



REPORT

on

DESERT LOCUST ECONOMICS MEETING

FAO Rome, 28-30 June 2000

**Emergency Prevention System for Transboundary Animal and
Plant Pests and Diseases
(EMPRES)**

Central Region Programme

**Plant Protection Service
Food and Agriculture Organization of the United Nations
2000**

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Introduction

The ad hoc Desert Locust Economics meeting met in Rome from 28 to 30 June 2000. Those in attendance included:

- Niek Van der Graaff (Chief, Plant Protection Service, FAO)
- David Vanzetti (Consultant, Eco Landuse Systems)
- Matthias Zweigert (Locust Coordinator, GTZ)
- Mohammed Belhaj (Economist, University of Göteborg)
- Keith Cressman (Locust Forecasting Officer, FAO-DLIS)
- Prof. El-Bashir (Entomologist, University of Khartoum)
- Prof. Hermann Waibel (Economist, University of Hannover)
- Bernd Hardeweg (M.Sc. student, University of Hannover)
- Christian Pantenius (Acting Coordinator, FAO-EMPRES/CR);

The purpose of the meeting was to:

- Present the Economic Guidelines developed by the University of Hannover;
- Evaluate promising approaches to assessing Desert Locust damage;
- Assess the possibilities for farm insurance schemes;
- Evaluate steps to improve data quality; and
- Examine other issues relating to the economics of improved Desert Locust management.

Preamble

Prior to the meeting, the status of Desert Locust economics was as follows. As part of the EMPRES programme, in 1996 FAO started to investigate the economic dimension of Desert Locust management strategies. The aim was to provide decision makers in the governments of affected countries and in donor agencies with improved knowledge, data and methods for economic evaluation of Desert Locust interventions.

As a first activity, a study was initiated in order to:

- Collate and analyse the best available information on the economic impact of Desert Locusts.
- Review the available literature and historical analysis in this field.
- Analyse the scale and distribution of the economic threat.
- Analyse whether current management strategies are an appropriate response to the economic risk.
- Assess other practical alternatives to reduce risks, which could compete with conventional control in terms of effectiveness and costs.

The study summarised present knowledge of the economic aspects of Desert Locust management. It showed new approaches for investigating the significance of the pest by introducing a bio-economic simulation model for quantifying population dynamics, crop damage and the impact of control operations over a period of several years. The main findings of this study, which had been presented to the international

stakeholder community and interested parties in Cairo in September 1997, can be summarised as follows:

- The Desert Locust has the potential to cause substantial damage to agriculture production, but the probability of such events occurring is low.
- Serious economic crop damage on a national scale is rare but can occur locally and for particular sub-sectors of the community.
- Simulations suggested that the economic impacts of hypothetical uncontrolled plagues would have minor effects at the national level in terms of the percentage of normal production and associated price effects.
- A threat to rural food security may occur in marginal subsistence areas.
- Control campaigns can be expected to prevent damage under “favourable” conditions. If they are hampered, significant damage may occur.
- Survey and control campaigns will only generate a net economic benefit if they successfully prevent severe economic impacts, which are considered to be unusual.
- Affected countries with substantial agricultural production, particularly high value export crops, have a major economic interest in regionally effective preventive control.
- For countries with low value production the net benefit rarely justifies expensive control efforts.

The study concluded that current Desert Locust control strategies are highly risk-averse and that affected countries and the international donor community are absorbing substantial net economic costs. It was therefore recommended that new and cost-effective tactics to match the risk and the economic response in a more efficient way should be sought.

The findings of the study have often been the subject of debate. They have been criticised for not being sufficiently objective in using simulation models and for having based the conclusions on unsatisfactory data that are not adequate to support a detailed quantitative analysis. In addition, the study was criticised for having excluded the social dimension of the locust threat, which was considered unacceptable particularly for those countries with low value subsistence production.

However, it was agreed that economic investigations could contribute to assessing the effectiveness of different management tactics and it was recommended that further investigations should take the social/humanitarian aspects into account.

Detailed recommendations included:

- To develop better information and decision tools for evaluating the actual economic risks posed by the Desert Locust, including the costs and effectiveness of all interventions.
- To apply a “bottom-up” approach to the evaluation of the risks at a local level.
- To evaluate options for sustainable national and international intervention strategies incorporating the economic, social and environmental dimensions of the problem.

The EMPRES Programme, which started operations early in 1997, attempts to improve the current Desert Locust management strategy. It includes a strong economic component that aims to:

- Provide more detailed quantitative information on the costs related to Desert Locust management as well as on its economic and social benefits at national, regional and inter-regional levels.
- Compare economic benefits of different preventive control strategies.

