition to this, the trainer needs to ensure participants are clear about:

- the next session date, time and place
- what to bring to the next training session
- any other relevant details (e.g. arrangements for transport to field sessions).

Materials included for copying

Appendix 1 (starting on page 45) provides a:

- pest identification recording sheet (with checklist)
- registration form
- baseline evaluation form
- session evaluation form (tick and flick sheet)
- monitoring sheet
- end-of-workshop evaluation form
- example focus group questions.

Basic PowerPoint slides numbered from 1 to 16 (in Appendix 2, starting on page 57) are included in the toolbox to get you started. Expand on and adapt these slides according to the needs of participants. Include as many images, 'live' presentations (microscope links) and diagrams as you can.

3.2 Ideas for facilitating the awareness meeting

This meeting provides an opportunity for the audience to find out more about the workshop program and for you to quickly assess interests, training needs and preferred times for training sessions.

Presenting a topic of interest

The purpose of this presentation is to act as a drawcard for the meeting and bring together potential participants for the 'Pest and beneficials identification' workshop program. The topic of the presentation needs to be timely and relevant to your target audience. It might include information on a recent pest outbreak or technology that has just become available. It could deal with new regulations, be relevant to the time of year (e.g. planting, harvest) or introduce an opportunity. It may involve asking a guest speaker to participate at the meeting.

Pest identification exercise

Ask the audience as individuals to identify each specimen or image either by name, its life cycle or type of feeding damage, and write their answer on a pest identification recording sheet that you provide. Ask individuals to grade themselves privately as you provide the correct answers to the group.

Guide participants through a checklist to help them decide if the pest and beneficials identification training is for them. Ask participants if you can keep their recording sheets to give you background information to help tailor the training to their needs. An example recording sheet and checklist questions are provided on page 46.

Finalising workshop plans and registration procedure

Potential participants need to know a little about what is on offer so that they can have meaningful input when negotiating the focus of training objectives and content, and the best times and locations for the training sessions. The pest identification exercise gives participants a taste of the type of approach you will be taking when delivering the training. Slides 1 and 2 on page 57 provide an overview of the proposed training objectives and structure of the training program.

Ask anyone intending to take part in the workshops to complete a registration form (on page 47). At a minimum, ask for a show of hands from those interested in attending. If you have decided to charge for the training, ask if participants would like to pay now. You will need to have receipt books ready.

The pest identification process (using images), checklist questions and a registration process could be converted into an online form using a web-based survey builder.

3.3 Ideas for facilitating Field session 1

Registration and collecting baseline data

The aim of the baseline evaluation is to determine the current skill and knowledge level of participants, and to measure the impact of the training. As participants arrive, ask them to register for the workshop program (if they have not already done so) and complete the baseline evaluation form. Explain that there will be a similar evaluation at the end of the last training session.

Emphasise that it is the workshop program and trainers being evaluated for effectiveness rather than participants, and that individual responses will remain confidential. Give participants the option of whether or not to write their name on the top of the form. The example evaluation form on page 48 illustrates the type of information you might want to collect.

The collection of baseline data could also be done online before the start of the first training session using a web-based survey builder as part of the registration process.

Introduction

At the start of the first training session it is useful to establish some 'ground rules' or guidelines for how you plan to work together during the workshop program. It is also important to make individuals feel comfortable in their learning environment. Start by briefly outlining the program for the day's training session (see Slide 3 on page 58) followed by on overview of the workshop process (see Slide 4 on page 58) and guidelines (ground rules) for participation (see Slide 7 on page 60). Some words and ideas to present with these slides are outlined below.

About the workshop process

Start by explaining that the training is based on a well-tested process to teach participants practical skills and procedures to identify pests and beneficials in agricultural crops.

The workshop program consists of 8–10 hours of training depending somewhat on what the group decides. About half of this training will be in the classroom or laboratory and the other half in the field. Some of the time participants will work alone, in pairs or in small groups to share knowledge, sort out information and plan improvements. Trainers will help the small groups through each process. After each small group session, a volunteer from each group will briefly describe their group's ideas and discussion to the whole group. Slide 4 on page 58 summarises these ideas.

You may also want to discuss the concept of action learning and different learning styles with the group. This falls more into the 'good to have' rather than 'essential' area, so include this discussion only if there is time and the group is interested. Slides 5 and 6 on page 59 outline the key points you might like to cover.

Guidelines for participation

Before beginning the training, the group needs to agree on some guidelines for running the workshop to help meet the objectives. Emphasise that the most important aspect of the workshop program is the participation of a wide range of people. Each will bring knowledge and experience to the workshop that, when shared with others, will help enrich the training sessions. So no matter what background—research, farming, consulting, education or agribusiness—everyone has an important part to play. Slide 7 on page 60 outlines some tips for successful group discussions. Ask the group 'Can we agree to the guidelines suggested?' and 'Would anyone like to add to, or change these ground rules?'.

Warm-up activity

Some people are reluctant to speak in a larger group, particularly if there is a diverse range of people present. People may also not know each other very well. A warm-up activity, often called an 'icebreaker', encourages everyone to say a few words early on and helps set a participatory tone for the program. A straightforward icebreaker activity is to ask each participant in turn to state their name and where they are from. You can combine the icebreaker activity with the expectations exercise below to speed up the introductory part of the first training session.

Running an expectations activity based on the nominal group technique

This activity starts with a question to the whole group, followed by silent time for individuals to list their responses. Ask participants to take a minute or two to write down their thoughts on what they would like to get out of the workshop program and their expectations of the training.

If the group is large (more than 10), the next step is to form small groups of five to nine people. Within each small group, a facilitator (trainer) or nominated group member (volunteer) asks individuals to read out one idea from their list. This idea is listed onto a group record that everyone can see (using a whiteboard, computer or butcher's paper). Ideas are not discussed at this stage except for clarification. Like ideas are not recorded twice, although additional words or a stroke may record how many like ideas are contained under the one point. Once every participant has listed one idea, the facilitator goes around again taking the next idea from each group member until all ideas are displayed.

If expectations are to be prioritised, votes can be allocated to each individual (represented by a marking pen or stickers) so that each participant can mark their preferences on the group record. A prioritised list of expectations can help trainers better allocate time and resources to different activities.

