

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>	

I2	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>	

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>	

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 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 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 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 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
	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.	OHT (S5a)
	3. Q&A (everyone): Who makes surveys in your country? <i>List these in left side of a table.</i>	PS table
	4. Q&A (individual): Prompt for other sources of information (travelers, nomads, farmers, villagers, security forces). <i>Add these to the above list.</i>	
	5. Q&A (individual): Are some of these persons or sources more reliable than others? <i>Make table showing person and experience.</i>	PS table
	6. Present: Emphasize that different people can provide information but accurate information can only come from qualified field officers.	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)
<p>Summary & Conclusion (5 mins)</p>	<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 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 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>	

<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 Plan	Duration
	How are foot transects made?	30 minutes

SECTION	TECHNIQUE AND CONTENT	AIDS
Introduction (5 mins)	1. Present: survey methods are: <ul style="list-style-type: none"> • Foot • Vehicle • Aerial 	OHT (S8b)
Core (20 mins)	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? <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 Don't worry about the sequence yet!	PS list
	2. Q&A (individual): Prompt for specifics (wind, transect length and width, counting, sample efficiency).	
	3. Q&A (everyone): Organise the PS list into above sequence	PS list
	4. Present: summary illustration	OHT (S9a)
Summary & Conclusion (5 mins)	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>	
	2. Present (to summarize): Survey methodology is linked to the type of information that is to be collected	OHT (S8a)
	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	

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 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 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 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 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 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 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 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 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 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 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 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 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 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 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 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.	

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 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 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 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 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 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 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 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 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 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 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 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 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 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 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 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.	

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 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 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 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 <i>concept of the training gap</i>	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 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 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)

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	<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 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 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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