EMPRES/CR

Contingency Planning Seminar

Borg Al Arab / EGYPT

13 – 21 February 2002

CONTENTS

Registration and Administration

Please fill in the attached. This is a Form sent to all countries some time ago. We wish to compare your opinion now with your estimate of what is likely, made at the end of the first section of the Workshop.

VALUES OF EARLY UPSURGE PARAMETERS

NAME:

COUNTRY:

QUESTION	ANSWER
1. Total area of upsurge breeding?	
2. Percentage of upsurge area green?	
3. Density of parent adult population?	
4. Area to spray to prevent swarm formation?	
5. Vehicle mounted ULV sprayers and/or aircraft needed to deal with hoppers? (Numbers)	
6. Density of hoppers worth controlling?	
7. Proportion of hopper population likely to be 'scattered'?	
8. Area young adult swarm expected without control?	
9. Proportion of young adult population likely to be in swarms (without control)?	
10. Proportion of reduction in number of young adults through hopper control (campaign effectiveness)?	

Remark: State only one figure if ranges cannot be given.

Personal details

Would you please fill in this Form? In this Workshop much will depend on the experience of participants so it is important to know who has done what.

Would you allow the completed Form to be placed on the Notice Board? (Tick): **YES** ☐ **NO** ☐

Name:_____

How do you want to be addressed?_____

Photo if possible

Country: _____

Present position: _____

Time in present position **(years/mths)** _____

Previous position: _____

Time in previous position **(years /mths):** _____

Other positions with locust responsibilities:

Locust field research (Tick): **Yes** ☐ **No** ☐
If **Yes** indicate research topic.

Control experience **–** actual application. (Tick):

Ground:	**Yes** ☐ **No** ☐	**Much** ☐ **Little** ☐
Air:	**Yes** ☐ **No** ☐	**Much** ☐ **Little** ☐
Outbreak/upsurge:	**Yes** ☐ **No** ☐	**Much** ☐ **Little** ☐
Plague:	**Yes** ☐ **No** ☐	**Much** ☐ **Little** ☐

Survey experience:- number of surveys (Tick):

None ☐ **Some(<5)** ☐ **Many (5-10)** ☐ **Lots (>10)** ☐

Attendance at “Training of Trainers” course (Tick):

Yes ☐ **No** ☐

Publications relevant to locust biology, behaviour and control in *referred* journals. Give abbreviated title, year and journal:

Why a Contingency Plan?

The Desert Locust has plagues and recessions. A plague results from successful breeding over a number of generations starting from an initially scattered population. The first generation with gregarious infestations – normally small aggregation of hoppers referred to as "patches" – is called an outbreak. The sequence resulting in a plague is termed an upsurge. Outbreaks occur only within the "recession area". The recession area occupies the more arid central belt of the total invasion area.

The last major plague ended in 1962. Since then there have been a number of outbreaks, 2 or perhaps 3 of which were followed by upsurges that led to brief minor plagues.

We must assume that the situation that has now lasted for 40 years will continue. (If it does not we shall have to plan differently.) That means infestations demanding a plague campaign in any one country will be very rare indeed. Few countries have experienced more than one swarm invasion in the last 40 years and many none at all. The permanent maintenance of the capacity to combat a swarm invasion in any country is thus totally unjustified. Moreover, such a capacity would not in practice be sustained; it would inevitably be starved of operating funds, and become demoralised, so that if and when the unit was called upon to act it would be unable to act effectively. *The maintenance of organisations whether national or regional that cannot do the job they are supposed to be able to do, simply gets in the way of necessary planning.*

The only solution is a Contingency Plan allowing an organisation to be created rapidly when the need arises. A Contingency Plan is not just a Plan; it is one designed specifically to deal with a rare event – a Contingency. Creating an effective Plan will be a very difficult task. It will demand much more rapid response from donors than in the past and technical underpinning by FAO that FAO has so far been able to offer, as well as a clear sequence of actions by countries. There is however no viable alternative.

Counties within the recession area have the additional task of monitoring recession populations and attempting to contain upsurges by control at the outbreak and early upsurge stage. That does require a permanent organisation but not one with the capacity to prosecute a plague campaign. Whether such an essentially monitoring organisation can be expected to combat an outbreak successfully or if it cannot, be strengthened quickly enough to do the job, needs to be determined and a Plan developed accordingly.

A permanent organisation provides a basis for a Plague Contingency Plan so plans for countries outside the recession are need to be significantly different from those within it.

About the Workshop

The aim

The aim of the Workshop is to help countries to prepare separate plans to deal with, 1 an outbreak/early upsurge, 2 a swarm invasion and the subsequent breeding.

The aim is not to prepare ideal plans – "blueprints". There is no one ideal plan. Risks vary, and so do the size of countries, their resources and their infrastructures.

Plans should be prepared later by each country.

Those attending the Workshop will work towards solutions. ***The Workshop is not a course of instruction. The Workshop is not a test; you are not being examined***. As far as possible the Workshop will consist of questions which you the participants, will try to answer. The questions will be incorporated in problems that you will be asked to try to solve. There are implicit assumptions in the choice of questions and in the way the problems are formulated. However, these have been made as value free as possible.

You may encounter problems; that will be a success not a failure. Problems are precisely what the Workshop is designed to reveal. We are not in most cases, likely to be able to find a solution. We have neither the time nor the resources. We must "flag" the problem for discussion in the final session and move on.

Basis of plans

All plans must start with methods of finding and killing locusts. The Workshop will investigate these methods, as far as possible with field simulations but where that is not feasible with computer simulations. Plans must be based on methods that can be relied upon to be effective, to be deployed in time and on a large enough scale.
Simulations are not a valid substitute for evaluation of actual campaigns. Such evaluations have not been carried out; they must be.

Factors

A plan will incorporate implicitly or explicitly a large number of factors. The values of many of these will have to be guessed. We must be honest about that and fair about the values we choose, otherwise the Workshop will be a waste of time, money and effort.

Organisation of the Workshop

For all field exercises and for some practicals you will work in 2 groups. Munir Boutrous will look after one group and Keith Cressman the other. These two will be referred to as "Enablers". Their job is to explain the problems: they are not instructors. With the computer simulations you will work either individually or in pairs.

A representative of the donors will take part in the Workshop. He will of course not be able to make guarantees even for his own country but any plans must make assumptions about what donors might do. There will also be an FAO Locust and Migratory Pest representative since FAO will have a vital role in supplying technical support and facilitating help from donors. There will also be Keith Cressman from the Desert Locust Information Service. Warnings from DLIS will be the trigger for operating various stages of a Plan.

The Enablers have a central role. With most of the exercises the Enabler will explain what is to be done and lead a Group discussion of the outcome. A member of each Group will then give a summary of the Groups conclusions to the Workshop as a whole. This will be followed by general discussion. In the Programme this is indicated by G D &D.

Many of the Field Exercises will involve spraying. In all cases we will use vegetable oil with an Ultra Violet (UV) dye that can be detected under Ultra Violet light.

FAO, DLIS and donors have each a vital role in any Plan. A Plan will have to make assumptions about what can be reasonably be expected of each. How much warning should DLIS be able to provide, of what type of situation and with what reliability? What technical back up will FAO be able to offer? Most importantly and most uncertainly, what might donors provide, with what speed and under what assurances?