If you have just one group then the process finishes here. If there are two or more small groups then these small groups need to report their ideas or expectations to the large group so that you can compile a whole-group record. Check these expectations against the workshop learning objectives presented during the awareness activity (see Slide 1 on page 57). One way to do this is to present these dot points as the expectations that you as trainers have for the workshop program. If there are areas that do not match, negotiate changes where you can or at least explain why these expectations cannot be met and suggest some alternatives.

At the outset it is best to be clear about what the workshop program can and cannot deliver. A visual method for negotiating is to develop a 'road map' for the workshop program. To do this, write the participants' and your expectations against a broad outline of the workshop program. This will show participants at what point their individual expectations are likely to be met. A summary of the list of objectives for each training session in Table 2 on page 9 would make a good starting point for this road map. You could also use Slide 2 on page 57 as the broad framework.

Insect collection kit and workshop manual (overall process)

Insect collection kit

Hand out the insect collection kits. The training entomologist goes through the kit one item at a time, holding up each item and asking participants to check that they have the same in their kits. As each item is checked, the entomologist gives a brief description of what it is, how it is used and any safety information. Make sure the training entomologist demonstrates how to use the killing jar on a live insect pest and also caution participants about the killing fluid. Ask participants to write their name on their kit.

Each insect collection kit should contain:

- a x10 hand lens
- a collection net
- a killing jar
- killing fluid
- five small specimen tubes (glass)
- five larger specimen tubes (plastic)
- one to two large plastic bags
- forceps
- a probe
- a mounting board
- entomological pins
- paper strips.

Workshop manual

Hand out the workshop manual and explain the field collection list on page 3 of the manual.

Be clear about whether completing the insect collection by the end of the training program is mandatory or optional for obtaining a certificate of completion.

Invite participants to search for pests and beneficials in the crop. Explain that they may not want to take the whole kit into the field but only a couple of jars, the hand lens and net. As participants are searching for specimens, demonstrate how you would look for pests and beneficials in that crop and what you would expect to find.

For a large group of 10 to 20 people, break into two or three groups with one trainer per small group and rotate between two or three crops. To do this effectively within the time frame, you will need several crops in close proximity to each other. Let individuals select their group and crop. For example, service providers may want to look at all three crops, while someone working primarily in only one of the crops on offer may want to spend the whole training session in that crop.

To conclude the exercise, small groups and/or individuals show what they collected and discuss any observations. It can be run as an informal discussion with a facilitator encouraging all to have a turn, or can be structured using a round robin process (see Section 1.5 on page 10). Conclude the discussion by sharing some ideas on what pest management strategies might be appropriate in the crop(s) observed.

Insect collection kits (use of equipment)

Hand lens

To use the hand lens, close one eye and hold the hand lens close to the open eye. Move the specimen towards the lens until it comes into focus. If the specimen cannot be moved, move your head towards it until the specimen is in focus.

Sweep net

To use the sweep net, swiftly pass it left and right over the crop about five times then grab the throat of the net. Invert the net into a plastic bag to collect the caught specimens. Handle the net with care as it may contain insects that sting or bite such as bees.

General insect collection guidelines

The following guidelines should be followed when collecting insects:

- Be gentle with insects. Wings, antennae and legs are all important for their identification, especially if you want them identified down to species level.
- Put a piece of paper towel into the jar or bag if you are keeping the insects for some time. This prevents moisture build-up and deterioration of the specimens.
- Point the bottom of the jar/phial towards light when opening. Insects tend to move towards light or up when you put them in the jar.
- Do not sniff the contents of the 'killing jar'.
- Seal and label all sample jars with the date and location of collection.
- Put specimens into an esky with a freezer brick if you want them alive (to observe feeding, movement etc.).

Refer participants to the section on collecting and preserving field collections on pages 4–5 of the workshop manual.

Options for end-of-session debrief

Allowing some time to reflect at the end of a training session helps participants to complete the action learning cycle. You can choose from several end-of-session activities. Select one or all of the four options listed below. The first two focus on evaluating the training session, while the last two are about reinforcing learning. The ORID discussion technique (page 42) is also an option. Do not forget that some people prefer action to reflection, so avoid evaluation overload.

Large group reflection

Give participants a few minutes to ponder the questions 'What was good about today's session?' and 'What could be improved?'. Follow with a round robin discussion (page 11), asking participants to volunteer their thoughts in turn. Record their comments on a whiteboard or butcher's paper. This is a good method for obtaining some immediate feedback on how the training is being received and how it can be improved.

Tick and flick sheet or session evaluation sheet

In some instances, trainers may find the tick and flick sheet a useful tool for obtaining some idea of how participants are finding the training. They are particularly useful when time is limited. Be aware, however, that tick and flick type evaluations can often give a 'rosier' view of the training than feedback provided after participants have had more time for reflection. An example session evaluation sheet for photocopying is included on page 51. You can customise the evaluation sheet by including questions more specific to each training session. See the examples below.

What was your understanding of……before this session?
(Please circle a point on the scale and add a comment.)

1	2	3	4	5
None	Poor	Quite good	Good	Excellent

What is your understanding now? (Please circle a point on the scale and add a comment.)

1	2	3	4	5
None	Poor	Quite good	Good	Excellent

Learning logs

Learning logs are an excellent way to encourage participants to consolidate their learning. Give participants time to set their own learning goals at the onset of training. This can provide a context for reviewing what was learnt at each training session. The impact of training can also be increased if participants are encouraged to record their implementation goals. This can help to link what was learnt to changes in practice on farm. Provide time at the end of the session for participants to review their learning and implementation goals and, if necessary, change or add to them. They also form a handy reference for reflection at the end-of-workshop evaluation meeting or activity.

There are some blank pages at the end of the workshop manual that participants can use for their learning log. If learning logs are to be used, simply ask participants to head up these blank pages with 'Learning log' and other headings such as 'My expectations', 'My implementation goals' and headings for each separate training session. To record their reflections and decisions at the end of each training session, ask participants to think about what they found interesting or useful during the day's session and how might they apply this in their work. Ask participants to record their thoughts in the learning log at the back of their workshop manual under the heading for that training session. Slide 8 on page 60 provides an outline of how to set up the learning log.

Buddy walk

Suggest participants 'buddy up' as they leave the training session to talk about the two or three most interesting or useful things they remember about the day's training. This is a good way to broaden, consolidate and share learnings with peers.