With regard to the EMPRES Programme Phase II, it was pointed out that socio-economic studies have already started and a preliminary analysis was completed during Phase I. However, more detailed socio-economic analyses need to address specific areas, including to:

- Conduct at least two case studies on the efficiency and socio-economic impact of national control campaigns.
- Continue the work on socio-economic impact assessments of locust control campaigns and the assembling and collating of existing data from survey operations and recent campaigns.
- Analyse the socio-economic impact of recent locust upsurges and plagues.
- Investigate the viability of farmer insurance schemes and other promising approaches.

Data issues

Some of the concerns expressed at the Cairo meeting in 1997 stem from the perceived data quality. These concerns relate to four areas:

- *Population dynamics:* There is considerable uncertainty about the determinants of locust population increases and their distribution. In the absence of any plague period with no public intervention, it is difficult to be sure that locust damage would not be significantly greater than the levels measured when public intervention does occur. At the same time, there is evidence to suggest that most plagues tend eventually to be self-limiting.
- *Control:* The impact of control activities on locust numbers is also subject to uncertainty. The evidence suggests that control may only be effective in reducing local populations in 20% of situations. No doubt this varies greatly according to the circumstances, the available equipment and the skills of the survey and control staff. On the cost side, it is sometimes difficult correctly to allocate costs to particular activities. For example, aircraft, vehicles or pesticides used in a campaign may be used for other purposes once the threat has past, or military or voluntary farm labour may be used without appropriate costing.
- *Damage:* Damage to crops and pasture is by its nature difficult to ascertain accurately. There appears to be a consensus that production losses rarely amount to more than a few percent of a nation's production of a particular crop, although damage may be disastrous for individual farmers. Furthermore, climatic conditions associated with a locust plague may even lead to above average yields.

- *Valuation of damage:* Of primary concern is the socio-economic impact of damage. In particular, the human or sociological impacts of a locust attack may be devastating at an individual or village level.

Methodological concerns

Economic impacts should not be equated only with lost production or damage. Farmers may respond to a locust attack by replanting, perhaps producing another crop, drawing down grain stocks, selling their labour off-farm, etc. Furthermore, if governments were to change policies regarding preventative control, farmers could diversify their crops or undertake other strategies to minimise the probability of significant losses. For these reasons, economic losses are likely to be less than the value of the crop losses.

The environmental impacts of Desert Locust control have not been ascertained in previous studies. The use of pesticides is likely to have a negative impact on the ecosystem. Some value ought to be attached to these environmental effects.

Alternative policies to control have not yet been properly assessed. If the costs of control in the long run were expected to be greater than the economic losses in the absence of control, an acceptable alternative policy might be for national or international governments to provide compensation to individual farmers, to subsidise insurance schemes, to require farmers to take out insurance against locust damage, or to allocate locust funds to improving credit availability, roads or social infrastructure such as educational institutions.

A conceptual framework for economic evaluation

Mr Bernd Hardeweg from the University of Hannover presented a draft guide to economic analysis in the presence of risk and uncertainty. A document entitled "A guide to economic evaluation of Desert Locust management projects" was tabled. This work had been commissioned by the German Technical Cooperation (GTZ). The paper emphasises the importance of allowing for the producers' response to risk, i.e. in the absence of public intervention, producers would perceive different probabilities of loss and respond accordingly. This may mean, for example, diversifying their crops so that all crops are not susceptible to damage at any one time. This would involve some cost to the farmer each year, but would reduce the expected damage in a year of locust plague, and therefore hopefully in the long run. A method for collecting data to measure such responses is described in the document. It appears that by taking into account the responses to risk, economic losses would be lower than current estimates. The magnitude of such reductions is unclear, and it cannot be concluded from this alone that the public intervention method is unsound.

Disaster insurance

Farmers face many uncertainties, such as fire, flood, hail, various pests, drought, civil unrest and other threats. In developed countries, farmers are able to insure against some of these contingencies. It seems likely that farmers, even in developing countries, would be willing to purchase insurance to offset the Desert Locust threat. The results of a study presented by Mr. Mohammed Belhaj from the University of Göteborg throw some light on this matter. Mr. Belhaj has used contingent valuation methods to elicit what farmers in Morocco and Sudan would be willing to pay for insurance in a variety of circumstances. The results indicate that in some cases farmers claim they would pay up to 3% of the value of the crop to remove the threat of damage from locust attack. Estimates of around 1% were more common.

Such estimates should, of course, be used with caution. When faced with reality rather than a hypothetical situation, farmers may perceive risk differently from what is assumed at the time of an assessment, and for various other reasons their actions may not match their stated intentions. Nonetheless, the results suggest that farmers in these regions may well see insurance as a useful risk management tool.