Personal note - Phil Symmons, Workshop Director:

The Workshop is a process of investigation. Everyone here is on an equal footing. You must tell me when you think I have got something wrong. I shall certainly tell you if I think you are wrong. Experience is very important but experience is not enough. We must have evidence. I shall not accept assertions based on your experience if my experience does not support your assertion - unless you have evidence to back what you say. But equally I do not expect you to accept any assertions I may make.

The question of choice of pesticide.

The Workshop will not cover choice of pesticide. All pesticides in current general use are quick acting and relatively short lived. All will give a satisfactory kill if applied properly. A poor kill is never the fault of the brand of pesticide. Arguing about which is the best pesticide is a way of avoiding the important problems.

Assumptions about you.

*We have assumed you all understand the principles of **Ultra Low Volume** application. We have also assumed that you understand the concept of outbreaks, upsurges, plagues. We also take it that you understand the basics of Desert Locust biology, behaviour and phase change.*

If you have any concerns about the adequacy of your knowledge for this Workshop, please discuss with your Group Enabler or with the Workshop Director, Phil Symmons.

The Principles of Campaign Planning

There are five elements:

1. **Control methods**
2. **Resources**
3. **Provision**
4. **Funding**
5. **Organisation**

1 Control

Campaigns are about finding and killing locusts.
There are 4 aspects to the choice of control method.

1. Effectiveness. The method must kill.
2. Target recognition and demarcation. We must know where to spray.
3. Time and resources. A method that is effective is of no use if it takes too long so that only a small part of the population can be treated.
4. Cost.

2 Resources

1 above leads to a calculation of the required control resources – manpower, equipment, pesticides.

3 Provision.

This is the critical element.

i) How much warning can be given and with what reliability?
ii) How much time is needed to put in place the resources that might be needed?

These are in conflict. Thus if the lead-time for an item is greater than the maximum reliably warning time, that item will have to be held permanently in country.

4 Funding

This is an element of provision. The lead-time – ordering to deployment - presumes that funds are available to underwrite an order. Provision of funds will have its own organisational requirements and lead-time. (If it takes 3 mth to obtain pesticide from order to delivery but also 3 mth to obtain funds, then the supply time will be 6 mth).

5 Organisation – the Plan

- Who assesses the likely need for a campaign?
- Who alerts the officer with operational responsibility?
- Who decides what, at a higher level?
- What action should be taken under the Plan to obtain funds, obtain materials, overhaul equipment, and solicit help and advice from FAO, and from donors?
- (What should FAO and donors do to enable them to fulfil requests that might be made?)
- What will be the operational system of command, day to day planning and deployment?

Overall

The basis of Planning must be the control method. One characteristic may rule out a method. For example baiting is probably not effective enough to use. Baiting has other drawbacks of course, but if it doesn't work adequately we do not need to consider these.

However, as a rule choice is a matter of weighing the advantages of a method against its' disadvantages. Here the considerations under 2- 5 above may come into play.

Aircraft for example are costly but an aircraft can treat a large area in a short time. Would the money be better spent on vehicle mounted sprayers? But could enough vehicles and sprayers be obtained in time? Aircraft can treat only band blocks not as a rule an individual band, so aircraft band treatment presupposes the solution of the band block demarcation problem.

We will assume throughout that ULV control will be effective if carried out in the recommended manner under recommended conditions using recommended equipment, and a recommended pesticide applied at the recommended rate.

We will not discuss this note. We want you to read it carefully and discuss amongst yourselves informally. We wish you to realise that the exercises we shall be carrying out bear on these questions. We shall, of course, return to these matters when we come to consider the preparation of Plans

Section 1: Outbreak/early upsurge campaigns

1.1 Finding and treating patches

"Patches" or very small bands are the targets for outbreak and perhaps early upsurge control. This is the basis of the current strategy of plague prevention. If we are to assess what resources might be needed for an outbreak/early upsurge campaign we need to know how long it takes to search an area and spray the patches. That is not at present known from field experience during actual campaigns. We have tried to create a plausible situation. At least with the mock infestation we shall know how many patches there are and hence whether any have not been sprayed.

"Patches" have been created in two areas of c 1 sq km, one for each group. The task of the Group to find and destroy the patches.

You can have flags and Microulvas charged with UV dyed vegetable oil.

You should discuss how to proceed amongst yourselves. In particular how long you should devote to the field exercise. About 2 h is available.

Each patch will have within it a coloured marker. If you treat a patch you should collect the marker. You may decide to treat a block containing many patches. You will have to mark the block corners with flags. You should tell your Enabler so that he can collect the markers from patches within the block.

The last session will be given to Group discussion and analysis with your Enabler. A general discussion will be held in the morning.
The factors you will need to consider are:

1. The time taken.
2. The proportion of "patches" found and sprayed.
3. The deposit on the markers. Where the patches adequately sprayed?

1.2 Spraying a small target – a hopper "patch"

It is assumed the patch will be in and at the base of a clump of vegetation (Plate 1). Each Group will treat 8 clumps – 4 pairs. Imitation locusts will be placed for you. Each group will treat 1 clump of a pair with a Microulva and the other with a Herbi. (The Herbi produces larger drops that fall relatively evenly over a circle of c 1m radius. The Herbi is not a "drift" sprayer). You will make 2 trials of each method.

One pair of clumps will be treated for the same length of time (30 sec). The other pair with the same volume of "pesticide" determined by spraying for different lengths of time depending on the emission rate of the 2 sprayers. You will be told the relevant lengths of time.

As in the earlier trial UV dyed vegetable oil will be used and the samplers examined under UV light. The mean and range of the number of drops collected by the ULVA samplers will be compared with the Herbi results.

1.3 Which control method?

This will be a Group discussion led by your Enabler with a presentation by a Group member and a general discussion to follow.

Some points to start the discussion.

Aerial control

The tacit assumption with the exercises so far is that neither aerial control nor "barrier" spraying is feasible against "patches". Do you agree?
Points to consider:

General

- Is a subsequent upsurge certain enough to justify a major effort regardless of expense?
- Could aircraft and pesticide be supplied in time?
- Could funds be found?

Technical

Block spraying:
- Could blocks be marked ?
- What patch density (number/ha) would make treatment worth while?

Barrier spraying:
- Is there a proven or likely pesticide?
- Would barrier treatment work since patches move little?

Ground control

At what patch density would block ULV treatment by vehicle mounted sprayer be worth while? (Later you can attempt to find an answer by using the Spreadsheet analysis.)

For individual patch treatment search and treatment are part of one operation. The earlier field exercises should provide a fair figure. The patch density is likely to be relatively unimportant since search will almost certainly take much longer than spraying.

For block spraying you will have to insert a guessed figure for time to mark out the block and decide whether it contains enough bands to make block treatment worthwhile.

If you conclude that there is a case for block treatment you must consider the problem of block demarcation. This is a problem for which there is no practicable objective solution. (This problem is examined in detail later for band block spraying. The problem is essentially the same.) Can experience and local information be accepted as adequate guides?

