

Desert Locust

Master Trainer Manual

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**FOOD AND AGRICULTURE ORGANIZATION
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A trainer's work is trying to help people change the way they react in a range of circumstances so that they can be more effective and positive in what they do.

Anon

Table of contents

INTRODUCTION TO THE MANUAL	PAGE
Preface	8
Introduction to the Master Trainer Manual	9
Terms used in the Master Trainer Manual	11
How to use this manual to deliver sessions	14
INTRODUCTION SESSIONS	
I1 - Introduction to course and objectives	17
I2 - Participants experience in locust operations and constraints	20
I3 - What are Desert Locust management, survey and control?	23
SURVEY SESSIONS	
S1 - Introduction to locust surveys	27
S2 - Is it possible to find all locust infestation in the field?	29
S3 - Are surveys really necessary?	31
S4 - What is the survey process?	33
S5 - Planning and making surveys: who, where, when?	35
S6 - What are assessment and search surveys?	39
S7 - What are assessment and search surveys? (simulation)	42
S8 - What are the different survey methods?	45
S9 - How are foot transects made?	47
S10 - What rainfall information should be collected?	49
S11 - How is ecological data collected?	51
S12 - What locust data should be collected?	54
S13 - How are vehicle transects made?	57
S14 - How are ground surveys organized?	59
S15 - How are aircraft used for surveys?	61
S16 - What equipment should be taken on a survey?	64
S17 - How are maps used?	66
S18 - How is a compass used?	68
S19 - How is a GPS used?	70
S20 - How can a map, compass and GPS be used together?	72
S21 - How are field data recorded?	74
S22 - What is eLocust and how can it be used?	77
S23 - Practicing survey techniques in the field	80
S24 - How are survey results transmitted?	83
S25 - Summary of survey sessions	85
Survey Exercise Sheets	88

CONTROL SESSIONS	PAGE
C1 - What is the process of control and is control always necessary	99
C2 - Which are the different locust targets and control options?	101
C3 - Choosing and using locust insecticides safely	104
C3ii - Safe pesticide handling and basic First Aid	107
C4 - How to use field equipment relating to control?	110
C5 - How can swath width be measured for ULV sprayers?	113
C6 - How does the size of droplets affect their number and behaviour?	116
C7 - What is sprayer calibration and how are calculations made?	119
C8 - How can we make correct sprayer settings?	123
C9 - What are good and bad ULV spraying conditions	126
C10 - What are the principles and techniques of ULV spraying?	129
C11 - How can control efficacy be checked (locust mortality)?	132
C12 - How can control operations and their efficacy be recorded?	135
C13 - Practicing control techniques in the field	137
C14 - What are the tasks of different locust field personnel?	139
C15 - Summarising the control sessions	141
Control Exercise Sheets	145
TRAINING SKILLS SESSIONS	
T1 - Introduction to the training process	171
T2 - Introduction to individual Learning Styles	173
T3 - Target groups – who are they?	175
T4 - Training needs analysis (TNA)	177
T5 - Training objectives and selecting the content of training sessions	179
T6 - The adult learning process and training methods	181
T7 - Planning the Training Session and programme	184
T8 - Evaluating the impact of courses	186
Training Skills Exercise Sheets	190
TRAINING SKILLS NOTES	
T1 - Introduction to the training process	202
T2 - Learning styles	209
T3 - Target groups	211
T4 - Training needs analysis	215
T5 - Training objectives and selecting the content of training sessions	222
T6 - The learning process and training methods	227
T7 - Planning the training sessions and programmes	247
T8 - Evaluating the impact of courses	257
APPENDICES	
Trainees personal profile and registration form	266
Facilities and equipment list	267
Suggested 9 day programme for National Course	269
Pre-course assessment – Survey	271
Pre-course assessment – Control	274
Course evaluation	277
Suggested certificate template	279
Energizers	280
Garmin 12 XL GPS quick reference	283
FAO Spray Monitoring Form instructions	284
FAO Spray Monitoring Form	285
FAO Survey and Control Form	286
Registration form for Master Trainers	287
National Desert Locust training course feedback form	288
CD Rom with electronic files for manual and OHTs	289

Introduction to the Manual

Preface

The Desert Locust plague of 1986-89 and the subsequent upsurges in the 1990s demonstrated the continuing capability of this historic pest to threaten agriculture and food security over large parts of Africa, the Near East and southwest Asia. They emphasize the need for a permanent system of well-organized surveys of areas that have recently received rains or been flooded, backed up by control capabilities to treat hoppers and adults efficiently in an environmentally safe and cost-effective manner. The events of 1986-89 showed that, in many instances, the existing strategy of preventive control did not function well, for reasons including the inexperience of the field survey teams and campaign organizers, lack of understanding of ultra low volume spraying, insufficient or inappropriate resources and the inaccessibility of some important breeding areas. These reasons were compounded by the general tendency to allow survey and control capacity in locust-affected countries to deteriorate during locust recession periods. To address this, FAO has given high priority to a special programme, the Emergency Prevention System for Transboundary Animal and Plant Pests and Diseases (EMPRES) that will strengthen national capacities. Given the certainty that there will be future Desert Locust upsurges, FAO produced a series of Desert Locust Guidelines for use by national and international organisations and institutions involved in Desert Locust survey and control.

These Guidelines are resource documents containing information on best practice for their detection, prediction and control. FAO encourages affected countries to disseminate this information as widely as possible to personnel involved with locusts so that it can be used to help make locust management safer and more efficient. This requires the development of a coherent national training strategy that will reach and influence staff at all levels from senior campaign managers to field officers, and to other stakeholders such as farmers and nomads who may assist with locust management activities.

FAO and its partners, including the Natural Resources Institute, began the process of developing this strategy by identifying the various groups that require training and the knowledge and skills that they need. The Master Trainer Manual is the first major step in the implementation of this strategy in that it provides the top-level source material and equipment for Master Trainers to train locust field staff and other National Trainers in their own country. In addition to detailed session plans and ready-to-use visual aids to be used in conjunction with the Desert Locust Guidelines, this manual contains comprehensive guidance on how to carry out effective training, that is, the all-important skills of communicating these messages to others. Appropriate curricula and manuals will be developed based on this manual for different levels of training in other languages throughout the Desert Locust-affected regions of the world.

Although the material in this manual has been developed during the past 10 years, the participatory methods promoted here have been finalized only recently and represent the most modern and innovative approaches currently available.

I would like to extend my gratitude to all those who have been involved in this important contribution to improved Desert Locust management.

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17 February 2003

Introduction to the Master Trainer Manual

This manual is designed for Master Trainers in locust-affected countries who conduct courses to train locust field staff and other National Trainers in their own country. It is intended to be used in conjunction with the FAO Desert Locust Guidelines, which provide valuable technical information to support the training.

This manual contains basic information, guidance and graphic aids that allow a newly-trained Master Trainer to conduct a well-structured and effective training course in his/her own country for locust staff and other trainers on safe and effective survey and control, and on how to train others. The case in which the Manual is supplied should also contain some items of equipment that are useful for participatory training in survey and control, but that are not easily available in locust-affected countries, for example anemometers, compasses and 'magic pens'. Other essential training equipment will need to be supplied by the organisers of each training course, e.g. GPS units and sprayers.

The approach adopted is that of participatory learning. This method requires active involvement of trainees throughout the course and has been shown to be far more effective than training based purely on lecturing.

A trainer performs two important roles. Firstly, he/she transmits information from the producers of the information such as researchers, policy-makers and managers, downwards in the information chain towards the end users. Secondly, he/she transmits information back up the information chain from the information users to the information producers. This secondary task is very important, but often overlooked, because it provides feedback on how useful and practical the advice to end users is, and it can help to steer the producers in the direction of more useful information.

There can be several levels in this information chain, and the information can change hands many times. There is inevitably a decrease in quality of information as it flows down or up the communication channels, but the better the trainer, the less the dilution and distortion of the important messages.

There are many qualities that make up a good trainer. He/she should be:

- capable of identifying the trainees' needs;
- highly motivated and interested in addressing the trainees' needs;
- technically well-informed, well organized and well equipped;
- a good communicator with good participatory training skills.

While some people find training easier than others, everyone can acquire the knowledge, skills and attitudes that will help them be an effective trainer. The Desert Locust Master Trainer Manual and its resources have been prepared to help trainers develop the necessary capabilities. They have been designed as a foundation but are not intended to be a blueprint for all situations; rather, they should be a dependable starting point. As a trainer gains confidence and ability, he/she will be able to adapt and adjust the content and methods of delivery to suit the needs of the trainees on a particular course.

The manual is divided into five main parts:

Introduction providing information on the purpose of the manual and guidance on how to use it.

Survey – resources for training the essentials of Desert Locust survey. These Session Summaries and Session Plans should be used in conjunction with the Desert Locust Guidelines, mainly Biology, Survey and Appendixes.

Control – resources for training the essentials of Desert Locust control. These Session Summaries and Session Plans should be used in conjunction with the Desert Locust Guidelines, mainly Control and Appendixes.

Effective training giving guidance on training methods, including characterizing target groups, assessing the training needs of the trainees, participatory training techniques and the use of visual aids. As this section does not have an associated Guideline in the Desert Locust Guidelines, it contains essential resource material (Session Notes) as well as Session Summaries and Session Plans.

Appendices with suggested training course programme, pre- and post-course tests, forms, glossary and other supporting material.

Pages are colour coded as follows:

- **White pages:** These are the Introduction, Training Skills resource notes and technical reference materials in the appendices for instructors to use during preparation of their own training courses in future.
- **Pink pages:** These are Session Summaries that outline the aims and objectives of the session, as well as indicating what equipment, visual aids, preparation and time are required for the delivery of the session. They list the appropriate technical resource pages in the Desert Locust Guidelines that the Master Trainers should refer to when preparing for their sessions. Key points that should be emphasized during the session are indicated.
- **Yellow pages:** These are Session Plans containing step-by-step instructions on how to organize and deliver each session. These plans should enable instructors to cover the main points of each session to a predetermined schedule, using participatory techniques to facilitate effective learning by the trainees.
- **Green pages:** These are practical exercise sheets that provide a step-by-step guide for indoor and outdoor learning exercises.

Terms used in the Master Trainer Manual

This Master Trainer's Manual has been distributed to individuals who attended a Master Trainer's Course. During that course, full instruction is given on planning, preparing, implementing and assessing impact of training, using the resource notes in the Effective Training section.

The words used in the table below should therefore be familiar to users of this Manual and are presented here as a quick reference for terminology used in the Session Plans on the following pages.

Training aids

Training aid	Description
Presentation surface (PS)	A presentation surface can be a blackboard, whiteboard, flipchart, or overhead projector transparency – in other words, any surface which the trainer can write or draw on for trainees to see. There are several different types of PS use – see the following four PS techniques.
PS list	Building up a bullet point list on the PS using trainee input from Q&A
PS table	Completing a PS table using trainee input from Q&A
PS sketch	Drawing a diagram or illustration on the PS
PS maths	Showing calculations from a worked example on the PS
Q&A	Question and answer (see following page)
OHT	Overhead transparency (followed by a number indicating which OHT to use)
Slide	Photographic slide presentation
PPP	Powerpoint presentation
Video	Video cassette tape presentation
Real materials	These are real items such as equipment, vegetation, insects or a publication which the trainees can examine

Participatory training techniques

A good trainer will use a variety of participatory techniques in his/her training sessions. Again these are covered in more detail in the Training Skills section of this manual and in the Master Trainer's course. They are presented below as a quick reference for terminology used in the Session Plans on the following pages:

Technique	Description
<i>Present</i>	Lecturing to communicate new ideas and information. This method is essential, but should only be used for short periods and in conjunction with visual aids and question and answer (Q&A) to involve trainees.
<i>Question and answer (Q&A)</i>	Questions should be 'open' – beginning with 'why, who, which, where etc' – since this stimulates a fuller answer than 'closed' questions – beginning with 'is there...', 'do you...?' These only bring a yes or no answer. Answers can be built up as a list on the whiteboard or flipchart. Two main types of Q&A are listed next.
<i>Q&A (everyone):</i>	Question to all trainees, answered by a volunteer. Use for sharing knowledge, learning by deduction and warming up a session.
<i>Q&A (individual)</i>	Question to an individual trainee. Use for sharing knowledge, learning by deduction, and focusing minds, especially for those who are finding it difficult to concentrate or participate.
<i>Buzz groups</i>	This is when a pair or small group of trainees are asked to discuss a question or issue, then to present their findings to everyone. Useful for sharing knowledge within the group and developing presentation skills, peer reviewing and building confidence.
<i>Demonstration</i>	To present a technique or concept by showing trainees how to do something.
<i>Indoor exercise</i>	An exercise in the classroom, either a desk exercise or a small practical exercise. Improves skills in problem solving and working with others. Done within groups or pairs of individuals.
<i>Outdoor exercise</i>	A practical exercise that is more easily done outside the classroom. Improves practical skills with equipment and techniques.
<i>Field exercise</i>	Putting knowledge and skills into practice in the field. Builds ability and confidence in practical techniques and working with others. Done within groups or pairs of individuals.
<i>Guided discovery</i>	Where trainees engage in an activity that leads them to discover knowledge or techniques. A powerful technique that helps trainees remember things well, but very time-consuming unless guided well.
<i>Trainee presentation</i>	Asking a trainee to prepare and present findings from classroom or field exercises. Consolidates and shares knowledge, and builds confidence.
<i>Simulation</i>	To simulate a real situation in the field, usually done on a computer.
<i>Role play</i>	e.g. nomad and Survey Officer. Humour retains interest and creates resonance with trainees' previous experiences and observation.

Tools in participatory training

In addition to the training techniques outlined above, there are several other tools that trainers can use to ensure effective learning and positive attitudes. These are defined below:

Tool	Description
<i>Energizers</i>	Group activities that may not be directly linked to the technical subject matter. They can be useful to break the ice, help people get to know each other and can lift flagging interest or energy, especially after lunch. Humour breaks down barriers and important messages can be woven into the activities.
<i>Expectations</i>	Establishing expectations at the outset then reviewing them at the end allows fine-tuning of the workshop content to meet needs and interests. This helps to ensure satisfaction when it is demonstrated that the major expectations have been met.
<i>Norms</i>	Course 'rules' that are established by the trainees themselves at the beginning. Examples might be not interrupting each other, or being punctual for sessions.
<i>Trainee representative</i>	It is useful to ask trainees to appoint a representative. The representative provides an anonymous and effective communication channel to course organizers/trainers for complaints and dissatisfactions amongst the trainees, or in the reverse direction.
<i>Trainee evaluation</i>	An anonymous questionnaire filled by trainees at the end of the course can be used to ascertain levels of satisfaction with all aspects of the course and to gather critical feedback on how things could be improved.
<i>Certificates</i>	These consolidate the feeling of achievement and satisfaction and demonstrate appreciation of trainees' efforts by the organizers. They help confidence and credibility among professional peers and next-level trainees, which in turn allows more effective and wider dissemination of survey and control messages. Make sure to circulate a list of names a few days before the end of the course so that participants can check spelling. It is easy to change things at this stage, but difficult to change the certificates once they are printed.

How to use this manual to deliver sessions

This manual is intended as a guide for you, the trainer, to teach the basic modules on Desert Locust survey and control and effective training in your own country. The first part comprises a series of Session Summaries and Session Plans that provide step-by-step instruction on delivery of each survey and control module and which training methods, visual aids and practical exercises to use. It should be used in conjunction with the FAO Desert Locust Guidelines, which provide the core technical resource material for you to draw on.

In addition to the session plans on survey and control, the manual also provides guidance on how to teach Training Skills to other Master or National Trainers in your own country. Since there is no existing FAO Guideline on training, this section contains resource notes (Session Notes) as well as Session Summaries and Session Plans similar to those in the survey and control sections.

Once a training course has been organized and is underway, the procedure for use of the Session Plans is as follows:

The day before the session

- Turn to the relevant Session Summary (pink pages).
- Read the aims and objectives so that you know what you are intending to do (**aim**) and what you are expecting the trainees to be able to do (**objective**).
- Check what is needed for the session (**equipment**) and arrange for this to be available for the session.
- Check what needs to be done before the session (**preparation**) and make sure this is completed.
- Read the relevant pages in the FAO Desert Locust Guidelines (**Guidelines reference pages**). B = Biology and Behaviour, S = Survey, R = Information and Forecasting, C = Control, O = Campaign Organization and Execution, E = Safety and Environmental Precautions, A = Appendixes
- Make sure the OHTs for that session are available (there is a set provided for each session) and that you have looked through them to ensure that you understand how they should be used.
- Read through the Session Plan (yellow pages) to ensure that you understand how you are going to teach the session.

The day of the session

- Prepare your materials (equipment, Master Trainer Manual, OHTs, etc.) in the training room.
- Check audio-visual equipment – does the OHP work and is it focused and at the right distance from the screen.
- Read through the **key points** to remind yourself of what is to be covered.
- Finally, read the objective again to remind yourself of what the trainees should be able to do by the end of your session.
- Deliver the session in a good-humoured and participatory way.
- Don't forget to finish each session with summary and conclusions as described at the end of each Session Plan and check on what they have learnt. Finally give the trainees some encouraging words and an idea of how this session leads on to the next session.

Daily schedule

The sessions should be chosen to build up a course programme which meets the training needs of the target group (see Training Skills section). Whichever sessions are included, the way they are scheduled can affect how well the trainees learn and their attitude to transferring the knowledge and skills to others. In particular, theoretical sessions should be interspersed with practical sessions and energizers in order to maintain levels of energy and interest. There should also be regular breaks for refreshments at pre-arranged times so that the trainees know when to expect them. Some of the additional points to consider are listed below:

1. The day should be started with a few minutes of discussion. This can include recapping the previous day's activities with some questions such as 'what did you learn' or 'what did you enjoy/dislike'. It can also include enquiring whether there are any problems or difficulties facing the trainees which they would like to discuss.
2. The day should be ended with a further opportunity for discussion. It is better if this is scheduled in the programme for 15-30 minutes every day so that the trainees consider it an integral part of the day, rather than an unscheduled addition which is prolonging a hard day. This period can be used to recap the day's activities and learning, to introduce the following day's activities to the trainees, to enquire about and discuss any questions which have not been dealt with adequately during the training sessions, or to seek comments on how the course is going in general. To help trainees who are reluctant to come forward, a system can be set up where trainees can write their questions, comments, criticisms on a slip of paper and post it up at an agreed site such as the training room door.

Introduction sessions

11	Session Summary	Duration
	Introduction to course and objectives	1.5 hours

Aim: To introduce the course, the people involved and to check the match between trainer objectives and trainee expectations. Also to establish levels of trainees' experience and knowledge at the start of the course.

Objectives: Workshop norms, trainee representatives and expectations will be established. Trainees will also know each other a little and trainers will have a rough measure of their technical knowledge relating to Desert Locust survey and control.

Equipment:

- PS, pens, eraser
- Sheet of A4 paper and flipchart/whiteboard pen (one each per trainee)
- Survey and Control multiple choice assessment papers
- Course programme
- Other course stationery such as ring binders, paper, pens etc

Preparation:

- Collate expectations from the Trainee Personal Profile and Registration forms which should have been filled in by all trainees during registration (see Appendices for personal profile form) and write them on an OHT.
- Photocopy the Survey and Control multiple choice assessment papers (one for each trainee) and the course programme

Guidelines page references: none

11	Session Plan	Duration
	Introduction to course and objectives	1.5 hours

SECTION	TECHNIQUE AND CONTENT	AIDS
Introduction (5 mins)	<p>1. Present: Welcome everybody again and inform them that we are going to start with establishing:</p> <ul style="list-style-type: none"> • Trainee expectations • General course objectives • Workshop norms • Trainee representatives • Current levels of knowledge relating to locust survey and control 	
Core (75 mins)	<p>2. Present and Q&A: Show the OHT of the trainee expectations (revelation technique) and go through each to determine whether the course can satisfy that demand. Be sure to point out areas which cannot be covered so that trainees are not disappointed when expectations are reviewed at the end of the course. Ask whether there are any additional expectations to be added to the list.</p>	OHT of expectations (prepared from the completed Profile Forms)
	<p>3. Present: The general course objectives will be to improve knowledge and skills relating to:</p> <ul style="list-style-type: none"> • Locust survey • Locust control • Effective training <p>Emphasise that the approach throughout the course will be participatory and explain the meaning i.e. as little lecturing as possible and as much participation as possible. We need input from ALL the trainees to make the course a success.</p>	PS list
	<p>4. Q&A: Ask what the words 'survey', 'control' and 'training' mean. Prompt trainees for 'looking for', 'killing' and 'passing on knowledge and skills', or 'changing the attitudes and abilities of others'.</p>	PS list
	<p>5. Buzz group: To help trainees begin to get to know each other, ask them to do the following in pairs (15 minutes):</p> <ul style="list-style-type: none"> • Draw a sketch on A4 paper of their partner's face (Trainers do this too). • Find out a few details about their partner and write them below the sketch. • Once everyone has finished, go round the room and ask each person to stand up and introduce their partner. 	

	<ul style="list-style-type: none"> At the end of this, stick the portraits up on the wall. This becomes a course 'gallery' of trainees and trainers. It helps to prepare stickers with their names legibly written or printed on them for attaching to each picture. There will be a variety of artistic abilities - do not ridicule the weaker efforts! 	
	<p>6. Q&A (everyone): Explain that training courses go more smoothly when everyone follows some basic rules. But these rules should be determined by trainees and trainers together so that they are easier to follow. Ask trainees to suggest the norms which we will follow. Once they are all agreed, stick the flip chart paper to the wall.</p>	PS list (best on flipchart paper so it can be stuck on the wall)
	<p>7. Present: Also explain that we want everyone to be happy on this course since unhappy people do not learn well, so we would like someone to be the trainee representative. This person will listen to any complaints or problems experienced by trainees and pass them on to the organisers. Ask them to discuss among themselves that evening and to elect either one or two representatives (if it is a mixed group, one man and one woman) and let you know their names the following morning.</p>	
	<p>8. Indoor exercise: Explain that you would like to establish the level of knowledge of the trainees before starting the course. Stress that it is not a test, but will help the organisers to concentrate on subjects where there is a need. Do not mention that the same test will be given at the end of the course since trainees will try to remember or copy the questions to prepare for the final assessment. Distribute the survey assessment, and when people have completed that, distribute the control assessment (not both together). When trainees have completed both, they can hand in their papers, collect any course stationery or other handouts, and leave the room.</p>	
<p>Summary & Conclusion (5 mins)</p>	<p>1. None immediately since trainees leave the room one by one as they finish the assessment. However, later on in the course, it is useful to brief trainees on which areas need extra attention.</p>	

12	Session Summary	Duration
	Participants' experience in locust operations and constraints	1 hour

Aim: To establish that trainees' needs are in line with the training course and get to know each other.

Objectives: The trainees will state their own experience in locust survey, control and training and briefly explain what constraints are faced in survey and control.

Equipment:

- PS, pens, eraser
- Flipchart with paper

Preparation:

- Chairs in a circle (for Fruit Salad – see Appendices)

Guidelines page references: none

12	Session Plan	Duration
	Participants' experience in locust operations and constraints	1 hour

Note: This is a good point to divide the trainees up into the groups they will work in. Use the Fruit Salad exercise described in the Energizer section of the Appendices to establish and consolidate groups of 3-5 people. After this, put chairs back at tables ready for group work.

SECTION	TECHNIQUE AND CONTENT	AIDS
Introduction (5 mins)	1. Q&A (everyone): Who works in a locust unit (ask people to raise their hands)? Ask those trainees if they can remember their first day on the job as a locust officer?	
Core (45 mins)	1. Q&A (individual): Address questions such as those below to 3 or 4 of the trainees until you have had feedback about uncertainty, lack of knowledge, lack of confidence etc. Do not spend too long on this: <ul style="list-style-type: none"> • Can you tell me what you remember? • What stands out in your mind? • Was it difficult? • How did you feel? • Did you think that you were adequately prepared when you started your job? • Did you have enough experience and training beforehand? 	
	2. Q&A (everyone): Did anyone else have a similar (or a different) experience? Ask one or two others.	
	3. Classroom exercise. Now ask each group to discuss amongst themselves what constraints they face when doing survey, control and training, and write them on a sheet of flipchart paper that you distribute (15 min). Each group should agree on five main constraints and select a spokesperson to come to the front and present their findings with their flipchart paper attached to the wall. The trainer should be careful that the session does not become too negative – ask what they do well too!	PS (best on a flipchart)

	<p>4. Present. As trainees present their constraints, the trainer should capture them on the whiteboard. A good technique is to put them in 'blind' columns which have no headings, but which correspond to the following:</p> <ul style="list-style-type: none"> • Management/administrative • Operational • Training • Financial • Political • Security <p>Once all constraints have been entered into the blind columns, ask trainees to suggest headings for the columns. Do not go into details at this stage.</p>	
<p>Summary & Conclusion (10 mins)</p>	<p>1. Present (to summarize): It is clear that there are many different types of constraints to survey and control operations, and to training programmes. Some of these constraints may be the same in other locust-affected countries.</p>	
	<p>2. Present (to lead into next session): This training course will address these issues so that by the end of the course you should have a better understanding of how to carry out safe and effective locust management. But before we go into the detail, we should be clear about what is locust management? The next session is a brief overview of locust management.</p>	

I3	Session Summary	Duration
	What are Desert Locust management, survey and control?	1.5 hours

Aim: To justify the course and the approaches adopted in order to help motivate the trainees and stimulate positive attitudes.

Objectives: The trainees will summarise the economic and social importance of DL and the types of management strategies possible (preventive, curative) in the context of the DL plague cycle. They will also be able to give reasons why survey and control are important (three reasons for each).

Equipment:

- PS, pens, eraser
- OHTs (I3 set)

Preparation: None

Guidelines page reference: B2-4, B36-41

13	Session Plan	Duration
	What are Desert Locust management, survey and control?	1 hour

SECTION	TECHNIQUE AND CONTENT	AIDS
Introduction (5 mins)	1. Present: Make point that this course does not aim to teach the biology, behaviour or population dynamics of DL in detail. However, it will present some basics and then concentrate on survey, control and effective training.	
Core (60 mins)	1. Present: As an introduction, mention that locusts have probably caused problems ever since agriculture began – an Egyptian painting from 3500 years ago shows a Desert Locust feeding on a papyrus flower.	OHT (I3a)
	2. Present: Provide general information on locusts (using revelation technique with the OHT)	OHT (I3b)
	3. Q&A: How do locusts affect people?	PS list then OHT (I3c)
	4. Present: Provide basic data on swarm size and vegetation consumption	OHT (I3d)
	5. Present: Make the points that DL plagues are dramatic with massive population increases at irregular intervals. But they do go away on their own eventually when conditions become unfavourable, as shown on the two OHTs. The same is true for other locust species.	OHT (I3e, I3f)
	6. Q&A: Ask how locusts are different from other crop and public health pests.	PS list then OHT (I3g)
	6. Present: Go through the DL plague cycle. Define outbreaks, upsurges and plagues, as well as recession.	OHT (I3h)
7. Q&A: What are the management strategy options available to us? Should we leave them alone? Should intervention be at the recession stage, outbreak stage, upsurge stage or plague stage? What are the pros and cons of the different options – prompt for the fact that control as early as possible has the attraction of stopping the population before it gets big, but the real disadvantage that targets are small, scattered and hard to find at the early stages of population build up.	PS list then OHT (I3i)	

	<p>8. Present: Introduce the key elements of DL management: survey and control (and for TOT course, training). Again define survey as monitoring the locust populations and control as reducing them. Both of these activities sit under the umbrella of 'locust management'. Also mention forecasting, campaign management, contingency planning, evaluation etc. In order for all of these activities to function, staff must be TRAINED – hence the training element of this course.</p>	OHT (I3j)
	<p>9. Q&A: Ask what are the possible negative consequence of locust control. Prompt for:</p> <ul style="list-style-type: none"> • Risk to people • Risk to livestock, bee keeping, etc • Risk to unique environments • Could also include the burden of monetary costs of control. <p>Make the point that we are interested in safe (see points above) and efficient (maximum impact with least cost) control operations.</p>	PS list
	<p>10. Q&A: Is eradication the aim? No, locusts play an important part in the ecosystem - we want to chop off the peaks of the plague bar chart, and manage their numbers at an acceptable level. Anyway, even if we tried to eradicate them, it would probably be impossible.</p>	OHT (I3k) Show OHT (I3e) again with a piece of paper over the bar chart peaks
Summary & Conclusion	<p>1. Q&A (to test knowledge). Ask how locusts affect people and what are the main management strategies. Is eradication the aim in locust control?</p>	PS list
	<p>2. Present: (to summarize). Summarise: old pest, sporadic devastation, eradication not the aim - just remove the population peaks, pros and cons of early/late intervention, why survey and control are important. But however much survey and control improve, there are still likely to be outbreaks, upsurges and plagues from time to time.</p>	OHT (I3l)
	<p>3. Present (to lead into next session): Now lets begin to think about the process of survey in more detail.</p>	

Survey Sessions

S1	Session Summary	Duration
	Introduction to locust surveys	20 minutes

Aim: To introduce the survey portion of the course so that trainees have a concept of the section and its component sessions and to raise their interest and motivation in the subject.

Objectives: The trainee will discuss practical problems they face in their country during survey and recognize the need for finding reasonable solutions.

Key survey points

- Must make surveys
- Problems: resources, security, access, detection

Equipment:

- A card for each group with a different survey problem

Preparation:

- Prepare four cards (or pieces of paper) each with a different problem that could realistically be faced in a locust affected country. The problem should be expressed in a single sentence, followed by “What do you do?”. See examples below.

Guidelines page references: none

S1	Session Plan	Duration
	Introduction to locust surveys	20 minutes

SECTION	TECHNIQUE AND CONTENT	AIDS
Introduction (5 mins)	<p>1. Indoor exercise: <i>Grab the attention of the trainees (and initiate group dynamics) by giving each group a different problem written on a card. For example,</i></p> <ul style="list-style-type: none"> You think that there might have been some rains and maybe some locusts present somewhere but you have no information. What do you do? You hear on the news that swarms are invading your country. What do you do? Locals report large locust infestations? What do you do? You do not think that it has rained or there are any locusts. What do you do? 	cards
	<p>2. Q&A group: Ask each group to read their problem and ask another group to quickly answer it with the first thing that comes to their minds. <i>Prompt for: make a survey in all cases</i></p>	
Core (10 mins)	<p>1. Q&A (everyone): What problems do you face when making surveys?</p> <ul style="list-style-type: none"> When, where, how do we look for locusts? How do we know where to stop? Can we find all the infestations? <p><i>This should be a general but short discussion. Do not let individuals speak too long or dominate.</i></p>	PS list
Summary & Conclusion (5 mins)	<p>1. Present (to summarize): It is clear that surveying is not easy and that there are many difficulties involved.</p>	
	<p>2. Present (to lead into next session): This portion of the training course will address these issues so that by the end of the course you should all be able to carry out good and effective surveys.</p>	

<h1>S2</h1>	Session Summary	Duration
	Is it possible to find all locust infestations in the field?	3.5 hours

Aim: To demonstrate that it is impossible to find all of the locust infestations in the field using current survey techniques, so that trainees appreciate that judgements have to be made on incomplete information.

Objectives: The trainee will explain why surveys cannot detect all locust infestations and estimate what proportion of the infestations are likely to be found in different environmental and locust circumstances.

Key survey points

- Find and treat 90% to reduce locust populations
- Difficult to find 90%
- Cannot find all locust populations

Equipment:

- PS, pens, eraser
- Enough dark coloured gravel (up to 1.5 tonnes) to make about 100 one m² patches
- 100 small blocks of wood
- Several shovels, buckets
- Two pickup trucks with laborers
- Two separate areas of about 1 km² each
- Enough GPS for two groups
- Extra batteries

Preparation:

- Find two areas of typical Desert Locust habitat, each about 1 km² in size with distinct boundaries if possible. They should be at least 0.5 km away from each other.
- Make small 1 m² sized hopper patches from dark gravel using the shovels and buckets. Be careful not to drive to each patch as trainees can easily follow the vehicle's tire tracks to find the patches. Place a small wooded block as a marker in each patch. Patches should be placed at the base of vegetation and in depressions, in clumps and in isolation.
- One area should have a low-density distribution of patches, say about 20, while the other should have a higher density, say about 80. Keep track of the total number of patches placed in each area.
- Make one example patch at each location or at a central meeting point.
- This can be done several days in advance and takes about 2-3 hours to prepare.

Guidelines page references: none

S2	Session Plan	Duration
	Is it possible to find all locust infestations in the field?	3.5 hours

SECTION	TECHNIQUE AND CONTENT	AIDS
Introduction (5 mins)	1. Q&A (everyone): When you make surveys, how much of the total locust populations present do you find, all, half, less than half? We have designed a field exercise to investigate this.	
Core (3 hrs)	1. Present: In the classroom, divide trainees into two groups. Explain that reports have been received from two areas of a number of small (1 m ²) hopper patches typical in the early stages of an outbreak. Each group will go to an area and search for these. There is unlimited time. Ask each group what equipment they want to take. During the drive to the field, they should organize amongst themselves how they will search.	PS sketch
	2. Field exercise: Once in the field, show each group an example of a patch and indicate the boundaries of their area to search. Give them unlimited time but note the time that they used in organizing themselves and in undertaking the survey. Once a patch is found, the block should be collected. This allows you to determine how many patches were found.	
Summary & Conclusion (25 mins)	1. Q&A (individual) (to test knowledge): <i>[In the field]</i> How many patches did each group find? How did you organize yourselves? How long did you spend?	
	2. Present (to summarize): Indicate the total number of patches present compared to what was found. This illustrates that it is nearly impossible to find all hopper patches even when we have the large number of people available to search one km ² . In practice, we are not likely to have such resources. We must realize that survey is just a process of sampling, giving us a rough idea what locust populations are present. It is not possible to find all infestations.	
	3. Present (to lead into next session): Now, we will return to the training centre and look at how we put everything that we have learned so far together.	

S3	Session Summary	Duration
	Are surveys really necessary?	20 minutes

Aim: To explain the importance of making surveys, so that trainees will carry out surveys as part of locust monitoring in order to reduce the frequency of locust outbreaks and plagues.

Objectives: The trainee will state the reasons for making surveys.

Key survey points

- If no surveys, cannot know what the situation is
- Basis of early warning and current plague prevention strategy

Equipment:

- PS, pens, eraser
- OHT (S3 set)

Preparation: none

Guidelines page references: S4-5

<h1>S3</h1>	Session Plan	Duration
	Are surveys really necessary?	20 minutes

SECTION	TECHNIQUE AND CONTENT	AIDS
Introduction (5 mins)	<p>1. Q&A (everyone): What do we mean when we say “survey”?</p> <ul style="list-style-type: none"> • Going in a 4WD (or by air) to visit desert areas • Checking ecological conditions • Asking locals about locusts, rainfall, vegetation • Collecting and recording data 	
Core (10 mins)	<p>1. Q&A (everyone): Does your country make such surveys? Why?</p> <ul style="list-style-type: none"> • No idea of field conditions or locust situation • Early warning of developments • Strategy to prevent plagues 	
	<p>2. Q&A (everyone) Why do you need to make surveys – isn’t it easier, cheaper and better just to wait for the locusts to come first, then act? The donors will always assist in emergencies!</p>	
	<p>3. Q&A (individual): Prompt for specific reasons to make a survey (“convince me”).</p>	PS list
	<p>4. Present: summary illustration</p>	OHT (S3a)
Summary & Conclusion (5 mins)	<p>1. Q&A (individual) (to test knowledge): Why are you making a survey? <i>Prompt for: to collect information, early warning, planning</i></p>	
	<p>2. Present (to summarize): Emphasize that survey is the BASIC ingredient in Desert Locust early warning, monitoring, control and plague prevention programmes. If surveys are not made, how do you know if there are locusts or green vegetation and where. Survey results are used by many different people for planning and forecasting not only in your country but by others such as neighbouring countries and FAO.</p>	OHT (S3a)
	<p>3. Present (to lead into next session): Now, let’s look at exactly what information to collect and how for each of these, starting with the first one</p>	

S4	Session Summary	Duration
	What is the survey process?	30 minutes

Aim: To introduce a logical step-by-step framework for carrying out Desert Locust surveys so that trainees can apply these in making locust surveys.

Objectives: The trainee will identify and prioritize the necessary steps in surveying for Desert Locusts and explain how different locust situations and habitat conditions affect this process.

Key survey points

- Planning, preparation, implement (collect data), follow-up
- Maximum amount of information in shortest time with least resources

Equipment:

- PS, pens, eraser
- OHTs (S4 set)
- XS4 exercise sheets and separate phrases

Preparation:

- Make photocopies of XS4a exercise sheet, one per group
- Make photocopies of XS4b and cut all the same size to fit boxes on XS4, one set per group
- Place the appropriate phrase over each item on OHT S4b, secured with a piece of tape

Guidelines page references: S2-3

S4	Session Plan	Duration
	What is the survey process?	30 minutes

SECTION	TECHNIQUE AND CONTENT	AIDS
Introduction (5 mins)	<p>1. Role play: Imagine that you are going to visit your family in another town. Do you just jump into your car and go, or do you do something before that? <i>Prompt for: call ahead to see if they are home, directions, pack bags, check the car (bus or train schedule)</i></p>	
Core (20 mins)	<p>1. Q&A (everyone): Now think about surveys. We know why it is important to make surveys, but how do we go about organizing and undertaking a survey? Surely there must be a systematic approach or something similar to how we organize ourselves to go on a family visit. In other words, things to do first, second and so on. Prompt for generalities only (no details):</p> <ul style="list-style-type: none"> • Planning • Preparation • Implementation (collecting data) • Follow-up 	PS List
	<p>2. Indoor exercise: Show blank skeleton OHT of the survey process and give XS4a handout of the same and individual phrases on XS4b to each group. They should prioritize and order the phrases on the skeleton (15 min). One group should quickly present their completed skeleton or the trainer can go through the OHT (S4b), uncovering each item one at a time, after everyone agrees.</p>	OHT (S4a, b) XS4 a and b
Summary & Conclusion (5 mins)	<p>1. Q&A (individual) (to test knowledge): Why should we have such an organized approach to planning surveys? <i>Prompt for: more effective and efficient use of resources, so as not to forget anything</i></p>	
	<p>2. Present (to summarize): A logical approach is required in monitoring Desert Locust and their habitat. This is referred to as the survey process, consisting of planning, implementation, reporting and followup. Emphasize that effective surveys are a result of good initial planning as well as collecting all of the required data, recording it, quickly transmitting it to those who need it for planning, decision-making and forecasting. Remember that you want to collect the maximum amount of information in the shortest possible time, using the minimum resources.</p>	OHT (S4b)
	<p>3. Present (to lead into next session): Now, let's look at the first item (planning) in some more detail.</p>	

S5	Session Summary	Duration
	Planning and making surveys: who, where, when?	60 minutes

Aim: To teach how to plan and make surveys so that trainees realize that well planned and effective surveys make it easier to determine the current locust situation and habitat conditions.

Objectives: The trainee will explain what decisions have to be made when planning and making locust surveys including who, where and when.

Key survey points

- Who (qualified, reliable)
- Where (most likely to find locusts)
- When (during the year, during the day)

Equipment:

- PS, pens, eraser
- OHTs (S4b, S5 set)

Preparation: none

Guidelines page references: S4-9, 48-53

S5	Session Plan	Duration
	Planning and making surveys: who, where, when?	60 minutes

SECTION	TECHNIQUE AND CONTENT	AIDS
Introduction (5 mins)	1. Present: Recall that surveys must be well organized in order to be effective.	
Core (50 mins)	<p>1. Q&A (everyone): Now let's just concentrate on the first item on our list: planning. What are some of the decisions that have to be made when planning a survey?</p> <ul style="list-style-type: none"> • who should make a survey • where to make a survey • when to make a survey • whether it is an assessment or a search survey • whether it is a ground or aerial survey • what equipment is required for the survey <p><i>Do not worry about the order of the listed items. Briefly explain each item.</i></p>	PS list
	<p>2. Q&A (individual): Is there a logical order or process in deciding which item to do first? Reorder the list and show summary OHT.</p>	OHT (S5a)
	<p>3. Q&A (everyone): Who makes surveys in your country? <i>List these in left side of a table.</i></p>	PS table
	<p>4. Q&A (individual): Prompt for other sources of information (travelers, nomads, farmers, villagers, security forces). <i>Add these to the above list.</i></p>	
	<p>5. Q&A (individual): Are some of these persons or sources more reliable than others? <i>Make table showing person and experience.</i></p>	PS table
	<p>6. Present: Emphasize that different people can provide information but accurate information can only come from qualified field officers.</p>	OHT (S5b)

	<p>7. Q&A (individual): Where do you make surveys and why?</p> <ul style="list-style-type: none"> • Favourable (recent rains, green) areas • Recently infested areas • Traditional (historical) habitats • Areas reporting locusts, vegetation, or rainfall (to confirm such reports) • Areas where there is an absence of information • Based on initial aerial survey or remote sensing <p><i>Explain each item on the list.</i></p>	PS list
	<p>8. Present: Emphasize that surveys are a form of sampling. They should be conducted in those areas where locusts are most likely to be present (don't waste time and resources for unlikely areas). This can vary from country to country but experienced officers usually know the traditional areas and where to look. However, these places are not fixed and they vary from year to year depending on rainfall and previous infestations. Survey must be done off-road.</p>	OHT (S5c)
	<p>9. Present: Apart from the common method of stopping and checking sandy areas with green vegetation, some people talk about other methods. For example, a systematic approach where, say, you stop every 10 km and check for locusts and vegetation. This may give you an idea of the habitat conditions but you may miss important locust infestations. Another method could be to stop at fixed locations but we have seen that these locations vary year to year because of the erratic rainfall. Neither of these methods are recommended for Desert Locust surveys.</p>	OHT (S5d)
	<p>10. Q&A (individual): How do teams decide where to make surveys and where to stop? How many stops should be made in one day? What is the distance between stops? How would a large continuous green area say 20x100 km be surveyed?</p> <p><i>Prompt for: varies according to habitat and survey results but usually about 6 stops in a morning or an afternoon (depending on length of time at each stop – come back to this later).</i></p>	OHT (S5e)
	<p>11. Q&A (everyone): When are surveys made during the year and why?</p> <ul style="list-style-type: none"> • On a regular basis during rainy season • After rainfall (about 2 weeks to allow vegetation to grow) • After reports of locust • If there is a threat of invasion <p><i>Prompt for: need rains and green vegetation.</i></p>	PS list

	<p>12. Present: Emphasize that Desert Locust do not occur exactly at the same time every year (like other pests). They are not seasonal but can coincide with seasonal rains as well as after unusual rains outside the season. Surveys must be carried out regularly (monthly) in key countries and areas, and on an ad-hoc basis in peripheral countries based on regional situation, forecast & threat.</p>	OHT (S5f)
	<p>13. Q&A (individual): When are surveys made during the day and why?</p> <ul style="list-style-type: none"> • After sunrise to before midday • Late afternoon to sunset <p><i>Prompt for: when locusts are most visible, depending on temperature, weather and habitat conditions.</i></p>	OHT (S5g)
Summary & Conclusion (5 mins)	<p>1. Q&A (individual) (to test knowledge): If hoppers are present, what do you? Bands? Swarms? Rain? Green vegetation? Nothing? Whom can you rely on for accurate survey? What about Agricultural extension agents? Whose information must be reconfirmed? Is it necessary to survey your entire country? Can you make surveys throughout the entire day during the winter?</p>	
	<p>2. Present (to summarize): Show the completed part of the skeleton OHT. Different situations (locusts, habitat conditions) call for different decisions to make when planning locust surveys. Surveys must be undertaken by qualified and experienced locust field officers supplemented by agricultural extension agents and scouts. Surveys should be regularly undertaken in areas where locusts are most likely to be present and when conditions are good. They should be made from just after sunrise to before midday and again in the late afternoon when locusts are mostly easily seen.</p>	OHT (S4b)
	<p>3. Present (to lead into next session): Now, let's look at exactly what we mean with each item, starting with the first one (who makes surveys).</p>	

S6	Session Summary	Duration
	What are assessment and search surveys?	1 hour

Aim: To teach the two types of surveys that can be made so that the trainee can choose the most appropriate type for estimating the locust situation in the field.

Objectives: The trainee will explain the differences between assessment and search and identify when each should be used.

Key survey points

- Assessment – overview of situation
- Search – detailed to find control targets

Equipment:

- PS, pens, eraser
- OHTs (S4b, S6 set)
- XS6a, XS6b exercise sheets
- A4 map with invisible bands and two different magic pen colours for each pair of trainees

Preparation:

- Make photocopies of XS6a exercise sheets, one per trainee
- Make photocopies of XS6b exercise sheets, one per two trainees
- Prepare each map the night before from a master map transparency. Place the master map transparency on the overhead projector, turn it on, and place a blank A4 map on top of the transparency. Use the invisible pen to draw the bands on the A4 map. Repeat this enough times so that there is one map per two trainees. Label the maps (A, B, C, D).