3.4 Ideas for facilitating Laboratory session 1

Start-of-session warm-up

This can be as simple as asking individuals to take a minute or two to think back to the last training session—'What did we do?' and 'What are some of the main points you remember?'. Then write up particpants' ideas on a whiteboard or butcher's paper. You can also include the question 'What would you be doing if you were not here?'.

The warm-up activity helps people to focus on the training, rather than the jobs that are waiting for them on the farm, at home or at work. Follow this activity with a brief introduction to the aims and structure of the day's training session (see Slide 9 on page 61).

Images and flashcards

The objective is to have a set of good quality images that represent pests and beneficials from the major orders found in vegetable crops, each stage of the different life cycles and types of feeding damage.

Once you have your set of digital images, you can use them in different formats throughout the training (e.g. as slides in PowerPoint format, in evaluations and for making flashcards, bingo cards and other printed material).

Access to good quality images

Some images can be downloaded from the web, but check for quality and copyright policy. You may need to purchase some images from state government departments and universities. When accessing images you may need to specify their intended use and acknowledge their source. If you are a good photographer or know someone who is, you may already have or are developing your own image library.

For print quality, the images need to be at least 300 dpi at print size.

To make flashcards

Print images at about 4″ x 6″ (around 10 cm x 15 cm) and no smaller than 3″x 3″ (around 7.5 cm square). You will need four to five copies of each image (one set per group). Laminate and trim the individual images.

Code each image with a number or unique letter that corresponds to identification and other details recorded on a list for use as your own reference and for participants to use as a checklist.

To make bingo cards

You will need four to six bingo cards with slightly different images on each. Images need to be inserted at print quality. Insert 9 to 12 images onto a PowerPoint slide and manipulate images to get them to fit onto one page. Print and laminate or put into a plastic sleeve. A master sheet with the title of the images and all the images used on the bingo cards will help the trainer keep track of correct answers and call-out names. Figure 3 shows an example bingo card with master sheet.

Instructions on how to play bingo using the bingo cards are in Section 2.7 on page 30.

Figure 3. Bingo card (left) and master sheet (right)

Running the flashcard session

This technique uses adult learning theory, linking in with participants' existing knowledge. It encourages learning from peers and avoids the classroom approach.

Flashcards are a good way to introduce the concept of insect orders during the first laboratory session. At the refresher course, flashcards are an excellent way of reinforcing and building knowledge about life cycles, insect orders and feeding damage and how these are interlinked.

Form groups of four to six people, selecting a mix of participants based on their job role, crop experience and level of pest knowledge. Endeavour to have at least one experienced person in each group and a range of crops represented. It is a good idea to briefly mention the rules of good group interaction (refer back to the guidelines on page 33).

Laboratory session 1

The objective is to illustrate to participants that orders are not a completely new concept for them, as they are already armed with some knowledge about what makes one group of insects different from another.

In small groups, invite participants to think and talk about what characteristics of each specimen are helpful in deciding what order is represented. Write the task on the board, giving a time frame for completion.

Ask the small groups to sort the flashcards according to the characteristics they have discussed. Come back together as a large group to generate a list of characteristics useful for grouping insects and natural enemies. Record responses from each small group on a whiteboard, clustering characteristics specific to different orders as you go.

Refer participants to the workshop manual section on 'Identification of the major orders' (pages 15–21) and give them a few minutes to look through this section.

Refresher course

The objective is to improve participants' knowledge of life cycles, orders and feeding damage using an active small group approach. It will take about 30 minutes per topic—life cycle, order and feeding damage.

In small groups, invite participants to think and talk about what characteristics of pests and beneficials are helpful in deciding what order they belong to. Write the task on the board, giving a time frame for completion.

Ask small groups to sort the flashcards according to life cycle, order and feeding damage:

1. Focus on life cycle—Report the results of the card sort and record on the whiteboard. This information could be already in workshop notes or hand it out at the end as 'take home' information. Alternatively participants can write their own notes.
2. Focus on orders—Ask small groups to cluster cards according to order. Repeat the feedback process. Then ask how is this information is important for making pest management decisions.
3. Focus on damage—Group according to feeding damage and repeat the feedback process. Discuss how this information is important for identification and making sound pest management decisions.

Have trainers circulating among the groups to assist with clarification of tasks, ask leading questions to direct focus towards identifying key characteristics and encourage participation from quieter people. Avoid providing answers.

Have back-up reference material at hand, such as ute guides, specimens and microscopes—particularly if the flashcard images are not as clear as they could be.

Tips for teaching use of microscopes

Set up the microscope properly and, in the absence of having a trainer standing by to help, leave instructions with a diagram at the microscope to show how to focus on the specimen. In our experience many participants do not have much, if any, experience with using microscopes and so need some assistance. Older participants have more variability in eyesight so are more likely to need individual assistance with focusing the microscope.

Instructions for setting up the microscope can be found with the microscope or on the web. Micrographia is a good site with excellent tutorials—visit www.micrographia.com

We normally only use a dissecting stereo microscope. You can attach the microscope to a TV or computer screen so you can demonstrate its use or show specimens to a larger group. Alternatively you could buy an inexpensive, small, hand-held digital microscope. Label any specimens left at microscopes for viewing so that participants know what is being demonstrated without a trainer being present.

Ideas for running the specimen identification practical

Ask participants to pair up and then work their way around a dozen or so stations set up in the laboratory. At each station they are to identify each specimen to order using the 'Identification of the major orders' section in the workshop manual (pages 15–21). Provide an opportunity to also name the specimen to species level.

Suggestions on the species to use for the different orders are provided in Table 11 opposite. If the first field session was run prior to the first laboratory session, then include at least two examples that were collected during the first field session for identification.

Discuss the results and finish the session. A lead-in question could be 'Did you find this session easy or difficult?'. To encourage problem-based thinking ask 'How could you make use of this information in your work or on your farm?'.

The effectiveness of this activity is magnified if there are plenty of specimens for participants to look at. Sourcing a range of good quality specimens can be time consuming and difficult to achieve. Keep any useful specimens collected during the field session and take advantage of the 'crowd' to collect as many specimens as possible from any unsprayed fields available during field sessions.

A disadvantage of this approach is that participants may not collect representatives of what you are looking for. It is a good idea to visit crops earmarked for field training before the session to see what participants are likely to collect and then focus your pre-workshop collection on the 'missing' representatives.