1.4 Inputs and Outputs for an Outbreak Campaign

(This is a Spread Sheet analysis)

The Spread Sheet only carries out arithmetic. There are no hidden assumptions.

The most important Inputs are allowed for. Some of those featured in the Form you filled in at the start of the Workshop. The exercises we have carried out in the Workshop should help in estimating plausible values for several variables.

Your Enabler will explain the Input parameters in detail and also the Outputs. However, most should require little explanation.

To operate you merely click on an Input box whose value you want to change. Type in the new value, which will appear to the top of the screen and click on the tick box next to it.

The first section compares Individual patch spraying by hand held sprayer with block vehicle spraying. Which is the quicker, requires the fewer resources, uses the less pesticide?

The second section estimates the resources likely to be needed for a successful campaign.

The third section estimates the likely result in terms of patches treated, hoppers killed and swarm prevented. If you find that you have "prevented" very little swarm, you should increase the value of your Inputs especially the area of the Outbreak, the % that needs to be searched and the mean patch density in an infested sq km.

1. You will first be asked to run the SpreadSheet individually or in pairs.
2. You will then discuss your conclusions and attempt to come to some agreement about Input parameter values.
3. This should lead to a Group estimate of what resources a Campaign would need.

You should finally look at the Form you filled in at the start of the Workshop. Have you changed your estimate of the Input vales. Which are the ones you think most important and most suspect?

1.5 Outbreak/early upsurge environmental requirements and forecasting

(Keith Cressman, Desert Locust Information Service, FAO Rome)

This talk will cover:

1. The distribution of potential "outbreak areas". Are there sections of the recession area that we can ignore as being, for some reason, unlikely ever to generate an outbreak?
2. What are the requirements for an outbreak to occur both environmental and in parent numbers?
3. Can either or both be forecast and if so how far ahead? That is how much warning is there likely to be of a potential outbreak?
4. Can the likelihood of the development of the Outbreak into an Upsurge be assessed or must every outbreak be regarded as the potential generator of an upsurge?

1.6 Contingency Plans for Outbreak Campaigns

(Chairman of main discussion Clive Elliott FAO)

This will take the form of a Group discussion flowed by a general discussion. The donor representative and the FAO representative will move between the Groups to answer questions and will be at the general discussion which the FAO representative will Chair.

This session has been left open since the form a Plan might take is uncertain. Outside help might not be needed but if it is the time available might be too short for help to arrive. Plans might still be needed but the plans might be wholly internal using only permanently available resources.

The final Session of this Section should attempt to decide what should be done, who should act, and who should see that the needed action is carried out.

- Do we have satisfactory control techniques?
- If not who should develop them?
- If we have sound techniques, are they generally known and practiced?
- If not how should that position be changed?
- If we have to rely on within country resources what is needed and where – in which countries – and how is any short fall in what is needed be made good?
- Is there research that might improve the estimation of outbreak risk?

Finally and most importantly, when an outbreak next occurs an estimate must be made of the actual impact of the campaign. Theoretical estimates, field exercises and computer simulations are not an adequate substitute for actual estimates of the real thing. Who makes this estimate? Estimation requires substantial resources and considerable practical knowledge of sampling methods and theoretical knowledge of sample layout and analysis.

- If Plans are to be made who makes them?
- Clearly those within the country but with outside help or without?

Section 2: Plague Campaigns

2.1 The Plague Campaign Problem.

The targets in a campaign will be hopper bands and adult swarms. The bands may be treated individually by vehicle or in a block containing a number of bands both by aircraft and by vehicle. Adult swarms may be treated when settled, when "milling" either before settling in the evening or before departure in the morning, and when flying. Flying swarms may either form a relatively low sheet (stratiform) or pile up to a thousand m and more (cumuliform).

We could reproduce mock bands but not easily. Mock swarms we could never produce. We have done what we can with computer simulations. These could be made realistic (virtual reality) but that would have required time, skill and money much beyond what is available.

We will follow the same sequence as in Section 1:

- Control methods and targets.
- Resources and requirements for a campaign.
- The time scale for supply and the likely warning.

We shall then try to prosecute a campaign in as realistic way as possible using a Plan for Sudan.

This should produce many problems and many questions especially about the role of donors and the role of FAO.

Finally we must decide what should be the next step.

2.2 Spraying a band using a hand-held sprayer – ULVA

The method of individual band control is well known. What is not known is how long marking and treatment takes and whether spray deposit is adequate over the whole band.

We will attempt to answer these 2 questions.

The edges of a "band" covering about 1 ha will be marked out. Your task will be to place flags to outline a block containing the band and spray it. You will do this with an ULVA since that is easier to organise than a vehicle mounted sprayer. Use a 20m track interval.

Samplers will be placed across the band in 2 directions at right angles. Your Enabler will note the time you take. After spraying has been completed you will collect the samplers.

In the laboratory the deposit in number of drops in unit area of sampler will be studied. – the number of drops will be entered on a "map" showing the position of the sampler.

The results will be discussed first in the Group and then generally.

2.3 Control of an individual band by vehicle mounted sprayer

A Field exercise takes time to organise and carry out. However, a computer simulation allows us to try various methods and see the likely result quickly.

Such a simulation has been developed. The band is represented by very small black dots. These can be seen from 20m when moving and from 50m when stationary. That may seem too small a distance but to off set that the simulation gives an overall view from above. That is a huge advantage over the real situation. A “virtual reality” simulation reproducing a low-level view would be ideal but that would need a team of programmers to produce. Five minutes has been allowed to rig the sprayer for control and a similar time to stow at the end of treatment. Two minutes is assumed for placing or replacing a flag. A vehicle speed of 10 k/h is assumed

We can accept that crosswind spraying using a 30m track spacing will produce satisfactory control with a vehicle mounted sprayer such as the Ulvamast. That is what the programme simulates.

The simulation is simple to operate. It will be demonstrated for you. It is hoped that enough computers will be available for you to work either individually or in pairs.

- Your task is to place 4 flags to mark a spray block with due regard to wind direction.

- Try to estimate the proportion of the band adequately sprayed. Note the time taken

- Complete at least 3 runs of the programme.

We will as usual discuss the results in the Group and then generally.

2.4 Ultra Low Volume Spraying

Field investigation of deposit from a single pass.

This is the only item in the programme that is essentially a demonstration not an investigation. That is we know the answer and so should you.

You should all be familiar with the basics of Ultra Low Volume(ULV) "incremental" spraying. However, we need to make quite sure that everyone understands the basic principles. With small targets it is vital to be able to understand where pesticide is likely to be deposited. With larger targets it is essential to understand how the method relies on the build up of deposit from overlapping swaths.

A cross-wind spray cloud will be created for you using a Microulva. The spray liquid will be vegetable oil with a UV dye. You will place samplers as illustrated ***(Fig 1a)*** at 2, 5,10,15,25, 35 and 50 downwind. At 15 and 25 m a volunteer will whirl a collector ***(Fig 1b)*** at the end of a cord to simulate a flying locust. The samplers will all have a black section of standard size on the vertical and the horizontal part of the sampler ***(Fig 1a)*** and on the whirled collector.

The Enablers will carry out the spraying.