Guidelines page references: S10-11

S6	Session Plan	Duration
	What are assessment and search surveys?	1 hour

SECTION	TECHNIQUE AND CONTENT	AIDS
Introduction (5 mins)	<p>1. Q&A (individual): You go on a survey and find a hopper band, what do you do next (stay, call others, search, continue survey)? A swarm? Solitary adults? Solitary hoppers? <i>Just accept the answers provided with no discussion.</i></p>	
Core (50 mins)	<p>1. Q&A (everyone): What does your decision depend on? <i>List responses; prompt for: vegetation, survey results, locust situation (recession, outbreak, plague)</i></p>	PS list
	<p>2. Present: Explain about presence of significant populations and the risks that these will develop further, and how it affects decision making for assessment, search and control planning. Show decision/risk flow chart OH. Introduce the idea of two different survey types depending on initial survey findings: assessment and search.</p>	OHT (S6a)
	<p>3. Q&A (individual): Is there a relationship between organizing surveys and the results of a survey? <i>Prompt for the idea that surveys must be organized according to habitat conditions and locust population type, if known in advance.</i></p>	
	<p>4. Q&A (individual): Do you do something different when they find such populations (e.g. solitary adults, hopper bands)?</p>	
	<p>5. Q&A (everyone): Who can explain the difference between assessment and search survey? Are both used?</p>	OHT (S6b)
	<p>6. Indoor exercise: Explain the assessment exercise. Each trainee answers the exercise questions (15 min)</p>	OHT (S6c) XS6a
	<p>7. Q&A (individual): Go through the answers after completion and write on OHT.</p>	OHT (S6c)
	<p>8. Indoor exercise: Explain the assessment/search exercise. Remind that assessment is done first, then search. Draw sample assessment and search survey lines on OHT and demonstrate magic pens. Hand out the maps, making sure that each pair of trainees within a group has a different labelled map. Trainee pairs complete the exercise (20 min).</p>	OHT (S6d) XS6b

SURVEY

	9. Q&A (everyone): Tally the results (number of bands) in both exercises, indicating percent total. Show OHT with bands.	OHT (S6e, f)
Summary & Conclusion (5 mins)	1. Present (to summarize): Explain that the total number of bands were 50 which represents a realistic infestation level (2%). Note that more bands were found during search than assessment. This is to be expected.	PS table
	2. Q&A (individual) (to test knowledge): If no bands were found during assessment, would you have thought that the area was free of locusts and no further survey/search is required? <i>Emphasize the difficulty of finding all bands and the shortcomings of survey.</i>	OHT (S6d,f)
	3. Present (to lead into next session): Now, let's look at the next item in our decision list.	OHT (S4b)

S7	Session Summary	Duration
	What are assessment and search surveys? [simulation]	30 minutes

Aim: To teach the two types of surveys that can be made so that the trainee can chose the most appropriate type for estimating the locust situation in the field.

Objectives: The trainee will explain the differences between assessment and search and identify when each should be used.

Key survey points

- Assessment – overview of situation
- Search – detailed to find control targets

Equipment:

- PS, pens, eraser
- OHTs (S6 set)
- Computer model
- Computers – one per group or, at the very least, one per two groups

Preparation:

- Set up computers and at least one day in advance.
- Install the simulation software on each computer
- Test each computer and software programme

Guidelines page references: S10-11

S7	Session Plan	Duration
	What are assessment and search surveys? [simulation]	30 minutes

SECTION	TECHNIQUE AND CONTENT	AIDS
Introduction (5 mins)	<p>1. Q&A (individual): You go on a survey and find a hopper band, what do you do next (stay, call others, search, continue survey)? A swarm? Solitary adults? Solitary hoppers? <i>Just accept the answers provided with no discussion.</i></p>	
Core (35 mins)	<p>1. Q&A (everyone): What does your decision depend on? <i>List responses; prompt for: vegetation, survey results, locust situation (recession, outbreak, plague)</i></p>	PS list
	<p>2. Present: Explain about presence of significant populations and the risks that these will develop further, and how it affects decision making for assessment, search and control planning. Show decision/risk flow chart OH. Introduce the idea of two different survey types depending on initial survey findings: assessment and search.</p>	OHT (S6a)
	<p>3. Q&A (individual): Is there a relationship between organizing surveys and the results of a survey? <i>Prompt for the idea that surveys must be organized according to habitat conditions and locust population type, if known in advance.</i></p>	
	<p>4. Q&A (individual): Do you do something different when they find such populations (e.g. solitary adults, hopper bands)?</p>	
	<p>5. Q&A (everyone): Who can explain the difference between assessment and search survey? Are both used?</p>	OHT (S6b)
	<p>6. Simulation: Introduce the computer model of survey and demonstrate an assessment survey and a search. Allow trainees to try doing either an assessment or a search, then an assessment followed by a search (20 min).</p>	
Summary & Conclusion (5 mins)	<p>1. Q&A (everyone): Did you feel that you found more of the locust infestations during assessment survey, searching or a combination? Why?</p>	
	<p>2. Present (to summarize): Explain that the total number of bands represent a realistic infestation level (2%). If more bands were found during search than assessment, this is to be expected.</p>	

	<p>3. Q&A (individual) (to test knowledge): If no bands were found during assessment, would you have thought that the area was free of locusts and no further survey/search is required? <i>Emphasize the difficulty of finding all bands and the shortcomings of survey. Show total infestation OHT.</i></p>	<p>OHT (S6d,f)</p>
	<p>4. Present (to lead into next session): Now, let's look at the next item in our decision list.</p>	

S8	Session Summary	Duration
	What are the different survey methods?	20 minutes

Aim: To explain what information should be collected during a survey and the different ways to collect this, so that the trainee can decide the best survey method to use for evaluating the locust and habitat conditions.

Objectives: The trainee will list what information should be collected and identify which methods could be used to do this.

Key survey points

- Information: location, habitat, locust, control
- Methods: foot, vehicle, aerial

Equipment:

- PS, pens, eraser
- OHTs (S4b, S8 set)

Preparation: none

Guidelines page references: S12-13, 26-27

<h1>S8</h1>	Session Plan	Duration
	What are the different survey methods?	20 minutes

SECTION	TECHNIQUE AND CONTENT	AIDS
Introduction (5 mins)	1. Present: Brief review of decisions to make when planning surveys, emphasizing that there are several different survey methods.	OHT (S4b)
Core (10 mins)	1. Q&A (everyone): What information should be collected by a survey? General categories are: <ul style="list-style-type: none"> • Location • Habitat • Locust • Control <i>Do not go into details at this stage.</i>	PS list OHT (S8a)
	2. Q&A (individual): Prompt for survey methods that could be used to do this (foot transect, vehicle, aerial).	OHT (S8b)
	3. Q&A (everyone): Prompt for characteristics of different methods to show advantages and disadvantages of each (area coverage, ease, time to do, what can/can't find, equipment required, cost, terrain to cover).	PS table
Summary & Conclusion (5 mins)	1. Q&A (individual) (to test knowledge): When should you make a vehicle transect instead of a foot transect? <i>Prompt for: when there is homogenous vegetation over a relatively large area such as a plain.</i>	
	2. Present (to summarize): Survey methodology is linked to the type of information that is to be collected. Each one has its own advantages and disadvantages and there are situations in which one is more appropriate than the other.	OHT (S8c)
	3. Present (to lead into next session): Now, let's look at each one of these methods, starting with the first one	

S9	Session Summary	Duration
	How are foot transects made?	30 minutes

Aim: To teach how to make a foot transect so that trainees can estimate the presence of locusts and the state of the habitat.

Objectives: The trainee will be able to correctly name, describe and put in order the steps that are carried out at a survey stop during a foot transect.

Key survey points

- Take coordinates (GPS)
- Check habitat (vegetation, soil)
- Count locusts (wind)
- Record data (form, eLocust)

Equipment:

- PS, pens, eraser
- OHTs (S8a, b, S9 set)

Preparation: none

Guidelines page references: S14-15

S9	Session Plan	Duration
	How are foot transects made?	30 minutes

SECTION	TECHNIQUE AND CONTENT	AIDS
Introduction (5 mins)	<p>1. Present: survey methods are:</p> <ul style="list-style-type: none"> • Foot • Vehicle • Aerial 	OHT (S8b)
Core (20 mins)	<p>1. Q&A (everyone): How do you make a foot transect in your country/region at present <u>or</u> how would you make a foot transect?</p> <ul style="list-style-type: none"> • Stop in vegetation • Take coordinates • Walk into wind • Walk apart • Check the habitat • Count the adults • Count the hoppers • Walk 100 – 300 m • Complete the form • Go to the next stop <p>Don't worry about the sequence yet!</p>	PS list
	<p>2. Q&A (individual): Prompt for specifics (wind, transect length and width, counting, sample efficiency).</p>	
	<p>3. Q&A (everyone): Organise the PS list into above sequence</p>	PS list
	<p>4. Present: summary illustration</p>	OHT (S9a)
Summary & Conclusion (5 mins)	<p>1. Q&A (individual) (to test knowledge): Why are you making a foot transect? <i>Prompt for: to collect information on vegetation, rainfall, locusts</i></p>	
	<p>2. Present (to summarize): Survey methodology is linked to the type of information that is to be collected</p>	OHT (S8a)
	<p>3. Present (to lead into next session): Now, let's look at exactly what information to collect and how, for each of these, starting with the first one</p>	

S10	Session Summary	Duration
	What rainfall information should be collected?	20 minutes

Aim: To teach what rainfall data should be collected during a survey so that trainees appreciate its relationship to habitat conditions for locusts.

Objectives: The trainee will explain which rainfall data should be collected, how to do this and why it is important by giving several examples.

Key survey points

- Location, date, quantity
- Rain station coverage

Equipment:

- PS, pens, eraser
- OHTs (S8a, S10 set)

Preparation: none

Guidelines page references: S28-29

S10	Session Plan	Duration
	What rainfall information should be collected?	20 minutes

SECTION	TECHNIQUE AND CONTENT	AIDS
Introduction (5 mins)	<p>1. Present: review the main categories of information to be collected during a survey:</p> <ul style="list-style-type: none"> • Location • Habitat (includes rainfall) • Locust • Control 	OHT (S8a)
Core (10 mins)	<p>1. Q&A (everyone): Why is rainfall important? To moisten the soil (allows locust laying) For vegetation development (allows locust survival)</p>	
	<p>2. Q&A (individual): What do we want to know about rainfall and how should this information be collected?</p> <ul style="list-style-type: none"> • Location • Date (including duration) • Quantity <p><i>Prompt for the sources of this information (interviewing locals, farmers, extension agents during a survey).</i></p>	PS list
	<p>3. Q&A (individual): If it rained 4 months ago, is that important?</p>	
	<p>4. Present: Emphasize that precise data (in mm) will usually not be available from people in the field. Define relative quantities (low, moderate, high).</p>	OHT (S10a)
	<p>5. Q&A (individual): Can we rely on meteorological stations to give us the complete picture of where it has rained? Explain that the spatial validity of station's observations (5 km) combined with the low number of stations in locust areas are not sufficient.</p>	OHT (S10b)
Summary & Conclusion (5 mins)	<p>1. Q&A (individual)ed (to test knowledge): What happens if you have no idea if it has rained or not? <i>Prompt for: make a survey and ask the locals.</i></p>	
	<p>2. Present (to summarize): Even though it is not precise, the most important source of rainfall data is from surveys. This can be supplemented by national rainfall station data.</p>	
	<p>3. Present (to lead into next session): Now, let's look at the next piece of information to collect</p>	

S11	Session Summary	Duration
	How is ecological data collected?	30 minutes

Aim: To teach what vegetation and soil data should be collected and how to do this, so that trainees know how to estimate the habitat conditions for locust breeding and survival.

Objectives: The trainee will correctly estimate the density and state of vegetation as well as soil moisture at a survey stop using several examples.

Key survey points

- Vegetation density, condition, type
- Soil moisture
- Related to locust biology

Equipment:

- PS, pens, eraser
- OHTs (S8a, S11 set)

Preparation: none

Guidelines page references: S28-31, B18-21

S11	Session Plan	Duration
	How is ecological data collected?	30 minutes

SECTION	TECHNIQUE AND CONTENT	AIDS
Introduction (5 mins)	<p>1. Present: review the main categories of information to be collected during a survey:</p> <ul style="list-style-type: none"> • Location • Habitat (includes vegetation) • Locust • Control 	OHT (S8a)
Core (20 mins)	<p>1. Q&A (everyone): What vegetation data should be collected on surveys? How? What is each used for? How long does it take to collect? List all possible responses, but be sure to include:</p> <ul style="list-style-type: none"> • Vegetation density • Condition (greenness) • Natural or crops 	OHT (S11a)
	<p>2. Present: Emphasize that it takes longer to collect more details so you must weigh this when deciding what to collect. You cannot collect every detail about the vegetation. This not only takes too long but also will be difficult to transmit all of these data to the Locust HQ.</p>	
	<p>3. Q&A (individual): How is the state or condition of vegetation determined (greening, green, drying, dry)?</p>	OHT (S11b)
	<p>4. Q&A (individual): How is the density of vegetation estimated (low, medium, dense)?</p>	OHT (S11c)
	<p>5. Q&A (everyone): Why do we need to know about soil moisture? <i>Prompt for: suitable for laying eggs.</i></p>	
	<p>6. Present: Relate the depth to check if the soil is moist with the depth of laying by the locust female. Warn that surface may look dry when underneath it can be moist enough for breeding.</p>	OHT (S11d)
	<p>7. Q&A (individual): How can soil moisture be measured? Are precise measurements necessary? How many times should the soil be checked at the survey site? <i>Prompt for: dig down to about 15cm with shoe, shovel, stick, and then feel with hand if it clumps. Precision not required. Check a few times if necessary.</i></p>	OHT (S11e)

<p>Summary & Conclusion (5 mins)</p>	<p>1. Q&A (individual) (to test knowledge): Is it useful to collect details of all plant species at the survey stop? <i>Prompt for: it can be but this may take too long; more of a research activity</i></p>	
	<p>2. Present (to summarize): The most important data to collect about the vegetation is its greenness and density, and for soil is its moisture. Other information is supplementary, takes time to collect and may not be very useful for planning or forecasting.</p>	<p>OHT (S11a)</p>
	<p>3. Present (to lead into next session): Now, let's look at the next piece of information to collect</p>	

S12	Session Summary	Duration
	What locust data should be collected?	60 minutes

Aim: To teach what locust data should be collected at a survey stop so that trainees realize which data is required in order to assess the current situation.

Objectives: The trainee will recall which locust data should be collected at the survey site and explain the importance of each item.

Key survey points

- Presence/absence
- Appearance (phases)
- Behaviour (link to phase)
- Maturity (stages)
- Density (methods)
- Size (methods)
- Sex

Equipment:

- PS, pens, eraser
- OHTs (S8a, S12 set)

Preparation: none

Guidelines page references: S32-45, B2-31

S12	Session Plan	Duration
	What locust data should be collected?	60 minutes

SECTION	TECHNIQUE AND CONTENT	AIDS
Introduction (5 mins)	<p>1. Present: review the main categories of information to be collected during a survey:</p> <ul style="list-style-type: none"> • Location • Habitat (includes soil moisture) • Locust • Control 	OHT (S8a)
Core (50 mins)	<p>1. Q&A (everyone): What Desert Locust data should be collected?</p> <ul style="list-style-type: none"> • Presence/absence • Appearance • Behaviour • Maturity • Density • Size <p><i>If other data is mentioned, discuss why and relate data quantity with collection time at survey stop.</i></p>	PS list
	<p>2. Q&A (individual): Prompt for specifics as to why each item listed is collected. Explain each item and show summary OHT.</p>	OHT (S12a)
	<p>3. Q&A (individual): How many phases does a Desert Locust have? What are these? <i>Prompt for: solitary, transiens, gregarious.</i></p>	OHT (S12b) OHT (S12b1, 12b2)
	<p>4. Q&A (everyone): Which behaviour is more significant than others? Link locust behaviour with appearance. Why is this important? How can you determine the phase? <i>Prompt for: copulating, laying, flying, grouping are important to note; to determine phase; behaviour first, followed by appearance (colour).</i></p>	OHT (S12c)
	<p>5. Present: Define terminology (isolated, scattered, grouping) for adults and hoppers</p>	OHT (S12d)
	<p>6. Q&A (individual): What are the stages of locust hoppers and adults? <i>Prompt for: egg, hopper instars 1-6, fledgling, immature, maturing, mature adult.</i></p>	PS list
	<p>7. Q&A (individual): How are these stages determined? <i>Prompt for: colour, eye stripes, and size.</i></p>	OHT (S12e)

	<p>8. Q&A (everyone): What is density? Why is it important? How is it determined? <i>Prompt for: number of locusts per unit area; indicates scale of infestation; per transect, per m², per ha, per km².</i></p>	
	<p>9. Present: Explain methods to determine the density of adults and hoppers, and how they should be reported. Do hopper example.</p>	<p>PS sketch OHT (S12f, g) OHT (S12h, i)</p>
	<p>10. Present: Explain methods to determine the density of bands and swarms, and how they should be reported. Define density terminology.</p>	<p>OHT (S12j)</p>
	<p>11. Q&A (individual): What does size mean? Why is it important? How should it be determined and reported? <i>Prompt for: area infested or of the band or swarm; indicates scale of the problem; m², ha km².</i></p>	
	<p>12. Present: Explain methods to determine the size of adult, hopper, band, swarms and flying swarm infestations. Define size terminology.</p>	<p>PS sketch OHT (S12k, l) OHT (S12m)</p>
	<p>13. Q&A (individual): How can you tell the difference between male and female adults? <i>Prompt for: females with hook for laying.</i></p>	<p>OHT (S12n)</p>
Summary & Conclusion (5 mins)	<p>1. Q&A (individual) (to test knowledge): What locust data should be collected at the survey site?</p>	
	<p>2. Present (to summarize): It is important to collect all of the required locust data at each survey site. This data is important for planning, control and forecasting.</p>	<p>OHT (S12a)</p>
	<p>3. Present (to lead into next session): Now, let's look at another way to make a survey besides foot transects.</p>	

S13	Session Summary	Duration
	How are vehicle transects made?	40 minutes

Aim: To teach how to make a vehicle transect as a method of estimating the presence of locusts and the state of the habitat.

Objectives: The trainee will explain how to make a vehicle transect, when it can be used and state what information can be collected.

Key survey points

- Large areas of green vegetation
- Conditions: wind speed < 6m/s, temperature > 20C
- Method: low vehicle speed, count locusts in front

Equipment:

- PS, pens, eraser
- OHTs (S8b, S13 set)
- 4WD vehicle used for survey and driver

Preparation:

- Have the vehicle and driver at the site

Guidelines page references: S16-17, A38-39

S13	Session Plan	Duration
	How are vehicle transects made?	40 minutes

SECTION	TECHNIQUE AND CONTENT	AIDS
Introduction (5 mins)	1. Present: survey methods are: foot vehicle aerial	OHT (S8b)
Core (30 mins)	1. Q&A (everyone): Who has made vehicle transects and how did you do it?	PS list
	2. Present: Explain methodology for vehicle transects and discuss specifics (wind, double-counting, length, speed, distance between, what information can be collected, can't see hoppers). <ul style="list-style-type: none"> • Drive upwind or crosswind for at least 1 km • Drive at a walking pace in low (4WD) gear • Count adults that fly up in front of the vehicle's hood • Keep track of the distance driven using the odometer • Count only when the temperature is above 20C and • Wind speed less than 6 m/s • Count adults that fly up in front of vehicle 	PS sketch OHT (S13a)
	3. Demonstration: Have a 4WD vehicle drive at walking pace in low gear so trainees see how slow this actually is. A trainee should walk along side the vehicle.	
Summary & Conclusion (5 mins)	1. Q&A (individual) (to test knowledge): When is it better to make a vehicle transect rather than a foot transect? <i>Prompt for: in large areas of homogenous vegetation such as green plains.</i>	
	2. Present (to summarize): A vehicle transect can cover larger areas than foot transects but it is very difficult to detect hoppers and soil moisture cannot be determined.	
	3. Present (to lead into next session): Now, let's look at another method of making surveys.	

S14	Session Summary	Duration
	How are ground surveys organized?	20 minutes

Aim: To teach how to organize extra field officers and vehicles so that trainees can efficiently use additional resources when making ground surveys.

Objectives: The trainee will demonstrate the ways covered in the session of organizing extra people and vehicles when making a survey.

Key survey points

- 1+ survey officer: transects in different directions
- 1+ vehicle: leap-frog
- Maximum 15-20 min/stop
- Too much time = too few stops
- About 6 stops in morning, 6 in afternoon

Equipment:

- PS, pens, eraser
- OHTs (S14 set)

Preparation: none

Guidelines page references: S14-15, 24-25

S14	Session Plan	Duration
	How are ground surveys organized?	20 minutes

SECTION	TECHNIQUE AND CONTENT	AIDS
Introduction (5 mins)	1. Present: So far, we have discussed two ground survey methods (foot and vehicle). Now we would like to see how we could best organize these ground surveys.	
Core (10 mins)	1. Q&A (individual): How do you organize yourselves at a survey stop if more than one field officer is present? <i>Prompt for: make transects in separate directions, more efficient use of resources, no double counting.</i>	OHT (S14a)
	2. Q&A (individual): How surveys are done with more than one vehicle? <i>Prompt for: same as above, leapfrog.</i>	PS
	4. Present: Explain how two vehicles can “leap-frog” to cover twice the distance in the same amount of time.	OHT (S14b)
	5. Q&A (everyone): How much time should you spend at a single survey stop? <i>Prompt for: 15-20 minutes.</i>	
	6. Present: you should spend about 15-20 minutes per survey stop. If you are spending more time, you may be collecting unnecessary data or you may not be carrying out foot transects efficiently. If you add the time it takes to go from stop to stop, you should be able to make up to about six stops in the morning and another six in the afternoon.	OHT (S14c)
Summary & Conclusion (5 mins)	1. Q&A (individual) (to test knowledge): How can four vehicles be used most effectively for surveying? <i>Prompt for: best not to use so many vehicles, perhaps survey in different areas as two teams of two.</i>	
	2. Present (to summarize): In most cases, a single vehicle with a field officer is sufficient although there may be instances when more than one is necessary. In such circumstances, resources should be used effectively to cover the most area in the least amount of time.	
	3. Present (to lead into next session): Now, let’s look at another way of making a survey.	

S15	Session Summary	Duration
	How are aircraft used for surveys?	30 minutes

Aim: To teach how to use helicopters and fixed-wing aircraft in surveying as a method of estimating the presence of locusts and the state of the habitat.

Objectives: The trainee will explain how a survey is made using a helicopter and a fixed-wing aircraft, when it is appropriate and what data can be collected.

Key survey points

- Aerial survey of vegetation, adults, bands, swarms
- Helicopter advantages: can see adults and can land
- Veg survey: 300m height, 50 km track space
- Adults: 5m height, swivel tail & look backwards (helicopter)
- Bands: 50m height, 10 km track space, early AM and late PM
- Swarms: 50m height, 50 km track space, 10 AM – 5 PM

Equipment:

- PS, pens, eraser
- OHTs (S8b, S15 set)

Preparation: none

Guidelines page references: S18-21

S15	Session Plan	Duration
	How are aircraft used for surveys?	30 minutes

SECTION	TECHNIQUE AND CONTENT	AIDS
Introduction (5 mins)	<p>1. Present: survey methods are:</p> <ul style="list-style-type: none"> • foot • vehicle • aerial (divided into helicopter and fixed-wing) 	OHT (S8b)
Core (20 mins)	<p>1. Q&A (everyone): Who has done a helicopter survey? Can you explain how you did it? <i>Prompt for: flying height, speed, track spacing, what can and cannot be seen.</i> <i>Note: if no responses, give examples of using a helicopter.</i></p>	PS list
	<p>2. Present: Explain how surveys can be done with a helicopter:</p> <ul style="list-style-type: none"> • Fly about 300 m above the ground (for identifying areas of green vegetation) • Use a track spacing of 50 km • Fly towards green vegetation and level out at 5 m or less above the ground • Reduce speed to 40-50 km/h and swing the tail from side to side • Look towards the rear of the helicopter for flying locusts • Use a skilled pilot with agricultural experience 	OHT (S15a)
	<p>3. Q&A (everyone): Who has done a fixed-wing aerial survey? Can you explain how you did it? <i>Prompt for: flying height, speed, track spacing, what can and cannot be seen.</i> <i>Note: if no responses, give examples of using a fixed-wing.</i></p>	PS list

	<p>4. Present: Explain how surveys can be done with a fixed-wing aircraft:</p> <ul style="list-style-type: none"> • Use experienced pilots who know the terrain and are trained in how to make locust surveys by air. • Do not survey for more than 3 hours at a time • For finding green vegetation: • Fly about 300 m above the ground • Use a track spacing of 50 km • Survey at beginning, middle and end of rainy season • For swarms and hopper bands: • Fly about 50 m above the ground • Use a track spacing of 10 km (bands) to 50 km (swarms) • Survey when most likely to see swarms (10AM-5PM) and bands (early morning and late afternoon) • The most suitable fixed-wing aircraft for green vegetation and hopper band surveys are those with high wings to allow better visibility. A low wing configuration is more appropriate for swarm surveys when the observer • must look above the horizon. 	OHT (S15b)
<p>Summary & Conclusion (5 mins)</p>	<p>1. Q&A (individual) (to test knowledge): Should helicopters be used during recession periods? <i>Prompt for: probably not due to high cost and few locusts.</i></p> <p>Can fixed-wing aircraft be used during recessions, for what purpose, and what configuration? <i>Prompt for: green vegetation, high-wing.</i></p>	
	<p>2. Present (to summarize): Helicopters can also be used to verify unconfirmed reports of infestations and visit areas that are difficult to access by vehicle. The main advantage of using a helicopter when compared to fixed-wing aircraft is its ability to land almost anywhere and allow the field officer to get out and make a foot transect in the area of interest. Fixed-wing surveys are useful during recession periods for identifying areas of green vegetation and planning ground surveys. During increased locust activity, they can be used to spot bands and swarms. The same area should be surveyed about every 3-4 days. Bands are visible up to 0.5 km from the aircraft, medium-density swarms 10-20 km or up to 120 km. Use experienced pilots and officers.</p>	PS list
	<p>3. Present (to lead into next session): Next, we will look at what equipment should be taken on surveys.</p>	

S16	Session Summary	Duration
	What equipment should be taken on a survey?	30 minutes

Aim: To introduce the different types of equipment that should be taken on a survey in order to estimate the current locust situation and habitat conditions so that trainees take only that equipment which is most essential.

Objectives: The trainee will identify the different types of equipment and explain the importance of each.

Key survey points

- Basic equipment is essential and required
- Compass, hand lens, tally counter, map, GPS, form (eLocust)

Equipment:

- PS, pens, eraser
- OHT (S16 set)
- Compass, hand lens, hand tally counter, maps, notebook/pen/pencil, GPS, survey form, dissecting kit, sweep net, sample boxes
- Additional equipment (suggested): anemometer, hygrometer, binoculars, MicroUlva+, ruler, cap, notepad, palmtop, cage, shovel, towel, road counter, clipboard with paper & form, sunglasses, Kleenex, calculator, FAO guidelines, marker pen, tools, flashlight, pocket knife (or other items that might be available)
- One large table placed in front of the classroom

Preparation:

- Lay out the above equipment on a table in front of the classroom before the session starts

Guidelines page references: S22-23

S16	Session Plan	Duration
	What equipment should be taken on a survey?	30 minutes

SECTION	TECHNIQUE AND CONTENT	AIDS
Introduction (5 mins)	1. Present: Some basic equipment should be taken on surveys. We will try to determine the most important items. Emphasize that this equipment is to be used for collecting information during a survey.	
Core (15 mins)	<p>1. Role play: Ask someone to come up to a table in front of the classroom full of equipment and select what he/she would take on a survey. Ask others if they agree. Repeat this several times with other trainees. What would they add or leave out? Now chose only eight. Ask why are they taking each piece and what would they do with it?</p> <ul style="list-style-type: none"> • Compass • Hand lens • Hand tally counter • Map of 1:500 000 scale or less • Notebook, pen or pencil • GPS • FAO Desert Locust Survey and Control Form (or eLocust) • Dissecting kit, sweep net, sample boxes <p><i>Note: if a trainee includes items such as water, food or fuel, state that these are basic items that you take with you regardless if you are doing survey or not.</i></p>	
	2. Present: summary illustration of most important items	OHT (S16a)
Summary & Conclusion (5 mins)	1. Q&A (individual) (to test knowledge): Who is responsible for this equipment? <i>Prompt for: the field officer.</i>	
	2. Present (to summarize): Some basic equipment is required and should always be carried when on survey in order to collect the data that is needed for planning, control and forecasting.	
	3. Present (to lead into next session): Now, we will examine the use of some of this equipment in more details.	

S17	Session Summary	Duration
	How are maps used?	1.25 hours

Aim: To teach the basic concepts of latitude, longitude and map reading in navigating and visualizing areas where locusts may be present so that trainees appreciate that good orientation skills are needed for effective survey and control operations.

Objectives: The trainee will correctly identify different items on map and use it for navigation by completing an indoor exercise.

Key survey points

- Latitude (N-S) / longitude (W-E)
- $1^{\circ}=110 \text{ km}$, $1'=1.8 \text{ km}$, $1''=30\text{m}$
- Parts of a map: legend, scale, lat/long, colours
- Use ruler to determine position coordinates

Equipment:

- PS, pens, eraser
- OHTs (S17 set)
- Inflatable globe
- Large wall map
- 4 sets of 1:500,000 or less scale maps
- 6 rulers, tape
- XS17 exercise sheet

Preparation: none

- Make photocopies of XS17 exercise sheets, one per group
- Inflate the globe
- Hang up a large map on the wall next to the PS
- Position 2 rules near the wall map

Guidelines page references: A2-5

S17	Session Plan	Duration
	How are maps used?	1.25 hours

SECTION	TECHNIQUE AND CONTENT	AIDS
Introduction (5 mins)	1. Q&A (everyone): After you have made a survey, you must be able to tell someone where you went and at what places you saw important things. How do you do this?	
Core (65 mins)	1. Q&A (everyone): What are coordinates? For example, what does 2015N/3455E mean?	PS sketch
	2. Present, Q&A (individual): Explain the basics of latitude and longitude by using an inflatable globe to show how the Earth is divided up vertically and horizontally. Ask the trainees to identify the equator, prime meridian, directions. Emphasize that every point on Earth has a unique location, it is a man-made system (can't see lines of latitude except on maps). Stress the length of a degree, minute and second. <i>Tip: toss the globe to a trainee when asking them questions.</i>	PS sketch OHT (S17a) Inflatable globe
	3. Present: Explain the different parts of a map (legend, scale, lat/long, colours). Show different maps of different scales. Emphasize that a map can provide you with a picture of the area. Use a wall map.	PS sketch
	4. Present: Explain how to determine the latitude and longitude of a point on a map, and how to plot coordinates on a map. A ruler is very helpful for this.	OHT (S17b)
	5. Classroom exercise: Explain that each group will be given a map and a set of questions to answer. Give each group a 1:500k TPC map and each group should answer the questions (45-60 mins).	XS17
Summary & Conclusion (5 mins)	1. Q&A (individual) (to test knowledge): Go over each question and re-explain those in which trainees had differing answers.	OHT (S17c,d)
	2. Present (to summarize): Maps provide valuable information that can be useful during surveys. You should now be familiar with the basic concepts of latitude and longitude and the use of maps.	
	3. Present (to lead into next session): Now, let's look at another piece of equipment and see how to use it.	

S18	Session Summary	Duration
	How is a compass used?	1 hour

Aim: To teach the use of a compass and how it can be used during locust surveys.

Objectives: The trainee will demonstrate the different ways in which a compass can be used in the field.

Key survey points

- Bearing = direction
- Used for navigation, directions, wind direction
- Away from metal (vehicle)
- Find a bearing and follow a bearing

Equipment:

- PS, pens, eraser
- OHTs (S18 set)
- Compass (one per group)
- Poles and flags (one per group)
- XS18 exercise sheets

Preparation:

- Make photocopies of XS18 exercise sheets, one per group
- In a nearby open space, layout the bearings (see the compass exercise), one for each group
- Indicate the starting point with a pole or flag showing the group number, one flag per group
- Preparation should be done well before the session starts.

Guidelines page references: A6-7

S18	Session Plan	Duration
	How is a compass used?	1 hour

SECTION	TECHNIQUE AND CONTENT	AIDS
Introduction (5 mins)	1. Present: Review the useful equipment to take on a survey.	
Core (50 mins)	1. Q&A (everyone): Hold up a compass in front of the trainees. Who can explain how to use this? <i>Allow trainee to demonstrate in front of the class.</i>	
	2. Present: Introduce concepts by drawing a circle to show 360 degrees and NSEW directions. Define bearing (direction). Emphasize that a compass can be used for navigating, giving other people directions and for finding the direction of the wind or of flying swarms. The floating needle always points to North so people can orient themselves accordingly. It is more precise to give people such as pilots directions as degrees rather than as words (i.e. northwest).	PS sketch
	3. Present: Go through the steps of (a) finding the direction of an object and (b) following a given bearing.	OHT (18a,b)
	4. Demonstration: Use the compass to demonstrate (a) and (b) above by placing the compass on the OHP (turn it on) so trainees can see how the dial is turned, how the arrows line up and how the arrows move when you move the compass. Emphasize the effect of metal on compass accuracy and the proper holding of a compass. When walking, don't look at the compass but pick out an object on the same bearing (direction) that you can walk towards to help you walk in a straight line. Review OHT of procedures.	OHT (18a,b) compass
	5. Outdoor exercise. Go outside in open area and complete the exercise within each group using one compass per group. (20 min)	XS18 compass
Summary & Conclusion (5 mins)	1. Q&A (individual) (to test knowledge): How can a compass be used during survey? <i>Prompt for: to find the bearing of an object and to follow a given bearing</i>	
	2. Present (to summarize): A compass can be a very useful tool during surveys. It is even more valuable when used in combination with maps and GPS. We will see that a little later.	
	3. Present (to lead into next session): Now, let's look at one more piece of equipment and see how to use it.	

S19	Session Summary	Duration
	How is a GPS used?	1.5 hours

Aim: To teach the basic concepts of a Global Positioning System (GPS) and how to use it in order to navigate more accurately in the field.

Objectives: The trainee will correctly demonstrate the use of a GPS and use it for navigation in the field.

Key survey points

- Needs at least 3 of 24 satellites, open sky day or night, rain or shine
- Accuracy of 10m or less
- On/off, take coordinates, mark, name, store, recall, delete, GOTO
- Should always be used for survey and control operations

Equipment:

- PS, pens, eraser
- OHTs (S19 set)
- GPS, map, compass (one each)
- GPS (one per two trainees)
- Compass (one per two trainees)
- Extra batteries
- XS19 exercise sheets
- Quick reference card for the GPS model being used

Preparation:

- Make photocopies of the XS19 exercise sheets, one per two trainees
- Insure that there is an large open area available near the classroom.
- Check to make sure each GPS is functioning and that there are enough spare batteries for each.
- If a GPS other than the Garmin 12XL is being used, prepare a quick reference card for that particular GPS model being used in the country (based on the Garmin 12XL card included here)
- Take the coordinates of one location that can be used in the GOTO function

Note: this session may take longer than the above-indicated time if trainees have no previous experience using a GPS.

Guidelines page references: A8-9

S19	Session Plan	Duration
	How is a GPS used?	1.5 hours

SECTION	TECHNIQUE AND CONTENT	AIDS
Introduction (5 mins)	<p>1. Q&A: You are lost in the desert, you are low on water, you are searching in your vehicle for any remaining food but instead you find three items that save your life. What are they?</p> <ul style="list-style-type: none"> • Map • Compass • GPS <p><i>Put these on a table in front of the class.</i></p>	
Core (80 mins)	<p>1. Q&A (everyone): Hold up a GPS – does anyone know how to use this? If so, ask to demonstrate it.</p>	PS list
	<p>2. Present: Explain the basics of the GPS satellite system and how it works. Emphasize that all work the same (requires open sky, one time initialization, batteries, antenna); what they can do; use at night, rain, clouds; improved accuracy to about 10m; do not cost much, should be used on every survey, not only during plagues. Show different models.</p>	OHT (S19a,b)
	<p>3. Present: Identify and explain the different parts of the GPS most commonly used in your country.</p>	OHT (S19c)
	<p>4. Outdoor exercise: Go outside and complete the exercise to learn the basic functions of the GPS (on/off, initialize, change settings, different screens, take coordinates, mark, name, store, recall, delete, GOTO, sunrise/sunset).</p>	XS19
Summary & Conclusion (5 mins)	<p>1. Q&A (individual) (to test knowledge): What are the most important functions of the GPS? Prompt for:</p> <ul style="list-style-type: none"> • Determine coordinates of survey stops, locusts, green vegetation • Save these coordinates • Go to coordinates that have been given to you of locust infestations (control) or green vegetation 	PS list
	<p>2. Present (to summarize): A GPS is the most important item to take with you on a survey. Without it, you cannot easily determine the coordinates of your position so that you can tell others where there may be significant populations of locusts. You should always take a GPS with you on surveys and continue to practice using it; otherwise, you will quickly forget.</p>	
	<p>3. Present (to lead into next session): Now that we know how to use a map, compass and GPS, let's look at we can use them all together.</p>	

S20	Session Summary	Duration
	How can a map, compass and GPS be used together?	30 minutes

Aim: To teach how a map, compass and GPS can be used together so that trainees can navigate better in the field.

Objectives: The trainee will correctly demonstrate the use of a map, compass and GPS for navigation in the field during locust operations.

Key survey points

- Line up map with N on a compass
- Bearing = direction (GPS GOTO, waypoints)
- Use for finding locust infestations, control targets, airstrips, navigation

Equipment:

- PS, pens, eraser
- OHTs (S20 set)
- GPS, compass
- Large wall map, stickers

Preparation:

- Layout a map, compass and GPS on a table in front of the classroom.

Guidelines page references: A2-9

S20	Session Plan	Duration
	How can a map, compass and GPS be used together?	30 minutes

SECTION	TECHNIQUE AND CONTENT	AIDS
Introduction (5 mins)	1. Q&A (everyone): Have you ever been lost in the desert, and if so, what happened?	
Core (20 mins)	1. Q&A (everyone): Who can demonstrate how to use a map, compass and GPS to find his/her way home?	
	2. Present: Explain where north is on a map and how to line the map to north using a compass. Tape a map on the board and orientate it with the compass.	
	3. Present: Explain how to find the bearing of an object (e.g. mountain, town) that you can see in the field on the map. Demonstrate with compass on the wall map with object and your position clearly indicated (use stickers)	
	4. Q&A (everyone): Did anyone notice “bearing” on the GPS GOTO function? What does this mean? Relate it to the compass, then relate it to waypoints and the distance shown on the GPS GOTO. Emphasize that waypoints must be in the GPS.	
	5. Q&A (individual): You are still lost in the desert. How can you get home?	
	6. Present: Show summary.	OHT (S20a)
Summary & Conclusion (5 mins)	1. Q&A (everyone) (to test knowledge): How can this method be used during locust operations? <i>Prompt for examples: finding previously identified infestations, control targets, airstrips, marking.</i>	PS list
	2. Present (to summarize): You now should be able to use a map, compass and GPS. Together these can be used during survey and control operations.	OHT (S20b)
	3. Present (to lead into next session): Now, let’s look at exactly what information to collect and how, for each of these, starting with the first one	

S21	Session Summary	Duration
	How are field data recorded?	1 hour

Aim: To teach the use of the *FAO Desert Locust Survey and Control Form* in order to improve data collection in the field.

Objectives: The trainee will correctly complete the form as taught using field data.

Key survey points

- Use form so information is complete and can be shared and analyzed
- Fill out the form at survey or control location not in office
- Mostly circle or tick, very little writing is required
- Add comments and your own interpretation
- Transmit via radio using row and column numbers

Equipment:

- PS, pens, eraser
- OHTs (S8a, S21 set)
- *FAO Desert Locust Survey and Control Form*
- XS21 exercise sheets

Preparation:

- Make photocopies of the XS21 exercise sheets and the *FAO Desert Locust Survey and Control Form*, one per group

Guidelines page references: S46-47, A46-53, 88-89

S21	Session Plan	Duration
	How are field data recorded?	1 hour

SECTION	TECHNIQUE AND CONTENT	AIDS
Introduction (5 mins)	<p>1. Q&A (everyone): Who can recall the main types of information collected during a survey?</p> <ul style="list-style-type: none"> • Location (date, coordinates, name, area) • Habitat (rainfall, vegetation, soil moisture) • Locust (appearance, behaviour, maturity, density, size) • Control (chemical, rate, area, type) 	OHT (S8a)
Core (50 mins)	<p>1. Q&A (everyone): How do you record survey results? Why would we want to use a form? Do you currently use a form? If you do not find anything, do you report this and how?</p>	
	<p>2. Present: Briefly explain the different sections of the form and the need to circle the appropriate items. Emphasize coordinates, survey stops, recording bands vs. hoppers, and nil reports.</p>	OHT (S21a)
	<p>3. Present: Emphasize adding comments to each survey stop and your own interpretation. It should be completed at each location before moving on to the next stop rather than filling it out in the office after the survey (because it is too late in case you forgot a piece of information). Give examples of a completed form including interpretation.</p>	OHT (S21b)
	<p>4. Indoor exercise: Each group will receive six reports. Divide the reports amongst the trainees in the group so that each trainee enters at least one report (one column) on the survey form. (30 min)</p>	XS21
	<p>5. Q&A (everyone): What difficulties did you have completing the exercise? Was the information complete and did this make it easier or more difficult for you? How would you improve the form?</p>	
Summary & Conclusion (5 mins)	<p>1. Q&A (individual) (to test knowledge): Why is it necessary to record survey results on a form? <i>Prompt for: for completeness and not to forget anything, for standardization so results can be compared and good decisions made.</i></p>	
	<p>2. Present (to summarize): The form presented in this session was jointly developed by FAO and locust affected countries. It contains the basic information required for analysis, planning and forecasting. You are encouraged to use this (or a similar) form to record the necessary information during survey and</p>	

	control operations. It should be completed in the field while you are at the location, not later when you are in the office.	
	3. Present (to lead into next session): Now, let's look at another way to record information during survey and control operations.	

S22	Session Summary	Duration
	What is eLocust and how can it be used?	1 hour

Aim: To introduce the concept of using a handheld computer to record data and teach how to use eLocust so that trainees appreciate that there are new technologies that can be used during surveys.

Objectives: The trainee will be able to demonstrate the use of eLocust and use it for recording data in the field.

Key survey points

- Touch screen, immediate on, 40h batteries, connect anything
- eLocust = electronic version of FAO Survey & Control form
- eLocust = PsiDat + RealMaps
- transmit data via HF radio modem

Equipment:

- PS, pens, eraser
- OHTs (S22 set)
- Psion 5mx handheld computer with latest version of eLocust
- Extra batteries
- XS22 exercise sheets

Preparation: none

- Make sure that each Psion is working and has a good battery charge
- Install the latest version of eLocust on the Psion
- Make photocopies of the XS22 exercise sheets, one per group

Guidelines page references: none

S22	Session Plan	Duration
	What is eLocust and how can it be used?	1 hour

SECTION	TECHNIQUE AND CONTENT	AIDS
Introduction (5 mins)	1. Present: Recall that information collected in the field during survey and control operations must be recorded in some manner. We have seen how to do this using forms.	
Core (50 mins)	1. Q&A (everyone): Hold up the Psion. Does anybody know what this is? Any ideas of how we could use this for surveys? Pass it around. <i>Prompt for: handheld computer that can be used to record information collected during surveys in the field.</i>	
	2. Present: On this device is a version of the <i>FAO Desert Locust Survey and Control Form</i> that you have been using in the previous session. Instead of completing a hardcopy of the form, you can enter the information at each survey location while on the spot and before moving to the next stop.	
	3. Present: Identify and explain the different parts of the Psion, its basic operation and how to connect the cables.	OHT (S22a,b)
	4. Present: Show how to use eLocust programme: start, enter data, next record, export, and quit.	OHT (S22c)
	5. Indoor exercise: Complete the exercise where each group enters location, habitat, locust, control and comments for one survey stop. (30 minutes) <i>Note: If only one Psion is available, have Group 1 enter location data, Group 2 habitat, Group 3 locust, and Group 4 control and comments.</i>	XS22
	6. Present: Once data is entered in eLocust it can be printed or, better still, exported in file that can be sent by HF radio modem directly from the field into the computer at the Locust Unit HQ for analysis. This system has been successfully implemented in a few key countries and we are hoping that it will be adopted in others.	OHT (S22d,e)
	7. Q&A (everyone): What difficulties did you have in using eLocust? What improvements would you like to see to make eLocust easier to use?	

Summary & Conclusion (5 mins)	1. Q&A (individual)ed (to test knowledge): What are the advantages of using eLocust compared to the traditional method of completing hard copies of forms? Prompt for: faster, easier, more accurate	
	2. Present (to summarize): FAO and EMPRES is trying out this new idea in a few selected countries as a way to show that it is possible to use a handheld device to enter survey and control data. This is not only more accurate but it allows National Information Officers more time to analyze the data which should lead to better planning and more accurate forecasts.	OHT (S22f)
	3. Present (to lead into next session): Now, let's look at some difficulties that are faced during surveys.	

S23	Session Summary	Duration
	Practicing survey techniques in the field	half day

Aim: To practice survey methodology and the use of survey equipment under field conditions as a review of what has been taught in the previous days and to improve the trainees' skills in locust and habitat monitoring.

Objectives: The trainee will undertake a field survey to assess locust and habitat conditions in a locust breeding area.

Key survey points

- Time taken for planning
- Time taken for survey (assessment/search used?)
- Was information correctly recorded?
- Not easy to organize survey and find all locusts

Equipment:

- PS, pens, eraser
- OHT (4c, 16a)
- Dark coloured gravel, fertilizer or sawdust to make fake hopper bands
- Two separate areas of typical Desert Locust habitat, about 10x10 km each
- 4+1 vehicles (to make the bands in advance, to transport the trainees)
- Radios in vehicles (or two mobile phones)
- 3-4+ laborers for making the bands
- Shovels and buckets for each laborer
- GPS, compass, map, forms, water, extra batteries (per vehicle)
- 1 flag on a pole
- Binoculars
- Whistle
- Signal mirror
- Wooden blocks, enough for one per band

Preparation:

- Identify an area of about 25x25 km of typical Desert Locust habitat
- Write numbers on the wooden blocks
- Each area should have two separate infestations, several km apart, of about 3-5 bands that are about 50-100 m² each at varying densities.
- Use the gravel, sawdust or fertilizer to outline the bands, hiding them near vegetation or in depressions. Identify each band with a numbered block (keep track of the numbers you use in each area). Take the GPS coordinates of each band.
- This can be done one or more days before the session and takes several hours.