Table 11. Suggestions on species to include in identification exercise for Laboratory session 1

Taxonomic order/ group	Example of order/group (with suggested degree of difficulty in identification)		
	Easy	Average	Tricky
Moths and butterflies	Cabbage white butterfly	Heliothis adult	Diamondback moth adult
Flies	Fruit fly adult	Hover fly adult	Hover fly larva
Lacewings	Green lacewing adult	Brown lacewing larva or egg	Dragonfly
Wasps, ants and bees	Honeybee	Orange caterpillar parasite	Aphid parasite adult
Beetles	Two-spotted ladybird	Pumpkin beetle	Whitefringed or sweetpotato weevil larva
Thrips	Bean blossom thrips adults	Tomato thrips/WFT adults	Any thrips larvae
Bugs—pests	Aphids (adults and nymphs)	Green vegetable bug	Silverleaf whitefly adult
Bugs—predators	Assassin bug	Damsel bug	Bigeyed bug
Mites	Two-spotted mite	Predatory mite	Tomato russet mite
Spiders	Wolf spider, flower spider or lynx spider (all are easy to identify)		

Tips for teaching skills for preserving specimens

Instructions on how to collect and preserve insects are provided in the workshop manual on pages 4–5.

Use these instructions to build an interactive presentation on how to preserve specimens.

This presentation needs to include:

- different methods for killing insects
- methods for mounting and preserving different orders of insects
- a demonstration on how to mount and preserve an insect
- time for each participant to kill, mount and preserve a similar specimen using the contents of their collection kit—butterflies are good candidates for this exercise
- how to label specimens correctly for identification
- how to develop and look after a reference collection.

3.5 Ideas for facilitating Field session 2

Brief to the crop consultant

The overall brief is to provide an overview of good crop monitoring practice and assist with the in-field demonstration of those practices. It is probably not essential to present this information as a PowerPoint slide show, as most of the concepts can be demonstrated in the field. A portable whiteboard or flip chart can be useful for reinforcing some concepts, such as random sampling of a field. Discuss presentation options with the consultant.

Ask the consultant to cover the points essential to good crop monitoring in their presentation, including:

- correct identification of pests and beneficials—resources available and options for identifying difficult specimens
- getting a representative sample—the aim is to be fairly confident that what is found in the crop represents what is happening in the crop; discuss the concept of random sampling, number of plants inspected versus cost/time available and keeping an eye on hot spots
- where to look and how to sample—varies with crop and pests, different problems likely to occur at different parts of the season and at different crop growth stages
- what do the numbers mean—how to interpret the numbers in order to make a good decision
- the importance of regular monitoring to pick up changes over time—pest or beneficial numbers increasing or decreasing, are control measures working etc.

Questions at the end of the crop monitoring exercise

The following questions should be asked at the end of the exercise:

- What did groups find?
- What are their recommendations?
- Are there differences between groups?
- Why might that be?
- If you took no action, what would you expect to see in the crop in a week's time?

Monitoring challenge

The aim of this exercise is to reinforce learning. Provide a blank monitoring sheet to each participant and trainer and ask them to monitor the crop, record results and make a recommendation on what actions to take. After 15 minutes, come back together as a large group and discuss the results.

You can offer a prize to the individual who comes up with an answer similar to the crop consultant's recommendation in the fastest time. Provide the monitoring data for the block from the last crop check to add depth to the exercise. See page 52 for a crop monitoring sheet.

3.6 Ideas for facilitating Laboratory session 2

Tips for presentations on life cycles, mouthparts and damage

We recommend a couple of slides for each topic and a summary slide to review the key points of life cycles, mouthparts and damage that relate to identification of pests and beneficials.

Life cycles

Use the relevant diagrams from page 9 in the workshop manual to develop slides of the incomplete and complete life cycles.

For each life cycle, describe the stages in that cycle. Include examples of the types of insects that have that life cycle then, using a pest example, explain the length of time required for each stage and the effect of temperature on the duration of each stage (see slides 11, 12 and 13 on pages 62–63).

Outline the implications of life cycle stages on the identification of pests and beneficials, drawing attention to the stages that cause damage to crops and how this affects pest management decision-making.

Conclude the topic with a brief talk on the life cycle stages of predators and parasitoids, pointing out which stages are largely responsible for reducing pest numbers and therefore need to be looked after. A diagram of the parasitic wasp life cycle is particularly useful for ensuring an understanding of how the life cycles of parasite and host are interlinked.

Mouthparts

Use the relevant diagrams from page 10 in the workshop manual to develop slides of the different types of mouthparts.

Ask the group to answer the question 'What types of damage does each type of mouthpart cause in vegetable crops?'.

To reinforce the discussion, you can generate a summary table using a whiteboard or butcher's paper to record contributions from participants as the discussion develops. List the mouthparts offered from the group across the top and then write the type of damage caused and examples of insects given under the different mouthparts as they are mentioned during discussion. Alternatively, use Slide 14 on page 63 to cover this topic.

Discuss the relevance of mouthparts to identification and pest management decisions.

If available, a microscope with video attachment and television monitor is particularly effective for showing mouthparts of live or preserved specimens.

Feeding damage

Using pictures and specimens of damage, discuss what could have caused these symptoms, looking for answers that include mouthpart, life stage and order. Ensure that at least one example shows oviposition damage. Slides 15 and 16 on page 64 give an idea of the type of information to cover.

Tips for running the practical on identifying damage

Set up 10 or more stations in the laboratory with examples of pest damage. Include at least one example of oviposition damage. Aim to cover a range of different types of damage related to different mouthparts and also include several challenging ones, and perhaps a red herring or two (see Table 12 for suggestions). Ask participants to pair up and then work their way around all the stations.

Finish the session by discussing results as a large group. A lead-in question could be 'Did you find this session easy or difficult?'. To encourage problem-based thinking ask 'How could you make use of this information in your work?'.

End-of-workshop evaluation

The end-of-workshop evaluation exercise (on page 53) will help to:

- complete the action learning cycle
- determine if the training program has been effective
- measure participants' progress in developing skills and knowledge in identifying pests and beneficials
- consolidate the workshop training
- give an indication of how useful the training has been for the participants.