A related question is whether insurance companies would be likely to supply insurance. In general, insurance companies are often not prepared to offer reasonable insurance when:

- Many policyholders are affected simultaneously (e.g. drought, wars, earthquake);
- The damage is difficult to assess (diseases);
- The insuree may behave differently once cover is provided (the moral hazard problem, e.g. arson);
- The probability of an event is unknown (nuclear explosion); or
- The insurer cannot screen out bad risks (adverse selection, e.g. health insurance).

With the possible exception of assessing damage, Desert Locust risk satisfies most of these criteria. Locust damage is relatively small (from the insurer's perspective), affects few policyholders at any particular time, is a known risk and is not easily influenced by the policyholder. (Farmers may grow more susceptible crops once they have insurance, but this response is manageable.) For damage assessment, the major issue is the magnitude of the damage rather than whether or not damage has occurred.

Although little attention has been given to Desert Locust insurance apart from in Mr Belhaj's study cited above, it seems that the Desert Locust risk is similar in many respects to hail and fire. As with locusts, farmers can do little about hail once it arrives, although they can of course manage the risk by growing non-susceptible crops. Therefore, it appears that the market for Desert Locust risk insurance would have similar characteristics to other insurance markets, and useful insights could be gained by examining them.

One crucial element should be mentioned. This is sovereign risk, the risk that governments may change their policies on Desert Locust control. By controlling

locusts, governments are providing some insurance to producers. Changing the level of control would imply that producers must assume a different degree of risk.

Data quality

At the Cairo meeting (1997), at which some Desert Locust economic analysis was presented, some concern was expressed about the quality of the data. While data quality is always an issue, the meeting came to the view that some of this concern may have been misplaced. In compiling his report, Joffe (1998) had undertaken eight individual country studies to obtain cost estimates and had compiled 650 individual records of damage. Estimates of the effectiveness of control are somewhat dubious, and this should be considered a stochastic variable dependent on a range of factors. It is difficult to see how these data can be readily improved upon, but it is possible that better use could be made of existing data.

Other concerns

Socio-economic studies: One commonly espoused view of economic analysis is that it takes little account of social concerns. Locust damage may involve individual farmers or whole villages being forced to desert their homesteads, and moving into cities. This causes obvious social upheaval and stress. Clearly, such events should be taken into account and avoided where possible, but this should not be at any cost. Responses to Desert Locust damage should be consistent with the concern shown in the face of events of a similar magnitude caused by other threats. Furthermore, such social effects may be mitigated by alternative policies to controlling locusts.

The EMPRES/CR Programme has agreed to undertake several socio-economic studies to investigate the possible impacts of Desert Locust damage at village level. It is hoped that these will clarify the social impacts (as they relate to the level of economic impact). Indicators of social upheaval include the incidence of farmers abandoning their land, becoming unemployed, falling into unusual levels of debt, taking outside employment, etc., and may be assessed by using participatory rural appraisal methods. As an indication, losses from other risks such as hail and fire might be used as a guide to the likely outcome. Responses to production losses may be similar if the nature of the losses is similar. FAO literature and expertise from other departments could be helpful here.

Modelling: The Economic Locust Simulator (ELS) model was used to generate results for the Joffe study. It is the only locust economic model of which the meeting is aware. It is a dynamic, stochastic simulation model run in Excel. Although originally designed to be a decision tool for operatives, it lacks an interface that makes it user-friendly. No programming skills are required to further develop or apply it. There may be some value in reviewing this model to re-examine:

- The model structure (currently 60 months, 4 regions, 8 crops, about 40 countries, GIS crop, production and locust frequency data, one feedback loop);
- Data (frequency data based on the pre-1970 period);

- Parameters (population growth and distribution, control effectiveness); and
- Assumptions (initial control threshold, constant costs, etc).

It may also be useful to undertake a sensitivity analysis in order to identify the key parameters, to run the model with a greater number of simulations to improve the accuracy, or to write an interface that makes the model easier to use for those who wish to apply it to economic analysis.

Importantly, the model could be used to explore optimal levels of public intervention, rather than merely calculating the costs and benefits of current versus no intervention. Assuming the model is a valid representation, it could also be used to assess the optimal timing, place and mode of intervention.

At present, some countries bear significant costs while greater benefits accrue to other countries. An equitable cost-sharing arrangement could also be examined in the scope of the model. The impact on national government expenditure of withdrawing international intervention might also be explored. A technique of applied dynamic games could be used for this purpose, although this requires a high level of mathematical expertise.

Finally, concerns expressed about the data and assumptions may reflect a general distrust of economics and models in particular. In its current form the model used to generate the results is not transparent and could be considered a black box. More sensitive ways of presenting the results may help in overcoming some of these reservations. It would be helpful in this regard if the Joffe report and the model underlying the results were made available to interested researchers and possibly the general public by placing it on the FAO website.

