ENVIRONMENTAL ASSESSMENT OF THE EGYPT
SCREWWORM CONTROL PROGRAM

United States Agency for International Development
Mission to Egypt
Cairo

May 1990
This Environmental Assessment for the USAID-purchase of vehicles and other equipment for contingency New World Screwworm prevention listed herein, excluding pesticides, was performed in Egypt from May 6 – May 21, 1990, by the collaborative efforts of USAID/Cairo, AID/ANE/TR, AID/OFDA, and the GOE. This is the first EA of USAID-sponsored anti-screwworm assistance outside of the Western Hemisphere, and is in response to the potential threat of screwworm introduction to Egypt from Libya. Therefore, this EA should serve as a model for subsequent and similar efforts that may be requested of AID in other screwworm-threatened countries.
# TABLE OF CONTENTS

<table>
<thead>
<tr>
<th>Section</th>
<th>Page</th>
</tr>
</thead>
<tbody>
<tr>
<td>i.  Preface</td>
<td>2</td>
</tr>
<tr>
<td>ii. Table of Contents</td>
<td>3</td>
</tr>
<tr>
<td>iii. List of Acronyms and Abbreviations</td>
<td>6</td>
</tr>
<tr>
<td>iv.  List of Tables</td>
<td>7</td>
</tr>
<tr>
<td>v.   List of Figures</td>
<td>7</td>
</tr>
<tr>
<td>1.0 Executive Summary</td>
<td>8</td>
</tr>
<tr>
<td>2.0 Scoping Procedure</td>
<td>9</td>
</tr>
<tr>
<td>2.1 Document Preparation</td>
<td>10</td>
</tr>
<tr>
<td>3.0 Purpose of Assessment</td>
<td>10</td>
</tr>
<tr>
<td>4.0 AID Environmental Procedures</td>
<td>16</td>
</tr>
<tr>
<td>5.0 Government of Egypt Environmental Legislation</td>
<td>16</td>
</tr>
<tr>
<td>6.0 The Screwworm and the Problem in Libya</td>
<td>18</td>
</tr>
<tr>
<td>7.0 Conditions in Egypt</td>
<td>19</td>
</tr>
<tr>
<td>7.1 Geography</td>
<td>19</td>
</tr>
<tr>
<td>7.2 Climate</td>
<td>22</td>
</tr>
<tr>
<td>7.3 Population</td>
<td>25</td>
</tr>
<tr>
<td>8.0 The Screwworm Threat to Egypt</td>
<td>28</td>
</tr>
<tr>
<td>8.1 Routes of Screwworm Entry into Egypt</td>
<td>28</td>
</tr>
<tr>
<td>8.2 Livestock</td>
<td>29</td>
</tr>
<tr>
<td>8.3 Humans</td>
<td>29</td>
</tr>
<tr>
<td>8.4 Wildlife</td>
<td>31</td>
</tr>
<tr>
<td>9.0 Infrastructure in Egypt</td>
<td>32</td>
</tr>
<tr>
<td>9.1 Survey</td>
<td>32</td>
</tr>
<tr>
<td>9.2 Control Practice, Pesticide Use, and Quarantine</td>
<td>34</td>
</tr>
<tr>
<td>9.3 Human Safety During Pesticide Application</td>
<td>37</td>
</tr>
</tbody>
</table>
9.4 Storage....................................................39
9.5 Disposal of Pesticides and Empty Containers.................41
10.0 Integrated Pest Management (IPM)..........................42
  10.1 Wind Oriented Trap (WOT)................................43
  10.2 Sentinel Sheep Pens..................................44
  10.3 Screwworm Adult Suppression System (SWASS).............45
  10.4 Ivermectin............................................46
11.0 International Mobilization..................................47
  11.1 Libya..................................................47
  11.2 Egypt................................................49
  11.3 Eradication Plan.....................................49
12.0 Training..................................................50
13.0 Recommendations...........................................51
14.0 Other Recommendations.....................................54
15.0 References...............................................59
16.0 Appendices...............................................63
  A. Persons Contacted
  B. Ministry of Agriculture Request for Screwworm Assistance from USAID
  C. Cable from AID/Cairo - Request for Assistance
  D. Initial Environmental Examination (IEE) and Environmental Assessment (EA) as Submitted by USAID/Cairo
  E. EPA Pesticide Fact Sheet - Coumaphos
  F. Screwworm Myiasis in Humans, A. T. Showler
  G. General Organization for Veterinary Services (GOE)
  H. Informational Pamphlet on Screwworm Control prepared by GOE
  I. Poster on Screwworm Threat prepared by GOE
  J. Screwworm Training Manual prepared by Food and Agriculture Organization, Rome
K. Insecticide Packet Labelling and Instructions for Wound Sampling (Arabic/French)