Table 12. Some ideas for damage that could be included in the practical exercise for Laboratory session 2

Type of damage	Cause of damage (with suggested degree of difficulty in identification)		
	Easy/common	Average	Tricky
Chewing	Pumpkin beetle on cucurbits	Cutworm damage to seedlings	Windowing damage in brassica leaf
Boring or tunnelling	Heliothis in tomato or capsicum fruit	Potato moth in potato tuber	Centre grub in brassicas, or bean pod borer
Leaf mining	Leaf miner in tomato or potato leaf	Beet leafminer in beetroot, silverbeet or spinach; or cabbage leafminer	First instar diamondback moth in brassica leaf
Sucking and piercing	Green vegetable bug in tomato, snow peas or beans	Silverleaf whitefly silvering of pumpkin leaf	Silverleaf whitefly damage to tomato fruit Aphid transmitted virus symptoms
Rasping	Thrips damage in onion Two-spotted mite on watermelon, capsicum or tomato	Broad mite on capsicum leaves Curled beans damaged by bean blossom thrips	Tomato russet mite on tomato stems Silvering of capsicum fruit by thrips
Egg laying	Fruit fly sting in tomato or capsicum	Bean fly damage on leaf or stem	Thrips eggs in leaf
Black mould	Silverleaf whitefly on eggplant or cabbage	Aphids on capsicum	Aphids on sweet corn cobs
Red herrings	Powdery mildew on vegetable crop of choice	Hare/snail damage to seedlings	Weather damage or spray burn

Running an ORID discussion

An ORID discussion is a group process that is prepared ahead of time and is facilitated by a conversation leader. The questions will relate to the objective of the activity being discussed and will represent each of the areas covered during training.

To prepare for an ORID discussion, the first step is to think about the intent of the discussion. Brainstorm questions and put them into the objective, reflective, interpretive, decisional sequence (see dot points below). Check that questions are specific and open-ended. Finish this draft and rehearse in your head or with the training team and think about the answers you might get. This may suggest some better ways to ask the questions. Remember that there will be no right or wrong answers (ICA 2000).

Some general example questions are listed below:

- **O**bjective—Was there anything unexpected or surprising about today?
- **R**eflective—Is there any scope to use information from this session in your work?
- **I**nterpretative—How would you go about using this information in your work?
- **D**ecisional—What are the next steps you would like to take to apply relevant learnings from today?

ORID discussions can be quick or detailed, depending on the purpose, but ensuring a quiet and comfortable environment, giving credibility to all answers and encouraging equal participation will get the most out of a conversation. You may choose to take notes on a whiteboard, butcher's paper or laptop so that the group can see the path of the discussion.

3.7 Ideas for facilitating the final evaluation session

Guidelines for focus group interviews

Focus groups are an ideal discussion tool to use in a post-workshop evaluation. They generate deeper insights into what participants felt about the workshop program than it is possible to obtain using individual or faster processes such as questionnaires or tick and flick sheets.

The process of planning and running a focus group requires considerable thought. Groups should be relatively small (approximately 6 to 10 people). If there are likely to be strongly opposing opinions, groups work best if participants are grouped with those of like ideas so that all can speak freely without fear of intimidation. The point of a focus group discussion is to talk about a topic in a permissive environment where different points of view are encouraged. Focus groups do not aim to reach consensus, the idea is to explore many elements of an issue.

Brief the facilitator on the objectives of the interviews and develop a list of questions with the facilitator to use as prompts to guide the conversation. A digital or tape-recording device can be used (provided participants agree) and it is useful to have an observer in the group to take notes.

The process

The facilitator will introduce the purpose of the meeting and ensure people are introduced and comfortable in the environment. Some points that the facilitator can make at this stage are:

- the facilitator will work with small groups to conduct a focused discussion
- discussion will centre on five to six main questions that the facilitator will pose to the group
- there are no right or wrong answers—the facilitator will encourage different points of view and perceptions without aiming for consensus
- it is the facilitator's job to help everyone to feel comfortable and make sure everyone has a chance to contribute
- just one person speaks at a time
- honest feedback is valued but please, no negative personal comments
- the process works best if comments are recorded on tape—this allows accurate transcribing of the comments but individuals will not be identified during analysis or reporting: 'Are you comfortable if I turn the recorder on now?'.

Question development is as important for success as skilful facilitation.

Generally, five to six focused questions leading from broader, open-ended questions to more specific ones works well. Questions should be open-ended and neutral, not leading. Question order is important and should begin with something participants feel strongly about and are familiar with. The facilitator needs to be comfortable to ask a question and allow a five second pause before encouraging a response. Probing, prompting, rewording the question and identifying future questions are part of the role. The facilitator needs to keep track of time and decide when discussion on one question is exhausted and it is time to move on to the next.

Refer to the example set of questions on page 56. Note that these questions also include prompts that the facilitator can use if participants find it difficult to get started on the topic.

The facilitator needs to encourage all to participate while being flexible to allow the conversation to follow relevant, if unexpected, paths. Disagreements and debate can generate new ideas, but care must be taken to avoid personal comments or conflict. Aim to stay within the time frame and bring the group back on track if the discussion becomes unfocused.

The data collected from focus groups is usually transcribed, analysed and interpreted after the meeting concludes. The key to analysing the data is to look for the big ideas, especially themes that various groups raised, and record these in the findings. Major differences between groups, especially groups with differing characteristics, need to be considered as important findings. Use selected quotations and repeated themes to illustrate points when reporting results. Take care to look for the answers to your evaluation key questions but do not be biased towards a positive result!

Trainers' reflection activity

At some stage after conclusion of the fourth training session, it is useful for trainers to come together to discuss and review the effectiveness of the workshop program. Ideally, results from the individual end-of-workshop evaluations will have been collated and interpreted against the baseline data collected at the first training session.

The activity could start with an ORID discussion to reflect on and share the overall workshop experience before moving on to some more specific questions:

- Were the objectives of each training session met?
- Were the methods and materials used suitable for the delivery of the training, the workshop manual and the collection kit?

Appendix 1: Forms and material for copying

This appendix contains the following forms and materials:

- Pest identification recording sheet
- Checklist: Is this pest and beneficials identification training for me?
- Registration form
- Baseline evaluation form
- Session evaluation form
- Crop monitoring sheet
- End-of-workshop evaluation
- Example focus group questions
-

Pest identification recording sheet

Date: _____

Specimen number	Name of specimen, type of life cycle or feeding damage
1	
2	
3	
4	
5	
6	
7	
8	
9	
10	

Checklist: Is this pest and beneficials identification training for me?

