Report on FAO

International Train the Trainers

Locust Survey and Control Course

7 – 17 October 2003

Sultanate of Oman

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Introduction

An International Training of Trainers Course was set up in 1997 in response to the need for safer and more efficient locust survey and control in many countries. A sustainable and cost-effective way to approach this is to train trainers who can then implement regional, national and local locust survey and control courses in their respective countries as well as informal on-the-job training of colleagues. The first two courses (1997 and 1998) were held at the International Pesticide Application Research Centre, Imperial College, UK under the auspices of NRI, but sponsored by various organisations including FAO, DFID, GTZ and others. In 2000, the decision was taken to move the course to a locust-affected country and the Sultanate of Oman offered to host it. This move increased the likelihood of having live locusts for the field exercises and failing that, at least the chance to work in habitat typical for locusts of the host country. Course costs were also significantly reduced.

These courses supported and dove-tailed with the FAO EMPRES initiative to develop a coherent Desert Locust training programme and training resources. While EMPRES is constrained by its mandate to focus on the Desert Locust, the International Courses provided the opportunity to broaden the participant base to include any country affected by any species of locust. This interaction with non-Desert Locust countries brought new ideas into the Desert Locust sphere (and vice versa) and aided the development and refinement of safe and efficient methods.

There was considerable beneficial synergy between the NRI-managed International Course and the much larger FAO locust training programmes (including the EMPRES training programme and other FAO regional and national courses). Support from FAO (amongst other sponsors) and participation by FAO staff as trainers were critical to the success of the International Course. In turn, the International Courses provided the opportunity for FAO staff, in collaboration with NRI and other personnel, to develop better training materials, techniques and capabilities. It also helped to develop modules on training skills through inputs from the Rural Development and Training Centre at Wolverhampton University – essential if investment in training is going to result in effective training courses being organised and run subsequently by former trainees in their own countries.

This beneficial collaboration between FAO and NRI continued in the form of joint development of a core Desert Locust Master Trainer Manual. This was to be a distillation of past approaches, materials and procedures – together with development of new ones – into a user-friendly resource for Master Trainers in their own countries and regions. The ultimate aim in the EMPRES training strategy is to utilize this core material to develop training and communication materials for other stakeholder levels – from policy-makers to farmers and nomads. The British Government's Department for International Development (DFID) supported some of the early stages of manual development, but a policy shift in 2002 meant withdrawal of their support, leaving FAO as the sole funding source. As a result some elements of the manual had to be dropped – for example, identification of locust species and contingency plans for plagues.

A final draft of the manual was developed in time to be piloted at a fourth course – this time focused entirely on the Desert Locust and funded by FAO – which was held in the Sultanate of Oman between 7 and 17 October 2002. The aim was to test out the manual, gather feedback on it and then finalise it shortly afterwards.

The Master Trainer Manual

The manual was designed to be used in conjunction with the Desert Locust Guidelines to form a comprehensive resource tool for Master Trainers and their training activities. It comprises several components:

- **Introduction** providing information on the purpose of the manual and guidance on how to use it.
- **Survey –** resources for training the essentials of Desert Locust survey. These Session Summaries and Session Plans should be used in conjunction with the Desert Locust Guidelines, mainly Biology, Survey and Appendixes.
- **Control –** resources for training the essentials of Desert Locust control. These Session Summaries and Session Plans should be used in conjunction with the Desert Locust Guidelines, mainly Control and Appendixes.
- **Effective training** giving guidance on training methods, including characterizing target groups, assessing the training needs of the trainees, participatory training techniques and the use of visual aids. As this section does not have an associated Guideline in the Desert Locust Guidelines, it contains essential resource material (Session Notes) as well as Session Summaries and Session Plans.
- **Appendices** with suggested national training course programme, pre- and post-course tests, forms, glossary and other supporting material.
- **Colour overhead transparencies** which can either be projected or photocopied for distribution
- **Training equipment** for teaching sessions and practical exercises – see Appendix 1 for list

In addition, to improve ease of use and navigation of the manual the pages were colour-coded as follows:

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

The training course

The course was held at the Ministry of Agriculture Rumas Training Centre some 60 km outside Muscat in the Sultanate of Oman. This provided comfortable accommodation and excellent modern training facilities with audio-visual equipment, while also allowing rapid access to open field sites in typical locust habitat for the survey and control practical exercises. The course was divided into three sections: survey, control and training skills (see Appendix 2 for course programme).