L. Dip Vat Management, Mobay Corporation, Animal Health

M. Outline of Screwworm Training Course. Natural History Museum, London
<table>
<thead>
<tr>
<th>Acronym</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>AChE</td>
<td>acetycholinesterase</td>
</tr>
<tr>
<td>ARS</td>
<td>Agricultural Research Service</td>
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<tr>
<td>C</td>
<td>centigrade</td>
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<tr>
<td>EA</td>
<td>Environmental Assessment</td>
</tr>
<tr>
<td>EEC</td>
<td>European Economic Community</td>
</tr>
<tr>
<td>FAO</td>
<td>Food and Agriculture Organization of the U.N.</td>
</tr>
<tr>
<td>g</td>
<td>grams</td>
</tr>
<tr>
<td>GOE</td>
<td>Government of Egypt</td>
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<tr>
<td>GOL</td>
<td>Government of Libya</td>
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<tr>
<td>kg</td>
<td>kilogram(s)</td>
</tr>
<tr>
<td>km</td>
<td>kilometer(s)</td>
</tr>
<tr>
<td>IAEA</td>
<td>International Atomic Energy Agency of the U.N.</td>
</tr>
<tr>
<td>IEE</td>
<td>Initial Environmental Evaluation</td>
</tr>
<tr>
<td>IFAD</td>
<td>International Fund for Agricultural Development</td>
</tr>
<tr>
<td>IPM</td>
<td>Integrated Pest Management</td>
</tr>
<tr>
<td>MEO</td>
<td>Mission Environmental Officer</td>
</tr>
<tr>
<td>MOA</td>
<td>Ministry of Agriculture and Land Reclamation</td>
</tr>
<tr>
<td>MOH</td>
<td>Ministry of Health</td>
</tr>
<tr>
<td>NARP</td>
<td>National Agricultural Research Project</td>
</tr>
<tr>
<td>NWS</td>
<td>New World Screwworm</td>
</tr>
<tr>
<td>ppm</td>
<td>parts per million</td>
</tr>
<tr>
<td>SIT</td>
<td>Sterile Insect Technique</td>
</tr>
<tr>
<td>SWASS</td>
<td>Screwworm Adult Suppression System</td>
</tr>
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<td>UNDP</td>
<td>United Nations Development Program</td>
</tr>
<tr>
<td>USAID</td>
<td>U.S. Agency for International Development</td>
</tr>
<tr>
<td>USDA</td>
<td>U.S. Department of Agriculture</td>
</tr>
<tr>
<td>USEPA</td>
<td>U.S. Environmental Protection Agency</td>
</tr>
</tbody>
</table>
**LIST OF TABLES**

Table 1  Temperature Ranges for Selected Cities and Towns in Egypt  
Table 2  Livestock Population Numbers in Egypt by Governorate  
Table 3  Ingredients for the NWS Attractant Swormlure  
Table 4  Ingredients to make Screwworm Adult Suppression System (SWASS) Pellets

**LIST OF FIGURES**

Figure 1  Map showing Zones A, B, C, D, of the Screwworm Control Program  
Figure 2  Map showing location of Protected Areas  
Figure 3  Map of Major Land Features  
Figure 4  Major Cities and Towns, and Geographical Regions  
Figure 5  Map of Rainfall Gradients  
Figure 6  Map of Egypt showing Boundaries of Governorates  
Figure 7  Map of Nomadic Livestock Routes  
Figure 8  Map of Quarantine and Inspection Stations  
Figure 9  Map of NWS Distribution and Quarantine Stations in Libya
1.0 EXECUTIVE SUMMARY

The introduction of the New World Screwworm (NWS) into Libya poses a serious threat to the livestock industries of Africa and Southern Europe. The NWS is considered the most economically important insect pest of livestock in the Western Hemisphere. If the screwworm is not eradicated from Libya and spreads beyond its present range in Libya, the chances of its eradication will become increasingly remote. There is an additional and very serious threat to the game herds of Sub-Saharan Africa and to human health.