- Do I need to know about identification of vegetable pests and beneficials, their life cycles and the damage they cause?
- Did I score less than 7 out of 10 in the pest identification exercise?

If you answered 'yes' to either of these questions then the 'Pest and beneficials identification' workshop can offer you something!

Registration form

Date: _____

Name: _____

Phone: _____

Email: _____

Postal address: _____

1. On a scale of 1 to 10 (where 1 is the lowest) how do you rate your ability to identify pests and beneficials of vegetable crops? (Please mark the line where you think you score.)

1	2	3	4	5	6	7	8	9	10
Low									High

2. Which vegetable crops do you work with?

_____

_____

3. What would you like to learn about pests and beneficials of vegetable crops?
Please be as specific as possible.

_____

_____

_____

Baseline evaluation form

Please answer the following questions.

Question 1: Please name the creature shown in each image and in the right-hand column circle the answer

	Name the insect	Identify the group/order
Insert the image of a moth or butterfly		Flies Moth and butterflies Bugs
Insert the image of an aphid, silverleaf whitefly or leafhopper		Flies Bugs Mites Thrips
Insert the image of an assassin bug or adult hover fly		Predators Parasites Pests
Insert the image of a ladybird or pumpkin beetle		Flies Beetles Bugs
Insert the image of a beetle larva		Flies Beetles Bugs

Question 2: Entomologists classify insects into a different group from spiders and mites. What makes the two groups different?

Spiders have _____ legs and _____antennae.

Insects have _____ legs and _____ antennae.

Question 3: Insects are further classified into groups called 'orders' depending on their physical characteristics. Circle your answer to the following questions.

A fly has **0** **2** **4** wings and **4** **6** **8** legs.

Beetles have **0** **2** **4** wings and **chewing** **sucking** **rasping** mouthparts.

Bugs have **0** **2** **4** wings and **chewing** **sucking** **rasping** mouthparts.

Ants are in the same order as **bees** **lacewings** **earwigs** **aphids**.

Question 4: Most insects, mites and spiders change as they mature into adults. The change can be gradual with immature stages resembling adults. This is called incomplete metamorphosis. Can you give an example of an insect that undergoes incomplete metamorphosis?

_____

The change can be more dramatic, with immature stages being very different from the adults. This is called complete metamorphosis. Can you give an example of an insect that undergoes complete metamorphosis?

_____

Why is this knowledge important in pest management?

_____

_____

Question 5: Choose a vegetable crop that you have worked with over the last year or two and that you intend to work with in the future.

The crop is _____

Think about how you manage pests in this crop in a normal season. What are three methods that you use?

1 _____

2 _____

3 _____

What is the most damaging pest in the crop?

_____

What are three other pests that can cause problems in the crop?

1 _____

2 _____

3 _____

Is it easy for you to find and identify these problems in the field?

_____

What were the most common insecticides you used or recommended for this crop last season?

_____

_____

Question 6: You have found an unusual problem or new type of damage in your crop. How would you go about identifying the cause of the problem or damage?

_____

_____

Question 7: What does the term integrated pest management mean?

_____

_____

Question 8: What do you hope to learn at these training sessions?

_____

_____

Thank you

Session evaluation form

Session name: _____ Session date: _____

1. How useful did you find this training session overall?
   (Please circle a point on the scale and add a comment.)

1	2	3	4	5
Not useful	Fairly useful	Useful	Very useful	Extremely useful

Comment:_____

2. What was the most interesting thing you learnt today? _____

_____

_____

3. How useful did you find the practical sessions?
   (Please circle a point on the scale and add a comment.)

1	2	3	4	5
Not useful	Fairly useful	Useful	Very useful	Extremely useful

Comment:_____

4. How useful did you find the presentations?
   (Please circle a point on the scale and add a comment.)

1	2	3	4	5
Not useful	Fairly useful	Useful	Very useful	Extremely useful

Comment:_____

5. What could have been improved? _____

_____

_____

6. Please add any other comments that might help us improve future training activities.

_____

_____

_____

Crop monitoring sheet

Block: _____ Crop: _____ Date: _____

Weather since last monitored: _____

Plant number	Heliothis	Aphids									Comments
1											
2											
3											
4											
5											
6											
7											
8											
9											
10											
11											
12											
13											
14											
15											
16											
17											
18											
19											
20											
Totals											
Average											
Recommendation											

End-of-workshop evaluation

To determine if the training program has been effective, we would like to measure your progress in developing skills and knowledge in identifying pests and beneficials. We hope that completing this exercise will help consolidate the last 8 hours or so of workshop training. It will also give us an indication of how useful the training has been for you. Your individual responses will remain confidential.

Without using your manual please answer the following questions.

Question 1

(Write your answer in the blank space.)

Insects have _____ legs and _____ antennae.

Spiders have _____ legs and _____ antennae.

Mites have _____ legs and _____ antennae.

Thrips have _____ wings and _____ mouthparts.

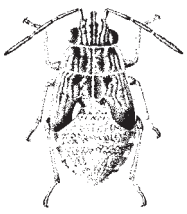
Bugs have _____ wings and _____ mouthparts.

(Circle the correct answer.)

Bees are in the same order as **ants** **lacewings** **earwigs** **aphids**.

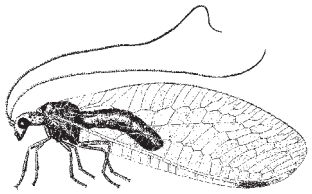
Question 2

The following pictures are of an adult insect and one of the younger stages in its life cycle. Which type of metamorphosis does each example represent?



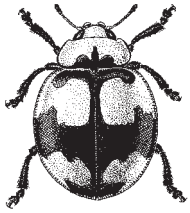
This is an example of

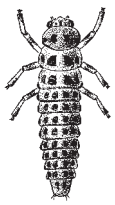
_____ metamorphosis.



This is an example of

_____ metamorphosis.





This is an example of

_____ metamorphosis.

For Questions 3 and 4 we collected some live specimens. There are five examples set up in the room. Using your manual, please answer the following questions.

Question 3

Which group (order) do the following examples belong to? List two features that helped you decide. What is the name of the pest or beneficial?