All participants were provided with copies of the Desert Locust Guidelines and a draft of the Master Trainer Manual.

The trainers (see Appendix 3 for contact details)

- Hans Dobson, Natural Resources Institute (locust control and training specialist)
- Munir Butrous, FAO Central Region Commission, (locust control and safety specialist)
- Keith Cressman, FAO Rome (locust survey and forecasting specialist)
- Fuad Bahakim, EMPRES/CR Programme, (locust survey specialist)
- John Lowe, Centre for Rural Development and Training (training skills specialist)
- Felege Elias, EMPRES/CR Liaison Officer (Co-Trainer)

The participants

These were staff involved with locust management from a total of 13 countries - see Appendix 4 for participant list and contact details.

The approach

The philosophy of the course recognized the depth and breadth of experience present within the group of participants and trainers and, through a participatory approach, aimed to promote the sharing of skills and experience to everyone's benefit.

To this end, the number of lectures were kept to a minimum while maximising the use of indoor and outdoor practical exercises and discussions sessions. As part of the training skills sessions, all participants prepared and delivered a short training session on a technical topic from the course programme – see Appendix 5 for topics.

Evaluation of the participants

Multiple choice tests were set at the beginning and the end of the course – see Appendix 6. The questions were identical before and after in order to be able to judge whether technical understanding had improved during the course. The results are shown in Appendix 7 and show an average improvement of 39% and 40% for survey and control sections respectively (or absolute improvements of 22 and 23 percentage points respectively). For the training skills sessions, the final afternoon was devoted to the participants training each other. Their performance was judged to be satisfactory and in some cases excellent by the training skills

consultant. The participants demonstrated their ability to set aims and objectives, to use audio-visual equipment effectively and to incorporate recently-learned techniques to encourage dialogue and understanding.

Assessment of the course

The response from the participants was very good with enthusiastic participation in classroom and field exercises. There was also a lot of sharing of ideas on different approaches to the problems of locust control. A formal assessment of participants' views was made using an anonymous multiple choice form and the results and pooled comments are shown in Appendix 8.

Assessment of the Master Trainer Manual

The opportunity was also taken to gather feedback from the participants on the Manual itself. Very useful comments were provided which will be taken into consideration during preparation of the final version of the Manual – some are shown below:

- The training skills sessions are beyond the reach of Master Trainers
- There should be one day on biology, behaviour, identification, life cycle etc of the Desert Locust before launching into the survey and control sessions
- Need detail on spraying in formation
- Need a table of contents for OHTs and dividers
- Increase the number of practical exercises even further
- The print on the spray monitoring form is too small to be seen with the naked eye
- Manual should be provided on CD
- IPCS Classification of Pesticides by Hazard should also be put on the CD
- Use real photographs of bands and swarms instead of illustrations
- All materials should be supplied in a strong case of some sort.

Participants also gave their views on the number of copies likely to be needed in their respective countries.

Conclusions

The course served two purposes. Participants were provided with technical training and updating on the procedures and techniques of survey, control and effective training of others. The technical material was an essential grounding for more junior staff and senior staff who have been transferred recently into locust control, and a useful refresher for experienced staff. The training skills sessions were warmly received and will help participants to deliver effective training courses in their countries. The sharing of skills and experiences from different countries and continents was one of the most valuable and rewarding aspects of the course. Some of the contacts made between participants are likely to continue and lead to productive linkages between individuals and institutions in the locust-affected world.

The second purpose was to ‘field test’ the Master Trainer Manual, together with its approaches, techniques and resources, and gather feedback on necessary improvements or modifications.

The feedback on the Manual and course was very encouraging and it is clear that they serve useful roles in improving participants’ technical capability and training skills, as a forum for exchange of ideas and experiences and as a test bed for new training materials and approaches. Some of the feedback is constructive criticism that will be an invaluable aid to the process of modifying and improving the entire training strategy in future.

Acknowledgements

I am grateful to FAO for sponsoring and encouraging the development of the Master Trainer Manual and the Master Trainer Course. Grateful thanks are also due to the Ministry of Agriculture and Fisheries, Sultanate of Oman, for hosting the course so well and to the Desert Locust Control Unit and its staff for their tireless efforts behind the scenes, which made the course a pleasure and a great success.