The Food and Agriculture Organization (FAO) has provided emergency assistance to Libya and the countries immediately at risk. The insecticide provided by FAO was coumaphos which is applied in premeasured amounts to NWS-susceptible animal wounds. This Environmental Assessment (EA) is in response to a request from the Government of Egypt (GOE) for additional equipment and supplies to support their screwworm early detection and control efforts using coumaphos. Although no pesticide is being provided by USAID, the request includes funds for livestock spray units and portable dipping vats. This is the first EA of USAID-sponsored anti-screwworm assistance outside the Western Hemisphere.

Although the spraying and dipping of animals is not new to Egypt, it does represent a departure from the relatively safe treatment of animal wounds. Coumaphos, when applied as directed, is registered for use against screwworms. Technical coumaphos, however, is moderately to very highly toxic to birds, fish and aquatic invertebrates. For that reason, the EA addresses the issues of how and where the pesticide will be used (especially in the
Western Desert of Egypt), the level of training the field staffs have received in pesticide application and disposal, the "banking" or partial shipment of pesticides as needed, and the overall impact on the environment. Recommendations concerning this request are outlined in Section 13.0, followed by 19 other recommendations which will improve the overall operation and management of the Egyptian screwworm control program.

2.0 SCOPING PROCEDURES

AID Environmental Procedures (22 CFR 216.3(a)(4)) describe the scoping procedure to be used in identifying the major issues to be addressed in an Environmental Assessment (EA). Critical elements include: (1) determining the breadth and significance of issues to be analyzed as they relate to the proposed action, (2) identifying the issues that are not significant, (3) format, (4) decision-making schedule, and (6) description of how the analysis was conducted and who will participate (representatives of host governments, public and private institutions, and staff and contractors). Due to the critical need for the document, the Scoping process was reduced to verbal processes in AID/Cairo, the Egyptian Ministry of Agriculture, and Egyptian veterinarians and other personnel in the field (Appendix A).
2.1 DOCUMENT PREPARATION

Analysis and document preparation was performed by:

Mr. F. Ken Lyvers, USAID/Cairo, AGR. Program Officer
Mr. Nasr M. Rohaiem, USAID/Cairo, AGR. Program Specialist
Mr. Ken LuePhang, USAID/Cairo, AGR. Environ. Officer
Dr. Allan Showler, AID/OFDA, Entomologist
Dr. Richard Peterson, AID/ANE/TR, Entomologist

Drs. Peterson and Showler travelled to Egypt 6-21 May 1990. They reviewed USAID/Cairo's Initial Environmental Evaluation (IEE) drafted April 8, 1990 (with 10 appendices) and proceeded to formulate an EA based upon preliminary findings within the IEE. On May 7, Peterson and Showler met with Ali A. M. Moussa, Chairman, General Organization for Veterinary Serves, MOA, and determined to travel with Abdel Kareem, MOA, to Marsa Matruh, Sidi Barrani, and Sallum, all in Zone A, the triangular area in northwest Egypt at greatest risk of screwworm introduction (Figure 1). See Section 8.1 for a description of each Zone. We discussed the current contingency operations for preventing the introduction of the New World Screwworm (NWS) from Libya to Egypt with Veterinary Specialists in the above towns, as well as pesticide safety, storage, calibration, and disposal.

This EA was compiled in USAID/Cairo, and presented, in draft form, to USAID/Cairo's Agricultural Program Officer, Environmental Officer, and Program Specialist on May 20, 1990.

3.0 PURPOSE OF ASSESSMENT

The Government of Egypt (GOE), through its Ministry of
FIGURE 1. MAP SHOWING ZONES A, B, C, and D OF THE EGYPT SCREWWORM CONTROL PROGRAM.
Agriculture and Land Reclamation (MOA), has established a screwworm eradication unit. The unit is operated by the Office of Livestock and Veterinary Services with partial funding by UNDP/FAO. It is presently working in the Libyan border area (Zone A) to detect and eradicate the screwworm to prevent its spread into Egypt, the rest of Africa, and the Middle East. The situation has been described by the GOE as a "creeping disaster". If not checked early, "there is no technical means of stopping the parasite from creating destruction in Egypt," as stated by the UNDP/FAO consultant that was in Egypt to make recommendations for the Egypt control program (Appendix B).