Guidelines page references: S10-17

S23	Session Plan	Duration
	Practicing survey techniques in the field	half day

SECTION	TECHNIQUE AND CONTENT	AIDS
Introduction (10 mins)	1. Present: A quick review of planning and making surveys including what equipment to take.	OHT (S4b, S16a)
	2. Present: Introduce the basic exercise. Remind trainees to bring survey equipment and dress properly. Provide the coordinates of the meeting point in the field (to allow trainees to practice GPS GOTO function).	PS sketch
Core (3 hrs)	1. Field exercise: Do the following: <ul style="list-style-type: none"> • Establish an initial meeting point in the field at a given time (mark with a flag) • Upon arrival, combine groups into two • Give the coordinates of one band to each group • Indicate the area that they should survey on a map, give rough boundaries (5x5 km?) • Suggest to start with assessment, switch to search if they find bands and then continue with assessment • Suggest maximum of 5 km by vehicles • Encourage that additional stops are made • Vehicles within each group must stay together and not split up. • Ideally, each group should have someone (trainer or assistant to invent habitat and Desert Locust details if there are no locusts or vegetation • Allow about 3 hr for survey and agree to meet at given time (1200h?) back at the initial point before returning to the training centre. 	
	2. Q&A (everyone): <i>[in the field]</i> Each group should present its survey strategy, justifications and findings. Emphasize completeness, accuracy and interpretation. <i>Prompt for: completed survey forms.</i>	
Summary & Conclusion (15 mins)	1. Q&A (individual) (to test knowledge): What were some of the difficulties faced during this survey? Did you have the right equipment? Were you well organized? Are you pleased with the results? If you were to do it again, how would you do it differently? What is one thing that you learned today?	

	<p>2. Present (to summarize): It is important to take what you have learned here and apply it to planning and carrying out surveys. Otherwise, you are likely to spend extra time and money for nothing because, for example, you forgot your GPS or did not collect an important piece of information.</p>	
	<p>3. Present (to lead into next session): Now, that you have collected and recorded the data during the survey, there is one final item left to do.</p>	

S24	Session Summary	Duration
	How are survey results transmitted?	30 minutes

Aim: To teach how and why survey results should be sent from the field so that trainees appreciate the need to send complete and accurate data on time.

Objectives: The trainee will recall the importance of transmitting data in a timely manner and identify the different means of doing this.

Key survey points

- Survey results must be sent to National Locust Unit HQ
- HF radio, telephone, fax, email, handcarry
- Results are needed quickly for planning and forecasting
- Data value decreases over time

Equipment:

- PS, pens, eraser
- OHTs (S4b, S24 set)

Preparation: none

Guidelines page references: S46-47, I10-11, 26-27, A54-55

S24	Session Plan	Duration
	How are survey results transmitted?	30 minutes

SECTION	TECHNIQUE AND CONTENT	AIDS
Introduction (5 mins)	1. Present: The steps in planning and making a survey.	OHT (S4b)
Core (15 mins)	1. Q&A (everyone): You have just finished a survey and completed the forms (or eLocust). Now what do you do? <i>Prompt for: sending the results somewhere (Locust Unit HQ).</i>	
	2. Q&A (individual): How is this done? How long does it take? <i>Develop a table: transmission method (HF radio, telephone, fax, email, handcarry), availability in country, time to transmit the data.</i>	PS table
	3. Q&A (individual): What communication equipment could be used? What is available in your country? Are there any new possibilities (mobile, fax, email, HF modem)?	
	4. Present: summary illustration	OHT (S24a)
Summary & Conclusion (10 mins)	1. Q&A (individual) (to test knowledge): Why are we interested in sending the data as fast as possible? Shouldn't it be summarized first before sending? <i>Prompt for: timely data needed to react fast, plan and to forecast; data should not be summarized because important details may be left out.</i>	
	2. Present (to summarize): It is important to collect all of the required data and accurately record it on forms or in eLocust. But the value of the data decreases over time. In other words, if it is not sent quickly to the Locust Unit HQ, it becomes worthless and no longer meaningful.	
	3. Present (to lead into next session): This completes the survey portion of this training course. We will now briefly review what has been covered during the past few days.	OHT (S4b)

S25	Session Summary	Duration
	Summary of survey sessions	30 minutes

Aim: To review the main points that were covered in the survey sessions.

Objectives: The trainee will recall the key important points of planning and conducting Desert Locust surveys, collecting information and transmitting data that were presented during the previous days.

Key survey points

- One thing learned?
- Hardest, most difficult session?
- Most confusing, least clear concept?
- Best and worse session? Improvements?

Equipment:

- PS, pens, eraser
- OHTs (S4 set)

Preparation: none

Guidelines page references: S2-3

S25	Session Plan	Duration
	Summary of survey sessions	30 minutes

SECTION	TECHNIQUE AND CONTENT	AIDS
Introduction (5 mins)	1. Present: Review the steps in planning and making a survey by showing a blank skeleton.	OHT (S4a)
Core (15 mins)	1. Q&A (everyone): Which item goes first in the blank skeleton? Second? And so on. <i>Uncover each item, one at a time after you get the answers from the trainees.</i>	OHT (S4b)
	2. Q&A (individual): What is one thing that you learned during the survey sessions? <i>Ask several trainees this.</i>	
	3. Q&A (individual): What was the hardest, most difficult, most confusing, least clear concept that was presented during the survey sessions? <i>Ask several trainees this.</i>	
	4. Q&A (individual): What was the best and worse survey session? Why? How can they be improved? <i>Ask several trainees this.</i>	
Summary & Conclusion (10 mins)	1. Present (to summarize): I think that we have all seen that surveying and reporting Desert Locusts is not an easy job. We tried several times to find hopper patches and bands but it is clear that we could not find all of them. When making surveys, you should remember that this is a basic limitation of our abilities. Although there are no obvious solutions, good planning of surveys, using your limited resources carefully, collecting complete information and reporting on time can lead to improved surveys and the best possible monitoring of the situation in order to have early warning of important developments that could lead to outbreaks, upsurges and plagues.	
	2. Present (to lead into next session): This completes the survey portion of this training course. You can see that we have tried to present the material in a clear and logical way, similar to how you should plan and undertake surveys.	

Survey exercises

XS1 - SURVEY PROBLEMS

Instructions to trainer: cut out each of the four problems below, and distribute one to each group. Each group should read their problem and the trainer will ask another group to quickly answer it with the first thing that comes to their minds.

You think that there might have been some rains and maybe some locusts present somewhere but you have no information. What do you do?

You hear on the news that swarms are invading your country. What do you do?

Locals report large locust infestations? What do you do?

You do not think that it has rained or there are any locusts. What do you do?

XS4 - SURVEY PROCESS

Instructions to trainer: cut out a set of each of the phrases below, and distribute one set to each group. Each group should try to put these in a logical and sensible order.

who? where? when?

**survey type?
(assessment, search)**

**survey method?
(ground, air)**

equipment

**collect, record &
transmit data**

we found everything?

assessment? search?

control?

XS6A - ASSESSMENT SURVEY

Introduction

You have received information that there has been recent rainfall in Desert Locust breeding areas in an area of about 200 km by 100 km. You are asked to check the area for green vegetation and locusts.

Please answer the following questions:

1. What time will you make the survey: _____ - _____ AM ; _____ - _____ PM
2. How much time will you spend at each survey stop: _____ minutes
3. What is the total number of survey stops that you hope to make in the morning and in the afternoon: _____ stops

Hint: try the following:

$$\frac{\text{Number of hours spent surveying in one day} \times 60 \text{ minutes} / 1 \text{ hr}}{\text{number of minutes per stop}}$$

4. How many kilometers do you expect to cover in one day: _____ km

Hint: allow for time to travel in between stops and estimate average driving speed

5. About how many days will it take you to assess the vegetation conditions and the locust situation in the area of recent rainfall: _____ days
6. What would you do if you find a hopper band along the way: *circle your choice*
 - a) Stop and search for other bands
 - b) Stop and immediately undertake control
 - c) Make a note and continue your survey

XS6B - ASSESSMENT/SEARCH: HOPPER BANDS

Introduction

When surveying in a vehicle, it is easy to find SOME of the hopper bands in a large infestation, but it is almost impossible to find all of the hopper bands.

Exercise

You have a map showing a coastal region in the Desert Locust recession area. An invisible pen has been used to mark it with a number of hopper bands. The exercise is to use a magic pen to trace an imaginary survey route wherever you like on the map. When the magic pen passes over a marked hopper band, the ink will change colour - you have 'found' a hopper band.

Use the information received from the field (see below) to help guide you where to make your survey. Using the magic pen, you should first **assess** the situation (assessment survey) and then **search** (search survey) for any hopper bands that you think may be present from your assessment survey.

The aim is to find as many hopper bands as you can. However, you cannot simply colour the whole map with the magic pen, you must make a survey over a distance which is realistic to drive in one day - say 150 km. At the scale of this map, this means that you can only draw your survey line for a total length of around 75 cm.

After surveying for an approximate line length of 75 cm (around 150 km), count the number of hopper bands you have found as follows:

Group No. _____	Assessment	Search
Distance surveyed (km)		
Number of bands found		

Information from the field (only use that which refers to your map)

- A. Nomads reported seeing hopper bands south of the coastal road.
- B. Heavy rains fell about one month ago near Habshan where mature swarms were seen.
- C. HQ requests that you check coastal and subcoastal areas.
- D. Swarms were seen laying about four weeks ago south-east of Tarif (port town).

Questions (to think about for the discussion that follows this exercise)

1. If no bands were found during the assessment survey, would you have thought that the area was free of locusts?
2. Why should you make an assessment survey first; why not start searching immediately?
3. When you found your first hopper band, what did you do – looked for others in the same area or continue with your survey?

XS17 - MAP READING EXERCISE*Instructions: Fill in the blanks or circle your answer*

1. What is the scale of this map: _____ .
2. 1 cm = _____ km.
3. Where is north on this map? (top, bottom, left or right side of map)
4. Where is the Yemen/Saudi Arabia border? (top right, top left, bottom right, bottom left, centre)
5. What are the blue polygons, circles and squares : _____ .
6. What are the units of elevation (metres or feet)
7. Where is the latitude scale: (top/bottom or right/left side of map)
8. Where is the longitude scale: (top/bottom or right/left side of map)
9. What colour are roads : _____ rivers : _____ airports : _____
big cities : _____ dry lake beds : _____ sea : _____
10. How are sandy areas indicated : _____ , and dunes : _____ .
11. What is the distance from Jizan airport to Khamis Mushayt airport by air: _____ km.
12. 20 km NW of Ad Da'ir (1720N/4309E) is a _____ with an elevation of : _____ (m or ft).
13. What is the blue and white spotted object about 100 km E of Najran (1730N/4409E) : _____ .
14. What is the object at 160830N/471530E : _____ ;
what is the closest big city : _____ ; and in what direction : _____ .
15. East of Qaryah (194800N/450830E) is : _____ for how many _____ km.
16. What are the coordinates of Jizan : _____ Khamis Mushayt : _____ .
17. What is at 184930N/444730E : _____ .
18. What is at 1747N/4423E : _____ .

19. How are mountains areas indicated on this map : _____ .
20. What is the name of the mountain range between Khamis Mushayt and Jizan :
_____ .
21. What is the elevation of the tallest mountain on the map : _____ (metres or feet) ; in
which country : _____ .
22. What is the name of the river SE of Al Hazm (Al Hazm is 160 km SE of Najran) : _____ ;
is it on the plains or in the mountains (circle your answer) ; what direction does it flow : _____ .
23. What do the very small fine brown lines on the map indicate :
_____ .

XS18 - USING A COMPASS

First exercise

Each group starts outside on the roadside at your red flag near the wall

1. Walk on a bearing of 90 degrees for a distance of 50 paces

Now give the compass to someone else in your group

2. Walk on a bearing of 240 degrees for a distance of 70 paces

Now give the compass to someone else in your group

3. Walk on a bearing of 80 degrees for a distance of 40 paces

Now give the compass to someone else in your group

4. Walk on a bearing of 320 degrees for a distance of 45 paces

Now where are you?

Introduction

One of the most important pieces of information to collect during survey and control is the coordinates of the location of the survey, green vegetation, rainfall, locusts and control operations. The most reliable method of doing this is to use a GPS (geographic positioning system). Every time you carry out survey or control operations, you should take with you a GPS. These are small handheld units that are robust and do not cost very much. Other units are available for mounting in vehicles and aircraft. The actual GPS model may vary in your own country but it is suggested that a country try to standardize on one model if possible because this will make it easier for training.

Exercise

This exercise concentrates on using a handheld GPS, preferably a Garmin 12 or 12XL. With the help of other trainees in your group and the group leader, you should practice the following techniques so that by the end of the exercise you can use them easily. It is suggested that you practice using the GPS after the training sessions but remember to turn it off when you are not using it so that you do not empty the batteries.

Practice the following:

1. Turn on/off
2. Initialize the unit
3. Change the date and time, latitude/longitude format
4. Take a position reading
5. Store the position
6. Recall the stored position
7. Enter, name and store a given latitude/longitude position
8. General care of the unit

XS21 - COMPLETING THE FAO DESERT LOCUST SURVEY AND CONTROL FORM

Introduction

It is easier to record survey results onto a form rather than in narrative format. This will also make it easier for others to use the information for analysis, planning and forecasting.

Exercise

Complete the *FAO Desert Locust Survey and Control Form* using the following locust survey results:

1. Scattered solitary adults at densities of 28 / 200x5 m foot transect were seen in Wadi Hamad (251630N/341222E) on 21 January 2002 in dense green vegetation on 15 ha. Hoppers were last seen here in October 2001.
2. On the same day, a farmer reported 4th and 5th instar hopper bands of medium density on 3 ha of his crops in wet soil mixed with scattered fledglings and immature adults at Bir Ali.
3. On 22 January, two immature dense swarms, varying in size from 1-2 km² were seen flying from east to west at 2610N/3315E. Groups of fledglings were present in green medium dense vegetation; soil was moist and moderate rains fell two weeks ago. Crops are being harvested.
4. On 24 January, no Desert Locust were found at Al-Kamili (271102N/336855E), but vegetation was green and low density, soil was dry and 15 mm of rain fell on 17 January. The survey covered 50 ha. High density grasshoppers present.
5. On 29 January, ground control operations treated eight 4th and 5th instar bands at densities of 10-20 hoppers/m² covering 150 ha. Vegetation was medium density and drying. Soil moisture was dry. The last rains fell about 1 month ago but were heavy. A total of 75 litres of Fenitrothion ULV was used at 0.5 l/ha. After 1 day, about 80% were killed. Bright yellow adults at densities of 9,000 locusts/ha were also seen laying but these were not sprayed.
6. On 30 January, 6 isolated immature adults were seen during a 1 km vehicle transect within an area of medium dense green vegetation of about 2x2 km. A nomad said he saw hoppers in the same area two weeks ago.

Questions (to think about for the discussion that follows this exercise)

1. Was the information in each report complete or was there some items missing?
2. What difficulties did you have when completing the forms?
3. What changes would you like to see to make the forms easier to use?

XS22 - USING ELOCUST

Introduction

FAO and EMPRES has been evaluating a new method to record locust and habitat data collected during field surveys. Rather than completing a form, the field officer enters the data directly into a handheld computer while at the survey location and before moving onto the next stop. The programme is called eLocust.

Exercise

Imagine that you are making a survey and have stopped in some green vegetation in which you have found some locusts. You must record your observations using eLocust.

Each group will enter one sentence of the observations into eLocust:

GROUP 1: location data (date, coordinate, name, area)

GROUP 2: habitat data (habitat, rainfall, vegetation, soil moisture)

GROUP 3: locust data

GROUP 4: control data and comments

We will use the reports from the previous exercise.

1. 21 January 2002, Wadi Hamad (251630N/341222E), 15 ha. Dense green vegetation. Scattered solitary adults at densities of 28 / 200x5 m foot transect. Hoppers were last seen here in October 2001.
2. 21 January 2002, Bir Ali, 3 ha. Crops, wet soil. 4th and 5th instar hopper bands of medium density mixed with scattered fledglings and immature adults. Reported by a farmer.
3. 22 January 2002, 2610N/3315E. Moderate rains fell two weeks ago, green medium dense vegetation, and moist soil. Two immature dense swarms, varying in size from 1-2 km² were seen flying from east to west, groups of fledglings present. Crops are being harvested.
4. 24 January 2002, Al-Kamili (271102N/336855E), 50 ha. 15 mm of rain fell on 17 January, vegetation is green and low density, soil is dry. No Desert Locust found. High density grasshoppers present.
5. 29 January 2002, 150 ha. The last rains fell about 1 month ago but were heavy, current vegetation is medium density and drying, soil moisture is dry. Eight 4th and 5th instar bands at densities of 10-20 hoppers/m², bright yellow adults at densities of 9,000 locusts/ha were also seen laying. Ground control ops used 75 litres of Fenitrothion ULV at 0.5 l/ha, after 1 day, about 80% were killed. The adults were not sprayed.
6. 30 January 2002, area of about 2x2 km (= 400 ha). Medium dense green vegetation. 6 isolated immature adults were seen during a 1 km vehicle transect. A nomad said he saw hoppers in the same area two weeks ago.

Questions (to think about for the discussion that follows this exercise)

1. Was eLocust easier and faster than entering data on the forms?
2. What difficulties did you have?
3. What changes would you like to see in eLocust to make it easier to use?

Control sessions

C1	Session Summary	Duration
	What is the process of control and is control always necessary?	1 hour

Aim: To provide a framework for more detailed discussion of the specifics of control in order that trainees have a reassuring 'route map' for the learning they will do. Also to transmit the message that control should be a logical process which is only initiated when necessary and comprises a number of clearly defined steps. This is to help them break down a rather complicated process into smaller components which are more easily understood.

Objectives: The trainees will put the different steps involved in the control process in the right sequence and explain them in general terms. They will also explain what factors might influence the decision on whether to control or not.

Key control points

- Training should be a logical process
- Control is not always necessary – several factors affect the decision
- The specifics of the process will differ depending on country and situation

Equipment:

- PS, pens, eraser
- OHTs (C1 set)
- XC1a, b and c – Control process jigsaw (control process sheet with no text, together with sets of separate text captions) – one for each group
- Sticky tack
- Sellotape

Preparation:

- Print out and cut out jigsaw captions and put in envelopes – one for each group.
- Print out top half and bottom half of blank process sheet and sellotape together to make the whole blank process sheet - one for each group

Guidelines page reference: C2-5

C1	Session Plan	Duration
	What is the process of control and is control always necessary?	1 hour

SECTION	TECHNIQUE AND CONTENT	AIDS
Introduction 5 mins	1. Present: Control has to be a logical process. This helps us to understand and carry it out better. We should understand the control 'skeleton' before learning in detail about each step	
Core 70 mins	1. Desk exercise: Make sure that nobody has their Control Guideline open. Distribute a blank control process sheet and set of captions (XC1a, b and c) to each group and ask them to discuss and attach (with sticky tack) the captions in the most logical places (20 minutes)	Control jigsaw
	2. Trainee presentation: Everyone gathers at the front and a rep from one group presents and explains their completed jigsaw. Comments are asked for from other groups and other groups can present their solutions if they differ from the first group's. Finally show them the OHT on the control process.	Control jigsaw, OHT (C1a)
	3. Q&A: Go through the process and ensure that everyone understands what the stages mean in general terms	
	4. Q&A: What factors might influence the decision on whether to control locusts or not? See OHT.	PS list then OHT (C1b)
Summary & Conclusion (19 mins)	1. Q&A (to test knowledge): Ask for a brief explanation of each of the steps.	PS list
	2. Present (to summarize): Review the steps to reinforce the learning	OHT (C1a)
	3. Present (to lead into next session): If the decision has been taken to initiate control, what are the technologies which can be used?	

C2	Session Summary	Duration
	Which are the different locust targets and control options?	2.5 hrs

Aim: To review targets and control technologies including detail on the most commonly used type – ULV sprays. This better appreciation of the options and better understanding of how they work will help trainees to choose and use these technologies more safely and more efficiently.

Objectives: The trainees will be able to describe the different control targets and their implications for control, explain and make appropriate choices of control technologies, sprayer platforms, sprayer types and methods of atomisation.

Key control points

- Locust targets take many forms – some easy, some difficult
- Several control technologies are available
- ULV spraying is the only practical option
- Different sprayer platforms – pros and cons
- Atomization is critical to efficacy – rotary are best for ULV

Equipment:

- PS, pens, eraser
- OHTs (C2 set)
- 4 atomizer types – bucket and brush, hydraulic (e.g lever operated knapsack with cone or fan nozzle), air shear (e.g. flit gun or motorized knapsack mistblower), rotary (e.g battery operated spinning disc sprayer)
- Water sensitive paper.
- Hand lenses
- XC2 exercise sheet
- NRI swarm video, television and VCR
- Blank OHT (2) and pens

Exercise preparation:

- Photocopy XC2 exercise sheet – one per trainee
- Fill all sprayers with water
- ensure that the battery operated sprayer has batteries and a suitable nozzle (orange)
- Television and VCR for the swarm video

Guidelines page reference: C5-19

C2	Session Plan	Duration
	Which are the different locust targets and control options?	2.5 hrs

SECTION	TECHNIQUE AND CONTENT	AIDS
Introduction (5 mins)	1. Present: If the decision is made to carry out control, there are some important decisions to be taken on equipment and techniques	
Core (70 mins)	1. Q&A: What are the different types of locust target – prompt for isolated locusts, scattered locusts, patches, hopper bands, blocks of hopper bands, settled swarms, flying swarms. After creating the PS list, show the C2a list and then each of the other OHTs afterwards to be sure that all trainees understand the target types. What is their suitability as targets for control? Make the point that the vegetation might also be a ‘target’ for the spraying, but in this case, the aim will still be to control a particular type of locust target.	PS list and OHT (C2a, b, c, d, e, f, g, h)
	2. Q&A: What are the different technology options for control - prompt for mechanical, baiting, dusting and spraying. Review their pros and cons	PS list and OHT (C2i, j, k)
	3. Q&A: Make the point that the most commonly used technology for control is spraying, and more specifically ultra low volume (ULV) spraying, but what does it mean? Prompt for points on OHT	PS list and OHT (C2l)
	4. Present: There are three options for sprayer platform – portable, vehicle-mounted and aircraft mounted.	OHT (C2m)
	5. Q&A: Ask trainees to rate the three types of platform on a scale of 1 to 3 with regard to the specific performance factors in the table on OHT (C2m). Fill in the acetate by putting a blank OHT on top of C2m and writing on that. Alternatively, use words to fill in the boxes, rather than the 1-3 scale	OHT (C2n)
(Can be dropped depending on time)	6. Q&A: What does a sprayer consist of – compile components on the PS, then show OHT. Now point out that the atomizer is one of the most important components since it makes the spray. But how?	PS list + OHT (C2o)
	7. Present: Explain that there are three main types of atomization – hydraulic (liquid is forced through a hole under pressure) airblast (a high speed jet of air shatters liquid coming out of a pipe) and rotary (droplets are thrown off the edge of a rapidly spinning surface).	OHT (C2p)

	<p>8. Indoor exercise: Carry out the exercise described in XC2 and compile the answers on the OHT table (with a blank acetate over it) and discuss answers to the exercise questions. NOTE: insist that people look carefully for the paper with the smallest droplet (singular) because first impressions are usually that the rotary atomizer is giving the smallest droplet since it is giving a uniformly small size. In fact it is usually the flit gun air shear nozzle which produces the smallest droplets (along with some much larger droplets). Do not go into any detail on the answers to question 'e'.</p>	OHT (C2q)
	<p>9. Present: Make a photocopy for each participant of papers with a typical droplet spectrum from each type of atomization and distribute. Explain that rotary atomizers produce droplets which are nearly the same size as each other, whereas other types of atomization produce a wide range of droplets. We will discuss in a later session why a narrow droplet spectrum is important for ULV spraying.</p>	OHT (C2r and s).
Summary & Conclusion (15 mins)	<p>1. Q&A direct (to test knowledge): Ask trainees to describe the different target types, control technologies and the characteristics of ULV spraying. Ask them to decide on the most appropriate sprayer platform for treating small hopper bands in steep sand dunes (portable sprayers), large hopper bands in firm, flat desert (vehicle mounted sprayers), and swarms roosting in tall trees (aircraft sprayers). Ask which type of sprayer produces the narrowest range of droplet sizes.</p>	
	<p>2. Present (to summarize): Summarise the session. Explain that the most appropriate equipment may not always be available, but it is important to know what would be best so that in these cases, plans can be made for the future.</p>	
	<p>3. Present (to lead into next session): Now, that we have chosen the technique and the technology, the next important decision is what product to apply?</p>	

C3	Session Summary	Duration
	Choosing and using locust insecticides safely	1.5 hrs

Aim: To provide an overview of pesticide types available for locust control and guidance on which criteria should be used in choosing them. Also the basics of safe use and First Aid

Objectives: The trainees will be able to state 5 important criteria for pesticide choice and will be able to judge all of the major insecticide groups against these criteria, as well as be able to describe First Aid procedures for pesticides and demonstrate the recovery position.

Key control points

- locust staff need familiarity with insecticide naming conventions
- lots of different constituents of a formulation, in addition to the active ingredient
- Key features to consider in choosing locust pesticides
- Mammalian toxicity of formulations is different from that of active ingredient and can be worked out, with the help of a reference document (IPCS/WHO)
- Role of pictograms and their meaning

Equipment:

- PS, pens, eraser
- OHTs (C3 set)
- WHO Classification of pesticides by hazard
- Personal Protective Equipment
- XC3 exercise sheets
- calculators

Preparation: Photocopy XC3 exercise sheet – one per trainee

Guidelines page reference: C26-33, A77-85

C3

Session Plan

Choosing and using locust insecticides safely

Duration

1.5 hrs

SECTION	TECHNIQUE AND CONTENT	AIDS
Introduction (5 mins)	1. Present: Insecticides are the principal tool currently used to control Desert Locusts. But there are many different types and users need to understand their characteristics if they are to be used safely and effectively.	
Core (70 mins)	1. Q&A: Ask what are chemical name, common name and trade name and ask for examples.	PS list
	2. Q&A: Make the point that although the active ingredient is the part that kills the locust, insecticide formulations can have other ingredients in – ask for examples (prompt for solvents, carriers, surfactants, colouring agents, emetics, stenches etc). All of these things make up the ‘formulation’.	PS list and OHT (C3a)
	3. Present: There are different types of formulation such as <ul style="list-style-type: none"> • emulsifiable concentrates • wettable powders • wettable granules • suspension concentrates • ultra low volume formulation <p>Make point that it is the formulation which is registered in a country e.g. Sumithion UL 50 is the brand name of a type of fenitrothion formulation, but other formulations of fenitrothion may not be registered in the country.</p>	PS list + OHT (C3b)
	4. Buzz group: Ask the groups to discuss for 10 minutes the 5 most important features to be considered when choosing a locust pesticide. Write this question on the PS and also write an example: ‘shelf life – must be long so that the pesticide can still be used in future years’. Ask them to write bullet points on a piece of flip chart paper and for a rep from each group rep to present their views? Possible answers are: <ul style="list-style-type: none"> • mammalian toxicity – as low as possible • toxicity to locusts – higher the better • mode of action (contact, stomach) – both is preferable 	PS lists + OHT (C3c)

	<ul style="list-style-type: none"> • persistence – the longer the better for efficacy, but the shorter the better for the environment • toxicity to non-target organisms – as low as possible • speed of action – as fast as possible • shelf life – as long as possible • availability – must be available at short notice • cost – as low as possible 	
	<p>5. Q&A: Go through the principal types of insecticide then review the pros and cons of ‘conventional’ locust insecticide – revelation technique. After that, go through the new/alternative types. Mention Pesticide Referee Group and their role.</p>	PS list and OHTs (C3d,e, f, g)
	<p>6. Present: Emphasize that mammalian toxicity is one of the most important criteria for locust pesticide choice and that they are classified by WHO according to their LD50. Explain what LD50 means and that the higher it is, the safer the product. Also explain that the toxicity of a formulation depends on active ingredient TOXICITY and CONCENTRATION of the formulation. Introduce the concept of hazard classifications and give figures for the WHO categories.</p>	OHT (C3h, i)
	<p>7. Desk exercise: Carry out the exercise described in XC3 and compile answers on whiteboard. Discuss.</p>	PS table
	<p>8. Q&A: Show the FAO pictograms without captions and ask what they mean? Then show the pictograms with captions to see how easy they were to understand without explanation</p>	OHT (C3j and k)
Summary & Conclusion (15 mins)	<p>1. Q&A direct (to test knowledge): Ask trainees to explain insecticide names, constituents of formulations, criteria for pesticide choice, characteristics of different pesticide types and the method of assessing toxicity of a.i. and toxicity of formulations. Also which PPE for which job and first aid</p>	PS list
	<p>2. Present (to summarize): Summarise chemical name, common name, LD50, types of insecticide, safe use, poisoning symptoms and First Aid.</p>	
	<p>3. Present (to lead into next session): Technology has been chosen (ULV spraying), tools have been chosen (type of sprayer and pesticide), now we need to understand a little more about how these tools can be used safely and effectively in the field.</p>	

C3ii	Session Summary	Duration
	Safe pesticide handling and basic First Aid	1 hour

Aim: To explain how to handle pesticides in a safe way and to demonstrate the necessary first aid steps to be undertaken in case of poisoning.

Objectives: The trainees will explain why handling pesticides safely is important. They will also explain the necessary precautions to be undertaken. The trainees will demonstrate first aid measures to be undertaken in case of poisoning.

Key control points

- three main routes of entry for pesticides
- acute and chronic poisoning
- which staff and tasks are highest risk
- First Aid procedures

Equipment:

- PS, pens, eraser
- OHTs (C3ii set)
- Full set of Personal Protective Equipment

Preparation: none.

Guidelines page reference: E5-7, 26-27, 44-63; A85.

C3ii	Session Plan	Duration
	Safe pesticide handling and basic First Aid	1 hour

SECTION	TECHNIQUE AND CONTENT	AIDS
Introduction (5 mins)	1. Present: Start by saying that most Desert Locust control operations are carried out using pesticides. If these operations are to be safe, it is important to avoid contamination and poisoning with these pesticides. This session aims to provide you with basic safety measure to be undertaken when handling pesticides. Also it will cover the necessary First Aid steps in case of poisoning.	
Core (45 mins)	1. Q&A: Ask what are the routes by which pesticide can enter the body? Prompt for by mouth (ingestion) lungs (inhalation) and skin (dermal).	PS list then OHT (C3iia)
	2. Q&A: What are the most common operations that can cause pesticide exposure? Prompt for the fact that operator exposure and environment pollution with pesticides can occur during: storage, transport, application, sprayer cleaning and product and container disposal. Ask for explanation of how exposure can occur in each.	PS list then OHT (C3iib)
	3. Q&A: Ask which DL staff are at risk of exposure to pesticides? Make the point that although all body parts may be exposed to pesticides, dermal exposure is more likely to occur on certain parts such as the hands.	PS list then OHT (C3iic, d)
	4. Present: Discuss various safe-use issues such as personal protective equipment, unloading drums and safety when transporting pesticides.	Personal Protective Equipment OHT (C3iie, f)
	5. Q&A: Emphasize that pesticides can be dangerous; they can cause immediate sickness from acute poisoning or can cause slow sickness from small doses over a longer period (chronic poisoning). Ask for what should be done in the following poisoning cases: <ul style="list-style-type: none"> • If you have poisoning symptoms; headache, blurred vision, feeling dizzy or sick. • If someone's skin is contaminated • If pesticide has been swallowed • If they are not conscious 	PS list and OHT (C3iig) Volunteer to demonstrate the recovery position on the floor or table

	<ul style="list-style-type: none"> • Make the point that first aid steps are essential until the doctor comes or the affected person is taken to the hospital. Make sure that the doctor is provided with the necessary information about the pesticide so that he can treat the poisoned person with the proper antidote. 	
Summary & Conclusion (10 mins)	1. Q&A: Ask what are the routes and causes of pesticide exposure? Who are the people most likely to be exposed to pesticide during application and other control activities, and what parts of the body are most likely to be contaminated with pesticides.	PS list
	2. Present (to summarize): Pesticides are toxic chemicals and can present hazards of acute or chronic poisoning. They should therefore be handled carefully and properly. All necessary precautions should be taken in storage, transportation, application, maintenance of sprayers and disposal of products or empty containers. If poisoning does occur, simple (but potentially life-saving) First Aid measures should be taken until medical assistance is available.	
	3. Present (to summarize): Now that we have outlined how to handle pesticides safely, let's look at some field equipment which can help us be safer and more efficient in our control operations.	

C4	Session Summary	Duration
	How to use field equipment relating to control?	45 minutes

Aim: To explain the purpose of field equipment relating to control and to help the trainees learn how to use it so they can carry out more accurate application operations under the most appropriate conditions.

Objectives: The trainee will be able to state the reasons why field equipment is important for field staff and will be able to use whirling hygrometers, pith ball anemometers, compasses and vibrating tachometers.

Key control points

- Field equipment helps to make control safer and more efficient
- Correct way to use anemometer, whirling hygrometer, tachometer, compass

Equipment:

- PS, pens, eraser
- OHTs (C4 set)
- whirling hygrometer + water for wick – one per group
- pith ball anemometer – one per group
- compass – one per group
- vibrating tachometer – one per group
- Micron Ulva + with six batteries
- Screwdriver
- XC4 exercise sheet
- Cross head screwdriver

Exercise preparation:

- Find an open area of around 150 m x 150 m near to the training room
- Photocopy XC4a and b exercise sheets – one each per trainee

Guidelines page reference: A6-7, A14-19

Comment: Add case studies with 4 scenarios – choose one product from FAO list for each: Expand current exercise to be the case studies based on:

- Barrier spraying in ecologically sensitive zone
- Urgent crop protection required
- Portable equipment and recently trained spray personnel
- Full coverage aerial spraying of swarms in remote arid areas

C4

Session Plan

How to use field equipment relating to control?

Duration

45 minutes

SECTION	TECHNIQUE AND CONTENT	AIDS
Introduction (5 mins)	1. Present and Q&A: In the survey sessions we have appreciated the importance of, and learnt how to use maps, compasses and GPS. Additional equipment which is useful for control staff includes whirling hygrometers, anemometers and vibrating tachometers. Also compasses can be used for navigating spray passes.	PS list
Core (45 mins)	1. Present and demonstrate: State that a whirling hygrometer is useful for measuring air temperature to check whether conditions are too hot for spraying. Make the point that it can also be used to measure relative humidity but this is not so important for locust spraying. However, the whirling of the thermometer is important for finding the true air temperature. Whirl for one minute in the shade (of a tree or your body)	Whirling hygrometer + OHT (C4a)
	2. Present and demonstrate: State that an anemometer is useful for checking whether it is too windy or too still for ULV spraying. Hold pith-ball anemometers with finger and thumb, above head height, facing into wind, and with no obstacles such as trees, vehicles or other people blocking the flow of wind.	Anemometer + OHT (C4b)
	3. Present and demonstrate: State that a tachometer is a useful tool for checking the rotational speed of ground based rotary atomizers to ensure that it will produce droplets of an appropriate size. Hold tachometer body firmly against sprayer body near to rotary atomizer (or electric motor) and move needle in and out until it oscillates.	Tachometer + OHT (C4c)
	4. Present and demonstrate: State that a compass is not only useful for navigation when used in conjunction with a map and GPS, but can also be used for navigating to targets or navigating spray passes. There are two things you can do with it: If you have a bearing you can find a direction; if you have a direction you can find a bearing.	Compass + OHT (C4d, e)
	5. Field exercise: Follow the procedure in XC4.	
Summary & Conclusion (10 mins)	1. Q&A direct (to test knowledge): <i>[Back in the classroom]</i> What is the value of each of these pieces of field equipment? What are the dangers if this equipment is not available?	PS table

	2. Present (to summarize): These are tools of the trade and can make control operations significantly faster or more effective. Their cost is repaid many times over in savings from reduced pesticide use and/or improved efficacy.	
	3. Present (to lead into next session): Now we will make use of this field equipment while we test the field performance of a ULV sprayer.	

C5	Session Summary	Duration
	How can swath width be measured for ULV sprayers	4 hours

Aim: To demonstrate the method for measuring swath width and to help the trainees discover the variability of downwind deposit from a ULV sprayer.

Objectives: The trainees will be able to carry out swath width assessments for ULV sprayers and will understand the concept of overlapping swaths to achieve a more uniform cumulative deposit.

Key control points

- Cannot see where ULV spray droplets are going (more than a few seconds after emission)
- Control staff need to understand the field behaviour of droplets and swath width measurement helps this understanding
- Concept of overlapping swaths by making track spacing less than swath width

Equipment:

- PS, pens, eraser
- OHTs (C5 set)
- Micron Ulva + sprayers (2) + 10 'D size' batteries
- Vibratak (4), Anemometer (4), Whirling hygrometer (4)
- Stop watch (4)
- Compass (4)
- 70 cm stakes (15)
- Flags (4)
- Buckets (2)
- tissue paper
- Oil-sensitive paper strips 1 cm x 10 cm (50)
- Blu tak or sticky tak for attaching papers
- Sunflower or other light oil
- Fluorescent tracer
- Hand lenses (4)
- Counting templates (4)
- Data recording forms
- Full PPE (4 sets)
- Graph paper
- XC5 exercise sheet

Exercise preparation:

- Photocopy XC5a and XC5b exercise sheets – one per trainee
- Find an outdoor area around 100 m x 100 m which is not sheltered from the wind by buildings or trees.
- Check that the type of oil used makes a good dark mark on the oil-sensitive paper, and that the mark stays dark for 2 hours afterwards. Some oils do not make a good mark, and others fade away very quickly on the oil sensitive paper.

Guidelines page reference: A60 - 63

C5	Session Plan	Duration
	How can swath width be measured for ULV sprayers	4 hours

SECTION	TECHNIQUE AND CONTENT	AIDS
Introduction (5 mins)	1. Q&A open: Introduce the exercise by saying that ULV spraying is a drift technique which relies on the wind. But how far is the spray carried under certain conditions and how is this affected by different spraying parameters? We have designed a field exercise to test these points.	
Core (100 mins)	1. Present: Ask the question how far might the spray travel from a hand-held sprayer, how far from a vehicle mounted sprayer and how far from an aircraft?	PS list
	2. Present: Show oil sensitive papers and explain how they are going to be mounted vertically on sticks at distances downwind in order to intercept the drifting spray. Point out that only one side is sensitive and that care is required in handling especially straight after the spray has deposited.	OHT (C5a)
	3. Present: Explain that we will count the number of droplets using hand lenses and counting templates. Reassure trainees that we will deal with use of the sprayers and their calibration in more detail later.	
	4. Present: Explain that we will look at the effect of two different sprayer parameters – emission height and droplet size. Assign parameters to groups. Make the point that we don't usually hold the sprayer so high or so low, but in exceptional conditions we might do so to allow for extremes of windspeed.	OHT (C5b)
	5. Field exercise: Follow XC5b – Swath width assessment. Note that trainers have to supervise the start of the counting carefully to ensure that the trainees use an appropriate size of counting template and that they each make one count on all of the papers before passing the set of papers on to the next team member.	OHT (C5c)
	6. Present: Pool the data by plotting all 4 groups' graphs roughly on one graph on the PS so that curves can be compared	PS sketch

	7. Q&A: Pool the answers to the 7 exercise questions by writing them on an acetate laid over the OHT table. Discuss the meaning of swath width (the distance over which most of the spray is deposited – not an exact figure) and track spacing (the distance between successive spray passes)	OHT (C5cii) and PS list
	8. Q&A: Draw a typical ULV deposition profile and ask if this is ideal for locust control. Prompt for the point that some areas are low (start and finish) and some are high (nearer the sprayer).	PS sketch
	9. Present: Show what will happen if track spacing is the same as swath width. Ask what are the consequences of this uneven deposit. Ask how this uneven deposit can be improved. Prompt for suggestion to overlap deposits by making track spacing less than swath width.	OHT (C5d)
	10. Present: Show the benefit of overlapping the deposits. Discuss the amount of overlap and the fact that track spacing should be between 1/3 and 1/2 of swath width.	OHT (C5e)
	11. Present: Show the plan view of this overlap on the OHT. Make the point again that the cumulative deposit is still not uniform, but much improved.	OHT (C5f)
	12. Q&A: This is the benefit of overlapping swaths, but ask what is the penalty associated with it. Prompt for a trade off between work rate and deposit uniformity when deciding on track spacing.	
Summary & Conclusion (15 mins)	1. Q&A direct (to test knowledge): <i>[Back in the classroom]</i> Ask what is swath width, what is track spacing. What is the effect of emission height and droplet size on swath width? How big should track spacing be compared with swath width? Why is it important to overlap swaths?	
	2. Present (to summarize): This swath width assessment technique can be used for hand-held, vehicle-mounted and aircraft-mounted ULV sprayers – only the number of samplers and the spacing between them will differ. Control teams should carry out these swath width tests with new machinery and occasionally with standard machinery in different conditions so that they are familiar with where spray is going – it CANNOT be judged simply by looking at the spray cloud.	
	3. Present (to lead into next session): Now that we have seen how much ULV spray droplets are affected by windspeed and emission height, we will look at the effect of different weather conditions on ULV spraying.	

C6	Session Summary	Duration
	How does the size of droplets affect their number and behaviour?	45 minutes

Aim: To explain the importance and implications of droplet size and also one way in which droplet spectra are described. Also to guide trainees to conclusions on which droplet sizes and spectra are most suitable for ULV locust control.

Objectives: The trainees will be able to explain the effect of droplet size on their number and behaviour and be able to explain the concept of VMD and NMD and the ratio between them. They will also understand which spectra are most suitable for ULV locust control.

Key control points

- Effect of droplet size on number
- Effect of droplet size on terminal velocity
- Effect of droplet size on impaction/sedimentation
- Parameters used to describe droplet spectra (VMD, NMD, R ration, Span)

Equipment:

- PS, pens, eraser
- OHTs (C6 set)
- Polystyrene droplets
- Plasticine
- Rulers

Preparation: None

Guidelines page reference: C10-15

C6

Session Plan

How does the size of droplets affect their number and behaviour?

Duration

45 minutes

SECTION	TECHNIQUE AND CONTENT	AIDS
Introduction	1. Present: Explain that droplets are strange things which can behave in unpredictable ways.	
Core	1. Present: Explain that a droplet is under the influence of gravity and air movements	OHT (C6a) (top section)
	2. Present: But size of droplets affects how fast they fall. After demonstration ask what effect droplet size has on fall velocity. Give figures for time to fall a certain distance. Also illustrate a micrometre (micron) on the PS by drawing a line labelled 1 mm then above it put = 1000 um.	Falling polystyrene droplets and OHT (C6b) and PS diagram
	3. Present: Explain that this phenomenon will affect where the droplet goes. Make the point that it affects not only how far the droplet goes, but where it deposits i.e. on the soil or on the vegetation/locust.	OHT (C6a) (middle and bottom section)
	4. Present: Explain that large droplets will land on the ground, and very small droplets will go round things which are in their path, like smoke does.	OHT (C6c)
	5. Q&A: Point out that in real life, things are not as simple as this. Ask if they think that if 100 droplets of the same size were dropped from the same position, whether they would all land at the same spot. In real life when wind moves across rough surfaces, it causes turbulence. The amount of turbulence is more if the surface is 'rougher' i.e. taller vegetation with a mixture of different heights.	OHT (C6d)
	6. Present: So rather than being carried in a straight line, it might be carried up a bit or down a bit. If many droplets of exactly the same size are released at the same point, some will go further and some will go less far.	OHT (C6e)
	7. Present: This does not help the largest droplets since they are like stones anyway, but it means that droplets of the right size will be spread over a distance downwind (the swath width). It also means that some of the very small droplets will be brought down, but that some will be carried upwards and out of the target area	OHT (C6f)

	<p>8. Indoor exercise: Discuss droplet size and number a little bit without giving away answers. Do droplet size exercise XC6 with Playdough, putty or similar material. Use card with holes cut in as a method of measuring the half-diameter balls of putty. Alternatively, put the needle of a vibratak through the ball to measure its diameter. Discuss and do calculation for those who prefer that proof using the formula – the volume of a sphere is $\frac{4}{3} \pi r^3$.</p>	After the exercise - OHT (C6g) PS calculation
	<p>9. Present: Discuss the fact that all sprayers produce a range of droplet sizes. Remind them that they have seen that some have a wider range than others</p>	OHT (C6h)
	<p>10. Present: Talk about methods of quantifying this size range VMD and NMD.</p>	OHT (C6i)
	<p>11. Present: Explain that the relationship between the two parameters gives a measure of width of spectrum. Give some VMD/NMD ratio data for different types of sprayer as on the OHT</p>	PS diagram + OHT (C6j)
	<p>12. Present: Mention that measurement of VMD/NMD is a specialist task due to</p> <ul style="list-style-type: none"> • different spread factors • specialist measuring equipment required • need to know how to analyse the data (graph or software) 	
Summary & Conclusion	<p>1. Q&A direct (to test knowledge): What happens to a very large droplet? What happens to a very small droplet? What is the effect of turbulence on droplet distribution? If one large droplet is divided into smaller droplets with $\frac{1}{4}$ its diameter, how many of these smaller droplets will there be? What is VMD and what is NMD and what does the relationship between them tell us?</p>	
	<p>2. Present (to summarize): The smaller droplets involved in ULV spraying are mysterious and it is necessary to make some effort to understand how they behave and where they deposit. Sprayers must be chosen which can produce a narrow range of droplet sizes, and these sprayers must be set up so that they produce the right droplet sizes for the job.</p>	
	<p>3. Present (to lead into next session): Droplet size is one of the factors to consider in calibrating ULV sprayers, together with emission height and dose of active ingredient.</p>	

C7	Session Summary	Duration
	What is sprayer calibration and how are calculations made?	2 hours

Aim: To teach why calibration is important and how to calculate sprayer settings so that trainees have a positive attitude to calibration and can confidently carry it out.

Objectives: The trainees will state why calibration is important and will explain the factors which need to be measured and set. They will also make calibration calculations (individually) for a variety of real calibration scenarios.