In the laboratory the samplers will be examined under UV light and the number of drops on the black tapes counted. The total will be entered on the Graph provided for each distance downwind and each sample position- vertical, horizontal, whirled. ***(Fig 1 c)***

- ***What can you conclude from this exercise?***

2.5 ULV Block dimensions.

Ultra Low Volume treatment uses overlapping swathes to build up deposit "incremental". The total deposit will build up progressively and then fluctuate about a "plateau". An adequate deposit will occur ONLY in that plateau region. Consequently ULV treatment can be used only for blocks above a certain size. That size will be a function of the swath width and swath width will depend essentially on the height above ground of the spray head, at least up to emission heights in normal use.

A computer programme has been written to show ideal treatment by aircraft at 10m and 5m, by vehicle and by hand. Target size and track spacing are under operator control. You will operate the programme.

Please try the following:

- **Settings Air 10m**, Area 4 ha, Track spacing 50m (*You will find the deposit is irregular with no plateau.*)
- **2 Settings Air**, Area 4 ha, Track spacing 20 m (*You will find that there is still no plateau. All that the tighter track spacing has done is smoothed the deposit profile*.)
- **Settings Vehicle**, Area 4 ha, Track spacing 33m. (*You will find a significant under-dosed band at the upwind edge*.)
- **Settings Vehicle**, Area 4 ha, Track spacing 33m, (*Double last run - by clicking Double and Show. You will find the under-dosed band has been effectively eliminated.)*

Now input values you think reasonable for the target area to satisfy yourself about the minimum target size for different treatment methods. That is the size where the plateau occupies virtually the whole area so that the build up to the plateau and the decline are relatively insignificant and can be ignored. The under-dosed band does *not* get smaller as the target size increases; it just forms a smaller fraction of the total area.

2.6 Defining and treating a ULV band block target

The vast majority of plague and late upsurge control is by air of blocks containing, or thought to contain, a number of bands. The level of infestation is usually expressed as the % of the block actually covered by band - the % infestation. 5% is thought to be a good target. Blocks are claimed to be marked by ground search. However, it is not clear how that is done.

The computer programme simulates a band distribution in an area and allows search either by vehicle or by aircraft. The parameters of search are under operator control.

We have not the time – it would take several days – to use the simulation to investigate the problem thoroughly. We want you merely to satisfy yourself that the problem of target block demarcation exists and that a solution is not self-evident. We cannot however stop because we have discovered an intractable problem. If a solution is not obvious we must “flag” this as a crucial problem for discussion in the final session. It would be foolish to build a Contingency Plan whose whole basis is a method of control that cannot be deployed.

(The programme has been developed for research purposes and there has been insufficient time to make it “user friendly”)

2.7 Control Methods for a Plague Campaign.

(This repeats and amplifies the Note we asked you to read at the beginning of the Workshop)

Campaigns are about finding and killing locusts.

There are 4 aspects to the choice of control method.

1. *Effectiveness. The method must kill.*
2. *Target recognition and demarcation. We must know where to spray.*
3. *Time and resources. A method that is effective is of no use if it takes too long so that only a small part of the population can be treated.*
4. *Cost.*

Some of these may turn out to rule out a method. For example, baiting is probably not effective enough to use. Baiting has other drawbacks of course, but if it doesn't work adequately we would not need to consider these.

Others are a matter of weighing the advantages of a method against its' disadvantages. Aircraft for example are costly but an aircraft can treat a large area in a short time. Aircraft can treat only band blocks not as a rule individual bands so aircraft band treatment requires the solution on the band block demarcation problem.

Swarm Control

This is the only target whether the actual method of application and its' effectiveness is unknown. Swarms as a rule move substantial distances in a day so it is rarely possible to lay on ground control and of course ground control is possible only with settled swarms. Swarm control requires aircraft.

The advantages are that swarms are not difficult to see, each one forms a complete target and there are not many of them. There are likely to be tens of swarms whereas there will be many thousands of bands.

Swarm control requires rapid response and hence flexibility. A swarm campaign presents a much greater organisational challenge than a hopper campaign. It is claimed spraying of flying and milling swarms is dangerous for the pilot but of that is clearly an excuse. Hundreds probably thousands, of flying swarms of many species have been sprayed by aircraft without mishap.

In theory spraying of flying swarms should be extremely effective and extremely efficient. Testing methods in the field would be extremely difficult. For the purposes of this Workshop we will accept that the area dosages recommended for band control will be effective against swarms estimated by plan area.

2.8 Control Methods for a Plague Campaign Compared I

This is a Spreadsheet exercise. You should work individually or in pairs.

The methods available are:

1. *Individual band control by vehicle.*
2. *Block band control by vehicle.*
3. *Block band control from the air.*
4. *Swarm control from the air*

Methods 3 and 4 assume that the target block demarcation problem has been or can be solved.

(4) Swarm control from the air

i) Settled.
ii) Milling.
iii) Flying.

Useful Inputs for individual band control should result from the earlier computer simulation. Much of the rest of the Inputs will be essentially guesswork.

The key comparison is the treatment of a unit area of swarm or its band target equivalent both in cost and resources. It is likely that in any campaign several methods will be used not least because of the political pressure to do *something*. Also some methods are much easier to organise than others. However, when planning and when executing a campaign it is essential to know what it is reasonable to expect to achieve with the resources available using different methods against different targets.

We are well aware of the desirability of being active on the ground and the temptation to ignore young swarms that will soon emigrate. You can safely claim effective control. In the words of Sir Boris Uvarov, “Swarms never leave countries, they only invade countries.”

In the case of Plagues we have some notion of the scale of the infestation we need to plan to combat. A population of 1000 sq km of swarm or its’ band equivalent is a fair figure. That would be 20 swarms of 50 sq km. A 50 sq km is a medium sized swarm. That would be equivalent to about 20000 III/IV instar bands with a mean size of c 2 ha. Again that is a plausible figure although perhaps on the high side.

That means you should start with 1000 sq km of swarm as an Input and record the resources needed to contain that infestation or its’ band equivalent by 1 method only. You should also note what might ideally be controlled with the resources likely to be available.

This is an important but time consuming exercise. The critical element is to agree on plausible values of key Inputs and be honest about which of those are guesses that may be wide of the mark. So Group discussion of Input values will be essential.

It will be up to Enablers to decide how to tackle this exercise. It may be best to concentrate on Group discussion with one member entering the values rather than working individually or in pairs. The Group must record its' key Input and the resulting Output values. A Form is provided.

There will of course be a general discussion.

2.9 A Simulated Plague Campaign in Sudan to Combat a Swarm Invasion

This is a desk top simulation. It deals only with a swarm invasion partly because there is not enough time to run a follow up hopper campaign.

Those of you not familiar with the usual pattern of swarm movements should spend some time reading the Desert Locust Forecasting Manual.

There will be an outline Contingency Plan - Appendix 1

For the sake of simplicity the simulation does not include participation by DLCO.