Hans Dobson
29 April 2003

Appendix 1. Equipment supplied in the Master Trainer Manual kit

Item	No per kit
Pith ball anemom	4
Whirling hygrometer	4
Vibrating tachometer	4
Swarm video	1
Droplet counting templates	4
Water sensitive paper	1
Oil sensitive paper	1
Magic pens	4
Hand lens	4
Tape measure	1
Field cards	set
Whiteboard pens and eraser	1
Compass	4
laser pointer	1
sticks for mounting sampling paper (set)	1

Appendix 2. Programme for Oman TOT course 2002 – trainer's

Day/Date	Time	Module	Session	Activities	WHO	Energizer
Day 1 Mon 7/10	0900-1000	Opening of course. Registration and profiling participants. Admin announcements		Registration, completion of personal profile form, distribution of materials		
	1030-1200	Introduction to course and objectives. Participants' introductions. Establish workshop norms, participant expectations and participant representatives. Pre-course assessment	I1	Discussions, multiple choice paper	HD/ MB	Portrait sketches in pairs and introduce each other
	1300-1430	Group formation. Participants experience of locust operations and the constraints to safe and effective locust management.	I2	Discussions	FB	Fruit salad
	1500-1700	Introduction to DL management – putting survey, control and training skills in context and discussion of safe and effective DL management and how to disseminate it effectively.	I3	Presentation and discussions. N.B. Distribute Trainer Confidence Table	HD	
Day 2 Tues 8/10	0600-1100	Finding all locust infestations	S2	Field exercise and discussion	FB	
	1130-1200	Are surveys necessary?	S3	Indoor discussions	KC	
	1330-1430	Survey process and Planning and making surveys – who, where, when?	S4, S5	Presentation and discussions	KC	Leaky hands
	1500-1700	Assessment and search surveys + different survey methods; what data to collect and how?	S6, S8 – S15	Presentation, indoor exercises and discussions. N.B Distribute Learning Styles questionnaire	KC	Arms crossed and name game with ball of paper
Day 3 Wed 9/10	0830-0900	Survey equipment	S16	Role playing and presentation, indoor exercise and discussions	FB	
	0900-1000	Map reading	S17	Presentation and indoor exercise, discussion	KC	
	1030-1200	Map reading (cont), compass	S17, S18	Presentation, indoor exercise, demonstration and outdoor exercise	KC	Objects under cloth
	1300-1430	GPS	S19	Presentation, demonstration and outdoor exercise	FE	

Day/Date	Time	Module	Session	Activities	WHO	Energizer
	1500-1600	Recording field data	S21	Presentation, indoor exercise and discussion	KC	Nose to nose
	1600-1700	Introduction to training, adult learning, learning styles and Target Groups	T1	Presentation, indoor exercise and discussions	JL	
Day 4 Thur 10/10	0600-1100	Practicing survey techniques	S23	Presentation, field exercise and discussion	FB	Inherent
	1300-1330	Transmission of survey results	S24	Presentation and indoor exercise	FB	Tearing paper
	1330-1430	Summary of survey sessions	S25	Review and discussion	KC	
	1500-1700	Training Needs Analysis		Presentation, indoor exercise and group feedback	JL	Rope trick
Friday		Day Off				
Day 5 Sat 12/10	0830-1000	What is the process of control and are control operations always necessary?	C1	Presentation and discussions + swarm video	HD	Hand to cheek
	1030-1200	Which are the possible control targets, control technologies, types of sprayer, sprayer platforms and ways of making spray	C2	Presentation, discussion, and indoor exercise	FE	
	1300-1430	Which insecticides are used in locust control and how should they be chosen?	C3	Presentation and indoor exercise	MB	Six letters
	1500-1700	Training Objectives and session contents		Presentation, indoor exercise and group feedback	JL	
Day 6 Sun 13/10	0700-1000	How is field equipment used in locust control and how can the swath width be measured for hand-held sprayers? Pace length calibration	C4, C5	Presentation and field exercise	MB	
	1030-1200	Swath width continued. Counting droplets. How is track spacing different from swath width and why?	C5 contd	Indoor exercise and discussions	FE/HD	Confused jacket
	1300-1430	How does the size of droplets affect their number and behaviour under different weather conditions?	C6	Presentation, discussions and indoor	HD	
	1500-1700	Participatory training methods and use of training aids		Presentation and demonstrations	JL	
	2030-2200	Introduction to the Psion palmtop	S22	Presentation, demonstration and indoor exercise	KC	
Day 7	0830-1000	How are ULV sprayers calibrated?	C7	Presentation and indoor exercise	MB	