Key control points

- Importance of calibration to get right dose and efficient operations
- Factors: droplet size; emission height; dose
- How to adjust droplet size and emission height
- Juggling track spacing, forward speed and flow rate to achieve recommended dose
- Competency with calibration calculations

Equipment:

- PS, pens, eraser
- OHTs (C7 set)
- XC7 desk exercise

Preparation: None

Guidelines page reference: C34-41, A79 and 113

C7	Session Plan	Duration
	What is sprayer calibration and how are calculations made?	2 hours

SECTION	TECHNIQUE AND CONTENT	AIDS
Introduction	<p>1. Present: Start by saying that we are coming to the bit that most people are afraid of – calibration. However, it is one of the most important stages of the spraying process since it can determine whether the operation is efficient, and even whether it is effective at all. This session aims to make it as simple as possible by using a step by step approach</p>	
Core	<p>1. Present: Ask what is calibration. Prompt for fact that it is the measurement and adjustment of spraying equipment in order to achieve the desired control result. Most people think it is just about flow rate, but we think it includes three factors:</p> <ul style="list-style-type: none"> • droplet size • emission height • dose 	OHT (C7a)
	<p>2. Q&A: Droplet size: Make the point that droplet size is important (as we have seen in previous sessions) and it is adjustable on good ULV sprayers. Ask what droplet size people think is best? Then ask whether people think that droplet size should be different for hand-held, vehicle mounted and aircraft mounted sprayers</p>	
	<p>3. Present: Make the point that there has not been much research carried out but it is BELIEVED that the best droplets size for ULV spraying is in the 50-100um range. It may be that droplets should be slightly larger for aerial spraying to avoid the possibility of losing them out of the target area, but this is not certain.</p>	OHT (C7b) but cover up emission height and track spacing
	<p>4. Present: Ask how we can set these droplet sizes? Prompt for the answer that we cannot usually measure droplet size in the field so we should consult the manufactureres handbook for the setting which will give us this droplet size. Pass round manufacturers literature and ask groups to identify the method for changing droplet size.</p>	Manufacturers literature

	<p>5. Present: Usually droplet size setting means altering the speed of rotation of the atomiser e.g. changing micronair blade angles or number of Ulva+ batteries. If we are using boom and nozzle on an aircraft (which we should not be!) angle the nozzles forward at 45 degrees - NOT backwards and NOT directly forwards.</p>	OHT (C7c)
	<p>6. Q&A: Emission height: Make point that we have seen the effect of emission height - prompt for comment that it makes the swath wider and the peak deposit further downwind. Ask for suggestions on emission heights for hand-held, vehicle and aerial sprayers for different targets. Point out that the overhead shows suggestions and that experienced operators will alter these according to conditions</p>	PS list and OHT (C7d) but cover up dose bit
	<p>7. Q&A: Dose: Now say that we have an idea of what we want for droplet size and emission height, but what about the last factor, dose? Ask what happens if we apply too low a dose? Ask what happens if the dose is too high?</p>	OHT (C7d) and uncover dose bit
	<p>8. Present: Make the point that we are aiming for a 'RECOMMENDED DOSE' which we are sure will give good results in most conditions without excessive waste. This recommended dose can either come from FAO, or from manufacturers data or from your own national trial results.</p>	
	<p>9. Q&A: Ask what is the DL rec dose for bendiocarb, fenitrothion and malathion. Direct the trainees to the table showing referee group recommended doses for DL. A79.</p>	OHT (C7e)
	<p>10. Q&A: Make point that this is a weight of product, but how can we measure this easily when we are given a liquid formulation? Prompt for the answer that we must convert this to a volume application rate (VAR)</p>	OHT (C7f)
	<p>11. Present: Go through formula 1 for bendiocarb formulation with concentration of 200 g a.i./l</p>	PS calculation
	<p>12. Q&A: But how do we achieve this VAR? Prompt for the factors which will influence VAR</p> <ul style="list-style-type: none"> • track spacing • forward speed • flow rate <p>Ask what happens to VAR when each of these is increased</p>	PS sketch of effect of these factors

	13. Q&A: Ask how we decide what track spacing and forward speed to use. Can we use a 100 m track spacing with an Ulva+? Can we use 10 km/hr forward speed with an aircraft. Prompt for the answers that there are constraints on track spacing and forward speed and it is flow rate which is easiest to change in order to manipulate VAR.	
	14. Present: Go through Formula 2 (which is on XC7, but don't give it out again) and give an example. Also explain where the 600 comes from. Put units in red and stress the importance that the units must be as in the formula otherwise the answer will be wrong.	PS calculation
	15. Present and trainee presentation: Go through example on XC7 hopper band with bendiocarb. Ask one confident trainee to come up and do an example on the board	PS calculation
	16. Present: Now go back to the beginning and say that this process can be broken down into three simple steps Step 1. Find the dose Step 2. Convert the dose to a VAR (formula 1) Step 3. Calculate the flow rate (using sensible figures for track spacing and forward speed) (formula 2)	PS list
	17. Desk exercise: Ask trainees to do calibration calculation exercises given in XC7.	Desk exercise
	18. Q&A: Review the answers and correct any errors. Discuss to ensure fully understanding.	
Summary & Conclusion	1. Q&A direct (to test knowledge): Ask trainees to outline the importance of calibration and to list the spraying factors which need calibrating. Ask how these factors affect dose applied.	PS list
	3. Present (to lead into next session): Now that we can work out the necessary sprayer settings from calibration calculations, let's move on to how we actually make these sprayer settings.	

C8	Session Summary	Duration
	How can we make correct sprayer settings?	2 hours

Aim: To teach how to set sprayers up in accordance with previously determined settings so that trainees can set sprayers up for efficient control operations.

Objectives: Trainees will explain how to alter droplet size, emission height and dose on 4 different types of sprayer. They will also measure their pace length and their forward speed.

Key control points

- practicing adjusting spraying parameters
- methods vary with different sprayers – but principles the same
- Sprayer manufacturers handbook is important

Equipment:

- PS, pens, eraser
- OHTs (C8 set)
- XC8a, XC8b and XC8c exercise sheets
- stop watch or watch with a second hand,
- measuring cylinder,
- bucket,
- protective clothing,
- soap and water,
- sprayer,
- pesticide,
- basic tools
- 8 flags

Preparation: None

Guidelines page reference: C42-45, A56-59, A65

C8	Session Plan	Duration
	How can we make correct sprayer settings?	2 hours

SECTION	TECHNIQUE AND CONTENT	AIDS
Introduction	1. Present: Now that we know the theory of calibration, we need to do it in practice – i.e. set the sprayer up to produce the right droplet sizes, emitted at the right height and delivered to the target area at the right dose.	
Core	2. Present and Q&A: Explain the ‘collection’ and ‘loss’ techniques of flow rate measurement. Make point that in real life, the actual spray formulation should be used and ask why? Give target flow rates for each sprayer to each group.	OHT (C8a)
	3. Demonstration: Four sprayers are arranged outside. Groups 1 and 2 join one trainer for explanation of workings of two sprayers and groups 3 and 4 do the same with the other two sprayers. Then groups swap over so that they are all familiar with the sprayers	Sprayers
	4. Q&A: Setting the droplet size – ask how this can be done? Can it be adjusted on all sprayers?	ULVA + and batteries
	5. Q&A: Setting the emission height - ask how this can be done? Most vehicle sprayers have fixed emission heights, but the portable sprayers can be modified. Measure the emission heights. Ask what effect an airblast can have on emission height	
	6. Field exercise: Ask trainees to do the flow rate exercise XC8a and then try to set the sprayer to their target flow rates. Make sure sprayers and groups are well spread out so that spray, airblasts and noise do not interfere with other groups’ work.	See XC8a
	7. Q&A: Discuss results - any problems with achieving the exact flow rates? If the exact flow rate cannot be achieved, what can be done to make sure VAR is right?	PS list
	8. Present: Ask whether there are any particular problems with measuring and setting aircraft flow rates	OHT (C8b)

	9. Present and Q&A: Once the flow rate has been set, it is important to measure and set the track spacing and forward speed in order to apply the correct volume and dose. Ask how we can measure the track spacing for portable, vehicle and aircraft sprayers? Ask how we can measure forward speed for portable, vehicle and aircraft sprayers?	PS list then OHT (C8c, d)
	10. Field exercise: Now carry out exercises XC8b	See XC8b
	11. Q&A: Review results and discuss.	
Summary & Conclusion	1. Q&A direct (to test knowledge): <i>[Back in the classroom]</i> What is the collection technique and what is the loss technique. How can droplet size and emission height be adjusted on different types of sprayer? When should calibration be carried out?	PS table
	2. Present (to summarize): Calibration is essential - better to do it more often than necessary than risk overdosing or underdosing.	
	3. Present (to lead into next session): Now that the sprayer and spraying technique are set up correctly, we need to deal with how ULV spraying is actually carried out.	

C9	Session Summary	Duration
	What are good and bad ULV spraying conditions?	1.5 hours

Aim: To go through the weather conditions which affect ULV spraying so that trainees know how to choose spray timings which maximise control efficiency.

Objectives: The trainees will name and explain the importance of the main weather factors affecting ULV spraying.

Key control points

- ULV spraying is more sensitive to weather than higher volume spraying
- Wind, sun and rain are important
- Methods to judge whether conditions are suitable

Equipment:

- PS, pens, eraser
- OHTs (C9 set)

Preparation: None

Guidelines page reference: C52-53

C9	Session Plan	Duration
	What are good and bad ULV spraying conditions?	1.5 hours

SECTION	TECHNIQUE AND CONTENT	AIDS
Introduction 5 mins	1. Present: Make the point that ULV spraying can be completely ineffective or very inefficient if carried out under the wrong conditions.	
Core 60 mins	<p>1. Q&A: Ask which types of weather factors are important for ULV spraying. Prompt for:</p> <ul style="list-style-type: none"> • wind • sun • rain <p>If someone suggests temperature or humidity – put them on the list but with a question mark after them.</p>	PS list
	<p>2. Q&A: Ask how wind affects ULV spraying. Cover problems of too little wind or too much wind. Someone may suggest wrong wind direction – ask what can be done about that? Ask what might cause the wind direction to change frequently (convection) but do not elaborate – there is more detail later. Mention that operator contamination is more likely in light wind.</p>	PS list and OHT (C9a)
	<p>3. Q&A: Ask how sun affects ULV spraying. Cover concept of convection. Start with hot sun. That heats the ground. Then the hot ground heats the air. Then the hot air rises (and cold air falls to take its place).</p>	PS list and OHT (C9b) (revelation technique)
	<p>4. Q&A: Ask how rain affects ULV spraying. Prompt for rain washing pesticide off vegetation.</p>	
	<p>5. Q&A: Ask how temperature and humidity affect ULV spraying? Discuss and make the point that they are not important</p>	
	<p>6. Present: In reality, this means that spraying should be carried out between 0800 and 1100 and after 1600, BUT these are not hard and fast rules – spraying MAY be possible all day, or not at all – judgement required.</p>	OHT
	<p>7. Present: Explain the effect of wind on convection.</p>	OHT (C9c then 9d and 9e)
	<p>8. Present: Also mention that wind is good for impaction on vegetation and locusts and that the limit that some people use of 5 – 6 m/s is probably too low - up to 10 m/s is effective</p>	OHT (C9f)

Summary & Conclusion	1. Q&A direct (to test knowledge): Ask about the key weather factors which affect ULV spraying. Ask if you can ever spray at 1300?	OHT (C9g)
	2. Present (to summarize):	
	3. Present (to lead into next session): Now, that we know what weather conditions are good for ULV locust spraying, we need to know how to carry out spraying operations.	

C10	Session Summary	Duration
	What are the principles and techniques of ULV spraying?	1.5 hours

Aim: To teach the basics of ULV spraying so that trainees can carry it out confidently, safely and effectively.

Objectives: The trainees will be able to describe and carry out the essential steps in ULV spraying

Key control points

- Demarcating targets – methods and major problems
- Contrast barrier and full-cover spraying
- Orientation and direction of movement with respect to wind direction
- Track marking is essential – various methods

Equipment:

- PS, pens, eraser
- OHTs (C1a, C10 set)
- ULVA + sprayer filled with water
- 6 flags

Preparation: None

Guidelines page reference: C48-51, C58-69

C10	Session Plan	Duration
	What are the principles and techniques of ULV spraying?	1.5 hours

SECTION	TECHNIQUE AND CONTENT	AIDS
Introduction	1. Present: Refer back to the Control Process diagram to review progress	OHT (C1a)
Core	1. Q&A: We have chosen the control technology (probably ULV), the product, the sprayer, the platform, and we have calibrated. The survey teams have identified some targets and we have gone there. What next?	OHT (C1a)
	2. Q&A: Ask what next and prompt for demarcation of the target	
	3. Q&A: Ask whether there are any problems with demarcating targets. How can we demarcate small bands, blocks of bands and settled swarms	OHT (C10b, c,d)
	4. Q&A: Ask what next and prompt for checking conditions	PS list of conditions
	5. Trainee presentation: Draw a target and wind direction and ask someone to draw in the spray tracks. Then show OHTs to show spray tracks then tracks together with deposited spray.	PS sketch + OHT (C10e, f)
	6. Present: Describe barrier spraying and make the contrast with full cover spraying	OHT (C10g)
	7. Q&A: Ask how the operator can maintain the correct forward speed for portable, vehicle-mounted and aircraft mounted sprayers (judgement, vehicle speedometer and ground speed indicator (GPS))	PS list
	8. Q&A: Ask how operators can maintain the correct track spacing for the three platforms (flag marking, flag marking/GPS and GPS/flag marking). What are the problems without track guidance of any sort?	PS sketch of overlapping passes
	9. Present: Talk a little bit about aircraft track guidance systems	OHT (C10h)
	10. Present: Talk about the aircraft track logging system and ability to map out sprayed areas	OHT (C10i, j)

	11. Demonstration: Step outside and demonstrate the principles of ULV spraying on a small plot using a hand-held spinning disc sprayer. This can be expanded to a group exercise where each group sprays a small fake hopper band with flagmen close to the training room. Debrief and discuss whether to mark out first or check wind direction first, and also whether flag marking is in fact necessary – on small targets, spraying can start without demarcating properly, but it is important on bigger targets.	Ulva + sprayer and 6 flags
Summary & Conclusion	1. Q&A direct (to test knowledge): How does the spray team know how big the target is? What conditions are suitable for ULV spraying. Which edge of the field does the sprayer operator start at? What are the benefits of track guidance systems in aircraft? What are the differences between portable, vehicle and aerial ULV spraying?	PS table
	2. Present (to summarize): We have put all of the pieces together now and spraying has been carried out safely and efficiently.	
	3. Present (to lead into next session): Now, let's look at how such operations can be monitored and their efficacy checked.	

C11	Session Summary	Duration
	How can control efficacy be checked (locust mortality)?	1.5 hours

Aim: To teach how and when to carry out control efficacy checks so that trainees are able to monitor performance of control operations

Objectives: The trainees will explain the different methods of mortality assessment and state which are best suited to which control situation. They will also carry out a simulation of field and cage assessments and calculate mortality in each case.

Key control points

- Feedback required on efficacy
- Different methods – field/cage – strengths, weaknesses
- What accuracy/frequency required during real control operations?

Equipment:

- PS, pens, eraser
- OHTs (C11 set)
- XC11 exercise sheet
- Equipment on XC11

Preparation: See XC11

Guidelines page reference: C72-79

C11	Session Plan	Duration
	How can control efficacy be checked (locust mortality)?	1.5 hours

SECTION	TECHNIQUE AND CONTENT	AIDS
Introduction	1. Present: If locusts are not killed by control operations, then all of the time, money and effort is wasted. However, control teams very rarely have a clear idea of how effective their control operations have been. This session should help you to know the value of checking mortality, the possible techniques and the strengths and weaknesses of each	
Core	1. Q&A: Why is it important to check locust control efficacy? What are the possible causes of poor mortality	PS list then OHT (C11a)
	2. Q&A: What different techniques have you used or heard of to assess locust control efficacy? (Rough visual, field counts)	PS list, then OHT (C11b) (but cover 'when' column)
	3. Q&A: When should locust mortality checks be carried out?	PS list, then OHT (C11b) (all revealed)
	4. Present and Q&A: Field assessments - rough visual checks. In many cases where control is effective these are sufficient since we are not interested in exact percentage mortality if control is good. Are there any particular problems which rough visual assessments might suffer (fast-moving targets and/or slow-acting products). Which types of situation are rough visual assessment suited to?	PS list of probs
	5. Present and Q&A: Field assessments – field counts. These are more accurate assessments of numbers of locusts before and after spraying. They are based on quadrat counts to provide density of locusts, together with assessments of areas of target. Densities are no good on their own since locust groups can spread out or clump together depending on time of day and weather. When these two factors of density and target size are combined, they provide a measure of total numbers of insects. Both live and dead locusts can be counted. Real quadrats are not necessary since with a bit of practice, field staff can estimate a 1m ² quadrat quite accurately. Are there any problems with this technique and what sort of target are they best suited to?	OHT (C11c & d) PS list of problems

	6. Present: Mortality can be calculated by comparing the number of locusts seen before and after spraying or by comparing the number of dead locusts with the number alive after spraying. Neither is perfect – give worked examples of both formulae on page C77 .	PS calculation
	6. Present and Q&A: Cage assessments. Cages can be made from different types of material and they overcome the problem of mobility of locusts. What sort of problems do you think cage assessments might suffer and what sort of target are they suited to? Make the point that untreated control cages are very important. Give a worked example of calculating mortality (no adjustment for mortality in untreated cages – if it is more than 10%, results are unreliable)	OHT (C11 e & f) PS list of probs PS calculation
	7. Field and desk exercise: Carry out the exercises described in XC11	XC11
	8. Q&A: Debrief on CX11	
Summary & Conclusion	1. Q&A direct (to test knowledge): Is it necessary to carry out exact field assessments of mortality for every control operation? Which situations are appropriate for rough visual checks, field counts and cage assessments.	PS table
	2. Present (to summarize): Mortality assessments are important and are not difficult to carry out providing the right techniques are chosen for the right situation	
	3. Present (to lead into next session): Now, we have covered all of the knowledge and skills involved in monitoring control operations, let's move on to how to monitor and record the most important information in a systematic way.	

C12	Session Summary	Duration
	How can control operations and their efficacy be recorded?	1.5 hours

Aim: To provide justification and techniques for recording spraying operations and their effects so that trainees are more motivated and capable of doing it.

Objectives: Trainees will complete a standard Spray Monitoring Form using information from one of four detailed reports of operations.

Key control points

- Systematic recording and reporting of control operations is crucial
- Most important aspects are included in the Spray Monitoring Form
- Understanding interaction with the Survey Form

Equipment:

- PS, pens, eraser
- OHTs (C12 set)
- Spray monitoring form
- XC12 and XC12 crib sheet

Preparation: Make photocopies of the FAO Spray Monitoring Form – one per trainee. Also make photocopies of XC12 – one per person

Guidelines page reference: C70-71, A90-91

C12	Session Plan	Duration
	How can control operations and their efficacy be recorded?	1.5 hours

SECTION	TECHNIQUE AND CONTENT	AIDS
Introduction	1. Present and Q&A: Control often takes place in remote areas and the amount of information coming back to control bases and headquarters can be very little indeed. Why would we want to improve the quantity and quality of information that is being fed back?	PS list and OHT (C12a)
Core	1. Q&A: What sort of information is important to monitor and record	PS list
	2. Q&A: Why is a form useful for recording information?	PS list
	3. Present: Show first part of Spray Monitoring Form, then the instructions section by section. Stress that the form should be filled out by a designated person during or immediately after each target has been treated, otherwise details may be forgotten	OHT (C12b, then 12c - j)
	4. Classroom exercise: Each group will receive four different reports of control operations. Each trainee will fill in the form based on the information provided.	XC12
	5. Q&A open: What difficulties did you have completing the exercise? Was the information complete and did this make it easier or more difficult for you? Was the information correct? Did you notice any bad application errors from the information provided? How would you improve the form?	PS list
Summary & Conclusion	1. Q&A direct (to test knowledge): Why is it important to monitor control operations.	PS list
	2. Present (to summarize). The form presented in this session was jointly developed by FAO, NRI and locust affected countries. It contains the basic information required for analysing control efficacy, efficiency and safety to humans and the environment. You are encouraged to use this (or a similar) form to record the necessary information during control operations. It should be completed in the field while you are at the site, not later when in the office.	
	3. Present (to lead into next session): Now, that we have all of the tools and skills at our disposal, let's move on to using them in the field in a realistic simulation of hopper band spraying.	

C13	Session Summary	Duration
	Practicing control techniques in the field	3 hours

Aim: To allow trainees to practice the knowledge and skills they have learnt relating to control operations

Objectives: Trainees will find and spray two fake locust hopper bands in a safe and effective way (including calibrating their sprayers), and will monitor and record all aspects of the operations (except locust mortality) using the Spray Monitoring Form.

Key control points

- Bringing together knowledge, skills and equipment relating to control
- Practice is often different from theory – real control is more so!

Equipment:

- PS, pens, eraser
- OHTs (C1a)
- 4 Micron Ulva + sprayers
- 24 D size batteries
- 24 flags
- 4 vibrataks
- 4 GPS
- 4 compasses
- dark colour gravel to make fake hopper band
- spray monitoring forms
- radios
- shovels and buckets for making bands
- 2 vehicles for making the bands in advance
- XC13 exercise sheets

Exercise preparation

- 4 bands should be prepared using the gravel or other fake band-making material, preferably out of sight of one another.
- Each band should be around 100m² but can be odd shapes
- Record the coordinates of each band using a GPS
- Photocopy XC13 exercise sheet – one per trainee

Guidelines page reference: All pages.

C13	Session Plan	Duration
	Practicing control techniques in the field	3 hours

SECTION	TECHNIQUE AND CONTENT	AIDS
Introduction	1. Present and Q&A: A quick review of how to carry out ULV control operations including what equipment to take. This exercise allows trainees to put into practice what they have learned about calibration, delimiting targets, spraying and monitoring/recording spraying.	OHT (C1a)
Core	1. Present: Introduce exercise CX13 and give out exercise sheet, equipment, forms.	PS list
	2. Field exercise: <ul style="list-style-type: none"> • establish an initial meeting point in the field • give the coordinates of bands to groups • tell them to follow instructions on CX12 • encourage them to assign specific tasks to specific group members e.g. GPS use, filling the control monitoring form, operating the sprayer etc. • give them around 3 hours to complete the task and arrange a time to meet back at the starting point before returning to the training centre. 	PS list
	3. Trainee presentation: A representative from each group should describe what their group did. Capture the calibration data and spray parameters on the PS. Discuss.	PS table
Summary & Conclusion	1. Q&A direct (to test knowledge): Did you encounter any problems with the control operation or monitoring and recording it.	PS list
	2. Present (to summarize). You have now put into practice much of the knowledge and many of the skills you have learnt over the past week or so. These principles apply equally to spraying with hand-held, vehicle-mounted and aircraft-mounted equipment – with some small differences.	
	3. Present (to lead into next session): Now that we have tried control in the field with group members taking different roles, it should be easier for us to identify the tasks expected of different staff involved in locust survey and control.	

C14	Session Summary	Duration
	What are the tasks of different locust field personnel?	1.5 hours

Aim: To help trainees identify the tasks of different locust field personnel

Objectives: Trainees will list the main tasks of survey staff, control staff, drivers, ground spray labourers, airstrip labourers, pilots, aircraft technicians, others?

Key control points

- Efficient operations require clear allocation of tasks
- Staff are not always in agreement with the tasks they should do, or are not allowed to do!
- Each locust organization will have different solutions

Equipment:

- PS, pens, eraser
- OHTs (C14 set)

Preparation: None

Guidelines page reference: A74

C14	Session Plan	Duration
	What are the tasks of different locust field personnel?	1.5 hours

SECTION	TECHNIQUE AND CONTENT	AIDS
Introduction	1. Present and Q&A: Now that we have tried spraying fake hopper bands, it should be clear that field operations are easier if members of the team know exactly what tasks they are responsible for.	
Core	<p>1. Buzz group: Each group will develop a list of tasks for two different types of staff as follows:</p> <ul style="list-style-type: none"> • Group 1 – survey officers and survey vehicle drivers • Group 2 – ground control officers and spray vehicle drivers • Group 3 – ground support staff for aerial spraying and airstrip labourers • Group 4 – spray pilots and engineers 	OHT (C14a)
	2. Trainee presentation: A representative from each group will present their findings and comments are given by others	PS list
Summary & Conclusion	1. Q&A. What do you think is the best way of ensuring that these groups of staff carry out these tasks and how can that be checked.	PS list
	2. Present (to summarize). There are clearly many tasks to carry out during survey and control operations. The exact lists of tasks will vary from country to country but staff find it useful to have their tasks clearly defined.	
	3. Present (to lead into next session): We are nearly at the end of our Survey and Control Course, so the next step is for us to assess how much your technical ability has improved and for you to evaluate the course and its trainers.	

C15	Session Summary	Duration
	Summarising the control sessions	1.5 hours

Aim: To go through the control process, review key points and to allow opportunity for questions on any specific control aspect.

Objectives: Trainees will answer questions on the key points from all control sessions. They will also broaden their knowledge through questioning and sharing information on control subjects.

Key control points

- All previous topics mentioned briefly
- Any topic(s) not well understood?
- Feedback on content, methods, styles, materials
- Suggestions for improvement?

Equipment:

- PS, pens, eraser
- OHTs (All sets – for quick reference)

Preparation: None

Guidelines page reference: All

C15	Session Plan	Duration
	Summarising the control sessions	1.5 hours

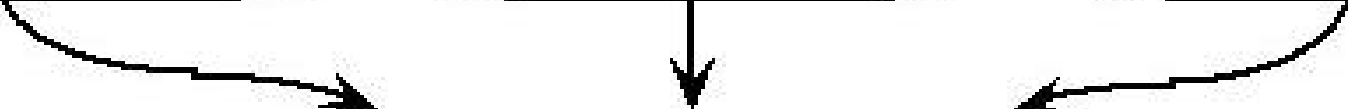
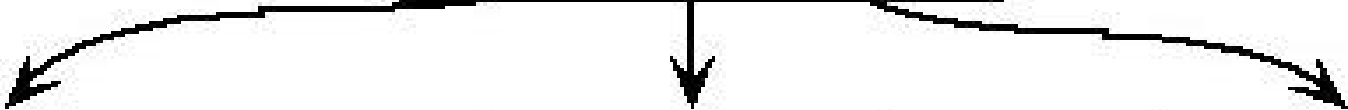
SECTION	TECHNIQUE AND CONTENT	AIDS
Introduction	1. Present and Q&A: We are coming to the end of the control sessions, so this is an opportunity to review what we have done and revise the key points. It is also an opportunity to ask questions or make points about any aspect of control which trainees wish to discuss.	
Core	1. Q&A: Reveal the first step on the control process OHT and ask questions about factors involved in the decision on whether to control or not.	OHT (C01a)
	2. Q&A: Reveal the next step and ask questions about control technologies	PS list
	3. Q&A: Reveal the next steps and ask questions about platform, control equipment, atomizers and insecticides.	
	4. Q&A: Reveal the next step and ask questions about calibration factors – dose, droplet size and emission height. Also the things which contribute to dose – VAR, speed, flow rate, track spacing.	
	5. Q&A: Reveal the next step and ask questions about suitable weather conditions for spraying.	
	6. Q&A: Reveal the next step and ask questions about getting set up for spraying – finding the wind direction and laying out a baseline at 90 degrees to that.	
	7. Q&A: Reveal the next step and ask questions about assessing locust mortality	
	8. Q&A: Reveal the next step and ask questions about assessing control efficacy/locust mortality	
	9. Q&A: Reveal the next step and ask questions about recording control operations and the spray monitoring form.	
	10. Q&A: Any particular topics that were difficult to understand and why? Any topics which were enjoyable and informative and why? Any training methods, activities or approaches that were good/bad? Any suggestions for improvement in content or methods?	

Summary & Conclusion	1. Present: We have seen that control is a complex process involving many different stages. It involves good understanding of locust biology, insecticide characteristics, meteorology, physics of droplet behaviour, mathematics of doses, engineering principles of equipment etc. No wonder it is sometimes done unsafely and inefficiently! We have also seen that good control relies on good information from survey operations, otherwise we are operating blind – the two activities are closely interlinked.	PS list
	2. Present (to lead into next session): We are nearly at the end of our Survey and Control (and Training, where applicable) Course, so the next step is for us to assess how much your technical (and training) ability has improved and for you to evaluate the course and its trainers.	

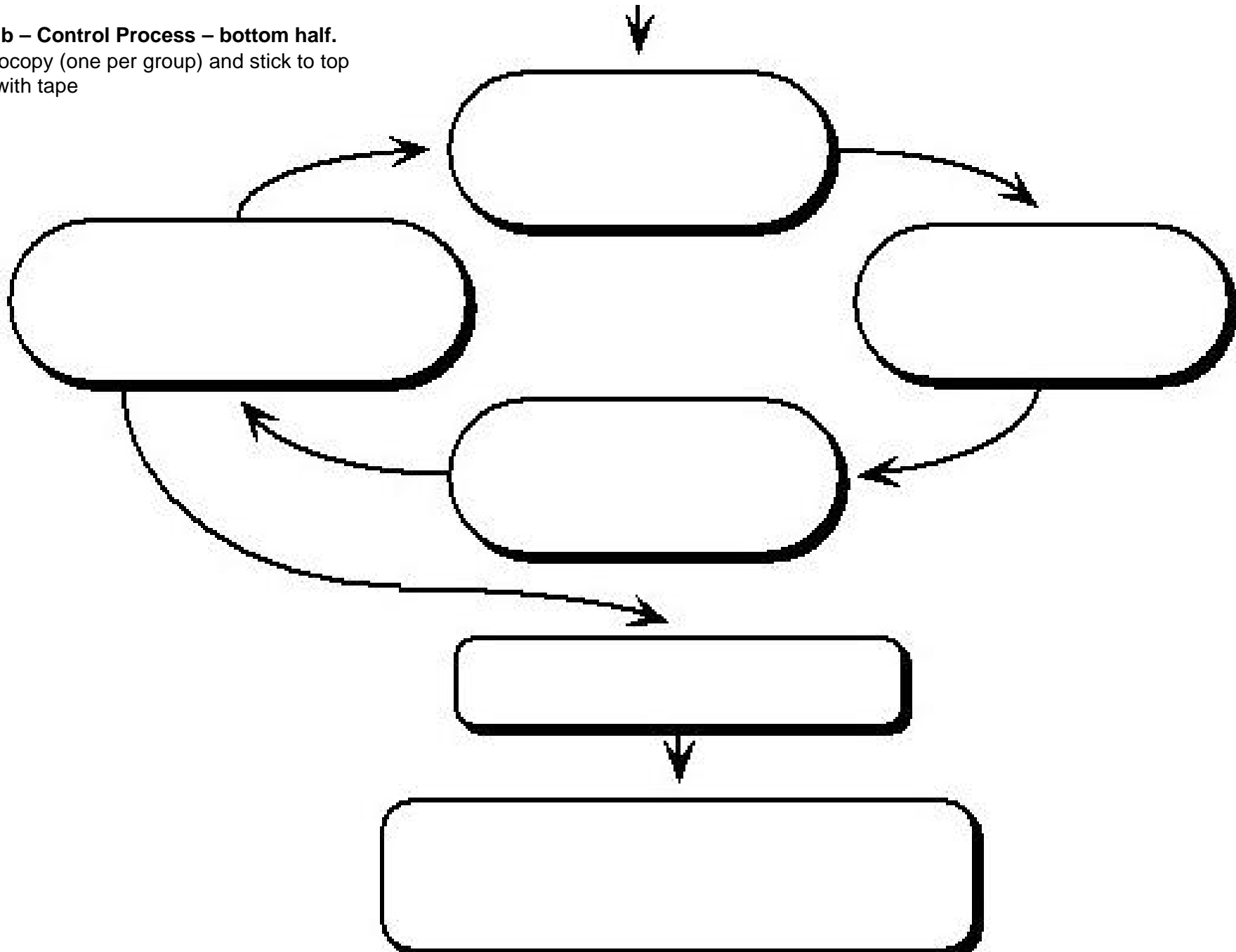
Control exercises

XC1 a – Control Process – top half.
Photocopy (one per group) and stick to
bottom half with tape

THE CONTROL PROCESS



XC1 b – Control Process – bottom half.
Photocopy (one per group) and stick to top half with tape



Find and delimit
the target

Choose an
insecticide

Submit report

Monitor/record
activities/efficacy

Choose application
platform

Control the locusts
safely/efficiently

Choose control
equipment

What is the target and is
control necessary. If so....

Make sure conditions
are right

Clean, maintain and store
equipment/pesticide

Choose a control
technology

Calibrate control equipment and
inform local population

XC2 - EXERCISE ON SUITABLE DROPLET SPECTRA FOR ULV SPRAYING

Exercise

Each group should expose a piece of water sensitive paper to the spray coming from each of the following in turn:

- a. A brush dipped in a bucket then flicked vigorously at the paper
- b. a lever operated knapsack sprayer (hydraulic nozzle)
- c. a 'flit gun' type sprayer (airblast nozzle)
- d. a spinning disc sprayer (eg Micron Ulva plus) fitted with 7 or 8 batteries (rotary atomiser)

Using the hand lenses, examine the size of the droplets (do not worry about the number of droplets on the papers as this will depend how long you held the paper in the spray). Now discuss in your groups and decide on a group answer to the following questions.

Questions

- a. which sprayer produced the largest droplet?
- b. which produced the smallest droplet?
- c. which produced the largest range of droplet sizes (many different sizes of droplets)?
- d. which produced the narrowest range of droplet sizes (most droplets around the same size)?
- e. which is likely to be the most suitable for ULV spraying and why?

XC3 - PESTICIDE TOXICITY EXERCISE

Introduction

The LD50 figures given in the World Health Organization (WHO) Classification of Pesticides by Hazard are for the **active ingredient (a.i.)**. To arrive at the toxicity of the pesticide formulations themselves, these LD50 values must be adjusted to take account of the concentration of the products actually used.

This can be calculated by using the formula

$$\text{LD50 of formulation} = \frac{\text{LD50 of active ingredient} \times 100}{\text{percentage concentration of formulation}}$$

For example, as we have seen above, the LD50 of fenitrothion active ingredient is 503 mg/kg (moderately hazardous), but the LD50 of a 10% EC formulation of fenitrothion is:

$$\frac{503 \times 100}{10} = 5030 \text{ mg/kg (i.e. slightly hazardous)}$$

The WHO classification takes into account the **type** of formulation as well as the concentration. Therefore dry formulations are considered less toxic than liquid formulations.

Exercise

Use the WHO Hazard classification guide to determine the mammalian toxicity and hazard classifications of the following products and their formulations

1. look up the pesticide name and the page number in the WHO document index
2. find the pesticide and look up the LD50 of the active ingredient
3. Use the formula above to work out the formulation LD50
4. Use the table on page 3 of the WHO Classification of Pesticides by Hazard to find the toxicity class of the formulation

Pesticide name	concentration (%)	LD50 of a.i.	LD50 of formulation	WHO class of formulation (oral)
fenitrothion	80			
deltamethrin	5			
diazinon	60			
malathion	85			
dieldrin	50			
carbaryl	10			
diflubenzuron	6			

XC4 a - EXERCISE ON FIELD EQUIPMENT FOR CONTROL OPERATIONS

Please use the field equipment to make measurements and fill in the following table.

Whirling hygrometer

What is the wet temperature on the whirling hygrometer?	
What is the dry temperature on the whirling hygrometer?	
What is the relative humidity now?	

Anemometer

What is the maximum wind speed in a period of a minute?	
What is the minimum wind speed in a period of a minute?	
What is the average of three windspeeds taken during one minute?	

Compass

What is the bearing of the wind direction? (the direction that the wind is coming FROM)	
What is the bearing of the tallest thing you can see?	

Vibrating tachometer

What is the rotational speed in revolutions per minute (rpm) of the Micron Ulva + sprayer with 8 batteries?	
What is the rotational speed in revolutions per minute (rpm) of the Micron Ulva + sprayer with 5 batteries?	

XC4 b - MEASURING PACE LENGTH

For many types of field operation, it is useful to know how long your normal pace length is. For example, it is useful for walking transects during survey operations and for measuring track spacings during spraying. We **cannot** assume that the pace length is 1 m – it is usually much less.

EXERCISE - calibration of pace

Each group should measure out a distance of 100 m using the tape measure and plant a flag at each end. Each person should walk along the line and count the number of paces to reach the end. Each person does this 3 times in total, then use the table below to calculate pace length and number of paces for 10 m. Note that the walking style should be as if the person is doing normal survey and control field operations i.e. not trying to stretch each pace out to be a metre, nor strolling along very slowly.

Name	
(A) Distance covered (100m)	
Number of paces (1st time)	
Number of paces (2nd time)	
Number of paces (3rd time)	
(B) Average number of paces	
Number of paces to measure 10 m (B divided by 10)	
Length of pace (A divided by B)	

Two examples of where this might be useful:

1. If a locust survey officer measures a hopper band and finds that it is 240 paces long, and he knows that his pace length is 0.75 m, he can calculate the true length in metres by multiplying 240 paces x 0.75 m = 180 m.
2. If a locust control officer is marking 30 m track spacings for a vehicle sprayer and he knows that he uses 12 paces to walk 10 metres, he can work out how many paces he should use between spray passes by multiplying 12 paces by 3 (three ten metre lengths are the same as 30 m) = 36 paces between spray tracks.

XC5 a - FORM FOR RECORDING METEOROLOGICAL DATA DURING SWATH WIDTH MEASUREMENT

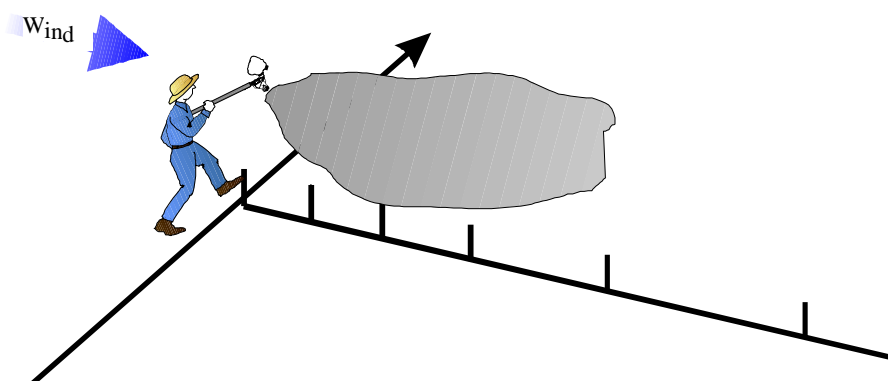
Factor	Group 1 swath (Group 2 to record)	Group 2 swath (Group 3 to record)	Group 3 swath (Group 4 to record)	Group 4 swath (Group 1 to record)
<i>Date</i>				
<i>Time</i>				
<i>Number of batteries and rotational speed (rpm)</i>				
<i>Emission height</i>				
<i>Bearings of spray line</i>				
<i>Wind direction during spraying</i>				
<i>Wind speed during spraying</i>				
<i>Temperature during spraying</i>				
<i>Sun conditions (sunny/cloudy)</i>				

XC5 b - SWATH WIDTH MEASUREMENT WITH HAND-HELD SPRAYERS

Introduction

The swath is the spray deposition downwind at right angles to a crosswind spray run.

We shall be looking at how the deposit varies with distance downwind. This will be estimated by counting the number of droplets per cm^2 on the upwind face of vertical rods at different distances downwind.



The rods will be set at distances of 0, 1, 2, 3, 5, 7, 10, 15, 20, 30, 50 and 80 m downwind.

Swath width is influenced by several factors such as wind speed, droplet size, emission height, temperature conditions. We will be looking at two variables:

1. Droplet size (large and small)
2. Emission height (high and low)

Spray will be produced by someone walking with an Ulva + sprayer. Large droplets will be produced by using 5 batteries and small droplets will be produced by using 8 batteries. Low emission height will be holding the spray head approximately 50 cm above the ground and high emission height will be holding it as high as possible, probably around 2.5 m.

Each group will measure deposit with one combination of these two variables.

Group 1. Small droplets (8 batteries), high emission height (2.5 m).

Group 2. Small droplets (8 batteries), low emission height (0.5 m).

Group 3. Large droplets (4 batteries), high emission height (2.5 m).

Group 4. Large droplets (4 batteries), low emission height (0.5 m)

EXERCISE

(1) Find the direction of the wind and using flags, mark out a spray line 100 m long at 90 degrees to the wind direction. Put out a line of rods running downwind from the spray line at the distances indicated above. Each group should measure the dry rpm of their atomizer disc.

(2) Each group will have 12 pieces of oil sensitive paper and some Blu-Tak adhesive. Care must be taken with this paper because it can easily be marked if handled roughly, and fingerprints can make counting droplets difficult. Only the shiny side is sensitive. Handle the paper only by the ends of the strips and do not touch the middle. The papers should be attached near the top of the rods, facing into the wind, with the sensitive side of the paper on the outside.

(3) After spraying, the paper should be labelled with the distance and the treatment they have been given, and stuck onto a piece of paper. Do not allow anything to touch the surface of the papers as the droplets may get smudged and difficult to count.

(4) Group 1 should put out their papers first. The spray operator will then make a spray pass (or more if droplet numbers are insufficient) with large droplets and high emission height. Group 2 take the meteorological data for Group 1 during the spraying. Group 1 papers are then collected in. Group 2 then put out their papers and the spray operator makes a spray pass (or more) but this time with large droplets and a low emission height. Group 2 collects their papers. The exercise goes on until Group 4 has collected their papers and the field work is finished. Papers should be labelled and stuck to a piece of A4 paper with sticky tak then kept safely in a clipboard.

(5) Record the meteorological conditions during the spraying and other details, taking turns as groups as indicated on the table provided.

(6) Back in the classroom, use the templates and hand lenses to count the number of droplets on the papers. If there are many droplets, count the number seen in the 0.25 cm² template and multiply by 4 to give the number of droplets/cm². If there are very few droplets, use the 1 cm² template and no mathematical correction is necessary to give number of droplets/cm².

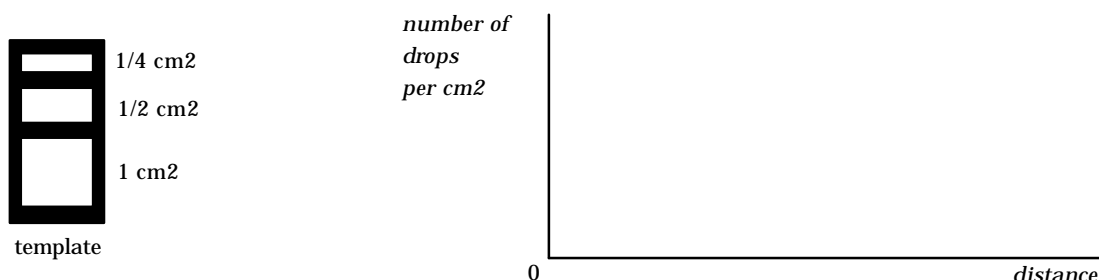


Table for data entry during droplet counting

Group n°

Droplet size large/small

Sprayer, high/low

distance downwind (m)	area used (1/4, 1/2 or 1 cm ²)	number of droplets (4 counts)				average number of droplets	average number of droplets per cm ²

(7) Now plot a graph of number of droplets/cm² (on the vertical or y axis) against distance downwind (on the horizontal or x axis) and answer the following questions.

Questions:

- a) At what distance downwind does the swath begin
- b) At what distance downwind is the maximum deposit
- c) What is the swath width and how can we define it
- d) What is the effect of size of droplets on swath width
- e) What is the effect of emission height on swath width
- f) What track spacing can we use for each treatment in order to obtain a deposition that is reasonably uniform?

XC6 - DROPLET SIZE AND NUMBER EXERCISE

Introduction

If we reduce the size of the drops produced by the sprayer, we increase the number of drops we can make from each litre of pesticide. But how many more do we get?

EXERCISE

1. Each group has a piece of soft stuff. Make it into a ball and measure its diameter with the ruler.
2. Now break the ball of soft stuff in half and roll the two pieces into balls. Measure their diameter – are they half the diameter of the original ball?
3. If not, break the two balls in half again, make all four pieces into balls and measure their diameter. Are they half the diameter of the original ball?
4. If not, break these four balls in half again, make all eight pieces into balls and measure their diameter. Are they half the diameter of the original ball?
5. How many smaller balls have you made from the larger ball?
6. If we are spraying locusts and we reduce the pesticide droplet size from 200um to 100 um, how many times more drops will there be?

XC7 – CALIBRATION CALCULATIONS

Volume application rate (l/ha) = $\frac{\text{recommended dose (g a.i./ha)}}{\text{formulation concentration (g a.i./l)}}$ (Formula 1)

Flow rate (l/min) = $\frac{\text{VAR (l/ha)} \times \text{speed (km/h)} \times \text{track (m)}}{600}$ (Formula 2)

Summary of steps

If you have been given a new pesticide to apply against Desert Locusts, or you need to make changes to the application technique, the calibration calculations are a three step process:

Step 1: Find the dose (g a.i./ha). Identify the pesticide active ingredient you are using and consult the FAO list of recommended doses (or other source) to determine the recommended dose for the pesticide in g a.i./ha.

Step 2: Convert the dose to a volume application rate (l/ha). Read the pesticide formulation concentration in g a.i./l from the pesticide label and use Formula 1 above to calculate the volume application rate (VAR) in l/ha. (This VAR may already be given on the pesticide label, in which case Step 1 is unnecessary).

Step 3: Calculate the required flow rate (l/min) Use Formula 2 above to calculate the flow rate required to achieve this volume application rate (using some sensible figures for track spacing and forward speed).

Tip. Remember , ultimately the person in charge of the spraying operation must decide on sprayer settings depending on the conditions and circumstances

EXERCISE

Carry out the necessary calculation for these 4 examples below. You will need to look at the list of FAO recommended doses attached and **remember the 3 steps:**

(1) Imagine you are controlling hopper bands with hand-held sprayers using the pesticide bendiocarb as a **20% formulation containing 200 g/l**. You are using a **track spacing of 12 m** and a forward **speed of 4.8 km/h**. What is the flow rate you require to apply the recommended dose of the pesticide?

(2) Imagine you are controlling large hopper bands using a vehicle mounted sprayer and the pesticide **deltamethrin as a formulation with 12.5 g/l**. If your spray vehicle travels at **10 km/hr** with a **flow rate of 400 ml/min**, what is the track spacing you must use to achieve the recommended dose of the pesticide?

(3) Imagine you are managing a control operation on a settled locust swarm using an aircraft and the **pesticide fenitrothion in a formulation with 1000 g/l**. If a **track spacing of 0.1 km** is used and a **flow rate of 13 l/min**, what is the forward speed (in km/hr) that the aircraft must fly at to achieve the recommended dose to kill the locusts?