Example 1

This belongs to the order _____

Features that helped me decide are:

(a) _____

(b) _____

Species or common name: _____

Example 2

This belongs to the order _____

Features that helped me decide are:

(a) _____

(b) _____

Species or common name: _____

Example 3

This belongs to the order _____

Features that helped me decide are:

(a) _____

(b) _____

Species or common name: _____

Example 4

This belongs to the order _____

Features that helped me decide are:

(a) _____

(b) _____

Species or common name: _____

Question 4

You have found an unusual insect in your crop and wonder if it could become a problem. Using the materials provided, package up the insect so you can have it identified later. What else could you do to find out more about the insect?

_____

_____

_____

The next questions are about what you thought of the training sessions. Any comments are appreciated.

Question 5

The field sessions were:

(Please circle a point on the scale that best describes your feelings about the training and add a comment.)

1	2	3	4	5
Not useful	Sometimes useful	Not sure	Quite useful	Useful

Comment: _____

_____

Question 6

The laboratory sessions were:

(Please circle a point on the scale that best describes your feelings about the training and add a comment.)

1	2	3	4	5
Not useful	Sometimes useful	Not sure	Quite useful	Useful

Comment: _____

_____

Question 7

What could have been done better?

_____

_____

Question 8

What did you enjoy most about the training?

_____

_____

Thank you for your participation.

Example focus group questions

1. Looking back, what do you now see as the most useful and enjoyable parts of the workshop program?

2. How do you now feel about identifying insects, natural enemies and plant damage on your farm or in your work?

   Prompts if needed:

   Do you feel more confident in your skills and knowledge as a result of the training?

   Which parts of the training contributed most to this?

   Did we get the balance between field and laboratory work right or could we have done better?

3. How useful was the workshop manual during the training sessions?

   Prompt if needed:

   Have you used the manual at home or at work since the training finished?

4. How useful was the insect collection for improving your identification skills?

   Prompt if needed:

   Was the workshop manual helpful for the collection of insects?

5. Have you used any of the tools or information from the workshop over the past few weeks?

   Prompt if needed:

   Can you give examples of what you have used?

6. At this stage have you made any changes to how you manage pests on your farm or in your work?

   Prompt if needed:

   How important was the workshop training in your decision to make these changes?

7. Are there any other comments you would like to make?

   Prompt if needed:

   Is there anything further you would like to add about the training and how it might be improved?

Appendix 2: Workshop PowerPoint slides

1. Workshop program learning objectives

- Improved skills in identifying pests and natural enemies commonly found in vegetable crops
- A better understanding of the life cycles of pests and natural enemies, and their relevance to crop monitoring and management of pests
- Skills in collecting insects, spiders and mites for later identification
- A basic understanding of pest levels and pest control options, and their effect on parasite and predator levels

2. Overview of the workshop program

Four training sessions:

- Up to 2½ hours duration each
- Sessions held no more than 2 weeks apart

Mixture of field and laboratory work:

- Field session 1—finding and collecting insects, spiders and mites
- Laboratory session 1—introduction to insect groups (orders)
- Field session 2—concepts of crop scouting
- Laboratory session 2—relating crop damage, life cycles and mouthparts to insect and arachnid identification

Optional:

- Individual insect collections
- Post-workshop evaluation meeting

3. Program for Field session 1

Getting started:

- Registration and baseline data collection
- Introduction and ground rules
- Expectations

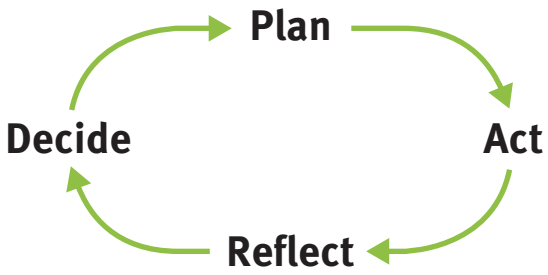
Finding and collecting insects, spiders and mites:

- Introducing the workshop manual and insect collection kits
- Practical activity – collecting pests and natural enemies
- End-of-session debrief

4. A varied and practical approach

- People are different and learn best in different ways
- Combination of classroom/laboratory and field training
- Some individual work, some work in pairs or groups
- Some work as a large group
- Discussions and questions encouraged
- Practical exercises
- Evaluation to assess the workshop program

5. Action learning



- Many of us 'plan' and 'act' without making time to 'reflect' before 'deciding' on what's next.
- Warm-up and debriefing activities are held at the start and end of each training session to help complete the action learning cycle.

6. Preferred learning styles

Where on the action learning cycle do you feel most comfortable?

- **Activists:** open-minded, uncomfortable with restrictions and become bored with long-term consideration and tedium
- **Reflectors:** need to think through experiences, analyse situations, delay making decisions and are cautious
- **Theorists:** are objective, rational, need to know why, dislike uncertainty and need to see patterns
- **Pragmatists:** like to try out ideas and techniques, are practical and realistic, and dislike unresolved discussions

7. Tips for successful group discussions

- Participate fully—share your thoughts openly, with no hidden agendas
- Listen to everyone's point of view—we all have something important to offer
- Keep it positive
- No side conversations
- Keep to the task at hand—we have a lot to cover and need to stay focused
- Turn your mobile phone OFF or onto SILENT

8. Setting up a learning log

Set up a learning log at the back of the workshop manual:

1. Head up the first blank page with 'Learning log'.
2. Follow by the heading 'My expectations' and about half way down the page 'My goals'.

   What do you hope to learn over the next few weeks?

   Is this different from what you thought at the start of the day's training?

   How do you hope to apply this learning in your work?
3. Divide the next two blank pages into four sections. Head up the first section 'Session 1', the second 'Session 2', the third 'Session 3' and the fourth 'Session 4'.

   Think about what you have found interesting or useful in today's training.

   Record you thoughts under the 'Session 1' heading.