Day/Date	Time	Module	Session	Activities	WHO	Energizer
Mon 14/10						
	1030-1200	How is the flow rate, track spacing and forward speed measured and set on ULV sprayers?	C8	Outdoor exercise	FE	
	1330-1500	Calibration calculations continued. Insecticide toxicity exercise continued.	C3 and C8 contd	Presentation and discussion	FE	
	1530-1730	Planning training and assessing its impact. Distribute topics for participant presentations and begin session preparations.			JL	
Day 8 Tue 15/10	0830-1000	Good and bad spraying conditions	C9	Presentation, discussions and field exercise	HD	
	1030-1200	How is ultra low volume (ULV) spraying carried out including other spray configurations such as barrier spraying?	C10	Presentation and outdoor exercise	HD	
	1330-1500	How can control operations be recorded?	C12	Presentation and indoor exercise	FE/MB	
	1530-1830	Participant presentations (10 mins each + 5 mins questions and 5 mins analysis and feedback). Two simultaneous sessions.		Participant presentations and feedback	JL	
Day 9 Wed 16/10	0700-1200	Mock control exercise – finding, demarcating, spraying, recording and reporting	C13	Presentation and field exercise	MB	
	1200-1300	Closing ceremony and certificates				
	1300-1400	Debrief on mock control exercise.	C13	Discussions and group feedback	MB	
	1530-16.30	Debriefing continued	C13	Discussions and group feedback	MB	
	1630-1745	Assembly of the Draft Manual and OHT binder		Group activity	All	
	2030-2230	Introduction to eLocust	S22	Presentation, demonstration and indoor exercise	KC	
Day 10 Thur 17/10	08301000	Droplet spectra continued. Safety and First Aid continued.	C6	Presentation and discussion	HD/ MB	
	1030-1200	Summary of control sessions	C15	Review and discussions	HD	
	1330-1400	Review of Master Trainer Manual draft - suggestions for improvements		Group discussions	KC	
	1400-1500	Feedback on the Master Trainer's Manual		Group presentation	KC/HD	
	1530-1630	Planning for the future – what courses are planned, where,		Round table discussions	MB	

Day/Date	Time	Module	Session	Activities	WHO	Energizer
		which groups, how many trainees. Integrate with mainstream agricultural training programmes?				
	1630-1730	Post course assessment and review of initial expectations. Participants' anonymous evaluation		Multiple choice papers, discussions and close	HD	

Key to Colours

Colour	*Topics*
	Introduction, planning and closing activities
	Survey
	Control
	Both survey and control
	Training

Daily schedule (except on three days is 0830 start with 30 minute coffee breaks at 10.00 and 14.30 and a one hour lunch break at 12.00. The sessions will usually finish at 17.00, allowing 15 mins for a recap of the day and 15 mins for any questions or discussion.

Appendix 3. Trainers for the Oman Training-of-Trainers Course 2002

FAO

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Appendix 4. Contact details for participants

THE TRAINEES			
Sr. Nr.	**Name of the Trainees**	**Address**	**Phone and email**
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4	Eyob Habtom Yosief	Plant Protection expert Ministry of Agriculture Zoba Debub Sub Zoba Mai-Aini, Box # 30, Mendefera Eritrea,	Tel. 002911181077 (Off) 002911188405 (Hom)
5	Fathi Omar Elwalid	Desert Locust Control, Tripoli, Libya	Tel. 00218 213616142 00218213616143 Tel. 00218214627769 (Hom)
6	Abdullatif Gh. M. AbdulSalam	National Center for Locust and Research, Ministry of Agriculture & Water, Saudi Arabia	C/o Jaber Al-Shehri Tel. 00966 2 6210096 (Off) Fax 00966 2 6204085 (Off) P.O.Box 13345 Jeddah 21493 Saudi Arabia Tel. 0096626548831 Fax 0096626580483 Mob. 055707863 locust@sps.net.sa alateef7@hotmail.com alateef7@yahoo.com
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Appendix 5. Topics for participants training sessions