4) You are in a vehicle spraying hopper bands with **Karate 4% ULV (lambdacyhalothrin)**. You are using a **track spacing of 25 m** and a **flow rate of 250 ml/min**.

a) What is the vehicle speed in km/hr which you must use to apply the recommended dose?

b) If the wind becomes very weak and you have to reduce the track spacing to 15 m still to get a reasonably uniform pesticide deposition, what must you also do to maintain the application of the recommended dose?

XC8 a - HOW TO MEASURE AND SET THE FLOW RATE

After calculating the flow rate required to deliver the correct VAR, which will deliver the recommended dose, the flow rate must be measured and set. The general principles of measuring and setting flow rate are the same for all types of sprayer. However, aircraft may either be easier (if they have an electronic flow meter) or more difficult (if they have a windmill driven pesticide pump).

Tip: During real control operations, the flow rate must be measured with the pesticide itself because other liquids may flow faster or slower. Measure it at least 3 times to make sure there have been no errors.

Equipment required

You will need: notebook, pen, stop watch or watch with a second hand, measuring cylinder, bucket, protective clothing, soap and water, sprayer, pesticide, basic tools

Some sprayers work in a way which allows the operator to collect and measure the liquid emitted over a given time e.g. spinning disc sprayer with the disc stationary. It is more difficult with others e.g. exhaust nozzle sprayer since the spray comes out together with the airblast. In these cases, the amount lost from the tank over a given time is measured.

THE COLLECTION TECHNIQUE

(for use when spray liquid can be collected easily as it is emitted)

Step 1. Put on protective clothing, fill the sprayer and position it to deliver pesticide into a measuring cylinder, or into a bucket.

Step 2. Allow the pesticide to flow from the sprayer into the container for a measured number of seconds (M) between 60 and 180 seconds (1- 3 minutes).

Step 3. Use the measuring cylinder to measure the volume emitted and collected (E).

Step 4. Calculate the flow rate (F) in ml/min by using the formula below

$$F \text{ (l/min)} = \frac{E \text{ (l)} \times 60}{M \text{ (s)}}$$

Step 5. Adjust the flow rate to the value calculated previously. This may be done by changing the restrictor nozzle, altering a needle valve setting or adjusting the pump pressure. Consult the manufacturers manual for details on individual sprayers.

THE LOSS TECHNIQUE

(for use when the spray liquid cannot be collected easily as it is emitted)

Step 1. Fill the sprayer up to a known level with pesticide (either completely full or to a mark on the tank) and spray over the target area using your normal spraying technique for a measured time (M in seconds).

Step 2. Use a measuring cylinder to measure the amount of pesticide required to refill the sprayer back to its original level. This will give the amount emitted (E).

Step 3. Use the same formula above to calculate the flow rate and adjust if necessary to the value calculated previously:

Tip: if the wrong units are used, the formulae will give the wrong answer and the wrong dose will be applied. Be sure to check the units and convert them if necessary to the units in the formulae above.

To illustrate the two techniques, each group will measure flow rate with several different types of sprayer.

EXERCISE – N.B. make sure that sprayers and groups are well separated for this exercise – some sprayers are very noisy and airblasts may interfere with flow rate checks that other groups are doing

Micron Ulva Plus (group 1 will start – target flow rate is 40 ml/min)

Method A. Fit the orange nozzle to the sprayer and almost fill the bottle with water. Fit the bottle to the sprayer. **Without switching the disc on** turn the sprayer over and allow the water to fall into a funnel and a measuring cylinder for 1 - 3 minutes. Measure the volume of liquid in the measuring cylinder. Repeat twice more. Use Table 1 to note the data and to calculate the flow rate. If necessary, change the restrictor in order to get as near as possible to your target flow rate.

Method B. Put **exactly 500 ml** of water into the sprayer bottle. Spray outside for a period of 1 - 3 minutes using the same orange nozzle. Measure the volume of liquid remaining in the bottle. Repeat this twice more. Use Table 2 to note the results and to calculate the flow rate, then change restrictor if necessary to get as close as possible to your target flow rate. When you have finished with this sprayer, move on to the next sprayer below.

Knapsack mistblower sprayer (2 types) (group 2 will start – target flow rate is 100 ml/min)
Put water into the sprayer. Use either technique A or technique B above, whichever you think is most appropriate, to measure the flow rate then adjust it to your target flow rate. When you have finished with this sprayer, move on to the next sprayer below.

Micronair AU8115 (group 3 will start – target flow rate is 350 ml/min)

Use the technique which you think is most appropriate to measure the flow rate of this sprayer with water. Keep adjusting the pressure and/or the VRU in order to achieve your target flow rate. When you have finished with this sprayer, move on to the next sprayer below.

Micron Ulvamast (group 4 will start – target flow rate is 200 ml/min)

Use the technique which you think is most appropriate to measure the flow rate of this sprayer with water. Keep adjusting the flow rate until you have achieved your target flow rate. When you have finished with this sprayer, move on to the first sprayer above.

Table 1 - Method A – the collection technique with the Ulva+

nozzle/ restrictor	volume collected (ml) 1	2	3	average volume collected (ml)	duration of measurement (mins)	Flow rate (ml/min)
red						
orange						
yellow						
blue						

Table 2 - method b

Sprayer	nozzle/ restrictor	initial volume in the tank (ml)	volume remaining in the tank (ml)	volume sprayed (ml)	Duration of spraying (min)	Flow rate (ml/min)

QUESTIONS

- 1) Which factors can influence the flow rate of a sprayer
- 2) Which method of measuring it is most appropriate for the different types of sprayer
- 3) Is each of the 3 results for a sprayer exactly the same? If not, why not?

XC8 b - CALIBRATING SPRAYER SPEED

For any sprayer, speed has a direct effect on dose applied. Aircraft usually have good airspeed indicators, but operators of ground equipment are often not sure what speed they are driving or walking at.

The procedure for measuring sprayer speed is very similar for portable or vehicle-mounted sprayers.

Step 1. Using a measured distance of 100 m marked out with flags, walk or drive between the two flags at the maximum comfortable working speed and record the time taken. In a vehicle note the gear used and the engine speed (if the vehicle is fitted with a tachometer).

Step 2. Enter the data in to the table below and calculate the actual speed you were travelling.

Step 3. Repeat this twice more and calculate the average speed in m/s. This can be converted to km/h by multiplying by 3.6.

Replicate	Distance walked (metres) (A)	Time taken to walk or drive 100 m (secs) (B)	Actual speed (m/s) (A divided by B)
1			
2			
3			
Average			

XC11 – MORTALITY ASSESSMENT EXERCISES

Imagine that a hopper band and a swarm are being sprayed. How can we check mortality?

There are problems concerning the mobility of the insects, especially with pesticides which do not act very quickly. A larval band can move a distance of some hundreds of meters before there is an effect. It is necessary to follow the band to determine the mortality. During countings, it is necessary to take account of the possibility that the dead locusts can be eaten by birds or ants and that the live ones might change their behaviour because of the sub-lethal effects of the pesticide.

The problem of mobility is even more serious with adults because they might fly away. In this case, it is necessary to catch the insects and to put them in the cages immediately after the treatment in order to observe the effects of the pesticide. It is necessary to take account of the possibilities of contaminating, or of damaging the insects with the net which one uses to collect them or with the cages. For this reason, the cages which contain the untreated insects are very important. There is also the risk that the insects will escape or be eaten by ants.

Exercise 1. Mortality of a larval band (Groups 1 and 2 start, then 3 and 4)

There is a mock band set out (gravel or beans). In fact, there are four bands but they represent the same band at various times after treatment: the first is just before treatment, and the others represent the same band at two hours, eight hours and twenty four hours after the treatment. Each bean or gravel piece is a larva, probably at the 3rd stage, and the colour indicates the condition - the light coloured beans/gravel are the alive insects and the black beans/gravel are the dead insects.

You want to know how many insects there are in the band at the beginning. A method of estimating is to measure the length and width which, when multiplied together, give you, its estimated area. Then you make a transect of the band taking ten quadrat samples of the density of insects (a number by measures square). The average density multiplied by the area will give you a very approximate number of insects.

You do the same thing for the band after 2 hours, 4 hours and 24 hours, by noting the density of the live insects (light coloured) and the insects dead (black).

Finally, calculate the death rate of the band by the three methods below:

$$\text{a) Mortality (\%)} = \frac{(\text{alive (0 hr)} - \text{alive (24 hrs)}) \times 100}{\text{alive (0 hr)}}$$

$$\text{b) Mortality (\%)} = \frac{\text{dead (24 hrs)} \times 100}{\text{alive (0 hr)}}$$

$$\text{c) Mortality (\%)} = \frac{\text{dead (24 hrs)} \times 100}{\text{dead (24 hrs)} + \text{alive (24 hrs)}}$$

QUESTIONS

1. Is the mortality the same for the three methods? If not, why?
2. Which are the most difficult problems with assessing band mortality?

Exercise 2. Mortality of a settled swarm (Groups 3 and 4 start, then 1 and 2)

You spray a settled swarm and before the insects can fly, you catch some individuals with a net and put them in cages, 20 insects in each one. The envelopes represent the cages and the beans represent the insects. The light coloured beans are alive and the painted beans (black) are dead.

There are three types of cages:

- a) Untreated control. The insects were caught before the treatment, therefore did not receive any insecticide
- b) Sprayed insects with unsprayed vegetation. The insects were put in the cages after spraying, but with the vegetation is from outside (upwind of) the treated area.
- c) Sprayed insects with sprayed vegetation. The insects were put in the cages after spraying, with vegetation from inside the sprayed area.

There are also three exposure levels for the insects - immediately after spraying, at 2 hours and 24 hours after the treatment. A new series of envelopes represents each time after the treatment.

Count the number of insects (beans), alive and dead, in each cage (envelope).

Calculate mortality for the three types of cages with the following formula:

$$\text{Mortality (\%)} = \frac{\text{dead (24hrs)} \times 100}{\text{alive (0 hr)}}$$

QUESTIONS

1. What percentage mortality is there in the cages with sprayed insects and unsprayed vegetation?
2. Which percentage mortality is there in the cages with sprayed insects with sprayed vegetation?
3. Why is there a difference between the two?
4. Which percentage mortality did you find in the untreated cages and why are some of the insects dead?
5. Should we adjust the mortality figures for the other cages due to the mortality in the untreated cages?

XC12 – COMPLETING THE SPRAY MONITORING FORM

Please transfer the information from the 4 reports below to the FAO Spray Monitoring Form as clearly as you can.

1. Radio report of operations from Ali - spray team leader

Villagers called to the locust base to inform us of a Desert Locust infestation in their area. We went there and controlled three hopper bands in sand dunes on morning of 8 September 2002, using Decis 12.5% ULV. 3.5 hectares sprayed. Ulvamast hand-held sprayers were used with 5 batteries and orange nozzle. Operations started around 10.00 with strong wind blowing towards the south east. Sunny. Team of three men sprayed with sprayers. Batteries went down so they stopped after three bands. 5 litres of Decis used. Swath width was 10 m. One man headache, but he washed himself with the soap and water and rested and was OK. Hopper bands were visited in evening – many dead locusts. One band got lost.

2. Verbal report during breakfast from pilot Jonas on 3 October 2002.

One swarm was sprayed when roosting in tall trees – estimated area of 5 km². Aircraft was Piper Pawnee Brave fitted with boom and nozzle equipment, with nozzles facing backwards. Dursban 45% ULV was used – four drums used - track spacing 100 m, airspeed 100 knots. Spray passes carried out East/West. Spraying started at 07.10, but wind direction not certain. GPS worked very well. After 08.00 ground team arrived and reported wind to be 2 – 3 m/s from bearing of 70 degrees. Job completed around 08.40 – air temperature 31 ° C.

3. Ground team report handwritten on paper and passed to locust base by Mamoon on 15 September 2002.

Block for barrier spraying with scattered hopper bands – some instar 4 and some adult fledgling. Green vegetation 25 – 35 cm tall – mostly *Cenchrus biflorens*, drying out. Soil moist at 20 cm depth, cloud cover 75%, temperature on arrival at 06.45 was 37 ° C. Flagmen deployed with vehicles over block of 10 km x 5 km as provided in map coordinates by survey team. Flags were red and one yellow, but two poles broken so new branches cut from trees. Pesticide was diflubenzuron (trade name not known) 6% ULV and pilot instruction was to spray at 100 g a.i./ha within the barriers. Aircraft was fixed wing and came at 11.25 and sprayed 6 passes (each 10 km long) for about 45 minutes with 4 Micronair AU5000 units – flow rate was reported to be 5 l/min from each atomiser. Blade angle was 40 degrees. Windspeed was 7.32 m/s. Humidity 130 %. Flying height was too low. When driving back to base, some small swarms seen flying out of the block.

4. Report by telephone to base by field officer on 19 October 2002.

Large swarm was sprayed on evening of 17 October 2002 until after darkness using Micronair AU8115 airblast sprayer. Locusts were roosting in low trees around 5 m high, over an area of 1 ha. Flow rate set to 500 ml/min and spray directed up into the trees after the wind dropped down to calm conditions. Area sprayed from all sides to try to get pesticide to all of them. Pesticide used was Sumithion ULV. One driver got dizzy after his dust mask became wet with spray. Many dead locusts falling from the trees. Sample of the green adult locusts taken back for confirmation. Reports of sick camels for 2 weeks afterwards.

XC12 – COMPLETING THE SPRAY MONITORING FORM

Please transfer the information below to the FAO Spray Monitoring Form as clearly as you can.

Case	Extra points apart from missing data
1. Radio report of operations from Ali - spray team leader	
<p>Villagers called to the locust base to inform us of a Desert Locust infestation in their area. We went there and controlled three hopper bands in sand dunes on morning of 8 September 2002, using Decis 12.5% ULV. 3.5 hectares sprayed. Ulvamast hand-held sprayers were used with 5 batteries and orange nozzle. Operations started around 10.00 with strong wind blowing towards the south east. Sunny. Team of three men sprayed with sprayers. Batteries went down so they stopped after three bands. 5 litres of Decis used. Swath width was 10 m. One man headache, but he washed himself with the soap and water and rested and was OK. Hopper bands were visited in evening – many dead locusts. One band got lost.</p>	<p>Wrong description of sprayer – Ulvamast is an vehicle sprayer – they probably mean Micron Ulva +.</p> <p>If batteries went down, how slowly were the discs spinning before they stopped?</p>
2. Verbal report during breakfast from pilot Jonas on 3 October 2002.	
<p>One swarm was sprayed when roosting in tall trees – estimated area of 5 km². Aircraft was Piper Pawnee Brave fitted with boom and nozzle equipment, with nozzles facing backwards. Dursban 45% ULV was used – four drums used - track spacing 100 m, airspeed 100 knots. Spray passes carried out East/West. Spraying started at 07.10, but wind direction not certain. GPS worked very well. After 08.00 ground team arrived and reported wind to be 2 – 3 m/s from bearing of 70 degrees. Job completed around 08.40 – air temperature 31 ° C.</p>	<p>If wind is 70 degrees, then an East/West spray line is WRONG.</p> <p>Nozzles are the wrong thing for ULV and should certainly not be facing backwards.</p>
3. Ground team report handwritten on paper and passed to locust base by Mamoon on 15 September 2002.	
<p>Block for barrier spraying with scattered hopper bands – some instar 4 and some adult fledgling. Green vegetation 25 – 35 cm tall – mostly <i>Cenchrus biflorens</i>, drying out. Soil moist at 20 cm depth, cloud cover 75%, temperature on arrival at 06.45 was 37 ° C. Flagmen deployed with vehicles over block of 10 km x 5 km as provided in map coordinates by survey team. Flags were red and one yellow, but two poles broken so new branches cut from trees. Pesticide was diflubenzuron (trade name not known) 6% ULV and pilot instruction was to spray at 100 g a.i./ha within the barriers. Aircraft was fixed wing and came</p>	<p>Note how long after ground team got there that the spraying was done</p> <p>Note the obsession with detail other than the important ones.</p>

<p>at 11.25 and sprayed 6 passes (each 10 km long) for about 45 minutes with 4 Micronair AU5000 units – flow rate was reported 5 l/min each atomiser. Blade angle was 40 degrees. Windspeed was 7.32 m/s. Humidity 130 %. Flying height was too low. When driving back to base, some small swarms seen flying out of the block.</p>	
<p>4. Report by telephone to base by field officer on 19 October 2002.</p>	
<p>Large swarm was sprayed on evening of 17 October 2002 until after darkness using Micronair AU8115 airblast sprayer. Locusts were roosting in low trees around 5 m high, over an area of 1 ha. Flow rate set to 500 ml/min and spray directed up into the trees after the wind dropped down to calm conditions. Area sprayed from all sides to try to get pesticide to all of them. Pesticide used was Sumithion ULV. One driver got dizzy after his dust mask became wet with spray. Many dead locusts falling from the trees. Sample of the green adult locusts taken back for confirmation. Reports of sick camels for 2 weeks afterwards.</p>	<p>Driver should not be getting spray on him. Should not be wearing a 'dust mask' – how did it get wet?</p> <p>Green adults locusts must be a different species from DL.</p> <p>Fenitrothion is relatively slow acting, so if there were many dead locusts quickly after spraying, definitely an OVERDOSE. Sick camels is also a sign</p> <p>Spraying from all directions is dangerous.</p>

CX13 - MOCK BAND SPRAYING EXERCISE

Introduction

All groups are given a new formulation of insecticide to control two bands of Desert Locusts. You will be given the GPS coordinates of the bands. Please take all equipment to treat these bands with the recommended dose of insecticide as given in the FAO Guidelines. In fact you will be using water, but you should measure exactly the quantities of pesticide (water) you use and all other details to fill in the FAO Locust Survey Form and Spray Monitoring Form.

Which group	Insecticide	Formula tion	GPS coordinates of band 1	GPS coordinates of band 2
Group 1	bendiocarb	20% w/v		
Group 2	chlorpyrifos	30% w/v		
Group 3	lambdacyhalothrin	3% w/v		
Group 4	deltamethrin	1% w/v		

Meeting point coordinates =

Equipment needed

- 4 Micron Ulva + sprayers
- 24 D size batteries
- 24 flags
- 4 vibrataks
- 4 GPS
- 4 compasses
- dark colour gravel to make fake hopper band
- spray monitoring forms
- radios
- shovels and buckets for making bands
- 2 vehicles for making the bands in advance

Training skills sessions

T1	Session Summary	Duration
	Introduction to the training process	30 minutes

Aim: To introduce a simple model of the training process so that the trainees can use this as a map to build their training skills within a logical structure

Objective: The trainee will state the main steps in the training process and give a brief description of the purpose of each one

Equipment:

- PS, pens, eraser
- OHTs (T1 set)
- XT1a and XT1b – one per trainee

Preparation:

- Copy and give out XT1 a and b **before** Session T1 so that participants can give it in at the beginning of Session T1 for the trainer to assess group experience and expectations
- Copy XT2a and XT2b to give out at end of session in preparation for next session

Key training points:

- Who
- Need
- Content
- Planning
- Training Method
- Evaluation
- The 5 “Ps”

Guidelines page references:

T1	Session Plan	Duration
	Introduction to the training process	30 minutes

SECTION	TECHNIQUE AND CONTENT	AIDS
Introduction (5 mins)	1. Present: Discuss the results of the questionnaire. Different people have indicated different areas where they feel they can be helped. This acknowledges that trainees already have some skills but also highlights where they can be helped and demonstrates that everyone has some need for training in the training process	
	2. Q&A: Introduce by stating that Training is a process and like all processes it will have a series of activities or steps. Ask group to suggest a series of headings for Training	
	3. Present/Q&A: the responses from the group by using the OHT on the training process with an uncover technique as a guide; <u>reveal</u> each heading of the left hand column one by one (keep the descriptions covered).	OHT (T1a)
Core (20 mins)	1. Q&A: Draw from the group possible answers to the Headings 1 to 6 in the OHT. Take the trainees through the headings one at a time and after some discussion reveal each comment in the left hand column. Ensure that the entire group can follow the individual points and the structure of the process. From this simple structure you can explain that the training method sessions will build up these simple terms into a detailed structure of how effective training can be achieved. <u>Use the manual text as a guide to expand on the headings 1 – 6 in the OHT</u>	
	2. Q&A: Test their understanding where necessary. The purpose of this is to give the trainees an overview (map) of the process and its main components. Do not go into depth at this stage as you will do this in T2 –T8 sessions that follow	
Summary & Conclusion (5 mins)	1. Q&A: Go around the group and ask individual trainees to give the steps in order and explain briefly what is involved in each. Explain any points that are unclear. Conclusion. Emphasise that we now have “A logical structure in which to plan and present Training” <u>Give out XT2a and XT2b – one per trainee and ask them to complete the table.</u>	

T2	Session Summary	Duration
	Introduction to individual Learning Styles	30 minutes

Aim: To introduce the concepts of learning style and the learning cycle so that participants can apply these to their own learning and to the design and delivery of training sessions that recognizes personal styles and the individual learner's experience and needs.

Objectives: The trainee will plot their own learning style profile and describe how they can expand their own and their trainees learning process

Key Training points

- Complete XT2a and XT2b forms
- Transfer to XT2c and XT2d
- Plot graphs
- Learning cycle
- Cycle / styles link
- Improving learning profiles

Equipment:

- PS, pens, eraser
- XT2a, XT2b, XT2c and XT2d – one per trainee
- OHTs (T2 set)
- Blank OHTs and OHT pens

Preparation:

- Copy XT2c and XT2d for distribution during the session
- Issue learning styles questionnaire and the recording sheet (XT2a and XT2b) **at end of previous day's programme** and instruct trainees to complete them for beginning of T2 session

Guidelines page references:

T2	Session Plan	Duration
	Introduction to individual Learning Styles	30 minutes

SECTION	TECHNIQUE AND CONTENT	AIDS
Introduction (5 mins)	<p>1. Classroom exercise: Check that all the participants have completed the questionnaire and recording sheet. Sort out any problems so that each participant has a complete recording sheet</p> <p>Ask all participants to transfer their scores to their Profile sheet</p>	
	<p>2. Q&A: Put Learning style OHT on the OHP and put a blank OHT over it to protect it. Ask for 3 or four volunteers to draw their results on the OHT. Use a different colour for each.</p>	OHT (T2a)
Core (20 mins)	<p>1. Q&A: Develop with them the four style categories from the learning cycle OHT Ask each if they agree that their profile indicates their preferred styles</p>	OHT (T2b)
	<p>2. Q&A: Now ask some of the other participants what are their weakest categories and how they think they could improve these</p>	
	<p>3. Explain that to make the learning process complete it is necessary for the learner to participate actively in all four categories</p>	
	<p>4. Discussion. Try to get the trainees to suggest ways in which they could plan training so that they can strengthen the learning style profile for different trainees. Remind them that the trainer is trying to deal with different trainees who all have different learning styles</p>	
Summary & Conclusion (5 mins)	<p>5. Summarise this part by emphasising that all trainees are different and they have to be seen as individual people with different needs and experiences</p>	

T3	Session Summary	Duration
	Target Groups. Who are they?	40 minutes

Aim: To introduce the concept of Target Groups so that trainers can prepare training, presentations and learning sessions that more accurately match the trainee needs and are sensitive to the personal, technical and environmental conditions of the trainee.

Objectives: The trainee will

1. State the main headings that can be used to construct a target group profile.
2. Complete a profile for a specified target group.
3. Use the profile to explain how the technical content, training methods and learning environment of a specified session would be influenced by the information available.

Key Training Points

- Exercise on the importance of people
- Target group Headings
- Sources of information
- Headings in detail
- Profile sheet exercise

Equipment:

- PS, pens, eraser
- OHTs (T3 set)
- XT3 – one per trainee

Preparation:

- Copy XT3 – one per trainee

Guidelines page references:

T3	Session Plan	Duration
	Target Groups. Who are they?	40 minutes

SECTION	TECHNIQUE AND CONTENT	AIDS
Introduction (10mins)	1. Q&A: Try to get the group to define what the title means. (the <u>people</u> we are <u>aiming</u> our training at.)	
	2. Exercise: Divide the group into small groups of 3-4 people. Explain the task using the OHT and give the groups 5 mins to make notes.	OHT (T3a)
	2. Participant presentation: Give each group a sheet of flip chart paper and get them to record their answers in the form of a table as in the OHT. Each group presents their answers to the full group	
Core (20 Mins)	1. Q&A: Develop from the group answer charts what reasons they have for selecting different reasons and content for the sessions for group 1 and 2.	
	2. Present: Emphasise that what has come out is that, while the title seems the same, the reason the training and the content are different, is because <u>the People are different</u>	
	3. Q&A: OHT reinforce the point by asking individuals how the people in the picture may differ in needs and experience within a locust control programme	OHT (T3b)
	4. Q&A: Show profile headings on OHT and ask which are most important and where can you get the information you need? Check against list in Training Notes.	OHT (T3c)
	5. Present, Q&A and discuss: Use the " <i>Profile headings in more detail</i> " part of the T3 manual text as a guide as you work through them with the group and that they are clear about the issues arising in each category	
	6. Desk exercise: Give out XT3 and ask each person to complete it for a target group they will have to train. Check one or two to ensure the concept is understood.	
Summary & Conclusion (10 mins)	Conclude by reminding group that they will use this method when they start to prepare sessions and they must remember that it is the target profile that dictates content and training approach. People first, <u>then</u> content second.	

T4	Session Summary	Duration
	Training needs analysis	60 minutes

Aim: To introduce practical methods of training needs analysis so that Trainees can use these to make sure their training courses are relevant to the needs of their trainees and the work they are doing

Objectives:

The trainees will:

- State what criteria can be used to judge the quality and efficiency of a job or task
- Explain the concept of the Training Gap
- Complete a training needs analysis exercise using the form provided
- Explain why the emphasis is on doing rather than subject matter in training needs analysis.

Key training points

- Work competence criteria
- Training gap
- Information
- Job Description
- Training Needs Analysis (TNA)
- Link to objectives

Equipment:

- PS, pens, eraser
- XT4 – one per trainee
- OHTs (T4 set)

Preparation:

- Copy XT4 – one per trainee

Guidelines page references:

T4	Session Plan	Duration
	Training needs analysis	60 minutes

SECTION	TECHNIQUE AND CONTENT	AIDS
Introduction (5 mins)	1. Classroom exercise: Ask groups to try to define what criteria could be used to define the level of competence of work performance. Use the OHT as a confirmation of the 5 main criteria and discuss examples of these criteria in desert locust control work	OHT (T4a)
	2. Present: Reveal the two questions on the OHT and with Q&A lead the trainees to the concept of the training gap	OHT (T4b and T4f)
Core (20 mins)	1. Buzz groups: Ask groups to consider where they can find information on the training needs of individuals and groups. After feedback confirm results with OHT and discuss any outstanding points.	OHT (T4c)
	2. Present and Q&A: Introduce the need for careful structuring of the analysis by first developing a job description of the work area being analysed. Ask trainees what tasks their jobs involve.	PS list
	3. Present: Show the OHT job description and discuss the layout and content. <u>Emphasise</u> that the text is written in a way which focuses on what is done and not a list of subject headings	OHT (T4d)
	4. Present: Introduce and discuss the TNA Diagnostic Sheet and the four steps in completing it.	OHT (T4e)
	5. Buzz groups: Once the group is clear on how to complete the Diagnosis Sheet put the participants in small groups and ask them to complete sections 2 to 6 on sheet XT4. Take the feedback and clarify any misunderstandings.	
Summary & Conclusion (5 mins)	1. Q&A: Summarise the TNA steps <ol style="list-style-type: none"> 1. Performance criteria, the training gap, sources of information. 2. The importance of the job description and describing in <u>Doing</u> terms 3. The Diagnosis sheet 4. Translating causes and problems (column 5) to Training content (column 6) 5. The link between Column 1 and training session Objectives 	OHT (T4f)

T5	Session Summary	Duration
	Training objectives and selecting the content of training sessions	1.5 hours

Aim: To introduce the use and writing of Training Objectives and how they can be used to guide the selection of session content and training methods so that trainees can apply this in their own training work.

Objectives: The trainee will:

- Write appropriate objective(s) for a practice training session,
- Explain and apply the process of linking Target Group, Objectives and Training content and methods to their practice training session at the end of the course.

Key training Points

- Destination / Objective
- Objectives in Training
- Training Gap – Training Needs Analysis - Objective link
- Exercise
- Objectives – Knowledge, Skills and Attitudes
- Exercise
- Simple to complex
- Must, should, could

Equipment:

- PS, pens, eraser
- OHTs (T5 set)

Preparation: none

Guidelines page references:

T5	Session Plan	Duration
	Training objectives and selecting the content of training sessions	1.5 hours

SECTION	TECHNIQUE AND CONTENT	AIDS
Introduction (5 mins)	1. Present and Q&A: Introduce the comparison of a journey without a destination and a training session without an objective	OHT (T5a)
	2. Introduce the examples of an Objective and establish, through Q&A, the importance of selecting action verbs. Explain the benefits of using Objectives - defines purpose and outcome	OHT (T5b)
Core (20 mins)	1. Q&A: Revise the link between Target Group, Training Needs and Objective and how the objective is developed	OHT (T5c)
	2. Emphasise and illustrate the dangers of using the verbs “Understand, Appreciate, or Know” in Objectives (they are hard to verify)	
	3. Desk Exercise: Each group to identify a target group, state an area of training need and write three objectives that reflect the need identified. Each group to present them on the flip chart.	
	4. Participant presentation: The groups evaluate and discuss the objective presented – strengths weaknesses	PS list
	5. Present: Revise the Training gap / bridge concept and the training content comprising of Knowledge, Skills and Attitudes. Illustrate what these mean	OHTs (T4f and T5d)
	6. Q&A and present. Use ULV calibration example of translating Objectives to content.	PS list then T5e
	7. Desk exercise and participant presentation: using same methods translate example from their own objectives developed in step 3 and present results to whole group	PS list
	8. Emphasise Structuring content “Simple to Complex” etc Prioritising content into Must, should, could know	OHTs (T5f and T5g)
Summary & Conclusion (5 mins)	1. Q&A: Summarise Importance of Objectives and the need for the content to reflect the Objective. (See Key points boxes in text)	

T6	Session Summary	Duration
	The adult learning process and training methods	1.5 hours

Aim:

- Highlight the main training approaches to be used with the Adult learner:
- Describe and demonstrate key participatory methods and consider the basic rules of perception and use of visual aids in Training so that the trainees can adopt and develop these approaches in their role as master trainers.

Objectives: The trainee will:

- Select and use appropriate participatory methods and learning aids in their Practice lesson on the final day of the effective training module.

Key training Points

- Adult Learner
- Participatory approaches
- Participation
- Learning cycle progression
- Teaching methods
- Participatory techniques matches with Learning Styles
- Perception and visual presentations
- Rules and standards
- Non Verbal communications

Equipment:

- PS, pens, eraser

Preparation:

- Selected examples of OHTs, charts and real materials and equipment from survey and control practical sessions to illustrate the range of possible learning aids.

Guidelines page references:

T6	Session Plan	Duration
	The adult learning process and training methods	1.5 hours

SECTION	TECHNIQUE AND CONTENT	AIDS
Introduction (10 mins)	1. Present and Q&A: Using the OHT reinforce the emphasis on the role of the trainer as someone who monitors the learning process by observing how the trainee is reacting to the training. Also revise the Active verbs in Objectives and the emphasis on Doing	OHT (T6a)
	2. Present: Link the OHT to the T5 Session and how T6 adds to the process by introducing training methods	OHT (T6b)
Core (20 mins)	<u><i>This is a broad area to cover so the trainer must use the Training Notes to expand upon the basic information appearing on the OHTs</i></u> 1 Present Q&A. Use the OHT to highlight the key points on Adult learners. Expand the presentation by referring to the Adult learner section of the T6 Training Notes.	OHT (T6c)
	2. Buzz groups: Move onto the central place of participatory approaches to training. Using the titles on the OHT ask each group to give at least one practical example for each of the 9 methods. Give examples of others to complement the examples given by the groups and clarify any misunderstandings. Encourage the groups to discuss how they could use these methods in their own training.	OHT (T6d)
	3. Q&A: Discuss what signs they might see if their trainees are not participating, What reasons may cause this and how can they be overcome them (See Training Notes)	OHT (T6e)
	4. Q&A: Revise the four steps in the learning cycle then make the point that in reality the circle is not closed, but more like a spiral. Explain how the learner will go many times round the learning cycle, but each cycle takes the learner a little higher, more knowledgeable and skilled.	OHTs (T2b and T6f)
	5. Present: From Training Methods Text expand upon the headings by presenting the methods suggested under the headings “Methods to encourage” Doing – Thinking – Analyzing – Planning. Use Q&A to get trainees to provide practical examples of methods suitable for each stage.	OHT (T6g)

TRAINING SKILLS

	<p>6. Present and Q&A: Explain the main techniques as in “techniques for participatory teaching” text. You may choose only those available to the trainees in their own work. Ask for and discuss examples from the group for each category.</p>	OHT (T6h)
	<p>7. Present: Establish that everyone does not always see in the same way and it is important to check through Q&A that everyone is seeing the same thing. Discuss visibility and size of lettering on PSs and OHTs. Demonstrate simple skills on use of PSs and OHP. Others teaching skills as appropriate. Group motivation can be maintained by reminding them that they will have to prepare and use learning aids and participatory methods in their practice training session</p>	OHT T6j (Start with it the right way up, then after a while turn it over)
<p>Summary & Conclusion (6 mins)</p>	<p>Summarise the key issues of participation and the use of learning aids in Adult Training. Discuss practice training session preparation and answer any questions</p>	

T7	Session Summary	Duration
	Planning the Training Session and Programme	1.5 hours

Aim: To teach the family tree structure used for programme planning and how to prepare a training session plan so that trainees can use the training plan guides provided in the manual to deliver their own training courses.

Objectives: The trainee will prepare a complete training plan for a practice training session that will be presented to peers.

Key Points

- Family tree structures
- Title, Aim, Objective Key points
- Intro Core and Summary / Conclusion
- Assessment sheet Instructions for practice training session delivery

Equipment:

- PS, pens, eraser

Preparation:

- Copy XT7a and XT7b – one of each per trainee

Guidelines page references:

T7	Session Plan	Duration
	Planning the Training Session and Programme	1.5 hours

SECTION	TECHNIQUE AND CONTENT	AIDS
Introduction (10 mins)	1. Present: Explain where we have reached in the training process diagram.	OHT (T7a)
	2. Explain family tree structure and how it is applied to structuring training programmes through Objectives and Content (Simple <i>upwards</i> to Complex)	OHT (T7b)
Core (70 mins)	1. Q&A: Why plan a training session? Know our Objective (destination.) etc	
	2. Present: Planning using the Session Summary sheet. Explain headings	OHT (T7c)
	3. Practice / supervision. Distribute XT7a and each trainee completes the sheet for the lesson they are teaching as a practice session	
	4. Present: Planning using the Session Plan sheet. Explain headings	OHT (T7d)
	5. Practice / supervision. Distribute XT7b and each trainee completes the sheet for the lesson they are teaching as a practice session.	
	6. Q&A: Check on group / individual progress and refine and correct problems	
	7. Discuss / Guidance as required on the preparation of training aids, equipment etc.	
Summary & Conclusion (5 mins)	1. Q&A: Ask what are the main parts of the planning process. 2. Present: Once all the planning, preparation and delivery of the training sessions has been completed, there is one very important step still remaining – assessing the impact of training. We need to ask ourselves ‘Did it work? If not why not? What can be done about it for current and/or future trainees?’	

T8	Session Summary	Duration
	Evaluating the impact of courses	1.5 hours

Aim: To teach methods of assessing impact of training so that trainees can measure their performance as trainers, identify areas for improvement, and make the necessary changes to their content, materials and techniques.

Objectives: The trainees will develop their own impact assessment scheme for a specified target group.

Key Points

- Indicators of success
- Pre and post-course tests – strengths weaknesses
- Continuous assessment
- Model assessment scheme
- Addressing impact on knowledge, skills and attitudes

Equipment:

- PS, pens, eraser
- OHTs (T8 set)

Preparation:

- Copy XT8a – one per trainee

Guidelines page references:

T8	Session Plan	Duration
	Evaluating the impact of courses	1.5 hours

SECTION	TECHNIQUE AND CONTENT	AIDS
Introduction (10 mins)	1. Present: Explain where we have reached in the training process diagram. Make the point that this is the stage where we find out whether the time, effort and cost of the training has been worthwhile	OHT (T8a)
Core (20 mins)	1. Q&A: How can we assess whether the training has been effective or not? Ask for specific methods.	PS list
	2. Present: Revise the points in the Training Needs Analysis section since this should be the benchmark against which we need to measure improvements	OHT (T04b)
	3. Q&A: Ask how well-written objectives might be useful in impact assessment?	
	4. Present: Discuss the advantages and disadvantages of different assessment techniques: continuous assessment, pre and post-course tests, participant evaluations of the value of the course, report on/observations of field practice after the course	PS list
	5.Q&A. Ask which of these techniques are suited to assessing improvement in knowledge, in skill or in attitude	
	6. Desk exercise and participant presentation: Ask each group to choose a particular Target Group and suggest the best ways to assess training impact for that group	
	7. Q&A: Ask what should be done if weak areas are identified during impact assessment (and point out the advantage of continuous assessment here i.e. problems can be addressed <i>during</i> the course rather than after it).	
Summary & Conclusion (10 mins)	1. Q&A: Summarise the main parts of the impact assessment process 2. Present: Make point that Trainers are learning too and that the more feedback (results of impact assessment) they have, the better they will become 3. Present: Clarify arrangements and timetable for next day's practice training sessions. 4. Present: Explain the Training Session Self Evaluation Checklist and distribute copies (XT8a)	

	5. Conclusion Explain rules for comments and discussion of each practice session. <i>No critical comments unless speaker is able to suggest a better solution or method..</i>	
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Training skills exercises

XT1a - TRAINER PERCEPTIONS

NOTE: To be given out 1 day before first training session for participants to complete

Look at the table below and indicate what you feel about these statements by ticking the appropriate boxes.

Tick the first column if you **strongly agree** with the statement and often have these doubts and feelings

Tick the second column if you **generally agree** with the statement and sometimes have these doubts and feelings

Tick the third column if you **disagree** with the statement and never have these doubts and feelings.

XT1b - TRAINER PERCEPTIONS

		Strongly agree	Generally agree	Disagree
1	I feel I don't know enough about the subject			
2	I don't know what to include and what to leave out			
3	I never know how long or short a course or a session should be.			
4	I don't know what criteria to use to structure and plan a training session / programme			
5	I'm never sure what I am trying to achieve or how I can measure my success			
6	The people I am expected to train know more than I do.			
7	I don't feel confident when standing up in front of an audience			
8	I don't know how to get my trainees to participate in sessions so I usually give them a lecture from my notes.			
9	I feel I should use visual aids but I don't really know how to use them			
10	I can give a demonstration on a practical subject but I find it difficult to organise a practical session so that all the participants can get practice in doing the task.			
	Enter below any other points you want to discuss.			

XT2a – LEARNING STYLE EXERCISE – STEP 1

EXERCISE This is a short questionnaire which will help to discover each participant's preferred learning styles. The accuracy of the results depends on how honest the answers are. There are no right or wrong answers.

Step 1

Use table 1 Learning Style Answer sheet to record your answers. If you agree more than you disagree with a statement put a tick by it (☑). If you disagree more than you agree put a cross by it (☒).

Table 1.

(☑)(☒)

1. I have strong beliefs about what is right and what is wrong, good and bad.	
2. I often act without considering the possible consequences.	
3. I tend to solve problems using a step-by-step approach.	
4. I believe that formal procedures and policies restrict people.	
5. I have a reputation for saying what I think, simply and directly.	
6. I often find that actions based on feelings are as sound as those based on careful thought and analysis.	
7. I like the sort of work where I have time for thorough preparation and implementation.	
8. I regularly question people about their basic assumptions.	
9. What matters most is whether something works in practice.	
10. I actively seek out new experiences.	
11. When I hear about a new idea or approach I immediately start working out how to apply it in practice.	
12. I am keen on self-discipline such as watching my diet, taking regular exercise, sticking to a fixed routine etc.	
13. I take pride in doing a thorough job.	
14. I get on best with logical, analytical people and less well with spontaneous, "irrational" people.	
15. I take care when interpreting data available to me and avoid jumping to conclusions.	
16. I like to reach a decision carefully after weighing up many alternatives.	
17. I'm attracted more to novel, unusual ideas than to practical ones.	
18. I don't like disorganised things and prefer to fit things into a coherent pattern.	
19. I accept and stick to established procedures and policies so long as I regard them as an efficient way of getting the job done.	
20. I like to relate my actions to a general principle.	
21. In discussions I like to get straight to the point.	
22. I tend to have distant, rather formal relationships with people at work.	
23. I thrive on the challenge of tackling something new and different.	
24. I enjoy fun-loving, spontaneous people.	
25. I pay meticulous attention to detail before coming to a conclusion.	
26. I find it difficult to produce ideas on impulse.	
27. I believe in coming to the point immediately.	
28. I am careful not to jump to conclusions too quickly.	
29. I prefer to have as many sources of information as possible - the more data I have to think over the better.	
30. People who don't take things seriously enough usually irritate me.	
31. I listen to other people's point of view before putting my own forward.	
32. I tend to be open about how I'm feeling.	
33. In discussions, I enjoy watching the manoeuvrings of the other participants.	
34. I prefer to respond to events on a spontaneous flexible basis rather than think things out in advance.	
35. I tend to be attracted to techniques such as network analysis, flow charts, branching programmes, contingency planning etc.	
36. It worries me if I have to rush out a piece of work to meet a tight deadline.	
37. I tend to judge people's ideas on their practical merits.	
38. Quiet, thoughtful people tend to make me feel uneasy.	
39. In meetings I put forward practical realistic ideas.	
40. I can often see practical ways to get things done quicker than other people.	

XT2c – LEARNING STYLE EXERCISE – STEP 2

In table 2 below record all the “yes” answers (☑) you made in table 1 against the question number shown in the columns in Table 2.

Do not record any questions you answered no (☒)

Add up and record the total of all the “yes” answers in each column

Table 2. Learning style recording sheet

Active	Thinking	Logical	Practical
2	7	1	5
4	13	3	9
6	15	8	11
10	16	12	19
17	25	14	21
23	28	18	27
24	29	20	35
32	31	22	37
34	33	26	39
38	36	30	40
Total of ticks =	Total of ticks =	Total of ticks =	Total of ticks =
Multiplied by 2 =	Multiplied by 2 =	Multiplied by 2 =	Multiplied by 2 =

XT2d – LEARNING STYLE EXERCISE – STEP 3

In the table below **circle** your column scores from Table 2 on the appropriate column and number score from the score sheet for each category

Active	Thinking	Logical	Practical	Preference
20	20	20	20	Very Strong
19				
18		19		
17			19	
16	19	18		
15			18	
14		17		
13	18	16	17	
12	17	15	16	<i>Strong</i>
	16			
11	15	14	15	<i>Moderate</i>
10	14	13	14	
9	13	12	13	
8				
7	12	11	12	<i>Low</i>
6	11	10	11	
5	10	9	10	
4	9	8	9	Very Low
3	8	7	8	
	7	6	7	
	6	5	6	
2	5	4	5	
	4		4	
1	3	3	3	
	2	2	2	
	1	1	1	
0	0	0	0	

This will show your most and least preferred style

XT3 - TRAINEE GROUP PROFILE FORM

Number of people to be trained

Male or female or a mix

Age range

Literacy and numeracy levels, language normally used

Range of educational ability (general education and technical training)

Previous “hands on” experience in the topic to be covered

Previous knowledge of the topic

Possible areas of interest and motivation

Social/cultural factors relevant to the training programme and approach

Other relevant information.

XT4 - TRAINING NEEDS ANALYSIS - DIAGNOSIS SHEET

Role/Job: FIELD OBSERVER REPORTING					
Column 1	2	3	4	5	6
Tasks/sub tasks/ Responsibilities From Job description above	No Problems	Some Problems	Many Problems	Cause of Problems/ Comments	Training Needs
1 Accurate observation				Insufficient life cycle knowledge and recognition skills	
a) Identifies and describes adults and hoppers by instar and sex				Does not recognise hopper instars or locust sex	Life cycle Characteristics of each stage and sex and practice in recognition
b) Accurately defines / describes quantity by reference to swarm dimensions and density / area				Problems with measuring flying swarms and flying speed	Speed / time / density /area calculations
c) Accurately report on swarm behaviour and wind direction e.g. High / low flying – on ground – Mating / laying etc				Confusion with mating and laying behaviour	Locust behaviour during laying and mating. Key indicators
2 Accurate time reporting					
a) Accurate registering of date and time including day and night					
3 Location					
a) accurate positioning of sighting by use of map co-ordinates (longitude and latitude)					
b) give position relationship to major geographical features Sea – city Mountain etc					
c) Includes well known local reference point					
4 Observer					
a) Includes name, address and contact details					
5 Report quality					
a) Report structured according to prescribed layout					
b) Descriptions and data easily understood					
c) Sent promptly to reporting office					
6 Importance of reports					
a) Understands need for accuracy and timeliness of reports to Locust Control Programme					

XT7a - SESSION SUMMARY SHEET

P1	Session Summary	Duration
		10 mins

Aim:

Objective:

Key training points:

Equipment:

Preparation:

Guidelines page references:

XT7b - SESSION PLAN SHEET

P1	Session Plan	Duration
		10 minutes

SECTION	TECHNIQUE AND CONTENT	AIDS
Introduction (mins)		
Core (mins)		
Summary & Conclusion (mins)		

XT8a - TRAINING SESSION SELF-EVALUATION CHECKLIST

Training is like any other job: it needs practice and continuous attention to detail. The self-evaluation sheet below can help you to improve your training skills if you answer them truthfully and try to improve the areas you appear to be weak.