The Set up

1. The Plan assumes all operations will be by staff under the direct control of the Head of Locust Operations. You will jointly play that role. Arnold van Huis and Clive Elliott will represent FAO and donors. Your Enabler will act as referee; the referee's decision is final.
2. Operations will be carried out only from 7 bases. All are at commercial airfields. The main base will be Khartoum where all resources will be originally located.
3. Daily radio control is assumed with all field bases, all aircraft and all teams, so that what is done in the field will be known at once by H Q.
4. Control will be only against swarms by aircraft. All sorties will all be by aircraft carrying pesticide. Aircraft will always apply a complete spray load.
5. All pesticide is effective at 50 l/sq km – an aircraft carries 500 l and can treat 10 sq km in a sortie. An aircraft has an endurance of c 4.5 h which means it can search and spray up to 300 km from its' base.
6. Aircraft, pick-ups, trucks, and pesticide will be represented by models. Avgas or Jet A1 is assumed to be available at all bases. The pesticide will be in 500 l units. Pickups are regarded as pairs representing one team. One team must be present at each base where aircraft operate. Any other teams may search within the relevant base sector.
7. After 1 June pesticide can be moved only if you have a truck available at the appropriate supplying base. Delivery takes 3 days. Movement of a pickup team also takes 3 days.
8. Aircraft arrive at Khartoum and require 1 day to reach another base.
9. You will have a set of monthly distribution maps for the whole invasion area for the 9 mth (Oct – June) with a Summary and Forecast, and special warnings
10. An invasion may occur at any time after 1 June.

11. For each day you will have an envelope containing information about locusts, weather and equipment not available – aircraft withdrawn for checks etc
12. There will be a daily map with hidden swarm locations; your Enabler will search as directed by you, by lifting the cover over that deg sq – assuming you have the resources to carry out search.
13. You will have a large map of Sudan on which you should place your resources – aircraft, vehicles, pesticide – and record the location with dates of swarms reported, found and attacked. Coloured stickers will be provided.

We are well aware of simplifications. For example an aircraft is not allowed to see a swarm en route; teams can move arbitrarily between degree squares. We could elaborate but we suspect you will find the game complicated enough as it is.

Operating

Preliminary

1. You must decide when to approach donors and FAO as envisaged in the Plan. The donor/FAO representative will require you to make a case for the envisaged assistance. If you ask too early you will not have the evidence FAO/donors may require. If the donor/FAO representative proves too unhelpful, he will be over ruled by the referee in order that the game may proceed. Aircraft arrive 4 weeks after agreement to supply. Remember once the contract is let the aircraft will be sent at the stipulated date and will cost money even if they have nothing to do.
2. You may up to 1 June distribute pesticide, trucks and pick ups where you choose with no penalty.

The campaign proper

1. From 1 June you will open the envelope for the day. You must decide whether or not to start operations, and if so from which bases and on what scale.
2. You may elect to “search” any degree square within operating range either by vehicle or by aircraft. – if of course you have the vehicles and/or aircraft at the base. Your Enabler will lift the masking tab on the swarm distribution map for that day.
3. Any swarm discovered by the aircraft will be sprayed and its’ area reduced by 10 sq km. That will consume one pesticide unit. An aircraft makes 1 sortie only in a day. You may dispatch a second – or third- aircraft if available, to attack a discovered swarm.(Each swarm has a letter and these relate to a list of sizes. You will record which swarm has been hit

and reduce its size accordingly). Swarms discovered by ground search CANNOT be sprayed that day but they can be sought the following day although by then the swarm may have moved. A swarm is likely to be seen or reported late in the day - too late to dispatch an aircraft.

4. All swarm sightings and all swarm control should be plotted on the large map – with dates.
5. You may request a delivery of 30 ton (30,000l) of pesticide from the Bank at any time. You must however, convince the donor representative that the pesticide is needed. Delivery takes 7 days by air to Khartoum.
6. The campaign will end with maturation and swarm division at laying and consequent decline in numbers.
7. You should then record the pesticide used, which is a measure of the aircraft operations, the swarm destroyed and the swarm that survived. You should also note the number of sorties. Forms to allow you to do that are provided.

Summary

This is not a test. The intention is to give you some notion of a campaign. An actual Plan must promote the sort of action we have tried to mimic.

The exercise will be followed by Group discussion and by General discussion

The general discussion will start with observations by the representative of Desert Locust Information Service, Donors and FAO

We have little idea what form the discussion may take. We would however, wish attention to be paid to the organisation problem. In the game you have total authority over deployment, up to date information about what has been done and found, and accurate knowledge of the position and amount of your resources.

We believe this is a prerequisite for a successful campaign but is not the usual way. The risk with an independent set up is lack of accountability. That risk can be avoided – it was with DLS, IRLCS, OCLA and APLC - but not recently with DLOCO-EA or IRLCOCSA.

2.10 What next?

This Workshop cannot require anyone to do anything. However, unless we consider not just what needs to be done, but who might do it and who might fund the work, we shall produce just another wish list. For example, no one can doubt the need to assess the impact of a campaign but there is no organisation with the necessary expertise or resources to carry out an assessment, still less to operate within a matter of weeks which is all the lead time there will be.

Areas for discussion:

1. Research and development.- of methods of target delimitation and assessment of control impact.
2. Action by DLIS
3. Action by FAO
4. Action by donors
5. What donors require from countries and from FAO.
6. Production of plans.

A comment – *(by Phil Symmons)*

The role of Donors and FAO is complicated. They might be expected to supply 3 things for a major campaign:- technical experts and technical advice; materials especially pesticide; aircraft. Each of these poses problems, some technical, some organisational. Only FAO and donors themselves can deal with the latter.

Technical experts:

The key requirement is for experts with experience of running major campaigns.

I suspect that Training Courses have concentrated on application methods. This Workshop will show that application is not a major problem. The problem is not how to apply the pesticide but where, and how to apply it quickly enough and on an adequate scale. That is, the problems are those of target detection and demarcation, organisation and deployment.

Neither FAO nor donors see it as their job to produce experts; they "buy" ready made experts. Some dozen years ago I urged FAO to try to develop a cadre of experts. That would have required a fundamental change in FAO's method of operation and could only have been carried out surreptitiously. It is not surprising that my advice was not acted upon.

Pesticide:

Donors like to supply pesticide of home manufacture. All recommended pesticides will work. However, trying to run a campaign using several different pesticides requiring different application rates and in some cases with different modes of action is a complication one can well do without.

A pesticide bank would probably provide a solution to that problem and also in large measure to the problem of pesticide disposal.

Aircraft:

Standard crop spray aircraft are not ideal for locust control – too short a range, no facility to carry an observer, unnecessarily large pesticide tank capacity. Pilots will as a rule have no locust control experience. Spraying of bands will have to be done without flagmen in most cases, so D G P S should be mandatory.

Hire through or by FAO presents problems because of FAO contract procedures. Those procedures are designed for accountability not for cheapness or speed of letting.

Appendix 1

An Outline Plague Campaign Plan for Sudan

Note: *This is not a model plan. It is a simple outline containing only the key elements. Its aim is merely to provide a basis for running the exercise.*

Assumptions

1. The campaign is under the sole charge of H Q Khartoum.
2. There is adequate manpower and cash to support the operation of all available resources.
3. The key resources are as follows:
   - i) *Pesticide* 30 ton = 30000 l
   - ii) *Pick ups teams of 2 vehicles* 10
   - iii) *Trucks (5 ton capacity)* 4
4. There is SSB radio communication with bases and vehicles directly from HQ Khartoum.
5. Warnings of a swarm invasion will be sent by DLIS as follows working from an invasion on D DAY.