Summary and Recommendations

The meeting concluded that there are two major concerns with the current state of Desert Locust economic analysis:

- In the absence of any plague period during which there is no public intervention (control), it is difficult to be sure that locust damage would not have been significantly heavier than the levels measured up to now.
- Potential losses are likely to be over-estimated, because little attention has hitherto been given to long-term responses of producers to the possible effects of changes in policy regarding control.

Given previous efforts to collect and analyse cost and damage data, and the uncertainty about locust population dynamics, it seems unlikely that these data could be readily improved upon in a short period of time; a long-term effort would be required. Hence, further missions, apart from those already initiated to collect data, are not recommended at this stage. No immediate economic evaluation mission into the Region was therefore considered necessary. Nevertheless, it is likely that better use could be made of existing and future data to be collected under the EMPRES/CR programme. Little attention has been given so far to alternative policies

to the current public intervention methods, such as insurance schemes or some form of compensation, but these might be a useful additional instrument for risk reduction.

The meeting noted that FAO had publicly released Joffe's paper "Economic and policy issues in Desert Locust management: a preliminary analysis." as issue no: 27 of the FAO Desert Locust Technical Series. Consideration should be given to giving this publication more publicity.

The meeting recommended that:

- (1) The consideration of the economic dimension of developing improved preventive Desert Locust control strategies through the EMPRES/CR programme should aim at sustaining the livelihood of the affected countries from the viewpoint of society as a whole. The specific objectives include:
 - Protection of (subsistence) farmers from losing their livelihood.
 - Protection of the poor from food insecurity.
 - Protection of the urban consumers from food insecurity and price increases.
 - Protection of high value export crops
- (2) At least two socio-economic studies be undertaken to illustrate the possible impacts of Desert Locust damage, taking into account the reaction of farmers, nomads and bee-keepers to the locust threat and control operations. Within the framework of the SIDA Project, Mr.Mohammed Belhaj is planning to conduct research on the acceptance and feasibility of insurance systems in locust-affected areas. This may require additional funding.
- (3) The scope for using disaster insurance schemes should be examined in further detail, with a literature review as a first step. A World Bank proposal to examine insurance issues may prove helpful.
- (4) The ELS model should be reviewed to examine crucial data, modify key assumptions, provide a more user-friendly interface, undertake sensitivity analysis, generally improve the model and release it to interested researchers at no cost. Further policy analysis may be desirable. This might include one or two experts reviewing the model and suggesting refinements. It was recommended that a revised model be used to examine various policy options.
- (5) Courses in risk and welfare analysis should be offered to Desert Locust policymakers in order to bring economists and local experts together, thereby generating better understanding of policy issues. The University of Hannover provides such short courses.

- (6) FAO should encourage staff to become familiar with the use of economic analysis. Employing an APO with some economic background would be desirable.
- (7) The guidelines presented by the University of Hannover were understood as a conceptual framework rather than as practical guidelines. Nonetheless the framework was considered to be a potentially useful tool for decision-making. It was recommended that after a suitable period for review (until the end of August) the paper be made available to the interested public. Since the paper was understood as a contribution to the EMPRES/CR programme, the paper should be published jointly by Hannover and FAO.

Appendix 1

Agenda

EMPRES Economics Meeting, FAO-Rome, 28/06 – 30/06/00

Wednesday: 28/06/00

14:00h - 15:30h	Presentation of the Economic Guidelines (Prof. Waibel, Mr. Hardeweg, University of Hannover)
15:30h - 16:00h	Coffee break
16:00h - 17:00h	Presentation of the Economic Guidelines (cont.)

Thursday: 29/06/00

09:00h - 10:00h	Presentation of the Economic Guidelines (cont.)
10:00h - 10:30h	Discussion
10:30h - 11:00h	Coffee break
11:00h - 12:00h	EMPRES's objectives and the obstacles to economic assessment studies of DL control (Christian Pantenius)
12:00h - 13:30h	Lunch break
13:30h - 14:00h	Proposals and approach of University of Hannover to assist in economic assessment studies (Prof. Waible)
14:00h - 15:00h	Proposals and approach of University of Gotenburg to assist in economic assessment studies (Mr. Mohammed Belhaj)
15:00h - 15:30h	Coffee break
15:30h - 16:00h	Proposals and approach to assist in economic studies (Mr. David Vanzetti)
16:00h - 17:00h	Discussion

Friday: 30/06/00

09:00h - 10:30h	Brainstorming on how to address socio-economic questions in the scope of EMPRES during Phase II
10:30h - 11:00h	Coffee break
11:00h - 12:00h	Definition of recommended approaches of socio-economic approaches during Phase II
12:00h - 13:30h	Lunch break
13:30h - 15:00h	Definition of recommended approaches (cont..)
15:00h - 15:30h	Coffee break
15:30h - 16:30h	Definition of recommended approaches (cont..)
16:30h - 17:00h	Summary of recommendations

Appendix 2

List of Participants

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