HOW WELL DID I.....?	very well	good	satisfactory	not very well	poorly	not applicable
1 Link this session to other sessions						
2 Introduce this session						
3 Make objective clear to the trainees						
4 Move logically through the structure						
5 Emphasise key points						
6 Summarise the session						
7 Maintain an appropriate pace						
8 Capture trainees' interest						
9 Maintain trainees' interest						
10 Handle problems of inattention						
11 Ask questions						
12 Handle trainees' responses						
13 Direct trainee tasks						
14 Cope with the range of ability						
15 Monitor trainee activity						
16 Use a range of teaching aids						
17 Make contact with all class members						
18 Cope with individual difficulties						
19 Keep the content relevant						
20 Be aware and use body language						
21 Maintain good eye contact with all trainees						
22 Check learning						
23 Build trainee confidence						
24 Convey enthusiasm						
25 Provide a role model						

Note:

- 1 This is a tool for self-evaluation but it is also useful for a master trainer when observing other trainers
- 2 Where two or more trainers are working together this can also be a good way for trainers to share their experience and strengthen each others skills by observing each others sessions.

Training skills notes

T1	Session Notes	Duration
	An introduction to the training process	30 minutes

TRAINING	
1. Who?	Who will you train?
2. Need?	What training do they need? What do they want to be able to do?
3. Content?	What information and skills will you have to include in the training?
4. Planning?	Bring it all together – Content, timing sequencing, preparation
5. Method?	What are the most suitable training methods to use?
6. Evaluation?	Can they do what you set out to train them to do? Checking on the impact of the training?

These simple steps are explained in more detail below

STEP 1. Who?



Trainer action

Get a clear picture / description (Profile) of the people you will be training. We call this our **Target Group Profile**

Some examples of target groups you may encounter:

Policy makers

Locust officers

Field teams

The experience and ability of individuals and groups will be different and these differences need to be accurately identified so that planning and the choice of training methods can closely match the learner's needs.

STEP 2. Needs?

Trainer action

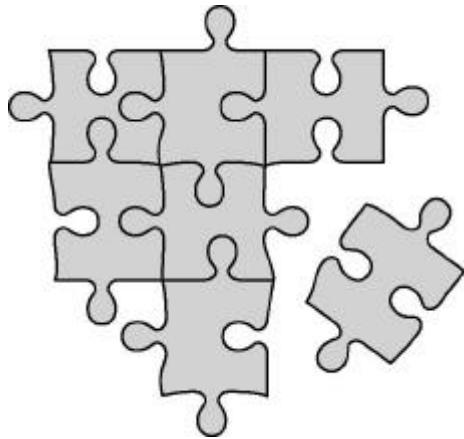
Once a target group profile has been developed the trainer can progress to carrying out a **Training Needs Analysis (TNA)**. The TNA helps the trainer to find out what the trainees already know and what training they need to reach the level of performance required to do their work successfully.

In simple terms we try to get the answers to two questions. These are

What can our target group **do** now? (before training)

What it is we **want** our target group to **do** (after training).

By comparing these answers we will be able to identify the target group training or performance gaps.



Filling this gap is similar to trying to find the pieces in a jigsaw.

You have to look around to find the pieces that fit the gaps that are left.

STEP 3. Content?



When you have specified your target group and clarified the new abilities you want them to develop. (**What new things they have to be able to do**), You can then work on identifying what new Knowledge, Skills and Attitudes they will have to develop to achieve these new abilities.

We describe what we want the trainees to do (achieve) in a certain way. These are **Learning Objectives**

An example is:

The trainee will identify the main stages in the life cycle of the Desert Locust and describe the main physical features of each instar.

STEP 4. Planning?



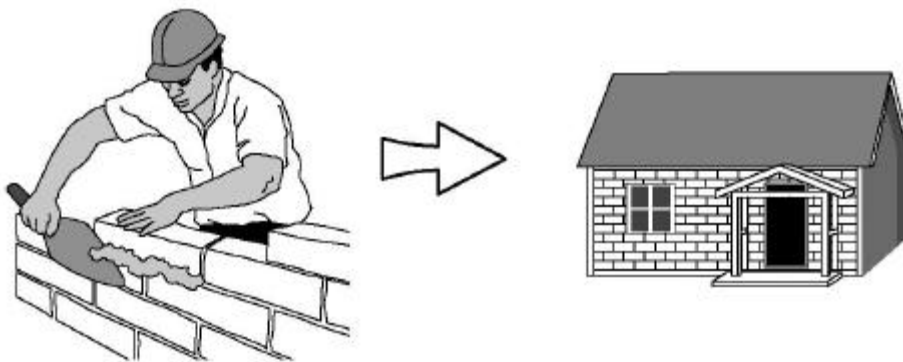
Planning is a central process in training. Planning allows us to bring together all the information gathered in steps one to three. The main purpose of planning is to decide how the training is to be structured and delivered. Usually this will mean:

- Deciding the overall time that can be allocated to the training
- Deciding how to allocate that time to the topics to be covered
- Deciding where and when the training is to be carried out
- Deciding what facilities and equipment are needed
- Developing a detailed programme which states the overall and allocates objectives to each sub-section or session in the training course
- Ensuring that the programme is logical and each session is building on the previous session
- Specifying objectives to achieve the programme

The trainer uses objectives as their starting point in developing their Training Plan.

Planning is often difficult as it is usually necessary to make compromises where there is not enough time to cover all the topics, where there is a shortage of resources, where the target group is from a very wide background and many other similar restrictions. Most trainers try to cover too much in the time available and that is why it is essential to have clear objectives and to stick to these when planning and delivering training sessions. In planning each session we begin by stating what we want our trainees to do (the Objective)

Objectives are like blocks; they are used to build the training programme...



...and to achieve the final overall training course objective.

Once you have developed the session objective(s) from the information contained in the target group profile and the training needs analysis you can then consider what technical content and structure the session should have to enable the trainees successfully to achieve the objective.

STEP 5. Method?



Choosing effective training methods can be quite difficult for new trainers. However, with practice, their skills in using training methods will grow and their impact as trainers will improve. The action verb in the Objectives gives trainers some good direction on what training methods and approaches to use.

Training Methods may include explanation, discussion, question and answer, diagrams and visual aids, models, real examples and material, problem solving, group work, demonstrations and practice.

The training methods you choose will have to fit closely with the target group you are training and what you are trying to teach. If it is a practical process or task you will have to ensure that trainees are given enough practice after the demonstration. If it is a complicated concept you may need to prepare simple diagrams to help understanding. If it is new ideas or methods you are trying to promote, you will have to include discussion sessions and group work so that trainees have time to explore the new ideas and the implications of change for them.

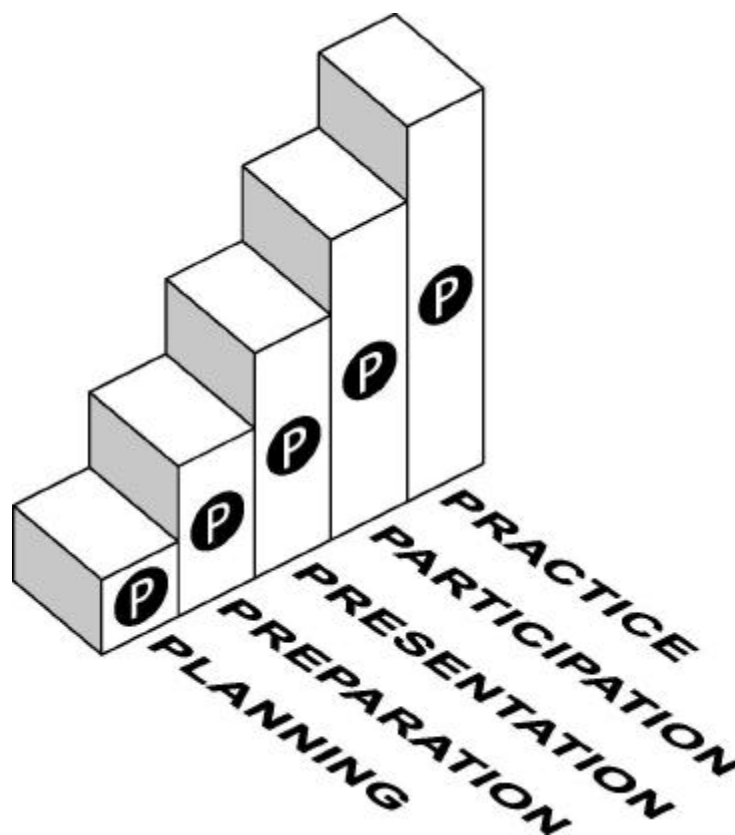
STEP 6. Evaluation?

Finally, like any process that you want to be able to improve, you must try to assess and evaluate your training so that you can use the feedback to improve the training process and the trainee learning. Checking if your trainees have achieved your objectives in each session is an effective way of testing your effectiveness as a trainer

However the improvement and longer term impact of training also needs to be looked at from a point of its impact on the quality of work trainees achieve in the longer term Trainers need to work together on continuously evaluating their work and trainee success so that training is accurately matching the needs of the trainee and is achieving improvements in the area in which trainees are working.

It is also necessary to remember that training cannot always succeed if the trainees work environment is not good. New skills cannot be applied if there are insufficient resources to support improvement or managers are unable to support new working approaches. The environment to which trainees will return after training also needs to be considered if training is to be effective.

Remember the 5 “P” steps in training



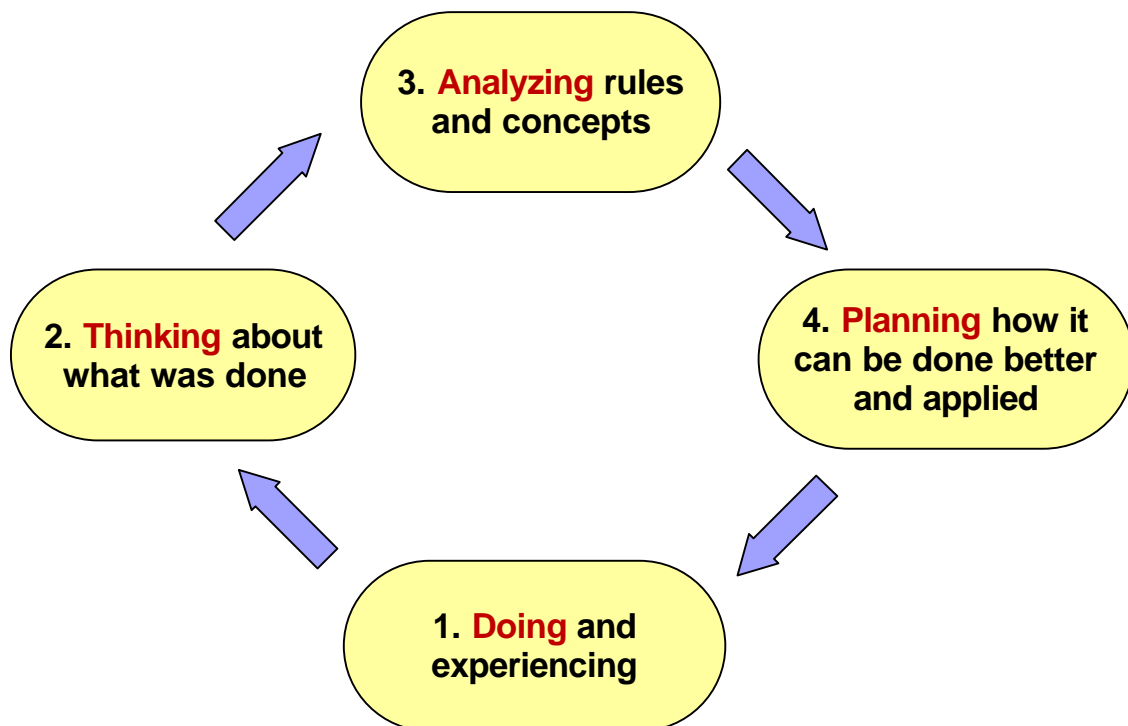
T2	Session Notes	Duration
	Learning styles	30 minutes

Most people are unaware that over the years they have probably developed learning "habits" that means that they may learn more from some experiences and situations than others. As a trainer it is important to realize this, be in a position to recognize these learning styles, and be able to design and conduct your training in ways that help people to learn better and more completely.

Exercise XT2b is a short questionnaire, which will help to discover each participant's preferred learning styles. The accuracy of the results depends on how honest the answers are. There are no right or wrong answers.

The learning cycle

In the diagram each of the boxes relates to the learning styles you have been plotting. The diagram shows that in the normal process of learning we should pass through all four of these one after another but with the plots you have done you will see what are the areas you prefer and the areas you are less likely to use. These are not absolute and only suggest where you can consider how you can strengthen your personal learning approach. This has application for trainers and trainees and we will return to this later in the programme



The four categories of learning style are described below – do you recognise yourself.?

Active people

- Enthusiastic about new ideas.
- Open-minded - try anything once, and usually immediately
- Bored easily and may not implement or consolidate their new knowledge well

Thinking people

- Cautious about new ideas
- Like to gather information and listen before contributing
- May take some time, but will understand ideas well at the end

Logical people

- Like a logical approach
- Need rational justifications for ideas
- Struggle to adopt ideas which are subjective or not completely supported by evidence

Practical people

- Like practical ideas and techniques for problem solving.
- Do not like long discussions when action is possible.
- May not feel able to include other people views.
- Just want to get on with it.

T3	Session Notes	Duration
	Target Groups	30 Minutes

Who are we training?

Target groups are the groups of people we are aiming our training at – the people we want to train.

Always begin your training planning by identifying who you are going to train

To emphasise this point consider the following situations. Imagine you are asked to conduct a training session on the “*Selection of locust control methods.*” How do you think the reason for training and its content might differ for the two examples given below?

Example one. Five Government officials who are responsible for providing budgets for the control programme

Example two. A group of 40 local farmers who are cooperating with the regional control team in a control programme.

Exercise

Form into small groups and after discussing the issues, complete the Table by writing your answers in the box below:

Example	Reason for giving training	Content
<i>One</i>		
<i>Two</i>		

From this exercise it should be clear that while the title of the training may be the same, the reason (objective) for the training and the content would need to be quite different for each of these trainee groups.

A common mistake made by inexperienced trainers is to begin their planning by focusing on the technical content of the training. As illustrated above this is a great mistake as it usually results in the training not being relevant to the needs of the trainee group.

To design training that is suitable and relevant for specific groups of people you need to know as much as possible about them

Drawing up a Trainee Group Profile

To develop a useful trainee group profile it is necessary to be logical and systematic in collecting that information. There are a number of general headings, which you can use to structure a trainee group profile. The list given below is a good starting point but obviously you may want to add headings according to the group you are working with.

For example, you may have a small group of technicians who have similar qualifications and experiences and the individuals will have similar profiles. On the other hand you could have a group that includes the whole regional team with supervisors, technicians, field staff and farmers. In this second case you will have to widen the scope of your profile to ensure you have an accurate picture of the range of knowledge and experience of this diverse group. After consideration you may decide that it is preferable to divide the group so that the training can be more accurately matched to the needs of different sub groups in the whole group

Trainee Group Profile Headings to use

- Number of people to be trained,
- Age range,
- Male or female or a mix,
- Literacy and numeracy levels, language normally used,
- Range of educational experience and ability (general education and technical training)
- Previous knowledge and “hands on” experience in the areas / topic(s) being considered for training programme,
- What motivational factors can be used to get their interest?
- Social/cultural factors relevant to the training programme and approach

Preparing a Trainee Group Profile

Using the headings given above and on the exercise sheet XT3 (and other headings if you need them) the trainer can develop a picture of the groups to be trained. When this information is linked with Training Needs Analysis information (covered in the next Section) the trainer will be able to plan and prepare an effective training programme.

Gathering information means using a wide range of sources. For example:

- Interviewing some or the entire trainee group. (Time and accessibility may limit the numbers that can be interviewed)
- Talking to people who know, and have regular contact with, the trainee group e.g. extension staff, farmers, supervisors etc.
- Personal records held by employers
- Your own and others experience of the group
- Reports and official surveys
- Sending out a questionnaire (not always successful)

You may have other ideas you can add to this list.

MORE DETAIL ON PROFILE HEADINGS

Numbers to train

Wherever possible, it is best to keep training groups small and particularly for practical sessions where more than 10/15 can make it difficult for all participants to have sufficient hands on practice. Watching others is not sufficient. With adult groups, it is important that they have the opportunity to discuss issues and topics, as this is an important element in the adult learning process.

Small groups allow greater participation and this makes them more effective

Age of trainees

The age of trainees can influence the training approaches needed in a number of ways. In general, younger people are able to grasp new ideas and concepts more easily than their older counterparts. However, this should not be seen as implying that older people are slow learners. It simply means that older people have more experience and often have to compare new ideas and knowledge being presented against their existing understandings and practices before considering adopting new ones. This is why trainers must allow plenty of time for explanation and discussion with adult groups. Remember also that older people do not like to “lose face” so when asking questions try to present questions they can answer. In practical sessions try to structure your sessions into simple steps and tasks so that the trainees can be successful at each step.

Success is motivating
Failure makes people frustrated and demotivated

Men and Women

In general, there is no difference between training men and women but it is important to remember that their experience and background may be very different. A good trainer (man or woman) will ensure that an accurate trainee group profile is developed so that the training programme meets the needs of **all** participants.

Where there are considerable differences in experience and previous training between men and women it may sometimes be appropriate to run separate courses. The primary guiding rule is that the trainer must remain sensitive to the needs of all participants, not just one particular sub-group.

Training should meet the needs of **all** trainees

Literacy and numeracy levels, language normally used,

Take great care that the terms and written materials you use in your training are recognised and understood by your group. Many trainers use scientific terms and complicated concepts when they are unnecessary and so end up confusing the trainee group. Equally do not use complicated graphs, formulae and calculations unless they are absolutely essential. Always try to use language and terms which are understood by all the group. Complicated explanations, unfamiliar terms and complicated words may impress your group but they are unlikely to help them to understand new concepts or learn new skills.

Keep it short, simple and link it to their existing experience and ability

Educational, technical and practical experience

A knowledge of the abilities of a group will allow a trainer to prepare the training programme at the right level and to include the right balance of practice and theory.

A major difficulty experienced by many trainers is how to deal with a group where individuals have very different levels of experience and ability in the topic. A good trainer will make use of trainees who have a lot of experience by getting them to contribute to the session by answering the difficult questions and help others in practical sessions or acting as group leaders in some of the practical exercises. Trainers should take full advantage of any special experience and knowledge available to them in the group. This can also considerably improve the involvement and motivation of people who may otherwise feel the course is at too low a level or not relevant to them. Use the experience in the group as a training resource.

New trainers often feel that asking assistance from someone in the group reflects badly on their own expertise. Trainees don't have the same perception and often take more notice of contributions that come from someone in the group.

Motivation

Motivation and enthusiasm are infectious and they must always start with the trainer. Good preparation, a sound knowledge of the subject and a good understanding of the trainee group, their experience and their problems are essential. Try to find out what interests them and what benefits they are hoping to get from training. Remember that it always takes a little time for trainer and trainees to get to know each other at the beginning of a course. This is a time when a trainer can be anxious and nervous. Good preparation will keep this anxiety to a minimum.

Most trainees will be keen to learn, providing the subject matter is relevant to their situation and needs. There will always be a few who will need encouragement; this can usually be achieved by actively drawing them into group activities or discussion. Letting trainees know that they will have to complete practical exercises and work on problem solving exercises usually helps to get the attention of the less enthusiastic members of the group.

The interest and motivation of the trainee group will be high if the training session content is ***relevant*** to them and participatory methods are used actively to ***involve*** the group in the learning process.

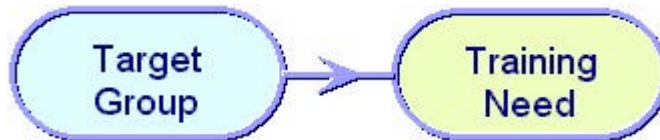
Finally, trainers should remember that even the best trainees can be easily distracted and de-motivated if the organisation and domestic details of the course (materials, transport, accommodation, meals, payment of daily allowances, etc.) are badly arranged. This can also include the failure to recognise and make provisions for specific cultural customs and personal needs.

Summary

From the simple example of the Government officials and Farmers it should now be clear that the ***people*** to be trained are the trainer's primary focus. In this section we have concentrated on their characteristics and experience. In the next section we will be looking at how to analyze their training needs.

<h1>T4</h1>	Session Notes	Duration
	Training needs analysis (TNA)	1.5 hours

You will remember in the introduction we saw that the target group is the starting point on which we develop the Training Need and identify the Purpose and general content areas of training courses.



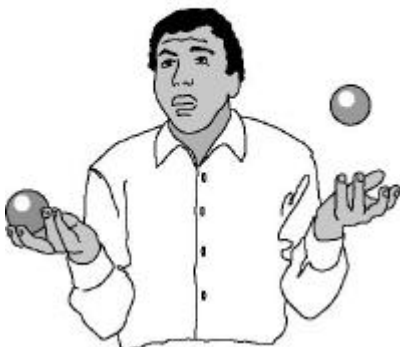
Training is intended to enable the target group to gain a greater knowledge about, and improved skills in, their work. It is also likely that they will get more satisfaction from doing it better.

We can say that with greater knowledge and skills a trainee should be able to do his/her job according to one or more of the following **Training Criteria**.

- To a higher standard
- In less time
- With less effort
- More economically
- More safely (for themselves, others and the environment)

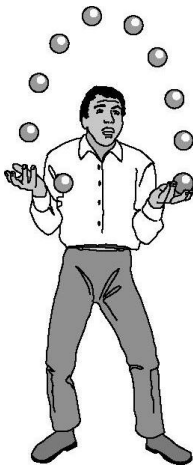
To achieve these improvements we need to be able to identify in what areas the improvement is needed and what has to be included in the training to achieve these improvements. We call this **training needs analysis (TNA)**. In TNA we have to find the answers to two questions

Question 1



How much knowledge and experience and ability does the target group have at present?

Question 2



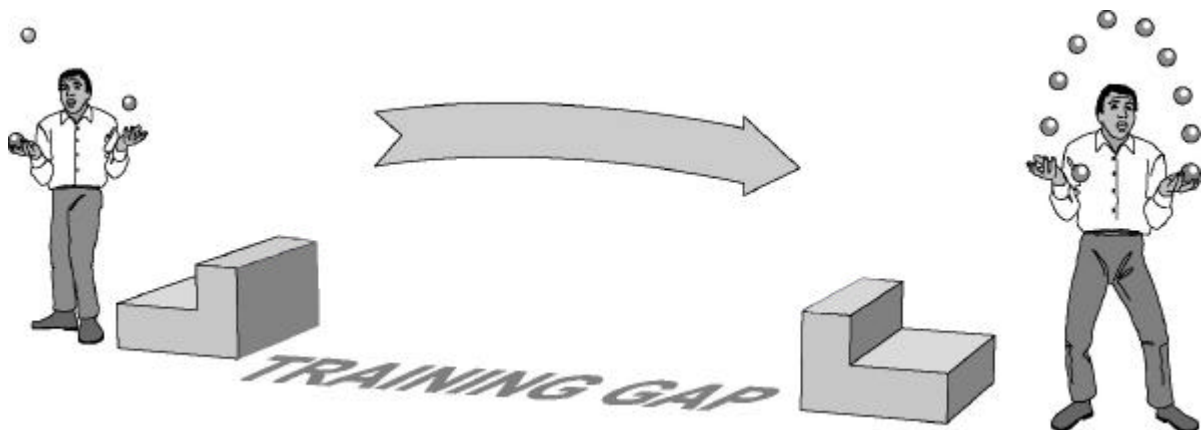
What do we want the group **to be able to do** after training that they could not do before?

The Answer to Question 1 tells us what we have.

The Answer to Question 2 tells us what we are trying to achieve.

By subtracting Answer 1 from Answer 2 we can identify the gap between them.

We call this **the Training Gap or Training Need**



Defining the training Gap

Training needs analysis is used when people are not doing their job to the standards required or when you want to prepare people to take on new responsibilities or use new techniques or methods in their existing work.

Training needs analysis helps us to identify what the Target Group can do now and.....

then to define in a logical and structured way what training is needed to help trainees reach the performance level required. We usually express this performance as **learning objectives or outcomes**

To get the information needed for the training needs analysis, we can take a number of approaches. Some of these are listed below.

- Observation and discussion with target group in the work place.
- Conversations with those who are influenced or benefit from the work (clients)
- Conversations with supervisors and managers.
- Conversations with colleagues.
- Field reports on problems arising.
- Research papers, official publications on areas of work being studied etc.
- Consultant and supervisor reports.
- Evidence from people who are in some way professionally or technically connected with the group.

You can probably think of more methods for some of the groups you work with. The wider the source of information the more accurate the training needs analysis will be. Using a range of methods also allows you to cross check the information you collect.



Observing and talking to members of the target group in their work place is very important as it often reveals issues and problems not identified with “off work” interviews

Structuring and organizing your analysis

Begin by identifying and describing the duties (areas of work) in the job and then briefly describe the main activities under each heading. This can be done from your own knowledge of the work and then refined with the information you get from your discussions, conversations, reports and visit to the workplace. If you are not familiar with the work you will have to do this in the work place through observation and interviews

An example of the tasks and duties associated with “Locust Control Reporting” is given below.

EXAMPLE of a JOB DESCRIPTION

Note that the headings describe what is DONE and not subject headings

<p>Job :LOCUST CONTROL REPORTING</p> <p>Tasks/Duties</p>
<p>1 Accurate observation</p> <ul style="list-style-type: none"> a) Identifies and describes Adults and Hoppers by colour and instar b) Accurately defines / describes quantity by reference to swarm dimensions and density or area c) Accurately reports on locust activity and wind direction e.g. high / low flying – on ground – copulating / laying etc
<p>2 Accurate time reporting</p> <ul style="list-style-type: none"> a) Accurate registering of date and time including day and night (24hrs clock)
<p>3 Defining Location</p> <ul style="list-style-type: none"> a) Accurate positioning of sighting by use of map co-ordinates (longitude and latitude) b) Give position in relationship to major geographical features Sea – City - Mountain etc b) Includes well known local reference points
<p>4 Observer</p> <ul style="list-style-type: none"> a) Records name, address and contact details b) Provides details of contact address or phone fax etc
<p>5 Report quality</p> <ul style="list-style-type: none"> a) Report structured according to prescribed layout b) Descriptions and data easily understood c) Sent promptly to correct reporting office
<p>6 Importance of reports</p> <ul style="list-style-type: none"> a) Appreciates and explains the need for accuracy and timeliness of reports to Locust Control Programme

The job description above gives a good picture of what the target group **should be able to do** in the role of reporter.

Next step

To find the training gaps you have to compare the group's present ability with the one you have described above. You can do this by using the **Diagnosis Sheet** (Exercise sheet XT4) and following the instructions (shown below).

- 1 Take the information contained in the Reporter Job Description above and place the various sections in a logical list in the left hand column (Col 1) of the Diagnostic sheet (task / sub tasks).
- 2 Estimate, from observation and research, the level of problems the person has in doing each task / sub task to a good standard (Cols 2,3,or 4)
- 3 Identify the cause and scale of the problem (Col 5)
- 4 Prescribe what training is needed to reach the performance required (Col 6)
(This should be in general terms as you will develop it in more detail at the training planning stage)

Remember - the quality of the training diagnosis is only as good as the information used so make sure the analysis is as thorough as possible. It should not just be filled in from memory while sitting in a chair.

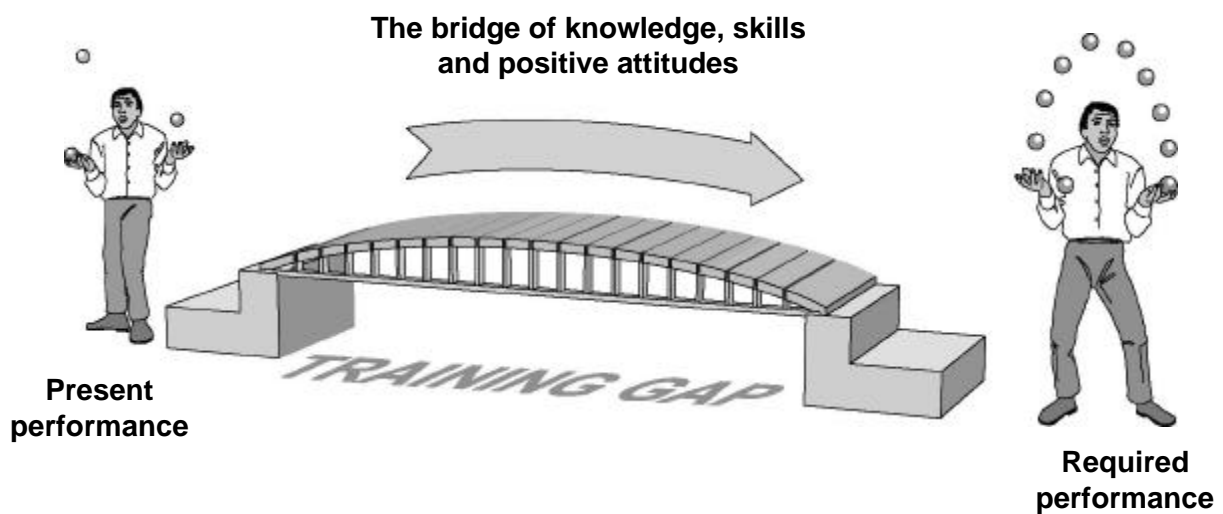
TRAINING SKILLS

Training Needs Analysis - Diagnostic Sheet

Role/Job: FIELD OBSERVER REPORTING					
Column 1	2	3	4	5	6
Tasks/sub tasks/ Responsibilities From Job description above	No Problems	Some Problems	Many Problems	Cause of Problems/ Comments	Training Needs
1 Accurate observation				Insufficient life cycle knowledge and recognition skills	
a) Identifies and describes Adults and Hoppers by colour and instar				Does not recognise hopper instars. Male / female recognition	Life cycle characteristics of each stage and practice in recognition
b) Accurately defines / describes quantity by reference to swarm dimensions and density or area				Problems with flying swarms and flying speed	Speed / time / density /area calculations
c) Accurately report on locust activity / wind direction e.g. High / low flying –on ground – Mating / laying etc				Confusion with mating and laying behaviour	Locust behaviour during laying and mating. Key indicators
2 Accurate time reporting					
a) Accurate registering of date and time including day and night					
3 LOCATION					
a) accurate positioning of sighting by use of map co-ordinates (longitude and latitude)					
b) give position relationship to major geographical features Sea – city Mountain etc					
c) Includes well known local reference point					
4 Observer					
a) Includes name, address and contact details					
5 Report quality					
a) Report structured according to prescribed layout					
b) Descriptions and data easily understood					
c) Sent promptly to reporting office					
6 Importance of reports					
a) Understands need for accuracy and timeliness of reports to Locust Control Programme					

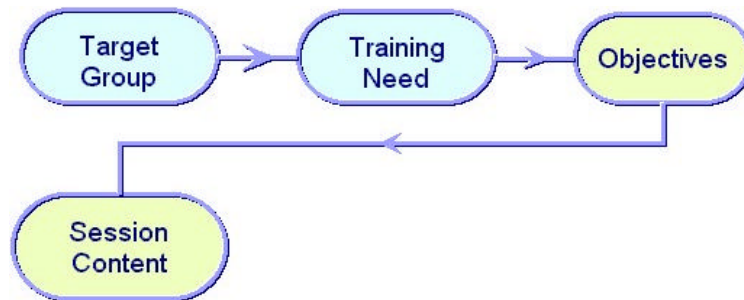
Sometimes it is not possible to specify the tasks and duties so you have to start with the task or process the person works on and, through discussion with them and others such as supervisors, you will draw up a list of the processes they do and then analyse these. Your own knowledge combined with the field evidence should allow you to carry out a TNA. This approach is useful when dealing with detailed processes and steps in a process. This requires the person's job to be broken down into individual activities and duties and then each of these is examined individually to discover where training may achieve improvements.

We have now reached the stage where we should have sufficient information to begin the process of deciding what content (Knowledge, Skills and Positive attitudes) we need to build the bridge and close the Training Gap.



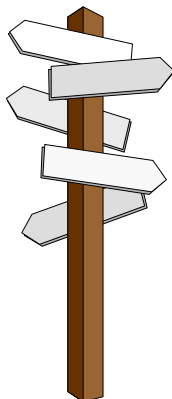
T5	Session Notes	Duration
	Training objectives and selecting the content of training sessions	1.5 hours

At this stage we should have collected a considerable amount of information about the target group and their training needs. Now we can look at the development of Objectives and detailed Session Content



We now need to use this information to guide the process of selecting what we will include in the Training programme.

Planning training is like planning for a journey



The first thing you need is a **destination**

With a destination:

- a. you can choose a route
- b. You can decide the best method of transport (Car, Ship, Air etc)
- c. You can plan detail like timing and what preparations you need to make.

However, if you have no destination, any route, transport and preparation will do.

In training, we can compare a destination with what we want our trainees to achieve at the end of the training input. We call this our **objective**. A training session without an objective is the same as a journey without a destination and any content and approach will do.

As we have seen above we must define our objectives before we can select the content. This is done by referring to the TNA Sheets for statements of what we want our trainees to achieve.

Writing Objectives

Objectives are statements of what the trainee should be able to do as a result of the training they receive.

EXAMPLE of an objective

The trainee will describe the steps in calibrating a ULV sprayer and demonstrate the calibration process

When you are constructing objectives you should concentrate on finding the **verb** which best describes what you want your trainees to be able to **do** after training.

We usually describe activity by using Action Verbs

Some examples of suitable action verbs are:

Identify, explain, define, assess.

List, name compare, measure, calculate, select.

Demonstrate, use, adjust, diagnose, evaluate, apply.

Some more examples of Objectives

- 1 The trainee will **identify and name** the main parts of a ULV sprayer.
- 2 The trainee will **explain** how the main parts of the ULV sprayer operate.
- 3 The trainee will **identify and describe** the main abdominal characteristics used to distinguish male and female locusts
- 4 The trainee will **separate** a sample of Locusts into males and females groups.

Writing Objectives

Remember that you are trying to design objectives that reflect the training needs you have identified in the Training Needs Analysis process

Some key points when designing objectives.

The objective must be a statement of an activity that you can observe and assess if it is being done to the standard required. **Don't use verbs such as "Understand" "appreciate" or "know"** as they tend to take place in the trainees head and are difficult to observe and verify.

Objectives must be realistic in terms of what we can expect a trainee to do at that stage of training and what we are able to observe and evaluate.

Exercise

Write three Objectives for a subject that you are familiar with and underline the Action Verb in each one

1	
2	
3	

Benefits of using objectives in training

- Trainers are encouraged to make sure that the training content is relevant to the needs of the trainees.
- They encourage trainers to make the intentions of the training clear to the trainees.
- They make the learning outcomes clear and provide a sound basis for evaluating learning
- They improve the communication of the content of training programmes to trainees, other trainers and employers.
- They set targets for the trainees.
- They provide a basis for setting levels and standards of performance.

Translating Objectives into Content

The content of training sessions can be divided into three parts

Knowledge Facts, names, ideas, rules, procedures, structures etc

Skills Ability to do things - Select, repair, diagnose, identify

Attitudes Positive attitudes mean trainees

- Pay attention to detail,
- Demonstrate a desire to do the job well,
- Pay attention to safety,
- Develop and maintain good relations with colleagues etc.

When planning the content of training, the trainer must select the knowledge, skills and positive attitudes required to achieve the Objective(s) of the session.

Example

Use the simple table layout below to help you to select and describe the knowledge (K), skills (S) and attitudes (A) that the trainee must have to achieve the objective below

Objective

The trainee will describe the steps in calibrating the ULV sprayer and carry out the calibration process effectively and safely.

Action verb from Objective What the trainee will do	Content (what you need to teach)
<u>Explain</u> the steps in calibrating	<ul style="list-style-type: none"> • The main parts of the sprayer • Purpose of calibration • Steps in process and key points • Setting droplet size • Setting flow rate • Selecting walking speed • Selecting spray track spacing • Selecting droplet release height • Accuracy and care in calculations • Attention to safety needs
<u>Demonstrate</u> the calibration process and achieve the correct dosage rate and operate safely	<ul style="list-style-type: none"> • Demonstration of the tasks in each of the <i>practical steps</i> in the process and emphasising the key points in each step and safety rules • How to make the correct calculations. • Achieving correct application rate • Individual practice by all trainees • Observing safety procedures

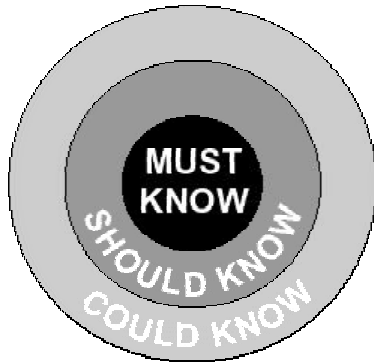
If we look at this example we can see that learning is progressive. We start with the simple aspects like the parts of the sprayer and the principles of calibration. We then build on this by identifying the main steps in calibration and **explaining** what we do in each step

When we move to the second part, which is **how we calibrate**, we are linking the practical steps with the knowledge by **demonstrating them and getting the trainees to practice** them.

Remember to structure the training content so that you go from:

- the simple to the complex
- the easy to the difficult
- the known to the unknown.

A final point in selecting the content of your training. Most trainers try to include more than they should for the time available so it is a good idea to set targets.



1. Decide what you **must** achieve
2. Then decide what you **should** achieve
3. Lastly consider what you **could** achieve if there is enough time.

Try to keep a good balance between the needs of Knowledge, Skills and Attitudes.

Too much lecturing and talking will mean that the trainees will not be given enough time to watch demonstrations and practice new skills.

Leaving no time for discussion will mean that trainees do not have the opportunity to discuss misunderstandings or develop positive attitudes to new methods and ideas through reflection and discussion.

Failure to provide enough information will lead to misunderstandings.

Some key points to remember

Your own attitudes and approaches to work can have a big impact on your trainees. If you are enthusiastic, motivated, interested and professional in your approach then your trainees are also likely to learn these from you

To define the content of a session you must always start by stating what you want your trainees **to do** as a result of your training. This statement is called an **objective**

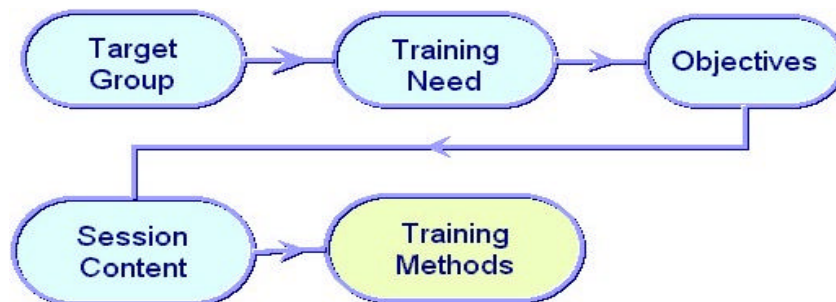
The objective indicates the **content** (knowledge, skills and attitudes) of the session. The objective also directs the trainer to what **training methods** could be used.

T6	Session Notes	Duration
	The learning process and training methods	1.5 hours

A trainer’s work is trying to help people change the way they behave in a range of circumstance so that they can be more effective and positive in what they do.

In meeting this challenge the trainer follows a process that was described in simple terms in the (T1) introduction section. As a result of studying sessions 2 to 5 you now have a more detailed knowledge of the building blocks used to construct training programmes and sessions.

While we now have the building blocks we still need the **processes and tools** (Methods) to put them together and deliver successful training



This session introduces **the learning process** and **training methods (tools)**. In the learning styles exercise we have noted that people have preferred learning styles and trainers need to both recognise these and try to select training methods that help trainees to widen their range of learning styles.

The adult learner

We have already emphasised the importance of the trainee group when establishing training needs and in our training programmes an important feature of the trainee group is that **our trainees are adults**.

When training adults, it is important to recognise that there are key differences in child and adults learning.

- Adults have a greater range of backgrounds and experiences

- Adults usually have experience and information related to the subject being taught. In some cases the training being given may challenge or even contradict what the trainee already knows and does.
- To accommodate change, adults often have to **unlearn** what they have already learned and experienced before they can adopt new methods and ideas.
- Adults are independent individuals used to controlling their own lives;
- Adults have established social and work roles that are important to them.

All of these differences require the trainer to use training methods that are suitable for adult training. This section provides the trainer with a range of these and suggestions on how they may be used.

Exercise

What do your own experiences as a trainee tell you?

- Think back to training that you have been given.
- What sessions did you enjoy and why?
- What made you want to learn more?
- What sessions or parts of the training did you not enjoy?
- What de-motivated you?
- Were there parts of it in which you could have done a better job than the trainer?

Write down a few notes on these questions here to see if you can identify factors that affect adult learning.

Look at your answers to the exercise and compare them with the points made below

Adults are motivated to learn:

- a. if their experience is valued and drawn upon,
- b. if they are given some control over their own learning,
- c. if this learning is seen to have immediate relevance to them.

Barriers to learning will be erected if:

- a. the trainees own experience and knowledge is ignored or devalued,
- b. their social or work roles are threatened by being made to feel or look stupid or ignorant.

The adult learner and participation

From the points discussed above it is clear that the adult trainee must be encouraged and allowed to actively participate in the training process. 'Participatory training' means using training methods in which the trainee is actively involved. Examples of participatory training methods include:

- Asking and answering questions
- Group discussions
- Observing and explaining processes
- Problem solving
- Guided practice sessions

- Self-assessment against established standards and peers
- Watching and evaluating others
- Listening to others
- Participation of trainees in the planning and evaluation of programmes.

Participation

- Participatory methods enable people to have more control over their own learning, which is important to adults.
- Participation enables the trainer to draw upon the experience and knowledge of each trainee so that the training is kept relevant to the trainee's learning needs.
- Participation is a means of pooling the knowledge and experience of the whole group. This allows them to be more effective in problem solving and to learn from each other.
- Participation enables the trainer to detect learning difficulties and misunderstandings in individuals or the group.
- Participation can increase trainee self confidence and ability to learn by themselves
- Finally, participatory methods improve learning, because they motivate participants and are essential to encouraging the process of **learning by doing**.

Exercise

In the light of these factors how should trainers behave in order to create the right learning environment for adult learners?

Participatory training of adults requires the trainer to be sensitive to trainee needs and skilful in using participatory methods. The trainer has to recognise that

- Adults may be 'out of practice' at learning.
- Adults may be afraid of losing face.
- Adults may wish to modify the training in various ways.
- Adults require trainers who are flexible and sensitive to their trainees feeling and needs and are able to listen to what trainees are saying.

What are the signs that trainees are not participating?

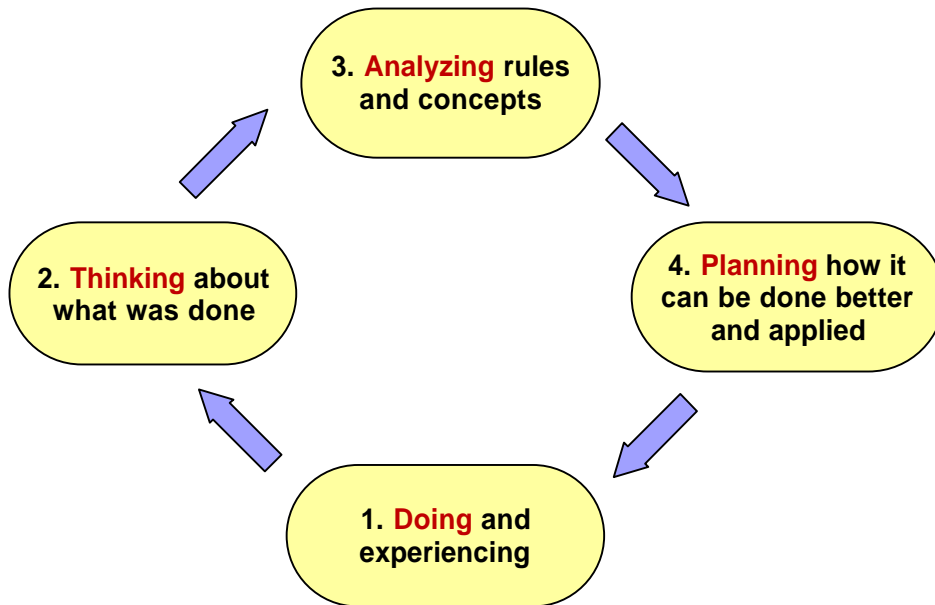
We have emphasised that training and learning should be an interactive process. Try looking for clues in body language – (see Body Language annex to this section):

- Are they involved and interested or are they removed and silent? –
- Are they volunteering ideas and discussing or are they passive and letting others do all the work?

There are many ways to tell if they are involved or confused or not interested. The Trainers job is to try to discover why and change things. A good starting point is to try to ensure that the topic being covered is relevant to the group's needs.

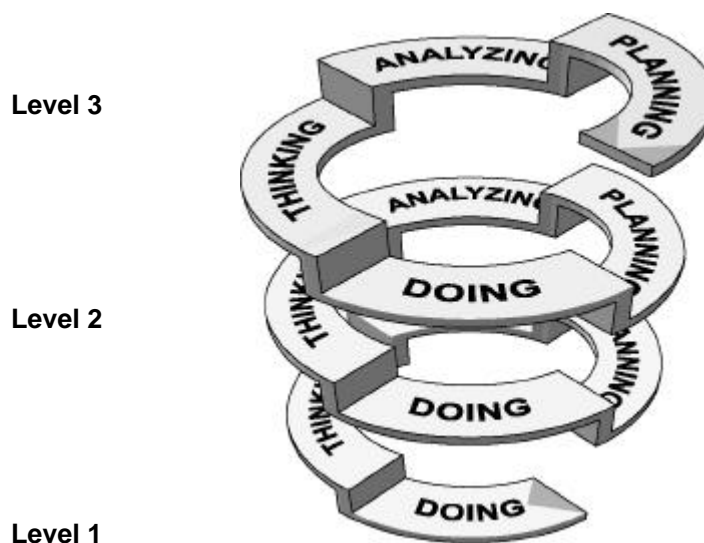
HOW PEOPLE LEARN - THE LEARNING CYCLE

The concept of ‘learning by doing and the Learning Cycle’ has already been covered.



Effective learning involves all the elements in this cycle. The trainee can enter the cycle at any point in the sequence.

Learning is rarely completed in one cycle and in most cases the learner will continue round and round but in each cycle the level will be raised until the skill is developed. (like this spiral diagram)



<p><i>The Learning Cycle has four stages</i></p> <p>Doing Thinking Analyzing Planning (and applying)</p>	<p><i>Learning styles have four categories</i></p> <p>Active people Thinking people Logical people Practical people</p>
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You may notice that these two groups have some common features and we can link them together as shown below

Active people are comfortable in the **doing stage**.