The GOE urgently needs some $1.5 million worth of equipment, including trucks, sprayers, cattle/sheep dipping tanks, pesticides, and training for two or more veterinary technicians at the joint Mexico-American rearing facility outside of Tuxtla Gutierrez, Mexico. The UNDP/FAO budget of $250,000 and current MOA resources are inadequate to field the type of control program needed. USAID has been officially requested by the MOA to provide survey and control, transportation, pesticide application equipment, and training to effectively combat this extremely dangerous threat to Egypt's economy and ecology. USAID/Cairo has in place the National Agricultural Research Project (NARP) which could support this emergency situation through its New Initiatives Component. Therefore, USAID is in a position to provide at least partial funding and it is planned that the European Economic Community (EEC) and other donors can provide additional funding. Our present estimate, as per cable Cairo 01570 of January 23, 1990 (Appendix C),
indicates a sum of $801,000 from the EEC for the pesticides. USAID's estimate for the procurement of the transportation, application equipment, and training/technical assistance, is $638,500.

The IEE (Appendix D) determination indicates a need for an EA. However, the field reports supplied by the UNDP/FAO consultants and staff clearly identify the factors involved and their relative impacts in this potentially disastrous problem. The host country decision makers have decided, based on information from consultants (UNDP/FAO, EPA, EEC) as well as their own staff, that the pesticide of choice is coumaphos.

The purpose of the EA is to engenders full discussion of the significant environmental effects of choosing coumaphos. The discussions and available reports set forth the alternatives which would avoid or minimize adverse effects. The expected benefits of development objectives can be weighed against any adverse impact upon the human environment or any irreversible or irretrievable commitment of resources.

As required by S216.3 (a)(4)(u)(a-d), Procedures, Scope of Environmental Assessment or Impact Statement, the USAID Project Officer's appended IEE contains references of previous competent work that determines an EA is required following the procedures set forth in S216.3(b). From these documents, the Project Officer has determined, and the Mission Environmental Officer (MEO) concurs, that UNDP/FAO has identified the significant issues relating to the proposed application of coumaphos to control the screwworm based on work begun in May 1989. The UNDP/FAO have also determined the scope
of the issues to be addressed, both by the GOE, as well as by the donor community. Participants of this process, have addressed the environmental aspects of the proposed action as set forth in the scoping process requirement of S216.3(a)(4)(i). These participants included USAID, USDA, UNDP/FAO, EEC, as well as the concerned academic, scientific and governmental organizations of Egypt.

In answer to S216.3(a)(4)(i)(a-d), the appended IEE covers in part those requirements, and the reference attachments cover the remainder. This documentation describes the scope and significance of issues to be analyzed including direct and indirect effects of the project on the environment. Substantive and detailed work covering nearly all aspects of the proposed pesticide, coumaphos, is covered in summary U.S. Environmental Protection Agency (USEPA) publication (Appendix E). As pointed out in the IEE, the decision has already been reached after thorough assessment of environmental factors. After the above documentation, and the additional documentation generated after a conference call on April 3, 1990 with Jim Gallup of ANE/PD/ENV, Richard Peterson of ANE/TR and Walter Knausenberger of AFR/TR/ANR/NR, we do not believe that further analysis is required. There is evidence of substantial screwworm presence in Libya and of its imminent movement into Egypt. Delay in implementation of this program could jeopardize a substantial portion of the previous efforts in livestock development in Egypt.

The pesticide manufacturer has provided the information required by 22 CFR 216.3(b)(2)(iii) to the GOE. There is additional guidance in detail on the full range of coumaphos applications in
USEPA documents (See REFERENCES, Section 15.0). Further, the USDA/PASA representative will provide technical assistance throughout the period of implementation of the Screwworm Control Program to monitor the use and effectiveness of coumaphos. In addition to his regular duties, he will ensure that the manufacturers of the pesticides package the coumaphos according to the required specifications and, at least quarterly, monitor the effectiveness of the program. USDA has extensive experience in screwworm eradication using coumaphos in the U.S. and especially in the southwestern U.S. which have ecological profiles similar to the target area in Egypt.

As the program progresses, the Mission may request technical assistance from AID/Washington to assist in the program's implementation. This will become more evident as Egypt will have to turn to a long range plan for control and perhaps eradication, using the Sterile Insect Technique (SIT), if Egypt is infested and it is still feasible to use such an option. At AID/Washington's suggestion during the April 3rd conference call referred to above, USAID/Cairo discussed with the EEC the possibility of a pesticide bank when EEC purchases the coumaphos for this program. USAID/Cairo was informed that a bank for the pesticides, as was used in the Locust Control Program, might not be appropriate in this situation. However, they are considering a twice a year procurement with four deliveries of pesticides, and a condition with each purchase that the contract could be terminated if the pesticide is no longer needed.
4.0 AID ENVIRONMENTAL PROCEDURES