Alert Stage	Probability	Approximate time
V	Virtually certain	In progress a
IV	Very likely	c D Day – 20 to D Day -30 b
III	Likely	c D Day – 60 c
II	Possible	c D Day – 90 d
I	Preliminary	c D Day- 150 e

e *= First breeding after initial outbreak*
d *= Further successful breeding.*
c *= Invasion of potential source area.*
b *= Breeding in potential source area.*
a *= Emigration from source area*

6. Operation possible from the following bases: *Port Sudan, Khartoum, Kassala, Ed Damer, El Obeid, El Fasher, El Genina*.

The Plan

The Plan depends critically on the warnings from the Desert Locust Information Service FAO Rome.

The key officers are:

- *The Minister for Agriculture for Sudan.*
- *The Head of P P D*
- *The Head of the Locust Unit*
- *The Locust Unit Information Officer*
- *The Senior Field Officer.*

The Plan presupposes support from donors advised by FAO. This will be instigated through a local donor committee. FAO will send a representative from its' Locust and Migratory Pest Section to key meetings.

The Plan presupposes the release of resources and personnel from other branches on the following scale: **Pick ups 6, trucks 2, officers 10**.

(Note: These are included in the "Resources available")

Sequence

Alert I: The Information Officer will alert Head of Unit. A check will be carried out of all equipment. Funds will be sought to make good any deficiencies.
Head of PPD will be asked to designate officers for secondment and source of trucks and pickups.
A training course will be held for the officers designated for secondment.

Alert II: The Locust Donor Committee will be inaugurated by the Minister, an inaugural meeting held, the Committee's purpose outlined, and its' mode of action discussed.

Alert III: A key meeting of the Donor Committee will be held attended by a representative from FAO Rome. At this meeting a decision will be taken to let aircraft contracts and about pesticide supply.

(For the purposes of this exercise it is assumed that recommendation by the Committee will be followed by immediate action. Firstly contracts will be let resulting in the supply of suitable spray aircraft within 30 days – of course delivery might be chosen to be later. Secondly, if pesticide in addition to the Pesticide Bank is assumed to be necessary, it can be ordered at once. Problems of security clearance for aircraft and customs clearance are discounted in the exercise.)

Alert IV: The Minister will be requested to order that operating funds be made available. Seconded staff and vehicles placed on standby. Head of Locust Unit designated Head of Locust Operations with additional powers (not specified here). A meeting of the Donor committee will be held.

A weekly information digest for interested parties and the press will commence. This will go first to the Head of PPD and the Minister.

Matters are now in the hands of the Head of Locust Operations who will commence operations when he thinks fit and direct operations on his sole authority.

Periodic meetings of the Donor Committee may be held but those are largely to keep members informed.

The Plan does not deal with operating the Campaign. Operations lie outside the scope of a Plan. Operations cannot be planned.

Information for the Game

These are general statements such as might have been sent by D L I S. In fact the sections in italics were what was ***actually*** sent out in the months indicated during 1967-8. There was of course more detail but this sort of brief statement is all that is essential. The statements up to April - early May will be available before the game operations start; the last 2 at the appropriate day after 1 June.

One thing that surprises me is that the Bulletins after that of April – early May are less forthright. I wrote the Bulletins but they were subject to review and comment. There was I know much political pressure to modify. I was accused of being alarmist. Indeed FAO issued an official statement saying my warnings of swarm invasions of India and Pakistan were to be ignored. One of my fondest memories is of that FAO's statement and the swarms arriving together! The Sudan Government banned any information being given out about locusts in the country during July and August.
It is all very well to say you should stick to what you believe but with locust forecasting you are guessing – and guessing that you are being lied to. My guesses turned out to be correct but you can't justify guesses against criticism and you cannot deny what you are being told - except subsequently.

Situation for November and early December

ALERT I

Situation for December and early January

Enough locusts are likely to survive from recent and current breeding to produce a very dangerous situation if the next breeding is successful. The prevention of a plague may depend on finding and destroying infestations occurring in the next few months, even though these are likely to be small by plague standards.

Breeding on a substantial scale is in progress on the plains of Yemen and the southern Tihama of Saudi Arabia. Breeding is also taking place on a significant scale in the south of the Sudan Red Sea coastal plain and the adjacent coastal plain of Eritrea. There is further breeding in progress in northern Somalia and probably also in the Mekran.

ALERT I

Situation in January and early February

Breeding at present under way or likely to start in the near future may determine whether or not a plague will occur.

Breeding on a substantial has continued on the coastal plains of Yemen and the southern Tihama of Saudi Arabia and has spread to the central and northern Tihama.
Breeding has continued also on the coastal plains of Sudan and Eritrea and in northern Somalia

ALERT II

Situation in February and early March

The next few months may be a crucial period. The appearance of hopper bands and swarms in several areas indicate a worsening situation.

Breeding has continued on the Yemen coastal plains but the progeny of early breeding has moved northwards to the central and southern Tihama of Saudi Arabia. That is where the major infestations now are with some large bands being found. Breeding has continued on the coastal plains of Sudan Eritrea and especially in northern Somalia.

Alert III

Situation in March and early April

The locust situation remains potentially very dangerous.

The apparent decrease in numbers in some infested areas is likely to have been the result of emigration.
Numbers have declined in Yemen probably through continued migration to the Saudi Tihama. That area continues to be infested but emigration from there to the interior may well have started.
Infestations have declined on the Sudan and Eritrean coastal plains perhaps indicating movement to northern Ethiopia. Serious locust infestations including mature swarms, numerous small and some large bands have been found in north west Somalia.

Alert IV

Situation in April and early May

Now is the last possible chance of preventing a plague. Indeed, even the maximum control effort may prove insufficient and many swarms are likely to form from the progeny of gregarious breeding now in progress in Saudi Arabia and in Eastern Africa. Preparations to deal with swarm invasions should be made at once in the threatened areas.

Westward and south-westward movement of swarms from central Saudi Arabia in June is likely to lead to the invasion of eastern Africa. In the north

swarms may move through southern Egypt but are more likely to invade Sudan.

Breeding is likely to follow heavy rain in the summer breeding area of northern Ethiopia. Further south the infestations in Somalia have spread into the southern Danakil and the Railway Area.

Alert V

Received 15 June

Situation in May and early June.

Swarms emigration from central Saudi Arabia may well have started since several swarms were found in the south of Egypt in early June. These will have moved south westwards into northern Sudan. However, a much larger swarm invasion of Sudan from Saudi Arabia is likely and may well be in progress.
Swarms are also likely to move into the Kassala area of Sudan from northern Ethiopia were significant breeding is continuing.
Substantial infestations exist in the Railway Area, the southern Danakil and northwest Somalia

Special Warning received 23 June

Alert V

Swarms have left west central Saudi Arabia and have almost certainly invaded Sudan on a substantial scale. Swarms will move rapidly south - westwards and west-south-westwards across country, and tend to accumulate along the Inter Tropical Convergence Zone.