Main topic	Sub topics
Calibration	1. Choosing track spacings 2. Measuring flow rate 3. Measuring pace length 4. Choosing emission height
Survey techniques	1. Making foot transects 2. Making vehicle transects 3. Checking soil moisture 4. Recognizing male and female locusts
Control techniques	1. Full coverage ULV spraying 2. Barrier spraying 3. Marking track spacings for hand-held, vehicle and aerial application 4. Good weather conditions for ULV spraying
Navigation tools	1. Explaining latitude and longitude 2. The parts of a map 3. Global Positioning Systems (GPS) and satellites 4. Finding the wind direction (the compass bearing)

Appendix 6. Pre and post course tests

Pre-course assessment – Desert Locust Survey

Name: _____

For each of the questions below, put a mark in the box next to the correct answer. Mark ONLY one box, unless the question asks you to mark more than one.

1. Assessment survey is	a quick survey to have an idea of the locust situation in an area a survey only on main roads a detailed survey in an area to mark infestations for later control when you stop and control the first big infestations you see
2. What are the six most essential items to take with you in order to collect information on a survey?	map, compass, notebook, pen/paper, net, hat compass, tent, survey form, radio, binoculars, pen/paper map, compass, gps, pen/paper, survey form, notebook pen/paper, gps, compass, camping gear, radio, map
3. What is the most important information to collect during a survey regarding locusts?	presence, appearance, behaviour, stage, density colour, instar, density, laying, gregarious number / km^2, copulating, flying, appearance, stage presence, behaviour, stage, hatching, density
4. What is the most important information to collect during a survey regarding rainfall?	date date, quantity date, quantity, time
5. What is the most important information to collect during a survey regarding vegetation?	species, appearance, density density, appearance species, density
6. Once you arrive at a place where you think there may be locusts, how would you make a survey?	stay in the vehicle and check the area by looking out the window walk about 50 m, check the soil, count the bushes and locusts, take the temperature ask the farmer if he has seen any locusts or if it rained last week or if his crops are okay walk about 200 m or more, count adults, check for hoppers, check the soil and vegetation
7. When making a foot transect, you should not walk downwind because	you will count the same locust more than once the wind is very bad for your neck and back the dust will blow in front of you so you cannot see clearly it is better not to make a survey when the wind is blowing

8. How many metres should you walk during a foot transect?	100 m 100-300 m 500 m 1 km
9. About how many minutes should you spend at each survey stop?	5 minutes 15-20 minutes 40 minutes one hour
10. If you are in a vehicle making a transect you should	drive downwind and count the locusts more than once drive into the wind so the locusts fly up and go behind you drive downwind so you do not run over the locusts not make a survey if the wind is blowing
11. How fast should you drive when making a vehicle transect?	as fast as possible without damaging the vehicle about as fast as a man can run at a walking pace in low gear at the same speed as the wind is blowing
12. How many km should you drive during a vehicle transect?	less than 1 km at least 1 km 5 km 10 km
13. During a vehicle transect, do you count the locusts	in front of the vehicle behind the vehicle on the right side of the vehicle on the left side of the vehicle
14. One degree = _?_ minutes; One minute = _?_ seconds.	10 minutes and 10 seconds 50 minutes and 50 seconds 60 minutes and 60 seconds 100 minutes and 100 seconds
15. One degree = _?_ km; One minute = _?_ km; One second = _?_ meters.	10 km, 1 km, 1 m 100 km, 10 km, 1 m 108 km, 1.8 km, 30 m 150 km, 15 km, 50 m
16. Latitude are lines from	N - S W - E
17. Longitude are lines from	N - S W - E
18. When you record coordinates, which do you write first?	latitude is first longitude is first

19. GPS can give us:	direction of north temperature latitude/longitude, distance and direction wind direction
20. How many satellites are required in order to determine your location (but not your elevation)?	two three four
21. When you use a GPS, you must	stand outside away from buildings, trees, mountains only use it during the day when there are no clouds stay out of the sun and away from rain and dust connect it to the vehicle battery and start the vehicle
22. Scattered solitary adults can be seen by	fixed-wing aircraft helicopters both
23. When you make a ground survey, how many of the locust infestations do you think you can find?	none of the infestations less than half of all infestations more than half of all infestations all infestations
24. After you make a locust survey, you should send the results	as soon as possible every week only after you receive instructions from HQ once a month
25. Locust surveys should be undertaken in your country	only after someone tells you they saw locusts every month of the year every few weeks during the winter only when FAO and PPD inform you

Pre-course assessment – Desert Locust Control

Name: _____

For each of the questions below, put a mark in the box next to the correct answer. Mark ONLY one box, unless the question asks you to mark more than one.