It is AID policy to ensure that environmental consequences of AID-financed activities are identified and contemplated by AID and host governments prior to final decisions regarding the procurement of project commodities and program implementation. The environmental consequences identified in an EA will be used to design environmental safeguards for the adverse environmental effects that may result from AID-sponsored assistance. This document indicates how the proposed AID/Cairo purchased commodities will relate to the use of anti-screwworm pesticides, and how the proposed AID assistance will be modified to mitigate determinable effects on the environment while still maintaining an effective contingency effort to prevent the introduction of NWS from Libya to Egypt. This policy is embodied in Title 22 of the Code of Federal Regulation, Part 216, AID Environmental Procedures (22 CFR 216).

5.0 GOVERNMENT OF EGYPT ENVIRONMENTAL LEGISLATION

Environmental legislation in Egypt is not as comprehensive as that in the U.S. An English summary of the legislation was not available and translation from Arabic was not feasible within the time frame. The law does, however, prohibit the use of pesticides in the country's protected areas (Figure 2) and restricts dumping of unused pesticide and rinsate into waterways. There are no restrictions on the use of coumaphos for the control of livestock pests.
FIGURE 2. MAP SHOWING LOCATION OF PROTECTED AREAS IN EGYPT.

1. Ras Mohammed
2. St. Catherine
3. Bardawil and Zaranik
4. El Da
5. Owayed
6. Wadi El-Kayan
7. Lake Quaron
8. Saluga, Ghazal Nile islands
9. El-Arish- Rafah Coastal line
10. Wadi El- Assuity.
11. Ashtoun El-Gamil, Tanees island.
6.0 THE SCREWWORM AND THE PROBLEM IN LIBYA

An IFAD Mission to Libya from May 21-26, 1989 confirmed the presence of the New World Screwworm (NWS) in an area 100 km west and 70 km east of Tripoli (along the Mediterranean coast) and 80 km inland. The NWS, Cochliomyia hominivorax (Coquerel) is the most economically important insect pest of livestock in the Western Hemisphere. The damage is caused by myiasis, the feeding on living tissues of all warm blooded animals by the NWS maggot. The NWS eggs are laid on the edges of a wide variety of animal wounds, including those caused by castration, dehorning, tick and bat bites, and on umbilical cords of newborns. The eggs hatch and the young maggots begin feeding on the open flesh. After 4-8 days, the larvae, which are now full grown, leave the wound and drop to the ground, burrow, and pupate. During the pupal stage the larvae develop into adult flies which emerge from the pupa in 5-7 days. Adults begin to feed and develop sexually, which is followed by mating and egg laying on an animal wound. Adults have the capacity to fly long distances in the search of food, mates, or hosts. A complete NWS life cycle takes about 24 days.

The recent introduction of the New World Screwworm (NWS) into Libya poses a serious threat to the livestock industries of Africa, southern Europe, and to wildlife south of the Sahel. Suitable climate, vegetation and an abundance of hosts assure that, unless eradicated while still confined to Libya, the NWS will spread to surrounding countries. Costs of control and losses to livestock owners area wide will be extensive and may exceed US$ 1000 million
per year. Humans will also suffer (Appendix F) as many people in Africa are far removed from adequate medical facilities.

Based on a per head treatment cost of US$ 4 ($3 for labor, $1 for insecticide) per head, Libya, with its 7 million head of livestock, faces costs exceeding US$ 28 million per year. Additional loss will occur through reduced weight gain and productivity. The annual quantity of insecticide required for screwworm control in Libya is estimated at 3-4 metric tons. Clearly, the long range costs of not eradicating the NWS are significant and would be a continual drain on any infested country's resources.

7.0 CONDITIONS IN EGYPT

7.1 Geography

Egypt lies in the desert belt of northeast Africa with the Nile flowing from south to north. Cairo is 630 km from the Libyan border. The country encompasses 100,248 square km with the population occupying 3.5% of the land. The major land features are shown in Figure 3. The four main regions of Egypt are 1) the Nile Valley, Delta, and Fayoum Depression, 2) the Western Desert, 3) the Eastern Desert and 4) the Sinai Peninsula (Figure 4).

Nile Valley, Delta and Fayoum Depression - The valley is 1,540 km long varying in width from 2-25 km. The cultivated areas, around 6 million square km, is made fertile and irrigated by the Nile River.