Thinking people are comfortable in the **thinking stage**.

Logical people are comfortable in the **Analyzing stage**

Practical people are comfortable in the **planning and applying stage**.

Also, remember that every trainer has their own preferred learning styles and if they are not careful, they may restrict the trainee learning process by giving more emphasis to their own preferences.

Training Methods

When choosing training methods remember:

- that we are dealing with adults,
- that participatory methods are especially appropriate for this trainee group,
- that the training method must reflect the training objectives and the way in which people learn.

Below are some suggestions on what methods might meet the needs of the

- *Doing stage.*
- *Thinking stage.*
- *Analyzing stage.*
- *Planning and applying stage.*

Methods to encourage the doing stage

Trainers can provide experience through:

- Practical exercises in the training room,
- Guided field work,
- Practical skill training

A substitute for real experience can also be:

- role play,
- problem solving and case studies,
- games,
- presenting mock reports and training sessions.

Methods to encourage the thinking stage

Trainees can be encouraged to think by

:

- question and answer techniques,
- guided discussions groups,
- simple problem setting
- reference to field reports and log books ,
- pictures, diagrams and video recordings,
- writing a short summary of event
- samples of real material
- watching others doing.

Methods to encourage Analyzing stage

Participants may develop their own concepts as a result of reflection on experience but they can be helped by the trainer by:

- giving them a presentation, supported with visual aids where possible.
- providing a written explanation on process for trainees to read and where possible, support with diagrams and sketches.
- Open discussion with group.

Methods to encourage Planning and Application stage

Participants can plan for further experience by:

group work with various level of direction
writing observation check lists,

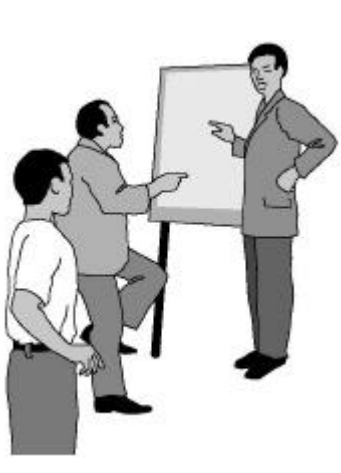
- setting objectives,
- summary techniques and action planning.

Remember: your trainees are adults who already have wide experience, including relevant work experience and skills, which must be drawn on and valued to encourage reflection.

Techniques (tools) for participatory training

A good trainer will use a range of different techniques to encourage participation and facilitate effective learning. The examples below are a set of basic techniques, which with practice you will be able to develop and use effectively.

Presentation –To communicate new ideas and information.



This method is essential, but should only be used for short periods and in conjunction with visual aids and question and answer to involve participants.

Question and answer (Q&A)– In this technique the trainer uses questions to;



- highlight a specific point or topic,
- to check if trainees are following the presentation,
- to check if the trainees are interpreting a diagram or piece of information correctly,
- leading trainees through a reasoned process to arrive at a logical solution.

This technique is probably one of the most powerful training tools if it is used correctly. However, it also takes a lot of practice to use well. Inexperienced trainers should try to plan question and answer session as part of their planning process so that they can build up their Q&A skills.

Use **open** questions which begin with ‘who, how, why which, when and where’. These require trainees to give a fuller answer, which will give the trainer some insight into what the trainee is thinking. If the trainee gives the wrong answer the trainer can help the trainee to gaining a better understanding.

Using **closed** questions beginning with “is there”, “do you understand”, “is that right” etc only bring a “yes” or “no” answer and little feed back on what the trainee is really thinking.

Q&A can also be used to get the trainees to build up a list of topics or check list etc on the whiteboard or flipchart.

If you think the answer or information is available within the trainee group it is far better to collect it by Q&A than by simply telling the group yourself. Remember that adults like to participate and to have their experience and knowledge valued.

There are two main types:

Q&A (everyone): to all participants. Use for sharing knowledge, focusing minds and learning by deduction. It allows anyone to offer the answer. This is a good method to warm up a group but be careful, as it favours activists and the most experienced in the group as they are most likely to answer the question.

Q&A (individual): to an individual participant. Use for sharing knowledge, focusing minds and learning by deduction, especially for those who may be drifting away from the session.

The technique for directed Q&A is:

1. Tell the group you will nominate someone to answer the question so no shouting out
2. Ask the question
3. Pause for a few seconds
4. Nominate someone to answer
5. Take the answer

The main points here are that by pausing before nomination, all the group have to think about the answer (participation). If you do get the wrong answer, try to help the trainee to arrive at the right answer and if not successful reassure them it is ok and nominate someone else. Then return to the first trainee to make sure they understand where they went wrong.

Don't begin a Q&A sequence by naming someone before the question as all the other trainees will breath a sigh of relief and shut down.

Use Q&A to

- **Gain** attention;
- **Increase** motivation and interest;
- **Stimulate** group and individual participation;
- **Encourage** communication between the Trainer and the trainee;
- **Give** the Trainer feedback about the effectiveness of training;
- **Encourage** and develop the participants' confidence;
- **Draw** out the quiet or passive trainee;
- **Test** trainees knowledge;
- **Develop** understanding and reasoning;
- **Reinforce** and clarify ideas and facts;
- **Open** a discussion;



Groups: Two or more trainees working together on a common task. Useful for sharing and developing knowledge within the group, developing presentation skills, peer reviewing and confidence building. Groups allow more complex and longer-term exercises and assignments to be set. Groups help to develop team working skills.

Working With Groups

Groups are a normal and important element of most cultures and they can be formed for many reasons. Group work is an important technique in participatory learning. Sometime groups do not work well and the following list may give you some clues why a particular group does not work.

Common barriers to good group dynamics:

- Artificial, contrived reasons for formation
- Unclear objectives
- Ineffective working procedures and processes
- Unbalanced composition
- Inappropriate leadership
- Overbearing leadership
- Unfavourable climate - internal or external
- Low creativity
- Unfavourable relationships between members

Trainer Preparation for group work

- Ensure that the working instructions are clear and understood by all
- Make sure the objective of the group is clear and attainable.
- Ensure they have all the materials and resources they need
- Ensure they have a suitable place to work **together**

The life cycle of a group

Forming



- Collection of individuals
- Each with own agenda
- Little or no shared experience

Storming



- Personal values and principles challenged
- Roles and responsibilities accepted or rejected
- Conflict with personal agendas
- If successfully handled, group objectives and processes are defined / accepted.

Norming



- Rules accepted
- Shared goals established
- Group and sub-group settle down and become cohesive

Performing



- Group maturity and energy
- Maximum productivity
- New insights and solutions appear

Adjourning



- Achievement (loss) of common goals
- Sub groups form with separate agenda
- Loss of interest and purpose
- Members drop out

Demonstration – Presents a technique or concept by showing and explaining to participants how to do something. Trainer must prepare a clear analysis of the various steps in the process and be able to demonstrate them, describe them and emphasise the key points and safety issues.

Make sure that all the trainees can see clearly. Use visual aids to support demonstration where a difficult concept or process is involved. Use Q&A to highlight points and check on trainee perceptions.

DEMONSTRATION PROCESS

Demonstrate process at normal speed to give the trainee an overview

Demonstrate each stage at a slower speed and explain the process Q&A as required

Note: a demonstration does not train someone to do a task. A demonstration must always be followed by supervised practice where every trainee has the opportunity to practice the task.

Training room exercise – Gives trainees an opportunity to practice applying new knowledge and techniques in a safe environment (learning by doing). Builds ability and confidence in practical techniques and working with others. Done within groups or pairs and should be preceded by a demonstration.



Field exercise – Same as training room exercises but has the additional feature of field conditions. Links up with previous demonstration work. Trainees learn by putting techniques into practice in the field. Builds ability and confidence in practical techniques and working with others. Done within groups or pairs. Essential all trainees have opportunity to practice all parts of the process

To achieve good participation remember that the trainees should be steered through the learning cycle.

Working on a cycle basis one trainee is doing the task and others in the group should be asked to explain the process, look out for errors and breaches of safety, suggest how it could be done better etc. This encourages everyone to have a more complete grasp of the process. The why, where and when as well as the how.

Problem solving – Participants working in groups are given a problem to solve or a task to do where participants are guided to engage in an activity which leads them to discover knowledge or techniques and apply them to a new situation. A powerful technique which helps participants remember things well, but needs to be carefully planned and managed. Participant / groups are usually asked to present their findings and experiences to others. This helps them to consolidate their own knowledge and experience and also increases their confidence in preparing reports and presentation. *It also shares their work with others.*

Participant presentation – asking a participant to prepare and present findings from classroom or field exercises. Consolidates and shares knowledge, and builds confidence

Simulation – to simulate a real situation in the field, usually done through models, games and computer modelling.

Role play – useful for exploring behaviour in social / human situations e.g. management, communication problems, conflict etc (nomad and Survey Officer). Humour retains interest and creates links with participants' previous experiences and observations. Needs high quality case study material and clear instructions and group review period to analyse what has been revealed and learned.

Energizers – these are group activities that may not be directly linked to the technical subject matter. These can lift flagging interest/energy, especially after lunch. Humour breaks down barriers and important messages can be woven into the activities.

Training Aids

Perception

It is worth remembering that while a number of people can look at and see the same picture/object/ event they do not always see what we see. We all tend to see things against a background of our own experience



Look at this picture. What do you see? At first probably just a jumble of shapes and then gradually you start imagining you see some shapes.

Now turn the picture upside down !!

Now you probably see a dog.

However in real terms you are still cheating because you are joining up a series of shapes to make a dog. This is because your brain recognizes it and completes the picture for you.

Consider this diagram. What do you see this time? You probably got it right first time because you are familiar with what to expect but your brain is still filling in the blanks from experience

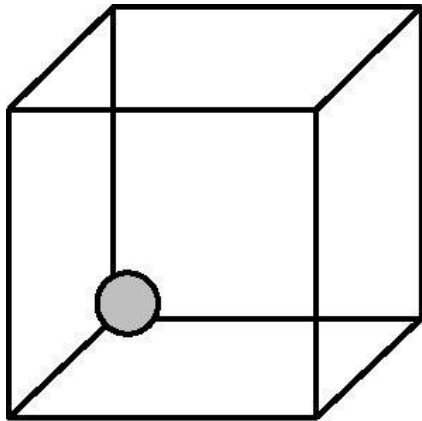


In interpreting what we see, we sometime use codes to interpret diagrams

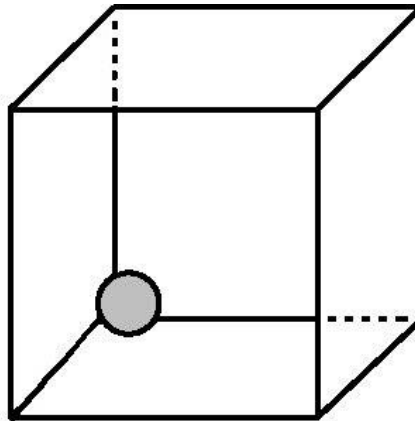
Try to decide where the ball is positioned in box 1

Now try to do the same in Box 2

In box 1 it is impossible because we cannot tell the front from the back of the box while in Box 2 we have some help with the dotted lines which are a code that tells us they are at the back



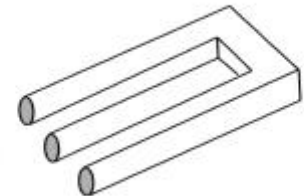
Box 1



Box 2

Finally look at this three pronged fork.

Confusing isn't it! This is because while we can see it, our brain cannot make sense of it as it is really an impossible shape and cannot exist in the real world. Your brain (experience) is rejecting it although you can see it.



From these examples we learn that it is essential that trainers choose their visual aids carefully and also check with Q&A that what the trainees perceive is what the trainer wants them to see when looking at a picture, diagram or real example.

Common Training Aids and how to use them effectively

Below we have identified the most common training aids (or learning aids as they are often called now as their real purpose is to help in the learning process).

The main purpose of these is to make trainee learning easier and interesting by;

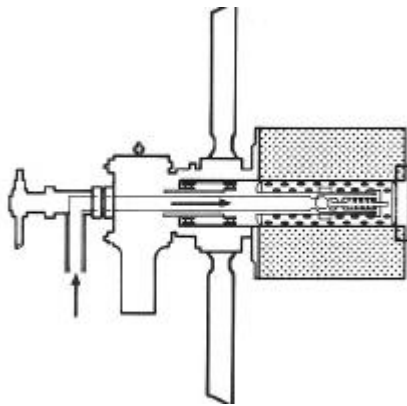
- simplifying complicated concepts
- providing real or substitute experience
- aiding reflection on real experience
- improving understanding and conceptualization
- raising and maintaining interest
- providing a focus for Q&A and discussion.

The purpose of this section is to identify the most useful aids that you might use in training and highlight some of the important aspects of their use.

Real materials

The best learning aids are real materials. Why use a drawing or slide of a sprayer when your trainees could see and handle the real thing? It is essential that wherever possible you should ensure that trainees experience and see what is being discussed. This could be the behaviour pattern of locusts or an aircraft mounted sprayer.

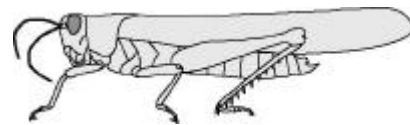
However sometime such real things can be quite complicated and pictures, diagrams and simple models can help the trainee to understand these.



The diagram of the sprayer helps to show how the sprayer actually works and to identify the main parts. The best way is to combine these in your training so that you take the trainee through from the simple to the complicated.

If you have samples of real material then it is important that they are big enough for all to see **or** you have enough samples to give everybody one.

Don't ask participants to hand round a sample – you will lose the attention of different participants at different times and, if it is something delicate, it may not survive the tour!



Presentation Surfaces

Chalk boards, white boards, flip charts. If properly used, these are a very simple and flexible group of aids but you must plan and prepare their use as carefully as any other aid. Don't just use it as a scribble pad – most trainers do!

Things you should do:

- ✓ Carefully plan use to develop key points or show overview of session
- ✓ Add main headings & key points as the session develops
- ✓ Keep diagrams very simple – especially if you expect trainees to copy
- ✓ Clean it for the next user or session.
- ✓ Make sure your writing is large enough for the room size (min 25 mm high) – walk to the back to check

Things not to do:

- ✗ scribble calculations and notes all over the board – this confuses the trainees

Charts and flipcharts

Charts: extremely useful for providing visual aids for field-based training. You can prepare them in advance, transport them easily, and use them again and again. They are also cheap and require no special equipment or electricity to use.

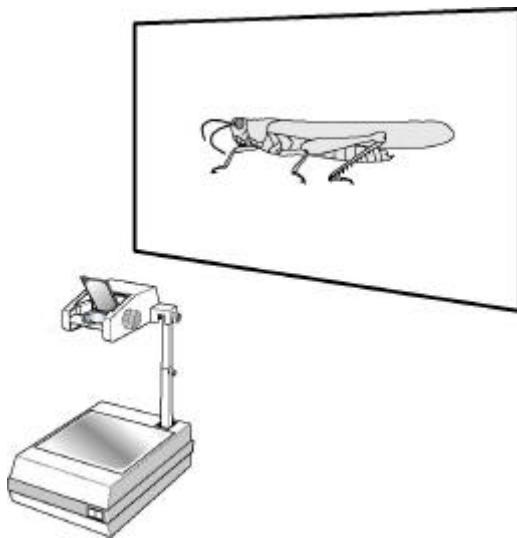
Flip charts: use them like a marker board but being able to flip over each sheet makes them useful for keeping a record of lists and other points. They are good to use for keeping a record of reports and feedback from group work and assignments.

Things you should do:

- ✓ keep diagrams simple – especially if you want trainees to copy
- ✓ use broad-tipped marker pens to ensure lines are visible
- ✓ ensure letters are large enough for the furthest trainee (min 25mm high)
- ✓ use colour for impact, clarity and coding parts of diagrams but limit to 4-5 colours.

Things not to do:

- ✗ include a lot of written notes or detail.
- ✗ Place headings and label across the diagram



You do not need to be an artist to produce an effective chart. You can trace from published diagrams (as long as you are not infringing copyright). And, if you have access to a photocopier you can put a diagram onto an OHT (make sure that it is one designed for photocopiers or it might melt in the machine), and project onto a wall to enlarge and trace onto the chart paper.

OVERHEAD PROJECTOR

The overhead projector can be used to do the same things that you might do on charts and chalkboards. However it costs more money and cannot be used in the field. On the other hand it has special advantages: the stimulus created by the projected image is very attractive if properly used, and you can use the projector whilst still facing your trainees and maintaining contact with them.

Things you should do:

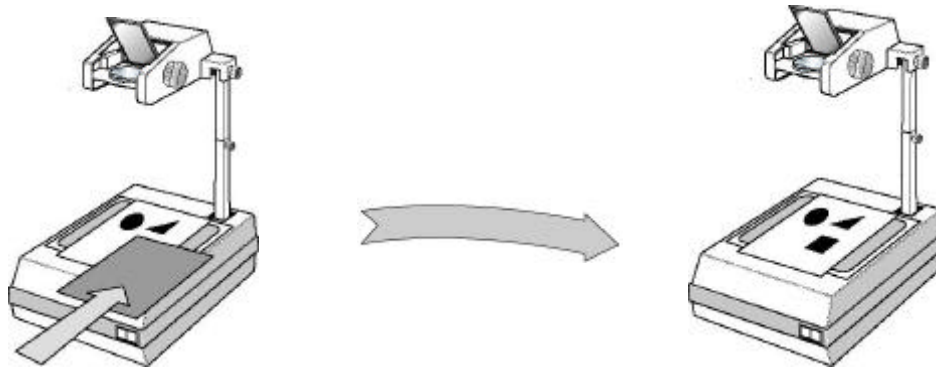
- ✓ use spirit-based OHT pens to create a permanent transparency
- ✓ use water-based pens when you need to remove and reuse the slide
- ✓ put lined paper under the transparency when preparing slides
- ✓ ensure that letters (a, e, i o, u) fill the space between paper lines to ensure they are large enough (min 5mm high)

Things not to do:

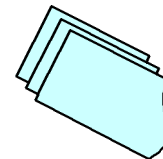
- ✗ put too much on each slide – a maximum of eight words at a time
- ✗ look at the screen – face your trainees instead
- ✗ leave the lamp on when you are no longer using the projector – visual images are **very** stimulating therefore very distracting.

TECHNIQUES

Use a piece of card or paper to reveal one part of the transparency at a time so that you can deal with a series of points in order



Use a number of acetate overlays to build up complicated concepts



Video programmes



You can use video programmes to stimulate and interest your trainees and to help them grasp concepts. However during programmes, ideas are coming at your trainees very fast and they must have the opportunity to reflect upon and consolidate what they have seen.

Things to do:

- ✓ brief participants on what they are about to see
- ✓ brainstorm key points that they might look for
- ✓ ask them to note down key points
- ✓ ask them to identify key points afterwards and note on a flipchart or board.
- ✓ Develop the main points you want to get out of the video session by Q&A

Things not to do:

- ✗ show videos unless they relate directly to teaching points in your programme.
- ✗ don't show the whole video if you only need to show a short part to cover the point you are teaching.

GOLDEN RULES FOR LEARNING AIDS

Room layout

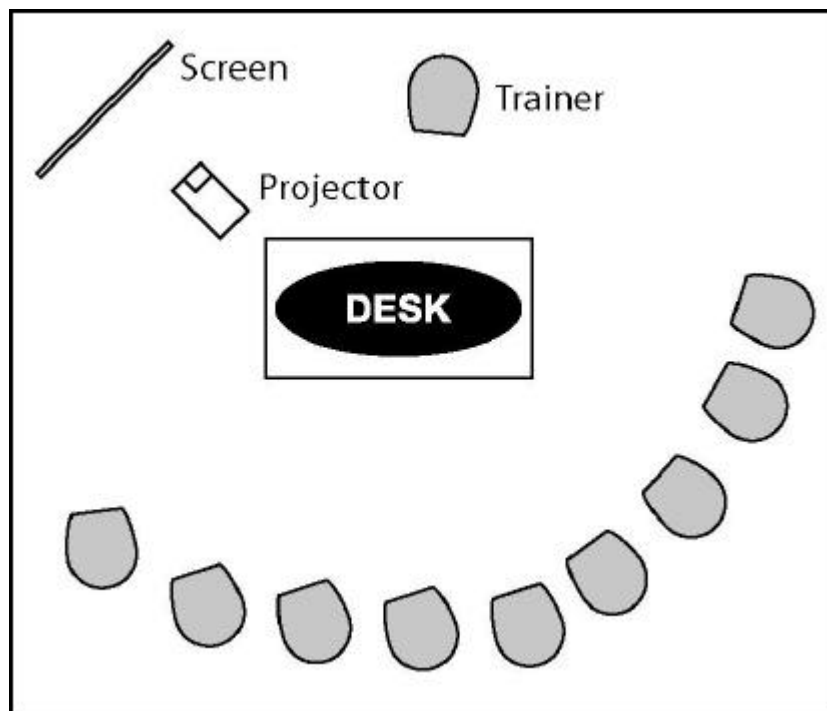
Make sure that everyone is in the front!

The most appropriate room layout is in a semicircle (perhaps around a table) so no-one is in front and no-one behind.

Visibility

Make sure everybody can see!

Don't stand in front of the screen or board. Site the OHP screen in the corner and angle it down to avoid 'keystone' images. Make sure that the writing and images are big enough for the most distant trainee



Use the learning aid at the right moment.

Aids should be used to focus attention on particular teaching points. They should be used like "hand holds" to take the trainees step by step through the session. They should help to structure and 'paragraph' the session and be removed when no longer needed.

Some non-verbal ways of communication

- Facial expression – a smile, a frown.
- Gestures – movement of hands and body to help to explain or emphasise our verbal message.
- Body posture – how we stand or sit.
- Orientation – whether we face the other person or turn away.
- Eye contact – whether we look at the other person or not, and the length of time that we look at the other person.
- Body contact – a pat on the back, an arm round the shoulder.
- Proximity – the distance we stand or sit from the person.
- Head-nods – to indicate agreement or disagreement or to encourage the other to go on speaking.
- Appearance – physical grooming and choice of clothes.
- Non-verbal aspects of speech – variations of pitch, stress and timing; voice quality and tone of voice (these are sometimes called ‘para-language’).
- Non-verbal aspects of writing – handwriting, lay-out, organisation, neatness and visual appearance generally.

Eye Contact

Adequate eye contact is usually the most important way of communicating one’s full and undivided attention. It can easily be achieved by doing the following:

Focus your eyes on the other person and gently shift your gaze from their face to another part of the body, such as a gesturing hand or a tapping foot, back to the face, and to the eyes. Occasionally, moving your gaze from the person will reduce the chance of staring, which may cause them to feel anxious or suspicious. Let yourself be natural.

Avoid staring at the person or pretending to make eye contact by fixing your eyes on the person’s forehead. This is a ploy used by military personnel who do not want to look a superior in the eye when they are talking. This behaviour can denote doubt, hostility or insincerity.

Avoid looking away from your speaker for long periods. If you are distracted by turning your gaze to others as they walk by, or to noises in the environment, the other person may interpret this as a lack of interest in them.

Non-verbal Prompts

These demonstrate listening while also serving to encourage the person to continue speaking;

Affirmative head nodding. These head nods should be used occasionally and paired with good eye contact.

Appropriate facial expressions. Generally, your facial expressions should reflect the kind and intensity of the person's expressed feeling rather than your own reactions to them. A frown is appropriate when you do not follow or understand the person's point.

The use of silence: silence on the part of the listener can communicate patience.

Open body posture

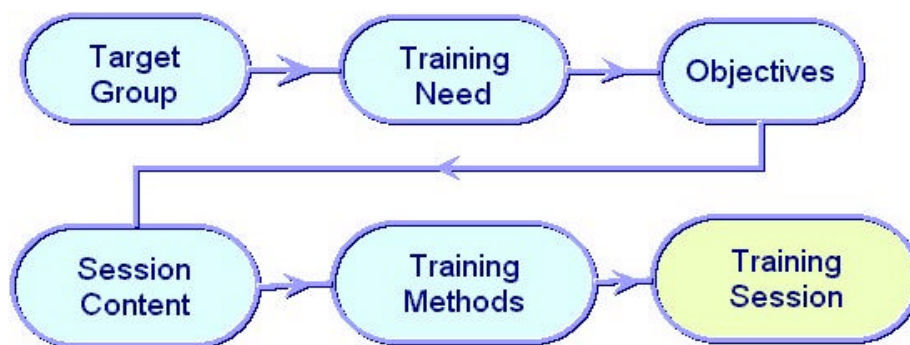
Relaxing your own body will usually encourage the other person to relax too. When your body shows openness and receptivity the other person is likely to talk freely and be less defensive. You can achieve open body posture by the following means:

1. Face the person squarely, rather than sitting or standing at their side.
2. Uncross your arms and legs. Crossed arms can communicate superiority or defensiveness as well as serving as a barrier.
3. Lean slightly forward; this communicates interest. A very casual attitude may be taken as an indication of boredom, fatigue or lack of interest.

T7	Session Notes	Duration
	Planning the training sessions and programmes	1.5 hours

Planning Programmes

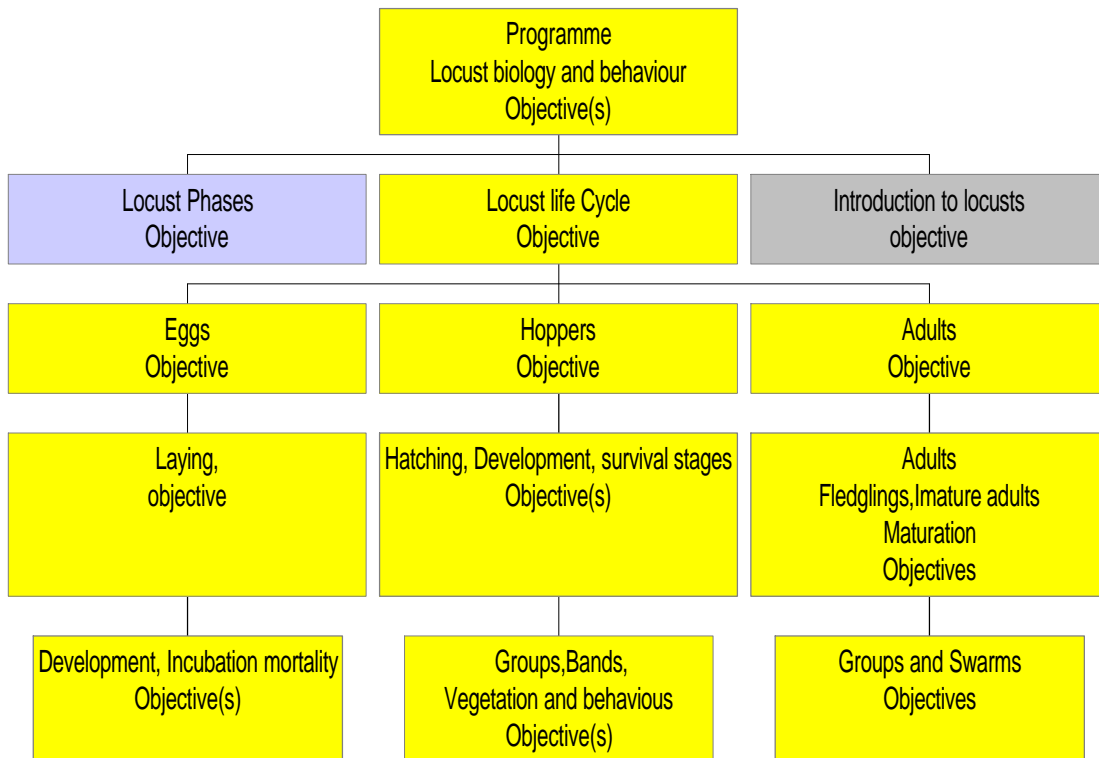
In the previous sessions we have developed all the building blocks we need to plan and prepare training. In this session we will assemble all these parts into a detailed training plan.



Objectives are the basic building block we use to plan programmes and individual training session. We start with the simple and move to the more complex. In designing the basic plan we refer to the training needs analysis that shows us the main areas that have to be built into the programme. These will also usually have a hierarchy like a family tree as shown below

In this example the basic content of the course, sub-sections and sessions is highlighted. The number of levels will depend on the complexity of the training being planned. At every level the objectives will help to define the detailed content of each box. These also have objectives attached so we also have a hierarchy of objectives where the achievement of a number of lower objectives contributes to the achievement of a higher level objective.

Typical programme planning hierarchy



Developing such a layout helps the trainer to have a better overview of the whole course and how it is structured from a number of individual training sessions.

In developing this “family tree” diagram we start at the top and gradually sub-divide each piece into a simpler and more detailed lower level until you have **individual sessions** that have an objective and an outline set of content headings. A good check of the quality of the work is then to start at the bottom and see if it “adds up” properly. Does each object and content fit comfortably into the levels above?

Objectives are like signposts that show us the way up a mountain until we reach the summit



From this overview we can move to the more detailed work of planning and refining individual training session plans

Planning Individual Training sessions

Planning training sessions is done in two stages

- Stage 1 is setting out the main structure in the *Training Session Summary*
- Stage 2 is drafting out a detailed set of *Training Session Plan*

The session plan form below provides a Stage 1 framework for planning a training session. It is here that the trainer works out the basic session content, structure and training approach.

Stage 1 TRAINING SESSION SUMMARY

T1	Session Summary	Duration
	Introduction to the training process	1 Hour

Aim:

Objective:

Key training points:

Equipment:

Preparation:

Guidelines page references:

STAGE 2 – TRAINING SESSION PLAN

T1	Session Plan	Duration
	Introduction to the training process	30 minutes

SECTION	TECHNIQUE AND CONTENT	AIDS
Introduction (mins)		
Core (mins)		
Summary & Conclusion (mins)		

Notes on completing the Training Session Summary (above):

Code – This indicates the section of the manual.

- I = Introduction sessions
- C = Control sessions
- S = Survey sessions
- T = Training sessions

Each Section Code is also numbered in sequence e.g. T1, T2, T3, etc.

Title - This should indicate what the training will be about. It should create interest, and be motivating and informative. Broad titles like “ULV sprayers” or “Aerial Spraying” should be avoided as they give no indication of purpose or level. It is better to try to have interesting and motivating titles such as “Use and maintenance of ULV sprayers in locust control”

Duration – how long is the session intended to run? Normally a session should be no longer than 90 minutes without a break. After that trainees concentration and interest is likely to fall away as trainees become tired. Try to plan breaks in your programmes and introduce changes of activity **during sessions**.

Target Group – Make sure you have analysed the target group and have identified the chief characteristics of the group and particularly emphasised anything that might limit the trainees capacity to benefit from training. e.g. previous experience in the topic and how to build on it, potential problems areas such as capacity to do calculations for calibration or poor skills in writing. This information comes from the Target Group Profile

Training needs - What need is the training session to meet? Consider why you are including particular content and how that will meet the need. This information comes from the Training Needs Analysis.

Session Aim – the aim is a statement of what the trainer is going to teach and an explanation of why it is being taught. This means stating how the trainee will use their new knowledge and skills in the future. This needs you to consider who you are training and how they will use the training received. It is a good check that your session will be relevant to target group needs

Objective(s) – Normally you should have only one objective per session. However in some cases it may be appropriate to break the session down into smaller parts by having two or three simple objectives. The Objective is central to the planning process as it guides the choice of **content** and it also will guide the training **methods** to use. Remember the objective states what the trainee **must be able to do** at the end of the training session. There should be a close link between the identified needs in the training needs analysis and the Objectives

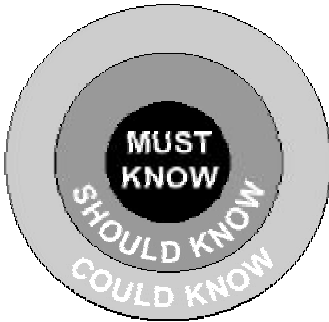
Session structure

Training approach – The choice of training methods will be signalled by the Objective and what you want your trainees to achieve. You will need to decide what knowledge, skills and attitude components need to be included to achieve the Objective.

- Knowledge will need information to be supplied through explanations.
- Visual aids to help to explain difficult concepts.
- Support notes for reference.
- Demonstrations and guided practice to develop skills.
- Group discussion and problem solving will help reflection and increase trainees understanding of applications.

This is a skilled part of the trainer’s job and needs practice and experience.

Timing The length of the session is usually decided during the preparation of the whole programme and you should try to stick to this as taking extra time in one session means there will be less available for another. The detailed timing is carried out when you preparing the session plan (stage 2). Here try to consider not only the amount of material you need to cover but also how difficult or easy the trainees may find particular topics.



Most trainers find that there is never enough time for training so you must remember the target of Must, Should, and Could know.

When allocating time a rough guide for the basic allocation is as follows for a 60 minute session

introduction,	5 minutes
core	40 minutes
summary	10 minutes
conclusion	5 minutes

New trainers are advised to plan the timing of their sessions carefully so that they are able to keep closely to the planned programme. Good timing will come with experience.

Introduction to Session

The introduction should -

- Describe what is going to be covered
- Get the interest and motivate the trainees by linking the subject to trainees’ training needs and previous training sessions if appropriate.

Core (Key training points)

In the Core you should have:

- A series of Training Points that are the headings for the main structure of the session. Usually no more than 5 / 6 headings per session.
- The headings should be logical and go from the simple to the more difficult.
- They should cover Knowledge, Skills and Attitudes according to the type of session and offer the opportunity to use participatory training methods
- Use training methods that encourage trainee participation and active learning situation. (learning by doing)
- Training Points should be related and illustrated with examples related to field practice (application)
- The Key training points should be directly related to the Aim and Objective

Summary

Should summarise the session content and check, by question and answer, that learning has taken place. This can be also include discussions, problem solving and other methods that check whether the objective has been achieved. The summary can also be used to help the trainees to clarify any misunderstandings.

Conclusion

The conclusion allows the trainer to explore with trainees where the trainees may go next in the topic. It can also allow a few minutes to expand on any area of related interest that trainees may have. (*Should* and *Could* know.)

Preparing the Training Session Summary (stage 1) gives the trainer and anyone else a good overview of what the session intends to achieve and what it contains. The Trainers session plan (Stage 2) is for the trainer to plan the detail of the session in terms of the content, training methods, aids and resources. This expands the Session Summary into a more detailed set of directions that are about how to conduct the session as well as its content.

These are personal to the trainer and will contain notes on the technical content of the session with key points highlighted. They will also have details of how each section of the session is to be organised and taught. This means indicating what training methods will be used and how they will be applied. What training aids will be introduced and how they will be used.

Planning Check list

When planning training, the following questions may help trainers to avoid the most common mistakes.

Introduction

- 1 Can I use real material or situations to motivate the trainees?
- 2 Will the trainees have personal **experience** of the subject that can be used for the benefit of all the group?
Have I planned how to motivate the trainees by involving them early in the session?
- 3 Have I planned some questions to use to involve trainees in the session?
- 4 Have I planned to explain the title of the session and its relevance to the trainees?
- 5 Have I identified links where this session fits with other training sessions?

Core of the Lesson

- 1 Does the lesson move from simple ideas to more complex ones?
- 2 Have I planned how to involve students in the lesson?
- 3 Have I planned what reference books the trainees may need?
- 4 Can I use handouts in the lesson?
- 5 Have I planned to use a range of training aids to increase trainee interest and understanding?
- 6 Am I trying to relate the lesson to practical, work based situations and processes?
- 7 Have I clearly identified the Must, Should and Could know segments of the session?
- 8 Have I estimated the time each section of the session will need?

Summary of the session

- 1 Have I written down questions I will ask the trainees to test whether the students have learnt what I intended?
- 2 Have I planned how I will test the achievement of the trainees against the objectives?
- 3 Have I considered how to encourage the trainees to ask about anything they did not understand?

Conclusion

- 1 Have I decided how to use this session as a feed into another session or to highlight further questions about where the session content will be applied in future sessions or in the trainees future work?
- 2 Have I allowed time to clear up any confusion that may arise in the Summary?

The Training environment

- 1 Is the training area comfortable and adequate for the training session and number of trainees expected. Does each trainee have a workspace and able to see and hear clearly all the things they are supposed to see and hear?
- 2 Is all the equipment needed available and in working order? Consider practical resources e.g. tools, equipment, audio visual aids, etc.

If the answer to most of these questions is YES then you are more likely to motivate your students, keep them interested and achieve your objectives - helping trainees to learn and improve their level of success in their work.

Training is like any other job: it needs practice and continuous attention to detail. The self-evaluation sheet below can help you to improve your training skills if you answer them truthfully and try to improve the areas you appear to be weak.

TRAINING SESSION SELF-EVALUATION CHECKLIST

HOW WELL DID I.....?	Very well	good	satis- factory	not very well	poorly	not applicable
26 Ask questions						
27 Capture trainees' interest						
28 Emphasise key points						
29 Handle problems of inattention						
30 Introduce this session						
31 Link this session to other sessions						
32 Maintain an appropriate pace						
33 Maintain trainees' interest						
34 Make objective clear to the trainees						
35 Move logically through the structure						
36 Summarise the session						
37 All or most of the group were engaged in the question and answer process						
38 Handle trainees' responses						
39 Direct trainee tasks						
40 Cope with the range of ability						
41 Monitor trainee activity						
42 Use a range of learning aids						
43 Make contact with all group members						
44 Cope with individual difficulties						
45 Keep the content relevant						
46 Be aware and use body language						
47 Maintain good eye contact with all of the group						
48 Check learning						
49 Build trainee confidence						
50 Convey enthusiasm						
51 Provide a role model						

Note

- 3 This is a tool for self-evaluation but it is also useful for a master trainer when observing other trainers
- 4 Where two or more trainers are working together this can also be a good way for trainers to share their experience and strengthen each others skills by observing each others sessions.

T8	Session Notes	Duration
	Evaluating the impact of courses	1.5 hours

Training is a process that can be seen in many different ways by different people.

It is well known that while we can introduce changes in structures, processes and policy, they will all fail if we do not address the issue of changing the people who have to make them work. Carefully planned training is a central component in the development process of improving the way people work within these changed systems and circumstances.

In Section T6 we defined the trainers role as

A trainer's work is trying to help people change the way they behave in a range of circumstances so that they can be more effective and positive in what they do.

Training is most likely to be successful if it takes place within a structure which has clear outcomes (learning objectives). If Objectives are not clear (which they are often not) then the training will rarely meet the expectations of the sponsors, employers or the trainees themselves.

In Sections T3, T4, and T5, we have emphasised what should be considered and investigated when developing and implementing a training programme.

These are:

- What are the shortfalls in performance? (What is the problem?)
- Who are the people who need to perform better? (The Target Group)
- What are the standards and criteria of the performance needed (Job Description)
- What knowledge / comprehension, skills and positive attitudes are needed to achieve this new level of performance (the Training Gap)

In simple terms

- Who are the people and what are their standards and conditions of work now?
- What are the performance levels and criteria of work needed.

A third question to ask is "If the new standards are achieved through successful training, will the working conditions allow these new standards to be applied in the work place?" Sometimes training fails because the newly trained person returns to a work environment that does not have the resources and equipment needed to be able to do the work in the way the training was given. This happens when a manager who does not appreciate the need for improved equipment or a change in the work environment can hold back the application of the trainee's new skills. These

examples demonstrate the importance of developing a dialogue with supervisors and managers so that the trainees' new skills and knowledge can be welcomed and used on return to post.

In this Assessment Section we will look at ways in which we can assess the following:

- What the trainee already knows before beginning the training
- What impact the training is having on the trainees during the training.
- The impact of training at the end of the training course.
- The impact of the training on Trainee performance in the work place

1 Pre-course diagnostic assessment - (what the trainee already knows before beginning the training)

This is a way of establishing what the trainee already knows about the topics being delivered in the training course. This gives the trainer an idea of where the training should start. It should confirm the training needs analysis work that was done during the planning period of the course. This assessment will usually be given at the start of the course. Participants are asked to complete a short questionnaire that checks their knowledge and comprehension of the subject content of the course. This should be quite short (approximately 30 minutes maximum. See the example taken from this programmes pre course test (see Appendices).

If you are running a course that emphasises very practical tasks (for operators) it may be more suitable to assess their practical abilities by introducing simple practical tests. For example - measuring volume flow, calibrating a hand held ULV.

These pre-course tests give the trainer a measure of the trainee's current knowledge and practical skills and experience. This form of assessment can make the trainees anxious as they may see it as a "Test" One way to reduce the risk is to present the assessment as a survey, rather than a test.

Pre course diagnostic tests can be useful in the following ways

- They give the trainer an indication of trainees' knowledge and skills
- From these indicators the trainer can decide at what level the course needs to begin.
- The results can help the trainer to refine the course content and methods to more closely match the trainees needs
- They can help the trainees to have a clearer understanding of their own abilities and the areas in which they need more training.
- By repeating the pre-test at the end of the course, trainees can see where they have improved on their entry score

2 Continuous assessment (What impact is the training having on the trainees during the training)

Sometimes also known as Formative assessment because it is carried out on a continuous basis throughout the training programme,

Some points about of this method are.

- 1 Can be used to indicate changes needed in the training programme so that it can adjust to meet trainee learning problems and difficulties shown up by this continuous process.

- 2 Provides the trainee with information on their strengths and so gives them positive feedback and motivates them
- 3 Provides the trainee with information on their weaknesses so that with help from their training, they can concentrate on improving these areas.
- 4 Regular feedback will often make the trainee try harder in areas where they are performing poorly. The feed back from continuous assessment is a very effective way of improving trainees learning and motivation.
- 5 Uses the short-term Training Session objectives as the criteria for assessing the trainees success in achieving the objective
- 6 Can be used within the training / learning process by asking questions, setting group work or short tests at the end of each training session or section.

Trainers should always remember that poor performance by trainees usually means poor performance by the trainer. Trainers must use this system as an indicator of their own performance.

Training Objective - the building blocks of successful training and assessment

In Session T4, we emphasised that Objectives state what the trainee must be able to do at the end of the training session. To develop a effective assessment system we must develop tests that can measure the trainees success in achieving the performance described in the objectives. This highlights the importance of developing objectives which clearly state (by using action verbs) what is to be achieved by the trainees.

Example

Objective The trainee will describe and demonstrate how to correctly carry out the “collection method” flow rate measurement on an electrically driven aircraft pump system.

In developing an assessment scheme you need to make sure you are assessing the knowledge, skills and good attitudes indicated in the objectives. In the objective above you can do this by asking yourself? **What am I asking the *the trainee to describe and demonstrate?***

This question can be answered by drawing up an assessment checklist as set out below in the example assessment checklist on the following page. This should be easy, as your training session should have already covered all of these technical points in a logical way. Remember the main purpose of continuous assessment is to assess trainee’s progress and trainer’s effectiveness so that;

- Trainees are made aware of where they are performing well and where they need to do better.
- Trainers are made aware of where their training is effective and where they need to make it more effective.

Example of an assessment checklist for the objective given above. The purpose of developing this checklist is to define WHAT has to be described and demonstrated And to be able to assess each of the knowledge and skills attained

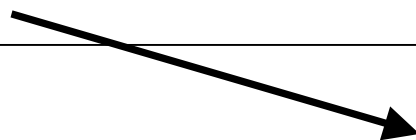
Assessment means grading the performance against a set of criteria. As the main purpose of this assessment is to diagnose the effectiveness of the training and learning process it is not necessary to be mathematical precise. The three levels described below are sufficient for the type of grading

Suggested standards to use

*A = Covered /answered **all** the points in detail - carried out **all** the tasks correctly*

*B = Covered /answered **essential** points - carried out **essential** tasks correctly*

*C.= Did not cover/answer **essential** points – **did not** carry out **essential** tasks correctly*



Model Assessment scheme

Procedure	Key points	A	B	C
a) Calculate desired flow rate	1 Clearly describes the calculation process 2 Defines the correct dosage rate from product label 3 Calculates pesticide volume required / min for correct dose	<u>x</u>	<u>x</u>	
b) Sets approximate flow rate	1 Describes the key steps in the process and indicates the control adjustments 2 Interprets tables in users handbook correctly	<u>x</u>		<u>x</u>
c) Primes pipes and sprayer system	1 Describes why priming is important 2 Adds approx 50L of spray solution to tank 3 Switches on sprayer and primes system	<u>x</u>	<u>x</u>	<u>x</u>
d) Measuring flow rate	1 Correct tools and equipment selected 2 Collection system set up correctly 3 Spray operated and timed accurately (1 minute) 4 Spray accurately measured and recorded 5 Repeat process and adjust to achieve less than 5% error from desired dose	<u>x</u> <u>x</u>	<u>x</u> <u>x</u>	<u>x</u>
e) Method and safety	1 Carried out efficiently 2 Carried out safely		<u>x</u>	<u>x</u>

The assessment is made by ticking (x) the appropriate box. In the example given the results would suggest that the trainee had a good grasp of the basic principles and generally understood and could describe processes However it is clear that the training was weak in ensuring that the student could apply this knowledge to practical applied situations

What action do you think is needed by the trainer to improve this score?

Remember that individual sessions are building blocks to reach more complex concepts and skills (See session T4). This means that individual skills and pieces of knowledge acquired and assessed in the earlier parts of the course are progressively built up into more complicated procedures where problem solving / diagnosis, and analysis work has to be **applied** in situations and conditions which are increasingly

more like the conditions the trainee will have to work in after training. It is important that the continuous assessment programme reflects this progression by testing that the students are continuing to achieve objectives that are reflecting the higher level of performance specified by the course objectives.

Summary

Continuous assessment

- It is undertaken throughout the whole period of the training
- Can be used to diagnose the need for improvement / changes in the training methods or content
- It can identify trainee learning problems early so that additional help can be given.
- Motivates trainees by providing regular feedback.
- Usually used to assess short term session objectives (Small units of learning)
- Results from continuous assessment can be included as a component of the final assessment of trainee performance.

End of Course Assessment

By the end of the course trainees must be able to build and apply the small segments of knowledge and skills in more complicated and complete procedures and tasks.