Planning Workshop - Notes for "Enablers"

The Workshop and your function

As I say in the introduction, the business of locust control is just that – controlling locusts. This means finding, marking and treating targets, and doing so on a large enough scale to prevent significant crop damage, whether by immediate crop protection or by total population reduction – although rightly in my view we attempt the latter only. This is a truism but it is one that is in fact ignored totally. We have elaborate structures of liaison, co-ordination, "research", forecasting without reference to whether these contribute to getting more locusts killed. These structures *might* contribute: 1 if we knew how to find targets; 2 if those doing the spraying did the job properly; 3 should those 2 conditions be fulfilled, deployment were on an adequate scale. I doubt all three.

I hope there will be 10 participants at the Workshop divided into 2 groups of 5. There will be an Enabler for each group. The Enablers are the key to this Workshop. My main function is to devise the Workshop. Whether the Workshop is a success or a failure will depend almost totally on the Enablers.

The underlying assumption with this Workshop is that 1 is known and that 2 is practiced; that is we know how to find targets and those targets are in general treated properly. I have set out exercises on the assumption that this is the case. The ostensible reason for the exercises is to find out how long, marking and treatment takes so that we can have plausible input values for some of the parameters needed to estimate campaign requirements. If as I suspect, the participants prove unable in some cases and perhaps in all, to carry out the exercises then we must note the fact and pass on. Your job is NOT in most cases to show your Group how to do the exercise but to help them to carry out what they decide they want to do. For example, one exercise will be to spray a c 1 ha band. We will mark the band edge perhaps by spraying dye, perhaps by trailing toilet paper, perhaps by a trail of sawdust. We will put spray collectors across the band. The rest will be up to the Group. Do they want flags? You will provide. Do they want sprayers- ULVAs? You will provide. If they ask for a wind vane, you should provide. You will collect the markers and help the Group analyse the result but you will NOT tell them how to lay out the plot. Your job is NOT to show them how to mark and treat a band. You are Enablers not instructors. You will then lead the discussion of the results in your Group, and of the problems and difficulties. A Group representative or perhaps you the Enabler if you have problems getting someone to come forward, will present the Group conclusions and I will lead a general discussion. Clearly it would be better for participant involvement if one of them – a different one for each exercise – made the presentation but will they be up to it? Not all exercises will take this form but most will.

I am worried out the participant's ability to cope with the computer exercises. One problem is the simple ability to operate the computer. Another is the conceptual jump from the screen to the field. I think you may in some cases have to tell them step by step what to do. In others you may have to get one person to type in figures agreed by the Group as a whole.

I hope that by starting with realistic field exercises we can force the participants – and perhaps some others – to face the fundamental problems of locust control. If we accept that those problems are already solved when they are in fact not solved at all,

we might as well not bother with the Workshop. I am hoping that by starting in the field we can inhibit participants from making the usual outrageous assertions.

Timing

It is very difficult to know how long different exercises will take. A lecture is simple – 40 min + 20 min for questions. There are the additional problems of a Muslim day of 3 sessions and the need to try to get field exercises in the first and longest session – and where the wind is likely to be better.

General requirements

We will need:

- Areas of scrub vegetation – units 1 sq km + nearby
- A lecture room
- A second room so that the 2 groups can work separately.
- Computers 1 for every 2 participants + 1 for each Enabler and 1 for me.
- A darkish room or blackout in the lecture rooms.
- Transport – for the Groups and also a runabout vehicle
- Labour and transport to set up field exercises.
- Local purchase facility for small items.
- I would like cap and overalls for each participant

The Forms

The purpose of the C V is to find out how much or how little survey and control experience participants actually have. Those in charge of locust units, advisors, and assorted “experts” have in the main little, in some cases no, control experience. That does not stop them making assertions or even writing articles. After now nearly 50 years in the business I know how much I do not know. I want to inhibit participants from making assertions based on a fraction of my experience. If people talk nonsense I shall say so but that will cause acrimony. I’d rather stop people asserting in the first place.

I hope I have made my position clear. Frank, open, honest discussion is the basis of the Workshop. However, too many are in positions where they believe they ought to know but don’t, so they assert. Once someone has made a daft statement based on inadequate knowledge and little experience, he and I will be in difficulties. I could not let the assertion stand. But to refute it would make the person who made the assertion look stupid.

The purpose of the second form is again to show what we do not know. It is a silly form anyway. However, the point is that most of the answers must be guesses and the guesses will be wildly different. Only 2 countries completed the form, Eritrea and Sudan. The former did an honest job and produced ludicrous figures. Sudan I suspect cribbed my guessed figures from the Wageningen Seminar. I finger you Munir.

Section 1

1 Finding and treating patches

We shall create patches in 2 areas of c 1 sq km – I would like to make that 2 since in an afternoon a team ought to be able to inspect every sq m in a sq km. We will use either fertilizer pellets or 20mm gravel to create the patches. I'll bring some cans of black spray paint to make the patches more realistic. I shall also bring markers to place in each patch. I suggest we make a "heavy" infestation in one block – say 100 patches and a "light" infestation – 20 patches in the other. The spraying by Microulva will be of UV dyed vegetable oil. The team must collect the marker to show it has sprayed the patch. We must of course know how many patches/markers we have created.

I do NOT want you to help the Group decide how to do the job. The assumption is that this is known to everyone. If it isn't then where does plague prevention stand?

After you should

1 Look at the spray deposit of the collected markers. That will not tell you anything definite but we come onto that in the next exercise.

2 Tell them what they missed - % of patches treated.

3 Consider the time taken – do a bit of calculation on what a team might search in a week/campaign.

4 Discuss the method – or lack of method – to search and spray. If search was haphazard and patches were missed then clearly a bit more training of trainers or maybe training of trainers of trainers is needed.

2 Spraying a patch

I expect you to find that the deposit on the markers from the previous exercise will be poor. The Microulva is not the sprayer for the job. The ULVA is a "drift" sprayer so you really ought to spray some distance up wind. The downwind side will get almost nothing. The Herbi is what you need. The system will be to spray patches some with an ULVA some with a Herbi and look at the results.
Again if we have been using as standard a sprayer one that is useless for the job, what price outbreak campaigns?

3 Which control method?

This is where you really earn your keep. You must try to get the participants to start to think rationally about outbreak campaigns.

The answer to the question of method is I am sure individual patch control using the Herbi and perhaps very small bands using the ULVA. The problem, which we deal with next, is scale. How many teams and what chance is there of getting them?

We need a conclusion about method and an estimate of time needed to deal with unit suspect area here, to proceed even if only a provisional conclusion pending further research – which of course will not be carried out!

Outbreak Campaign Inputs and Outputs

I have little to say in these notes. You will have to go through the spreadsheet first – it is all fairly obvious.

The outcome of all this should be an estimate of what an outbreak campaign would need. This is set out, I hope reasonably clearly in the notes for the troops.

Clearly this is the critical exercise since it is on the Outputs that any plan must be based ie the Spreadsheet will tell us what resources we would need to deploy. Most of the Input values can only be guessed. Your job is to get the troops to put in values that are not too daft. I think almost any Inputs will show block spraying to be a non-starter – apart from the minor problem of being unable to define the block! The other point is to try to get them to generate a patch population that gives you something of the order of 10 sq km of low density (25/sq m) of swarm prevented ie destroyed as hoppers. Anything less than that would not be a significant Outbreak.