9. Program for Laboratory session 1

- Flashcards—grouping insects for identification
- Using microscopes and hand lenses
- Practical activity—identifying pests and natural enemies
- Preserving specimens
- Completing individual insect collections

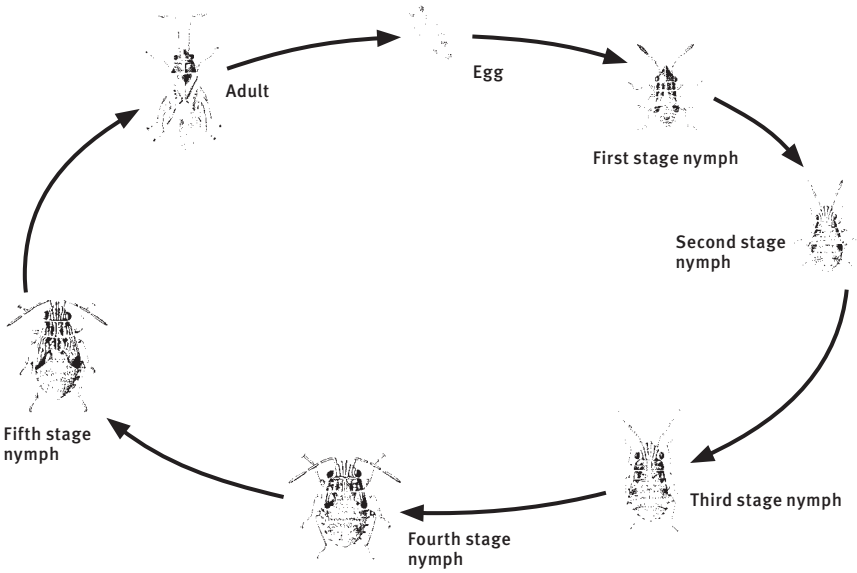
10. Program for Laboratory session 2

- Life cycles, mouthparts, plant symptoms and damage
- Practical activity—identification of symptoms and damage, and their cause
- Individual insect collections
- End-of-workshop evaluation
- Plans for follow-up activities

11. Life cycles

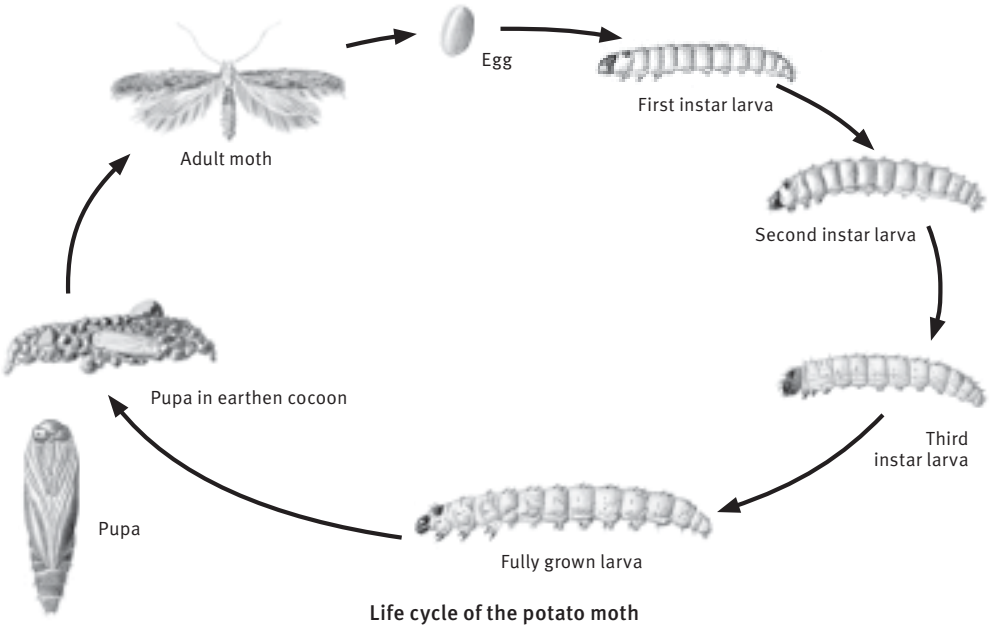
- Process of developing from egg to mature adult
- Duration of life cycles are influenced by temperature
- Moulting:
  - Insects and arachnids shed their external skeleton as they develop
  - Between periods of moulting the insect is called an instar
- Metamorphosis:
  - Newly hatched insects and arachnids change as they develop into adults
  - Without metamorphosis—silverfish, springtails
  - Incomplete metamorphosis—bugs, grasshoppers, thrips
  - Complete metamorphosis—butterflies, moths, bees, beetles, flies

12. Incomplete metamorphosis



Life cycle of the Rutherglen bug

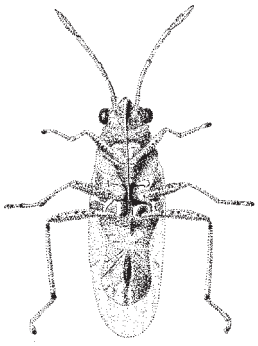
13. Complete metamorphosis



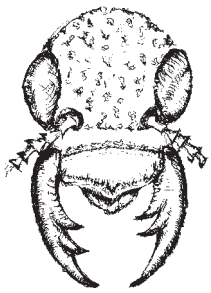
Life cycle of the potato moth

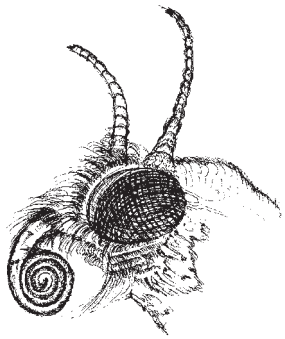
14. Mouthparts

- Biting and chewing—caterpillars, beetles, ants, grasshoppers, lacewings (adults), spiders and most wasps
- Piercing and sucking—lacewings (nymphs), some flies, bugs, thrips and mites
- Coiled sucking—butterflies and moths
- Sponging—flies



View from below





15. Symptoms and damage

- Most damage is caused by feeding.
- Some damage is caused by laying eggs or seeking shelter.
- The type of damage or symptoms observed depends on:
  - basic feeding or egg-laying habits
  - its size—larger insects eat more and take bigger bites
  - the stage in its lifecycle—older is usually bigger, but nymphs and larvae focus on growing and feeding while adults focus on moving around and reproducing
  - the number of insects—a swarm of many small insects can cause considerable damage
  - the part of the plant that is attacked.

16. Other sources of plant damage

Insect and arachnid damage can sometimes be confused with:

- plant diseases caused by fungi, bacteria and viruses
- virus diseases spread by some insects
- nutritional disorders caused by deficiencies, toxicities or nutrient imbalances
- physical damage from other animals, people or machinery
- damage from pesticide sprays, herbicides, fertilisers and other chemicals
- weather damage from dry, wet, windy, hot or cold conditions
- growth disorders such as mutations.
-

Notes

Notes

Notes

Notes