For example –

- The learning achieved in using the GPS, maps and compasses are applied in survey work.
- Calibration, machine maintenance, speed of travel, volume control and problem diagnosis is combined to form the greater process of spray application.
- The knowledge of the life cycle, instar recognition and locust behaviour patterns are applied when survey work and decisions on action to take are made

In *End of course* assessment the main emphasis should be on the **application** of the knowledge and skills acquired during the course. Here we need to design tests that will assess how well the trainees can apply their knowledge and skills in situations that reflect the conditions in which they work. This requires trainees to think, reason and apply their knowledge and skills in a range of situations and conditions.

Some examples of end of training assessment questions and assignments

- 1 Weather conditions are critical to the success of utilising ULV spraying. **Explain** how the three factors of Wind, Sunshine and Rain would influence your decision to spray or wait for better conditions. (ref Guidelines volume 4, p53)
- 2 **Explain** why it is important to differentiate between “Observed” data and “Radioed” data. **Describe** what problems could arise if you failed to recognise this difference? (Ref Guidelines volume 3, p21)
- 3 Practical test Trainees to be given sprayers with a number of faults that require to be repaired / corrected before being used

Instructions

You have three hand held ULV sprayer which are to be issued for use.

Examine them and prepare a **report on** what faults exist and what maintenance /repairs will be needed before they can be used.

Describe what improvements in post spray maintenance might avoid these faults

End of course assessment has to be more rigorous and test all trainees. It has to provide sponsors, supervisors and employers *and the trainer* with reliable information about the skills and knowledge that the individual trainee has acquired and how effectively he/she can apply them to the real conditions in which they have to work.

This will mean setting assignments, problem solving tests, questions that test trainees'

- a) understanding and comprehension of complex concepts and situations,
- b) ability to identify, analyse and solve complex problems and situation
- c) ability and positive attitudes needed to carry out practical procedures in an effective and safe manner.

Constructing good assessment schemes are very important in this stage of the assessment process. All trainees should be tested using the same conditions and criteria. Use the same method as described in Fig 1 above to structure your assessment scheme and refer to the Desert Locust guidelines where you will find detailed procedures to guide and structure the technical content.

Some examples of procedures that can guide the structuring of end of course assessment can be found in Desert Locust Guidelines 7

P85 Prevention and treatment of pesticide poisoning.

P65 Ground Team Procedures During Aerial Spraying

Summary

End of course assessment

It should be searching in the depth of knowledge and skills tested

It should measure trainees' abilities (final achievement and outcomes) in a more formal and individual way so that each trainees knowledge and ability can be accurately measured and reported upon.

The results of these end of course assessments should be good predictors of the standard of work that employers can expect from trainees on their return to post.

The real evaluation of any training course must be how well the trainees are able to do their work after training. Unfortunately, trainers do not always have the opportunity, time or resources to carry out this follow-up impact assessment. That is why it is essential that the trainer makes sure that the training objectives are achieved (tested) within the period of the training course.

Every trainer should be aiming to achieve a trainee standard of performance that ensures that they can carry out their work:

To a higher standard of professional performance

More efficiently and economically

More safely (for themselves, others and the environment)

Post Training Impact assessment

Post Course impact assessment is about trying to determine how well the trainee is applying what has ben learned on the course

The period of time allowed between the end of the course and the follow up impact assessment will vary according to circumstances but usually 3 to 6 months is a suitable period. New and improved skills will take some time to develop as trainees

will need time to try out the new ideas and methods (the learning cycle) in their own working environment

When assessing staff performance it is essential that this is carried out against a clear definition of the work schedules and procedures the staff member is supposed to do. The process is very similar to the process of training needs analysis described in T4.

The main information that should be collected in impact assessment is to find out in what ways the training has been effective in improving work performance and where the weaknesses are. This can be done in a number of ways:

- Interviews with the trainee - improvements they have been able to make and what they have been able to apply. Possibly watch them at work and ask to see written reports, plan etc
- Observing the trainee carrying out their normal work
- Interview employers and supervisors to seek their opinion of the trainees improved performance.
- Written reports made by supervisors

Clearly visits and observations in the work place are the best way to do this assessment but this kind of information can also be gathered through questionnaires to trainees, supervisors and employers and stakeholders. However research and experience shows that this method is not very successful as the number of responses is invariably very low and the amount of detailed information that can be collected is limited.

In planning this area of assessment you should check performance against course objectives and procedure guides in the Desert Locust control guidelines.

The feedback from this type of assessment is probably the one that is the best measure of the success of training. It is also able to indicate where changes are needed in the training programme.

Summary

In the course we have divided the trainee learning into the broad headings of Knowledge, Skills and Attitudes. We have emphasised that training objectives must use active verbs and assess trainee knowledge skills and attitudes by setting questions and exercises that test the trainee performance against the performance described in the objectives.

In very general terms knowledge can be assessed by using written tests like the multiple-choice test in appendix 1. These are useful to get a broad picture of a wide range of topics very quickly. However they are generally checking what the student remembers

To test deeper levels of knowledge and particularly its application it is necessary to set questions which make the trainee use or apply the knowledge e.g In what ways can you change the application rate of a hand held ULV sprayer?

To test practical skills it is usually necessary to assess someone as they are carrying out the process. Questions will tell you if the trainee knows **what** to do (knowledge) but you have to observe the trainee if you are to be sure that they know **how** to do it.

Assessing attitudes is a little more difficult but they are usually assessed by observing how the trainee approaches assignments, carries out tasks and works with others. Positive attitudes are usually demonstrated through such indicators as attention to detail, working logically and conscientiously, following safety rules and is interested in finding ways to improve the quality of the work being done.

Participant assessment of the Course

These are evaluations by the participants of their satisfaction with various aspects of the course, including domestic arrangements, ability of trainers, but also their view on the value of the course to them. Participants are likely to answer much more honestly and critically if these evaluations are anonymous and the trainer leaves them in peace to complete them. Appendix 2 has an example which can be used or adapted. The results of this assessment will give you direction on areas where the management and the organisation of the course may be improved.

Trainers' self evaluation

It is also valuable for trainers to judge themselves against a performance check-list (or for a senior trainer to judge them using the same check-list). If the trainers have followed certain procedures and covered certain topics, the training is likely to have been effective. An example of such a check list is presented in the Appendix 3 for use or adaptation.

APPENDICES

Trainees' Personal Profile and registration form

1. Full Name and date of birth	
2. Office postal address	
3. Office telephone, fax (including country and city code) + email address	Tel: Fax: Email:
4. Education/locust experience	Education: Years in locust service:
5. Current occupation/ job and for how many years?	Job title: Job responsibility: Number of years in current job:
6. How many surveys have you carried out?	
7. How many control operations have you carried out?	
8. How many locust training courses have you organised and conducted?	
9. What are the biggest problems you have experienced with locust survey, control or training?	
10. What do you expect to gain from this course?	1. 2. 3.

Facilities and equipment list

Item	Number
Accommodation / food / transport / communications	
Accommodation for trainees and trainers together, plus other personnel involved with the course	
Sufficient number of vehicles to take trainees and trainers to the field sites.	
Venue facilities	
Large room (for presentations) with desk space and seating for up to four groups of four people each, and curtains or blinds to darken the room	1
Small locking room (for equipment) adjoining the large room	1
Whiteboard (or blackboard), overhead projector with screen and spare bulbs, coloured pens and erasers, electrical extension cords	
Large table with chairs for each group	1 per group
Table for trainer	1
Course banner and/or poster(s)	
Open area nearby at least 300m x 300m where spraying of water and harmless oil can be carried out by hand and by vehicle	
Open area at training venue of at least 200m x 200m where field demonstrations and exercises can be conducted	
Access to a rapid photocopier, preferably in the small locking room	
VCR and TV	
Optional: computer, slide project	
General	
Stationery set for trainees comprising of: clipboard, large ring binder, A4 block pad, pens (red and blue), pencil, ruler, eraser, sharpener, small electronic calculator, name badges and small bag to carry these items.	20
Scissors, tippex correction fluid, heavy duty hole punch, sellotape, stapler with staples, tape measure (100+m), stopwatch, chalk, stickers (bright and large stars or circles)	
<i>FAO Desert Locust Guidelines</i>	1 set
NRI Locust Slide Kit	1
Locust video	1
Buckets and shovels	3-4 sets
Basic tool kit (screwdrivers, spanners, pliers)	4
Survey sessions	
4WD station wagons with HF radios	4
Hand-held Garmin GPS with 1 set extra batteries (Alkaline)	10-20
Compass	5

Item	Number
Maps for mapping exercise (TPC 1:500,000 scale, or National maps commonly used on survey)	4
Maps for survey field exercise (TPC 1:500,000 scale or National map of the actual area)	2
Binoculars, whistle, signal mirror, hand lens, hand tally counter, sweep net, dissecting kit, sample boxes, inflatable globe	1 each
eLocust handheld computer (currently, Psion 5mx)	1
Gravel	up to 2 tonnes
Control sessions	
Micro-ulva or Ulva + with nozzles and bottle	2
Standard knapsack sprayer	1
Exhaust nozzle sprayer mounted on a vehicle	1
Drift sprayer (e.g. Micron Ulvamast) mounted on a vehicle	1
Motorised vehicle sprayer (e.g. Micronair AU8010) mounted on a vehicle	1
Flags (3 m pole with bright cloth 1m x 1.5 m)	16
Whirling hygrometer	4
Handheld anemometer	4
Stop watch	4
Oil sensitive paper (non-fluorescent) rolls	8
Water sensitive paper, packs	4
Bamboo canes as oil sensitive paper mounts	20
Water container and soap for washing in the field	2
Paper towels or tissues for the field – rolls or boxes	4
Fluorescent lamp	4
AA size batteries for lamp	32
D size batteries for sprayers	16
Camera and film (if camera is not digital)	1
Vibratak tachometers	4
Blu-tak, packs	2
Graph paper sheets	80
Plastic measuring cylinders	2 large, 2 small
Plastic funnels	2 large, 2 small
Plastic buckets	4
protective clothing (nitrile gloves, boiler suits, dust masks, goggles)	4 sets
Light cooking oil for spraying, litres	2
Fluorescent dye, bottle	1
Drop counting templates	4
Polystyrene droplets	1 set

Suggested 9 day programme for National Locust Officer Course (not training skills)

INTRODUCTION

Day/ Date	Time	Module	Activities
Day 1	0900-1000	Opening of course. Registration. Admin announcements	Registration, distribution of materials
	1030-1130	Introduction to course. Pre-course assessment	Multiple choice paper
	1130-1230	Participants experience of locust operations and the constraints to safe and effective locust management	Discussions

SURVEY SESSIONS

Day/ Date	Time	Module	Activities
	1230-1300	Introduction to surveys	Classroom presentation + discussions
	1400-1730	Finding all locust infestations	Field exercise + discussion
Day 2	0830-1030	Why make surveys and how to plan and make them, who, where, when	Classroom presentation + discussions
	1100-1145	Assessment and search surveys	Classroom presentation + exercises + discussions
	1145-1300	Different survey methods; what data to collect and how	Classroom presentation + discussions
	1400-1530	Continuation	
	1600-1800	Continuation	
Day 3	0830-0900	Survey equipment	Role playing
	0900-1015	Map reading	Classroom presentation + exercise + discussions
	1045-1145	Using a compass	Classroom presentation + demonstration + field exercise
	1145-1300	Using a GPS	Classroom presentation + field exercise
	1400-1430	Using maps, compass & GPS	Classroom presentation + discussion
	1430-1530	Recording field data	Classroom presentation + exercise + discussion
	1600-1730	eLocust	Classroom presentation + exercise + discussion
	1730-1800	Practicing survey techniques	Classroom presentation
Day 4	0700-1200	Practicing survey techniques	Field exercise
	1400-1430	Transmitting field data	Classroom presentation + exercise + discussion

CONTROL SESSIONS

Day/Date	Time	Module	Activities
Day 5	0830-1030	The control process - a logical procedure. Is control necessary? Decisions on when and how.	Discussions
	1100-1300	Different control targets and different control technology options - pros, cons.	Swarm video and discussions
	1400-1530	Different conventional pesticides and formulations. Toxicities, pictograms etc. Alternatives to conventional pesticides	Discussions and toxicity calculations
	1600-1730	Use of additional field equipment	Demonstration and exercise
Day 6	0830-1030	Swath width exercise (vehicle and hand-held) sampling spray.	Field practical
	1100-1300	Contd. Counting drops, graphing deposition profiles, track spacing to use and work rate	Indoor exercises and discussions
	1400-1530	Droplet size and behaviour. VMD/NMD. Types of atomiser and the spectrum they produce	Discussions and indoor practical
	1600-1730	Good and bad spraying conditions	Discussions
Day 7	0830-1030	Sprayer calibration - what is it. Calibration calculations	Indoor exercises
	1100-1300	How to calibrate a sprayer and make settings (including aircraft if available)	Field practical
	1400-1530	Principles and techniques of ULV spraying, demarcating and track guidance, GPS technology for aerial and ground spraying	Discussions and field practical
		Measuring control efficacy	Discussion and desk exercise
	1600-1730	Monitoring and recording operations and efficacy	Indoor exercise + discussion
Day 8	0730-1300	Mock spraying exercise (aerial and ground) - demarcating, spraying, monitoring	Field practical
	1400-1500	Analysis of the mock spraying exercise and data collected	Discussions
	1600-1730	Course evaluation and post course assessment. Certificates and close.	Multiple choice papers and close

CLOSING

Day 9	1600-1730	Course evaluation and post course assessment. Certificates and close.	Multiple choice papers and close
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Pre-course assessment – Desert Locust Survey

Name: _____

For each of the questions below, put a mark in the box next to the correct answer. Mark ONLY one box, unless the question asks you to mark more than one.

1. Assessment survey is	<p>a quick survey to have an idea of the locust situation in an area</p> <p>a survey only on main roads</p> <p>a detailed survey in an area to mark infestations for later control</p> <p>when you stop and control the first big infestations you see</p>
2. What are the six most essential items to take with you in order to collect information on a survey?	<p>map, compass, notebook, pen/paper, net, hat</p> <p>compass, tent, survey form, radio, binoculars, pen/paper</p> <p>map, compass, gps, pen/paper, survey form, notebook</p> <p>pen/paper, gps, compass, camping gear, radio, map</p>
3. What is the most important information to collect during a survey regarding locusts?	<p>presence, appearance, behaviour, stage, density</p> <p>colour, instar, density, laying, gregarious</p> <p>number / km², copulating, flying, appearance, stage</p> <p>presence, behaviour, stage, hatching, density</p>
4. What is the most important information to collect during a survey regarding rainfall?	<p>date</p> <p>date, quantity</p> <p>date, quantity, time</p>
5. What is the most important information to collect during a survey regarding vegetation?	<p>species, appearance, density</p> <p>density, appearance</p> <p>species, density</p>
6. Once you arrive at a place where you think there may be locusts, how would you make a survey?	<p>stay in the vehicle and check the area by looking out the window</p> <p>walk about 50 m, check the soil, count the bushes and locusts, take the temperature</p> <p>ask the farmer if he has seen any locusts or if it rained last week or if his crops are okay</p> <p>walk about 200 m or more, count adults, check for hoppers, check the soil and vegetation</p>
7. When making a foot transect, you should not walk downwind because	<p>you will count the same locust more than once</p> <p>the wind is very bad for your neck and back</p> <p>the dust will blow in front of you so you cannot see clearly</p> <p>it is better not to make a survey when the wind is blowing</p>

8. How many metres should you walk during a foot transect?	100 m 100-300 m 500 m 1 km
9. About how many minutes should you spend at each survey stop?	5 minutes 15-20 minutes 40 minutes one hour
10. If you are in a vehicle making a transect you should	drive downwind and count the locusts more than once drive into the wind so the locusts fly up and go behind you drive downwind so you do not run over the locusts not make a survey if the wind is blowing
11. How fast should you drive when making a vehicle transect?	as fast as possible without damaging the vehicle about as fast as a man can run at a walking pace in low gear at the same speed as the wind is blowing
12. How many km should you drive during a vehicle transect?	less than 1 km at least 1 km 5 km 10 km
13. During a vehicle transect, do you count the locusts	in front of the vehicle behind the vehicle on the right side of the vehicle on the left side of the vehicle
14. One degree = __?__ minutes; One minute = __?__ seconds.	10 minutes and 10 seconds 50 minutes and 50 seconds 60 minutes and 60 seconds 100 minutes and 100 seconds
15. One degree = __?__ km; One minute = __?__ km; One second = __?__ meters.	10 km, 1 km, 1 m 100 km, 10 km, 1 m 108 km, 1.8 km, 30 m 150 km, 15 km, 50 m
16. Latitude are lines from	N - S W - E
17. Longitude are lines from	N - S W - E
18. When you record coordinates, which do you write first?	latitude is first longitude is first
19. GPS can give us:	direction of north temperature latitude/longitude, distance and direction wind direction

20. How many satellites are required in order to determine your location (but not your elevation)?	two three four
21. When you use a GPS, you must	stand outside away from buildings, trees, mountains only use it during the day when there are no clouds stay out of the sun and away from rain and dust connect it to the vehicle battery and start the vehicle
22. Scattered solitary adults can be seen by	fixed-wing aircraft helicopters both
23. When you make a ground survey, how many of the locust infestations do you think you can find?	none of the infestations less than half of all infestations more than half of all infestations all infestations
24. After you make a locust survey, you should send the results	as soon as possible every week only after you receive instructions from HQ once a month
25. Locust surveys should be undertaken in your country	only after someone tells you they saw locusts every month of the year every few weeks during the winter only when FAO and PPD inform you

Pre-course assessment – Desert Locust Control

Name: _____

For each of the questions below, put a mark in the box next to the correct answer.
Mark ONLY one box, unless the question asks you to mark more than one.

1. What volumes of liquid are used in Ultra Low Volume (ULV) spraying	10 - 50 ml/ha 0.3 - 3 l/ha 15 - 150 l/ha Any volume - it depends on the type of pesticide
2. ULV spraying is useful for large scale control because:	it is safer than baiting it is faster and easier than other methods of locust control the hard work of survey is not required swarms will not land on the sprayed crops
3. The quality of spray is best (narrow droplet spectrum) from which type of atomiser?	Air blast nozzle, e.g. exhaust nozzle sprayer Hydraulic nozzle, e.g. lever operated knapsack sprayer Rotary atomiser e.g. spinning disc sprayer Aircraft type sprayer because of the high speed
4. If there are big droplets in ULV spray, they will:	fall down on the locusts and kill all of them fall close to the sprayer be carried away easily by the wind be the most concentrated and give a better kill
5. How many droplets will be produced if a 200 micrometer drop is broken into 100 micrometre droplets (i.e. half the size)	2 4 8 100
6. What is the first thing a spray team should do when arriving at a hopper band target	Start spraying straight away Find the wind direction and strength Measure the volume of pesticide in the tank Check whether the soil is wet and vegetation is green
7. Swath width is:	The distance between spray passes The wind speed during the spraying The amount of pesticide applied in the target area The distance downwind over which most of the pesticide is deposited
8. Track spacing is:	The distance between spray tracks The size of the spray target The height of the atomiser The distance the spray is carried by the wind

9. If the windspeed is very high, an experienced operator may decide to use a wider track spacing. If he wants to maintain the same volume application rate (VAR in l/ha), what should he also do:	<p>Increase the flow rate to compensate for the wider track spacing?</p> <p>Decrease the flow rate because droplets are carried further?</p> <p>Increase the speed to allow for the wider track spacing?</p> <p>Make no changes because it will help to kill the locusts?</p>
10. If the weather is very hot and the wind is changing a lot, ULV spraying should not be carried out because:	<p>The spray will be too concentrated</p> <p>The spray will be carried upwards by convection (hot air rising)</p> <p>The spray team will become too hot and have to find a tree for shade</p> <p>The water in the spray droplets will evaporate</p>
11. If we apply more insecticide than the recommended rate per hectare, we will...	<p>Kill more than 100% of the locusts</p> <p>Get higher mortality by killing the locusts very quickly</p> <p>Waste insecticide and pollute the environment</p> <p>Treat a much larger area of locusts, and more quickly</p>
12. Calibration of a sprayer means:	<p>Maintenance of the motor, the pump and the nozzles</p> <p>Filling the sprayer through a filter and using a funnel</p> <p>Putting on protective suit, gloves and goggles</p> <p>Adjusting droplet size, emission height and flow rate</p>
13. If windspeed is very high, experienced ULV sprayer operators should:	<p>decrease the droplet size</p> <p>wear a dust mask due to drift</p> <p>reduce the height of the sprayer if possible</p> <p>increase the flow rate of the sprayer to improve the deposit</p>
14. On a sprayer it is useful to be able to: (tick as many boxes as you want on this question)	<p>adjust the droplet size</p> <p>adjust the emission height</p> <p>switch the sprayer on and off easily</p> <p>collect the spray so that flow rate can be easily checked</p> <p>adjust the flow rate</p>
15. What flow rate is required from a vehicle mounted sprayer moving at 10 km/hr using a 30 m track spacing in order to apply 100 g a.i./ha of bendiocarb 10% ULV.	<p>400 ml/min</p> <p>6 l/min</p> <p>500 ml/ha</p> <p>0.5 l/min</p>
16. What is a GPS (global positioning system) useful for?	<p>Finding the locusts</p> <p>Finding out where you are</p> <p>Safe use of pesticides</p> <p>Measuring the windspeed and humidity</p>
17. What are the advantages of bio-pesticides such as the <i>Metarhizium</i> fungal pathogen?	<p>they avoid the need for survey</p> <p>locating the breeding areas is easier</p> <p>it makes control operations safer</p> <p>they give better kill than conventional insecticides</p>

18. Monitoring and recording control operations are important to	<p>check the safety and efficiency of control</p> <p>keep an inventory of equipment</p> <p>improve the percentage locust kill</p> <p>keep vehicles operational</p>
19. List 4 safety precautions which operators should take when carrying out locust control operations	<ol style="list-style-type: none"> 1. 2. 3. 4.
20. Estimate the costs (in US\$) of the following factors to help calculate the cost of control operations	<p>ULV pesticide costs per liter are</p> <p>Spray aircraft costs per hour are:</p> <p>The purchase cost of a vehicle mounted sprayer is</p>
21. If you see a few locusts in the field, you should immediately.....	<p>start control operations – timeliness is important</p> <p>try to find out more about the infestation</p> <p>inform the plant protection department so that they can send aircraft</p> <p>bury them</p>
22. Pesticide categorized by the World Health Organisation as Class 1b are:	<p>highly hazardous</p> <p>extremely hazardous</p> <p>unlikely to cause hazard under normal use</p> <p>moderately hazardous</p>
23. The area of locusts which can be treated in one day with a vehicle sprayer is	<p>1 ha</p> <p>10 ha</p> <p>100 ha</p> <p>1000 ha</p>
24. When working with aerial spraying spraying aircraft, the pilot should decide....	<p>when weather conditions are safe for flying</p> <p>where to spray</p> <p>what dose rate to apply</p> <p>whether to do barrier or full coverage spraying</p>
25. Write down two advantages of barrier spraying when compared with full coverage spraying	

Course evaluation

Instructions to trainers

Give each trainee a Course Evaluation sheet (on following page) to complete and return to you. Allow up to 15 minutes for completion. It is not necessary that the trainee indicate his/her name on the sheet but it is important that each trainee actually completes the entire form.

Analysis

Add up the circle numbers for each item and divide by the number of trainees to get the average response. Use the 1-4 scale for each section to determine the strengths and weaknesses of the training course for future improvements.

Training Course on Desert Locust Survey and Control
Anonymous course evaluation form

Please indicate your satisfaction with the following by circling the appropriate number on each line:

PRACTICALITIES	1 = Very bad	2 = Bad	3 = Good	4 = Excellent
Accommodation	1	2	3	4
Food and drink	1	2	3	4
Training facilities	1	2	3	4
Course organisation	1	2	3	4
Social/leisure activities	1	2	3	4
DURATION	1 = Much too short	2 = A bit short	3 = A bit long	4 = Much too long
Length of the course	1	2	3	4
Daily schedule	1	2	3	4
INSTRUCTORS	1 = Very bad	2 = Bad	3 = Good	4 = Excellent
Knowledge	1	2	3	4
Ability to present material	1	2	3	4
Helpfulness	1	2	3	4
TECHNICAL CONTENT	1 = Much too easy	2 = A bit too easy	3 = A bit too hard	4 = Much too hard
Survey modules	1	2	3	4
Control modules	1	2	3	4
Training modules (if done)	1	2	3	4
Classroom presentations	1	2	3	4
Field exercises	1	2	3	4
Course notes	1	2	3	4
Test at the beginning/end	1	2	3	4
USEFULNESS	1 = Not at all	2 = Only a little	3 = Quite confident	4 = Very confident
How confident are you that you can apply the skills that you learned and the knowledge that you obtained when you return to your work?	1	2	3	4

Please write any suggestions for future improvements below:

Suggested Certificate Layout

LOGO HERE

LOGO HERE

This is to certify that

Name here

successfully completed the 'National Course on Locust Survey and Control'

held in [place], [country], from [dates], [year]

Official signatory

Trainer(s)

Energizers

<i>Title</i>	<i>Equipment</i>	<i>Brief description</i>	<i>Message or purpose</i>
Leaky hands	2 buckets, water, measuring cylinders	Two lines competing to carry water from one end to the other in their hands	Cooperation and communication leads to improvement of techniques
Objects under the cloth	10-15 misc objects, large cloth	Reveal objects for short time, then ask people to list the objects they remember. Ask one person to give his list, then others should add to it. Then finally reveal all objects	Different people see different things. Nobody sees everything. Combined eyes see a lot more
Locust matching cards	8 matching equipment/technique and use cards	People seek their partner with card set with straight edges. Then they try the same thing with the cards which have a unique 'key'.	Energize and stimulate. Get over the message that knowledge and skills are the 'key'.
Farmer and locust officer role play		Role play of locust officer and farmer	Exploring attitudes to transfer of knowledge and perceptions of each other
Bad back role play		Woman with bad back tried three things to cure it, then doesn't know which one worked	Illustrate that only one variable at a time should be tested in a trial.
Names games	nothing	Stand in a circle and name the person to the left of you – if you get it wrong, go into the middle	Break ice, learn names
Fruit salad	Chairs in a circle	Everyone on a chair around trainer. Ask for four fruits and put them on flipchart. Go round and each person call out a fruit name in turn to assign themselves a group. Then call out one fruit and all people in that fruit group have to change places as quickly as possible. Again, again, then call fruit salad and everyone has to change places. Then call another fruit and this time, trainer sits in one of the chairs. Person still standing then calls out fruit names and tries to get a seat etc etc.	Form groups, energize, consolidate group membership
Putting jacket on	Chair and jacket	Stand behind person sitting on a chair. They have to instruct you to take a jacket off that chair and put it on you.	Difficulty of communicating without visual feedback
Folding paper	One piece of	Everyone stand in a circle and receive a sheet of paper. Now all	Unclear instructions can lead to many

	A4 paper per participant	turn outwards and follow instructions. Fold paper in half and tear off top left hand corner, then fold in half and tear off bottom left hand corner, then in half again and tear off top left hand	different outcomes from people trying to follow instructions
Chinese whispers	nothing	Snakes like to eat rats after heavy rains have made the soil wet.	Corruption of messages
Spoon fight	Two large spoons and two cloths		Light moment – and a method of levelling
Songs	nothing		Break up a session
Just a minute	Prepared topics for discussion	People try to talk for a minute on a given subject (unrelated to course)	Learn how to talk about things you know little about! Humourous and can build confidence in speaking if managed carefully
Sketch each other or themselves then put stepping stones to get to the course or interview and introduce each other.	Paper, pens		Begins relationship building amongst trainees. Also makes introductions more interesting. Drawings provide welcome light moment to break tension at start of the course.
Fingers or arms crossed	nothing	Ask trainees to cross their arms or interlink their fingers in their usual way. Now try it the 'wrong' way.	Convey the message that behaviour change feels strange and that there is a hurdle to overcome. Both ways of crossing arms or linking fingers are identical, but one feels odd because it is unfamiliar
Cross out six letters	BSAINXLEAT NTEARS Paper pens	Ask trainees to cross out six letters to make a familiar word	Brain teaser. Also demonstrates that with the 'key' to the problem, the solution is easy.
Balloons keep up in group	balloons	Each person has a balloon which they should keep up in the air by hitting, but they cannot hit their balloon more than twice –	Energizes and encourages group cooperation

		their other group member have to help them out, as they have to help the others.	
Ball throw in group and say name, then others name	Ball or crunched up piece of paper	Each person says his/her name as they throw the ball to someone else. After some time, change the rule so that the thrower has to say the name of the catcher. Anybody who fails goes in the middle, which makes the passing harder	Encourages learning of names early on in the course – trainers are usually as bad as trainees.
Hand to chin, but to cheek	nothing	Ask people to touch various parts of their body and you do the movements too. Then start getting it wrong. Ask them to touch their chin, but put your hand on your cheek. They will usually do the same	Illustrates the power of ‘do as I do, not what I say’. Trainers who set a bad example e.g. in safety with pesticides are a powerful negative influence on trainees
FLY	Acetate with fly	Ask people what they can see	Visual perception varies and some people take longer to see the fly
Dot half way up triangle	Acetate with dot and acetate with dot and measurements	Ask people how high up the dot is. Optical illusion – the dot is halfway up but looks higher	Things are not always as they appear
Box four (dealing with uncertainty)	none	Four boxes – you know and trainee doesn’t know, you know and trainee knows, you don’t know and trainee doesn’t know, you don’t know and trainee knows.	Remind everyone that they are not alone in facing difficult situations as a trainer and provide some hints on coping
Nose to nose	Blanket or sheet	Ask people to stand either side of a sheet nose to nose but either side of it. The sheet is pulled away and the first person to name the other wins	Breaks barriers, adds humour, helps learning of names

Garmin 12XL GPS Quick Reference




TURN ON: Press 

TURN OFF: Press and hold 






TAKING YOUR POSITION READING

1. Turn on the GPS and wait a few seconds for the globe to stop spinning and the satellites to be acquired until the coordinates appear.



STORING A POSITION (WAYPOINT)

1. Take your position reading, press **Mark**
2. Use  to move to the top of the screen, press **Enter**
3. Use  to type the name of your position, press **Enter**
4. Use  to move to "Save", press **Enter**
5. Press **Page** until you return to the Position Screen


ENTERING A GIVEN POSITION (COORDINATES)

1. Press **Page** until you reach the Main Menu screen
2. Press **Enter** to select "Waypoint"
3. Use  to move to "New?", press **Enter**
4. Use  to type the name of your position, press **Enter**
5. Press , press **Enter**
6. Use  to type the latitude, longitude ( to move right)
7. Press **Enter** after you finish entering the longitude
8. Press **Enter** ("Done") to save the new waypoint
9. Press **Page** until you return to the Position Screen

RECALLING A WAYPOINT

1. Press **Page** until you reach the Main Menu screen
2. Use  to move to "Waypoint List", press **Enter**
3. Use  to move to the waypoint you want, press **Enter**

GO TO A WAYPOINT






1. Press **GoTo** and  to move to the waypoint you want to go to, press **Enter**
2. A screen will appear with either a highway or a compass (press **Enter** to change)

BRG = compass bearing of location, DST = distance to location





INITIALIZE THE GPS (if it is new or moved 500 km since it was last turned on)

1. Press **Page** until you reach the Satellite screen
2. Press **Enter** and select "1 Select country from list" and chose your country, press **Enter**





CHANGING TIME

1. Press **Page** until you reach the Main Menu screen
2. Use  to move to "Setup Menu", press **Enter**
3. Use  to move to "System", press **Enter**
4. Use  to move to "Offset", press **Enter**
5. Use  to move to the right one space and  to select the correct number of hours ahead (or behind) of GMT that corresponds to the local time in your country, press **Enter**
6. Press **Page** to return to Setup Menu screen, and **Page** again to return to Main Menu screen

CHANGING LATITUDE/LONGITUDE FORMAT

1. Press **Page** until you reach the Main Menu screen
2. Use  to move to "Setup Menu", press **Enter**
3. Use  to move to "Navigation", press **Enter**
4. Use  to move to "Position Frmt", press **Enter**
5. Use  to move to "hddmmss.s", press **Page** to return to Setup Menu screen, and press **Page** again to return to Main Menu screen

CHANGING DISTANCE UNITS

1. Press **Page** until you reach the Main Menu screen
2. Use  to move to "Setup Menu", press **Enter**
3. Use  to move to "Navigation", press **Enter**
4. Use  to move to "Units", press **Enter**
5. Use  to select "Metric", press **Page** to return to Setup Menu screen, and press **Page** again to return to Main Menu screen

FAO spray monitoring form

FAO SPRAY MONITORING FORM - INSTRUCTIONS

1 CONTROL LOCATION		
1-1	date	Write the day / month / year of the control operation
1-2	name (from DL Survey Form)	Write the local place name of where you made the control (? = name unknown). This should match the place name in the same column on the Survey and Control Form.
2 VEGETATION DATA		
2-1	vegetation type (Grass, Bushes, Trees, Crop)	Circle G if grass, B if bushes, T if trees or C if crop
2-2	height (m)	Write the approximate or average height (in metres) of the vegetation
2-3	crop names and damage (%)	Write the names of the crops and estimate the percentage of damage; if there are no crops and it is natural vegetation, write Natural.
3 INSECTICIDE DATA		
3-1	trade name	Write, for example, SUM for Sumithion and DUR for Dursban, etc.
3-2	concentration (g a.i./l or %)	Write the concentration of the active ingredient in grammes/litre or as a percentage
3-3	formulation (EC, ULV, Dust)	Circle E if Emulsion Concentrate, U if Ultra Low Volume or D if Dust formulation was used
3-4	expiry data	Write the expiry date of the insecticide found on the label of the drum
3-5	is insecticide mixed with water or solvent?	Circle Y if the insecticide is mixed with water or solvent or N if not mixed
3-6	if yes, what solvent and mixing ratio	Write the name of the solvent used for mixing and what ratio was used (insecticide:solvent)
4 WEATHER CONDITIONS		
start and end of control operations:		Write the required weather conditions at the start and the end of the control operations as indicated below
4-1	time	Write the time operations started and the time operations ended
4-2	temperature (°C)	Write the temperature at the time operations started and the temperature at the end of operations, in centigrade (use the dry-bulb reading on a whirling hygrometer)
4-3	relative humidity (%)	Write the relative humidity in percentage at the start and end of operations (use a whirling hygrometer)
4-4	wind speed (m/s)	Write the speed of the wind in metre/second at the start and the end of operations (use a anemometer)
4-5	wind direction (degree from N)	Write the wind direction in degrees from the north at the start and the end of operations (use a compass)
4-6	spray direction (degree from N)	Write the spray direction in degrees from the north at the start and the end of operations (use a compass)
5 SPRAY APPLICATION		
5-1	sprayer type	Circle R for rotary, A for airblast, E for exhaust nozzle sprayer (ENS), H for hydraulic or O for other
5-2	sprayer operator	Circle P for pilot, D for driver, L for locust officer, H for hired labour or O for other operator
5-3	sprayer manufacturer	Write the name of the sprayer manufacturer or company
5-4	sprayer model	Write the model of the sprayer, for example, Micronair AU8000 or Micronair AU7010
5-5	sprayer platform	Circle A for aerial spraying, V for vehicle spraying or H for handheld sprayer
5-6	date of last calibration	Write the date of the last calibration done on the sprayer used in the control operation
5-7	atomizer height above ground (m)	Write the height (in metres) of the atomizer above the ground
5-8	ROTARY SPRAYERS: speed setting	Write the degree of blade angle for Micronair, pully setting for Ulvamast or no. of batteries for Micro-ulva
5-9	speed of atomizer (rpm)	Write the speed of the atomizer per minute using a vibrating tachometer
5-10	flow rate setting	Write the colour or size of the nozzle, or what orifice or restrictor was used
5-11	flow rate/atomizer (l/min)	Write the flow rate (in litre/minute) for each atomizer used in the control operation
5-12	number of atomizers	Specify the number of atomizers used in the control operation (i.e. the number of atomizers on the aircraft used for control)
5-13	track spacing (m)	Write the track spacing (in metres) used during spraying
5-14	BARRIERS ONLY: width and spacing (m)	Write the spraying width of a barrier and the width in between each barrier not sprayed (in metres)
5-15	forward speed (km/h)	Write the sprayer speed (in km/h). This will be the speed of aircraft, vehicle or walking operator.
5-16	AERIAL SPRAYING: support supplied	Circle GP for ground party, RC for radio communication or TG for DGPS if it is used
5-17	ground marking (GPS, flag, Mirror, smoke, Vehicle, None)	Circle G for GPS, F for flag, M for mirror, S for smoke, V for vehicle or N if no ground marking was used during the control operation
6 CONTROL EFFICACY		
6-1	locust mortality (% dead)	Write in figures the estimated percentage of locusts dead or dying
6-2	time after treatment (hours)	Write the time (in hours) after treatment when the mortality estimate was carried out
6-3	method of mortality estimation	Circle Q for quadrats, T for target size, V for visual, C for cages or O for other methods
7 SAFETY AND ENVIRONMENT		
7-1	protective clothing: what did the operator wear?	Circle G for goggles, M for mask, L for gloves, O for overalls and B boots
7-2	was soap and water available?	Circle Y if soap and water were available or N if they were not available during operations
7-3	who was informed of spraying?	Circle F for farmer, N for nomad, V for village, O for officials and B for beekeepers
7-4	effect on non-target organisms?	Circle Y if you noticed an effect on non-locusts in the field after operations or N if none
7-5	if yes, what?	Write what insects, animals, wildlife etc were affected (killed or sick) by the control operation
7-6	detail if anyone felt unwell or if other problems were encountered:	Write the details if any operators, ground teams or nearby inhabitants felt sick or unwell (i.e. headache, eye or skin irritation, dizziness, vomiting) after control. Write any other problems that were encountered during or after the spraying operations (i.e. broken vehicles, sudden rainfall during or shortly after control).

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How to use this form in the field

Always carry this form with you to record control details. Use this form in conjunction with the FAO Survey and Control Form. Each column represents a control location and should match the location, habitat and locust information on the survey form.

Equipment required for monitoring spraying

Gloves, clipboard, blank copies of this form, pen, anemometer (for wind speed), tachometer (for speed of rotary atomizers).

FAO spray monitoring form

(indicate appropriate information as required)

CONTROL LOCATION	1		2		3		4		5		6				
date															
name (from DL Survey Form)															
VEGETATION DATA															
vegetation type (Grass, Bushes, Trees, Crop)	G B T C		G B T C		G B T C		G B T C		G B T C		G B T C				
height (m)															
crop names and damage (%)															
INSECTICIDE DATA															
trade name															
concentration (g a.i./l or %)															
formulation (EC, ULV, Dust)	E U D		E U D		E U D		E U D		E U D		E U D				
expiry date															
is insecticide mixed with water or solvent?	Y N		Y N		Y N		Y N		Y N		Y N				
if yes, what solvent and mixing ratio															
WEATHER CONDITIONS															
start and end of control operations:	start	end	start	end	start	end	start	end	start	end	start	end			
time															
temperature (°C)															
relative humidity (%)															
wind speed (m/s)															
wind direction (degrees from N)															
spray direction (degrees from N)															
SPRAY APPLICATION															
sprayer type (Rotary, Airblast, ENS, Hydraulic, Other)	R A E	H O	R A E	H O	R A E	H O	R A E	H O	R A E	H O	R A E	H O			
sprayer operator (Pilot, Driver, Locust officer, Hired, Other)	P D L	H O	P D L	H O	P D L	H O	P D L	H O	P D L	H O	P D L	H O			
sprayer manufacturer															
sprayer model															
sprayer platform (Aerial, Vehicle, Handheld)	A V H		A V H		A V H		A V H		A V H		A V H				
date of last calibration															
atomizer height above ground (m)															
ROTARY SPRAYERS: speed setting (blade angle, pulley setting, no. batteries)															
speed of atomizer (rpm)															
flow rate setting (which nozzle or restrictor used)															
flow rate/atomizer (l/min)															
number of atomizers															
track spacing (m)															
BARRIERS ONLY: width and spacing (m)															
forward speed (km/h)															
AERIAL SPRAYING:	GP = ground party available RC = radio communication with aircraft TG = DGPS track guidance														
support supplied	GP	RC	TG	GP	RC	TG	GP	RC	TG	GP	RC	TG			
ground marking (GPS, Flag, Mirror, Smoke, Vehicle, None)	G	F	M	G	F	M	G	F	M	G	F	M			
	S	V	N	S	V	N	S	V	N	S	V	N			
CONTROL EFFICACY															
locust mortality (% dead)															
time after treatment (hours)															
method of mortality estimation (Quadrats, Target size, Visual, Cages, Other)	Q	T	V	Q	T	V	Q	T	V	Q	T	V			
	C	O		C	O		C	O		C	O				
SAFETY AND ENVIRONMENT	G = goggles M = mask L = gloves O = overalls B = boots														
protective clothing: what did the operator wear?	G	M	L	O	B	G	M	L	O	B	G	M	L	O	B
was soap and water available?	Y	N	Y	N	Y	N	Y	N	Y	N	Y	N	Y	N	
who was informed of spraying? (Farmer, Nomad, Villager, Officials, Beekeeper)	F	N	V	F	N	V	F	N	V	F	N	V	F	N	V
	O	B		O	B		O	B		O	B		O	B	
effect on non-target organisms	Y	N	Y	N	Y	N	Y	N	Y	N	Y	N	Y	N	
if yes, what details of anyone who felt unwell or if other problems were encountered:															

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FAO Survey Form

(indicate appropriate information as required)

1 SURVEY STOP	1	2	3	4	5	6
1-1 date						
1-2 name						
1-3 latitude (N)						
1-4 longitude (E or W)						
2 ECOLOGY						
2-1 area (ha) of survey						
2-2 habitat (wadi, plains, dunes, crops)						
2-3 date of last rain						
2-4 rain amount (mm, Low Moderate High, ?)	L M H ?	L M H ?	L M H ?	L M H ?	L M H ?	L M H ?
2-5 vegetation (dry, greening, green, drying)						
2-6 vegetation density (Low Medium Dense)	L M D	L M D	L M D	L M D	L M D	L M D
2-7 soil moisture (wet/dry)	W D	W D	W D	W D	W D	W D
3 LOCUSTS						
3-1 present or absent	P A	P A	P A	P A	P A	P A
3-2 area infested (ha)						
4 HOPPERS						
4-1 hopper stages (H123456F)	H 1 2 3 4 5 6 F	H 1 2 3 4 5 6 F	H 1 2 3 4 5 6 F	H 1 2 3 4 5 6 F	H 1 2 3 4 5 6 F	H 1 2 3 4 5 6 F
4-2 appearance (solitary, transiens, gregarious)	S T G	S T G	S T G	S T G	S T G	S T G
4-3 behaviour (isolated, scattered, groups)	I S G	I S G	I S G	I S G	I S G	I S G
4-4 hopper density (/site, /m2, Low Med High)						
5 BANDS						
5-1 band stage (H12345F)	H 1 2 3 4 5 F	H 1 2 3 4 5 F	H 1 2 3 4 5 F	H 1 2 3 4 5 F	H 1 2 3 4 5 F	H 1 2 3 4 5 F
5-2 band density (/m2 or Low Medium High)						
5-3 band sizes (m2 or ha)						
5-4 number of bands						
6 ADULTS						
6-1 maturity (immature, mature)	I M	I M	I M	I M	I M	I M
6-2 appearance (solitary, transiens, gregarious)	S T G	S T G	S T G	S T G	S T G	S T G
6-3 behaviour (isolated, scattered, groups)	I S G	I S G	I S G	I S G	I S G	I S G
6-4 adult density (/transect, /ha, L M H)						
6-5 breeding (copulating, laying)	C L	C L	C L	C L	C L	C L
7 SWARMS						
7-1 maturity (immature, mature)	I M	I M	I M	I M	I M	I M
7-2 swarm density (/m2 or Low Medium High)						
7-3 swarm size (km2 or ha)						
7-4 number of swarms						
7-5 breeding (copulating, laying)	C L	C L	C L	C L	C L	C L
7-6 flying (direction, time passing)						
7-7 flying height (Low Medium High)	L M H	L M H	L M H	L M H	L M H	L M H
8 CONTROL						
8-1 pesticide name & formulation						
8-2 application rate (l/ha or kg/ha)						
8-3 quantity (l)						
8-4 area treated (ha)						
8-5 ground or air	G A	G A	G A	G A	G A	G A
8-6 estimated % kill						
9 COMMENTS						

Was a GPS used to determine locations? yes no

Is a brief interpretation or analysis of the results included? yes no

Country: _____

Locust Officer : _____

date : _____

cleared by : _____

date : _____

S21a

IMPORTANT! Registration Form for Master Trainers

In order to qualify for updates to the *Master Trainer's Manual of Desert Locust Survey, Control and Training*, and to allow FAO to assist countries better in their national training programmes, Master Trainers in locust-affected countries are kindly requested to complete this form and return it to FAO by facsimile (+39 06 570 55271) or by email (ecl@fao.org) if you use the electronic version of this form.

Master Trainer information

Name: <i>(last, first)</i>
Job title:
Organization:
Postal Address: <i>(street, city, country, postal code)</i>
Email:
Fax: <i>(country code, city code, number)</i>
Telephone: <i>(country code, city code, number)</i>
Master Trainer course(s) attended: <i>(dates, locations)</i>

Scheduled Desert Locust training courses to be held in your country

Dates	Location	Title

Training constraints <i>(difficulties in planning and conducting courses)</i>
--

Comments on the Master Trainer's Manual <i>(suggested improvements)</i>
--

Thank you for your assistance

National Desert Locust Training Course Feedback Form

FAO is interested in knowing what successes and difficulties you had as a Master Trainer when planning and conducting a national training course on survey, control and/or training in your country. In order to help you improve your own training skills as a Master Trainer and to provide better support to your national training programme, we would be grateful if you could please complete this form after every training course that you carry out and return it to FAO by facsimile (+39 06 570 55271) or by email (eclo@fao.org) if you use the electronic version.

Note: If you are using the hard copy of this form, please photocopy it before completing it so that you always have a blank form available

Master trainer's name:

Training course: *(date, location, title)*

Training course on: survey control training *(check boxes)*

Trainees: locust staff PPD staff extension agents farmers

trainers other: _____ **Number of trainees:** _____

Difficulties: *(list and describe each)*

Improvements to future courses you will conduct: *(list and describe each)*

Thank you