Of course there is no estimate of what might be missed.

The task does not become much less with fewer patches unless that means a smaller area to search. It is area searched that is the key parameter not patches present. That is it takes nearly as much time to deal with a sq km with few patches as one with many.

Outbreak/early upsurge environmental requirements and forecasts

Yours Keith. The notes for the troops set out what I want covered. You and I know the answers. An outbreak might occur almost anywhere in the recession area. The rain is where it starts which gives you c 3 weeks to play with. You may well need more parents than usual but we can't estimate parents in a source area. Nor can we tell what will happen next though we might have some idea where it might happen if it does. But it is essential to get this on record at this junket.

Plans for an Outbreak Campaign

I want Clive to Chair this. I have left this open simply because I genuinely don't know what might be done. I suspect not much. That is we would probably need a dozen teams in a high state of readiness permanently in the season and I doubt that is feasible or perhaps even justified. It is like war; it takes a year or so for an army to get up to speed unless you spend without limit on "exercises".

Section 2

1 Treating a c 1 ha band in the Field

I am being more than somewhat disingenuous. It is assumed that outlining a spraying a band is easy and that every one knows how. I have assumed that too although I doubt it is so. We will outline a “band” and place lines of samplers at 10m intervals across the band.

Your job will be to help them count the drops on the samplers and plot the result. Your job is NOT to show them how to outline and treat a block. You MUST record how long they took

I shall expect you to get them to discuss why they went wrong assuming that they do. The likely problems are:-

Difficulty in outlining a block – “driving round the band” is not always easy.

Underdosing of sectors because of

- failure to align the block with the wind
- failure to allow for incremental build up – which is why I need the Single Pass exercise.

2 Spraying a band by vehicle - a computer simulation.

Keith has tried this and suggested mods and pointed out errors. It is simple to operate. It is a valid representation of the problem. I trust the participants will not just reject it on principle. I think that less likely if they have encountered problems in doing the job in the field

I should also like to calculate the proportion of the band adequately sprayed. It is easy for a person to see whether a dot lies inside or outside a quadrilateral. The computer has to have a rule. It is a problem I have solved but it is a real bastard.

I want you to draw attention to the relatively small area with adequate deposit. That is the importance of target size with “incremental” spraying. A sector downwind of the last run will be underdosed. Also poor alignment w r t wind results in a shifting sideways of the adequately treated block.

If, as I suspect, the students find putting a rectangle round the band difficult I want them to try this. But I do not wish them to have my suggestion until they have failed on their own.

A Possible Method of Laying out a Spray Block Containing a Single Band.

1. When you come across a band place a Guide Flag 20m short of that spot.
2. Drive on, either cross wind or up/down wind, and as near as possible in the same direction as when you encountered the band.
3. When you reach the other edge place a second Guide Flag 20 m on, and note the distance.

4. 4 Return to the mid point between the 2 Guide Flags. Drive at right angles until you reach an edge and place a third Guide Flag 20 m further on.
5. Return to the mid point. Drive on and place the 4th Guide Flag 20m beyond the edge. Note the total distance.
6. You will now have a diamond.
7. At the upwind edge place a Guide Flag a further 30 m upwind.
8. Place block corner Flags. There are various ways of doing that. Using a pentagonal prism would be the best but it would be adequate to return to a Guide Flag and drive at right angles for half the distance between the other pair of flags. For example if the distance between Guide Flags 1 and 2 is 150m drive at right angles to the line joining Guide Flags 3 & 4 line for 75m from both Flags 3 and Flag 4 on both directions and place the 4 Spray Flags. It works a treat.

Note To operate this you will need to place Guide Flags. I have incorporated a Guide Flag option in the programme.

3 Single pass of a UV sprayer in the Field

This is all I think clear and all standard stuff. Everyone must have done this before. The points to bring out in the Group are:

1. The build up and decline – the shape of the deposit curve. Of course number (of drops) is not a satisfactory measure of deposit. You might ask the participants why that is so.
2. The difference between collection on the vertical and on the horizontal. Again why is that?
3. The high efficiency of the whirled sampler – simulating a flying insect. Again what is the explanation?

4 Block size

This is a matter of relevance both to 3 and 4, and to 7. I have written a programme that produces ideal deposit profiles for various sprayers with track spacing and target size under operator control. You may need to dictate inputs to show various things. For example try 100m track spacing sprayed by air from 10m on a 1 ha block – all build up – no plateau. Repeat with 25 m track spacing. Only effect is to make build up smoother – still no plateau. Try 100 track spacing with hand- just a series of bumps.

Note The vertical (deposit) scale is arbitrary – it depends on the emission rate. The troops will find this difficult to take in. The scale (emission) can be altered but that is really only to let you fit the curves conveniently onto the screen.

Note. I suspect the minimum sizes will be greater than in the Guidelines – current version. In sundry places the draft version recommended what was convenient but what I know from experience and experiment will not work. How much Hans changed on my advice I do not know.

5 Outlining a band block target

This is a fairly complicated simulation. It would take several days to run this programme properly. You may have to restrict this to demonstration runs by you. I think if you try to get them to do the job they will get lost. If they sit at the computer you may have to get them all to do the same thing under your direction. “Click on x, scroll y to register n etc etc” We shall need a get together over this before the exercise.

6 Control methods for a Plague Campaign

I shall deal with this. It will be a very short talk in preparation for 9. If there are queries you can deal with when starting the Spreadsheet

7 Control methods compared

This is the Wageningen Spread Sheet omitting baiting. How you deal with this is up to you. There will be forms to note the output.

I have some doubt whether the participants work individually will get you anywhere. I think you may need to go through the inputs and get some agreement- consensus – about what those values should be. The size of the problem – area of swarm, late instar mortality, band density and hence area of band - we must eventually take as standard (the suggested Input values) otherwise we are not looking at the same problem.

You need to finish with a Group result to compare with that of the other Group.

This is not going to be easy or quick. It may be necessary for you to have one person at the computer and get the Group to pick a figure for each input that the operator puts in. You need to record the Input values. I suspect we need an hour together to work out quite how to tackle this.

8 The Game

I have nothing much to add to the notes. Those are self explanatory – as far as they go. We shall need a fair time to run through so that you at least know how it all works.

You will need to prime the FAO/donor representative. He must agree to aircraft being obtained in time to arrive by 1 June. He may restrict the number to 8. Also I do not want him to agree to extra pesticide until the first swarms have been reported. Then he can ship 30 tons by air from the bank IF asked.

The point is that I want the troops to have to use their resources to the maximum. They have enough capacity too destroy all of a major swarm invasion if they plan and operate sensibly. But they will need to shift resources around. If we give them too much, they can put resources everywhere and most will not be used.

There will be a Form to note the effect of treating the swarms. Each swarm will be identified by a letter. Against each will be an area in10 sq km units ie 8 = 80 sq km.

Each time a swarm is treated its' area will be reduced by 1 unit. One of your team can handle this. There will also be a Form to note the number of sorties. Another of the Group can handle this. The pesticide used will show how many of those sorties were spray sorties.

Note I think we shall need 4 clear days together before the Workshop starts. Four days enough? I hope so.

PS Nov 2001