1. What volumes of liquid are used in Ultra Low Volume (ULV) spraying	10 - 50 ml/ha 0.3 - 3 l/ha 15 - 150 l/ha Any volume - it depends on the type of pesticide
2. ULV spraying is useful for large scale control because:	it is safer than baiting it is faster and easier than other methods of locust control the hard work of survey is not required swarms will not land on the sprayed crops
3. The quality of spray is best (narrow droplet spectrum) from which type of atomiser?	Air blast nozzle, e.g. exhaust nozzle sprayer Hydraulic nozzle, e.g. lever operated knapsack sprayer Rotary atomiser e.g. spinning disc sprayer Aircraft type sprayer because of the high speed
4. If there are big droplets in ULV spray, they will:	fall down on the locusts and kill all of them fall close to the sprayer be carried away easily by the wind be the most concentrated and give a better kill
5. How many droplets will be produced if a 200 micrometer drop is broken into 100 micrometre droplets (i.e. half the size)	2 4 8 100
6. What is the first thing a spray team should do when arriving at a hopper band target	Start spraying straight away Find the wind direction and strength Measure the volume of pesticide in the tank Check whether the soil is wet and vegetation is green
7. Swath width is:	The distance between spray passes The wind speed during the spraying The amount of pesticide applied in the target area The distance downwind over which most of the pesticide is deposited
8. Track spacing is:	The distance between spray tracks The size of the spray target The height of the atomiser The distance the spray is carried by the wind

9. If the windspeed is very high, an experienced operator may decide to use a wider track spacing. If he wants to maintain the same volume application rate (VAR in l/ha), what should he also do:	Increase the flow rate to compensate for the wider track spacing? Decrease the flow rate because droplets are carried further? Increase the speed to allow for the wider track spacing? Make no changes because it will help to kill the locusts?
10. If the weather is very hot and the wind is changing a lot, ULV spraying should not be carried out because:	The spray will be too concentrated The spray will be carried upwards by convection (hot air rising) The spray team will become too hot and have to find a tree for shade The water in the spray droplets will evaporate
11. If we apply more insecticide than the recommended rate per hectare, we will...	Kill more than 100% of the locusts Get higher mortality by killing the locusts very quickly Waste insecticide and pollute the environment Treat a much larger area of locusts, and more quickly
12. Calibration of a sprayer means:	Maintenance of the motor, the pump and the nozzles Filling the sprayer through a filter and using a funnel Putting on protective suit, gloves and goggles Adjusting droplet size, emission height and flow rate
13. If windspeed is very high, experienced ULV sprayer operators should:	decrease the droplet size wear a dust mask due to drift reduce the height of the sprayer if possible increase the flow rate of the sprayer to improve the deposit
14. On a sprayer it is useful to be able to: (tick as many boxes as you want on this question)	adjust the droplet size adjust the emission height switch the sprayer on and off easily collect the spray so that flow rate can be easily checked adjust the flow rate
15. What flow rate is required from a vehicle mounted sprayer moving at 10 km/hr using a 30 m track spacing in order to apply 100 g a.i/ha of bendiocarb 10% ULV.	400 ml/min 6 l/min 500 ml/ha 0.5 l/min
16. What is a GPS (global positioning system) useful for?	Finding the locusts Finding out where you are Safe use of pesticides Measuring the windspeed and humidity

17. What are the advantages of bio-pesticides such as the *Metarhizium* fungal pathogen?	they avoid the need for survey locating the breeding areas is easier it makes control operations safer they give better kill than conventional insecticides
18. Monitoring and recording control operations are important to	check the safety and efficiency of control keep an inventory of equipment improve the percentage locust kill keep vehicles operational
19. List 4 safety precautions which operators should take when carrying out locust control operations	1. 2. 3. 4.
20. Estimate the costs (in US$) of the following factors to help calculate the cost of control operations	ULV pesticide costs per liter are ..... Spray aircraft costs per hour are: ..... The purchase cost of a vehicle mounted sprayer is .....
21. If you see a few locusts in the field, you should immediately……	start control operations – timeliness is important try to find out more about the infestation inform the plant protection department so that they can send aircraft bury them
22. Pesticide categorized by the World Health Organisation as Class 1b are:	highly hazardous extremely hazardous unlikely to cause hazard under normal use moderately hazardous
23. The area of locusts which can be treated in one day with a vehicle sprayer is	1 ha 10 ha 100 ha 1000 ha
24. When working with aerial spraying spraying aircraft, the pilot should decide….	when weather conditions are safe for flying where to spray what dose rate to apply whether to do barrier or full coverage spraying
25. Write down two advantages of barrier spraying when compared with full coverage spraying	

Appendix 7. Multiple choice test results

		Survey			Control		
		Before	After	% change	Before	After	% change
1	Abdullah Masoud Mhd Al Ma'mari	15	19	27	11	19	73
2	Adel Ibrahim Ahmed Al-Shaibani	21	23	10	14	23	64
3	Adullatif Gholam Mhd AbdulSalam	12	22	83	15	21	40
4	Ahmed Kamel Hassan Hosny	15	16	7	12	12	0
5	Ali Ahmed Al-Raisi	16	18	13	14	22	57
6	Eyob Habtom Yosief	10	21	110	13	23	77
7	Fathi Omar El Walid	14	15	7	11	17	55
8	Gholamreza Abbaszadeh	17	22	29	21	22	5
9	Krishan Kumar Singh	late	21		late	20	
10	Manyazewal Ejigu	17	25	47	19	25	32
11	Mohamed Jama Dahir	14	21	50	14	16	14
12	Muhammad Muzaffar Alam	11	13	18	11	18	64
13	Rachid Elmi Hersi	15	24	60	20	23	15
14	Seyed Reza Fani	11	20	82	14	20	43
15	Zafar Ali Khan	16	20	25	14	24	71
16	Zienab Hayder El Mahdi Ibrahim	11	19	73	16	22	38
	Average scores	14.3	19.9	39*	14.6	20.4	40*
	Average percentage	57	80	22**	58	82	23**

*Expressed as % of pre-course result

** Expressed as absolute increase in percentage points

Appendix 8. Results of anonymous participant assessment of course

Number of trainees marking each box

PRACTICALITIES	Very bad	Bad	Good	Excellent
Accommodation			9	7
Food and drink			8	8
Training facilities			6	10
Course organisation			5	12
Social/leisure activities	2	1	9	4
DURATION	Much too short	A bit short	A bit long	Much too long
Length of the course		11	4	1
Daily schedule		2	9	5
INSTRUCTORS	Very bad	Bad	Good	Excellent
Knowledge			3	13
Ability to present material			5	11
Helpfulness			5	11
TECHNICAL CONTENT	Much too easy	A bit too easy	A bit too hard	Much too hard
Survey modules	1	3	9	3
Control modules	1	3	9	3
Classroom presentations	3	4	4	5
Field exercises	1	6	6	3
Course notes	3	4	6	3
Test at the beginning/end		7	7	2
USEFULNESS	Not at all	Only a little	Quite confident	Very confident
How confident are you that you can apply the skills that you learned and the knowledge that you obtained when you return to your work?			9	7

Please write any suggestions for future improvements below (comments compiled):

- Don't invite managers
- Instead of 10 days, 2 weeks is relevant (3 participants wrote this)
- Increase the duration of the course
- Social and leisure activities should be improved (3 participants wrote this)
- Organize the Oman course in cooler temperatures (Nov, Dec, Jan, Feb)
- Concentrate on field exercises
- The sessions must be in easy english language
- Control methodology should be given more time than this (for practical exercise)
- The approach and skills of teaching of all the instructors (resource) persons were really fantastic and they are full of knowledge, but much appreciation goes to Keith Cressman (thank you very much) For future improvements, nothing can be said except demonstration of aerial spraying. Otherwise keep everything you have up (i.e. keep it up). Thank you for your kindness and hospitality.
- Survey and control modules were hard. They should be easy.