The Western Desert - This area stretches from the Nile River to the Libyan border and from the Mediterranean to the Sudan border. The area is over 40% sand dunes with several depressions including
FIGURE 4. MAJOR CITIES AND TOWNS, AND GEOGRAPHICAL REGIONS OF EGYPT.
the Quattara which is 133 m below sea level. The oases in the region include Siwa, Kharga, Dakhla, Rayon and El Natroun. Most of the oases are inhabited.

The Eastern Desert - This region stretches from the Nile River east to the Gulf of Suez and the Red Sea. The area is also referred to as the Arabian Desert.

The Sinai Peninsula - The Sinai is separated from Egypt by the Suez Canal and the Gulf of Suez. The Northern Sinai includes the coastal zone and an interior sand dune zone. The Middle Sinai is a stony and barren zone 400 m above sea level. The region of the South Sinai is a mountainous region of rocks and mountain peaks including Egypt's highest, Mt. St. Catherine at 2,642 m above sea level.

7.2 Climate

The climate of Egypt is particularly diverse. There are two main seasons: summer and winter. The temperature, which rarely approaches freezing, permits plant cultivation throughout the year. Temperature differences of 15 degrees C from day to night are not uncommon in Upper (i.e., southern) Egypt. Summer temperatures average between 27 and 32 degrees C in most of Egypt. Southern Egypt is especially hot, being far from the cooling winds of the Mediterranean Sea. (Table 1).

The Mediterranean coast of Egypt receives an average of 20 cm of rain a year while Cairo receives 2.5 cm (Figure 5). Northerly and northwesterly winds predominate throughout the year.
TABLE 1. TEMPERATURE RANGES FOR SELECTED CITIES AND TOWNS IN EGYPT.

| Area            | Winter (Nov. - Apr.) | | Summer (May - Oct.) | | |
|-----------------|----------------------|----------------|---------------------|----------------|
|                 | Max. | Min. | Max. | Min. | | |
| Port Said       | 20.6 | 14.2 | 28.7 | 22.8 | | |
| Ismailla        | 23.0 | 11.0 | 34.1 | 20.1 | | |
| Suez            | 23.9 | 11.5 | 34.2 | 20.5 | | |
| Cairo           | 22.9 | 11.2 | 32.7 | 19.7 | | |
| Luxor           | 27.8 | 9.8  | 35.2 | 19.7 | | |
| Hurghada        | 23.1 | 12.6 | 30.9 | 22.8 | | |
| Matruh          | 20.5 | 10.2 | 26.0 | 18.4 | | |
| Minia           | 24.2 | 9.7  | 34.4 | 19.6 | | |
| Siwa            | 24.0 | 7.3  | 35.9 | 18.1 | | |
| Qena            | 28.0 | 10.8 | 39.1 | 22.2 | | |
| Assiut          | 26.5 | 9.7  | 35.1 | 21.2 | | |
| Wahat El Baharia| 26.5 | 9.7  | 35.0 | 21.2 | | |
| Wahat El Kharga | 26.7 | 10.1 | 44.4 | 21.7 | | |
| Alexandria      | 21.2 | 11.6 | 28.6 | 20.3 | | |

SOURCE: Office of Meteorology.
7.3 Population

Of the country's 44.6 million inhabitants (1982 estimate), 99% live along the banks of the Nile River and in the Delta Region. The country is divided into 26 Governorates, their size generally reflecting population density (Figure 6). Population density is as high as 1,260 persons per square kilometer in urban centers. The remaining 1% of the population consists of Bedouin, Nubian and the Hamitic Beja groups.

The Nubians are located from Aswan south to the Sudan border. The Hamitic Beja occupy the southern portion of the Eastern Desert. The northern part of the Eastern Desert is occupied by Arabian Bedouin groups.

Of particular interest to the screwworm program are the groups that occupy the Western Desert. This area is occupied by the Saadi and Murabitan Bedouin clans. The most numerous of these are the Awlad Ali of the Saadi clan. The Bedouin are nomadic, semi-nomadic or sedentary nomadic. They are of Arab and Berber stock and were originally herdsmen and tent dwellers. Although now most are either semi-nomadic or totally sedentary their groups may disperse widely. Sheep are their primary livestock with some camels and donkeys as beasts of burden. The groups follow the greening of the vegetation and camp for periods of time near known water sources. Access to water is gained by either digging a simple hole by hand or by utilizing tube or 'Roman' wells that exist in the area. The nomadic peoples periodic movements back and forth across the uncontrolled Egyptian-Libyan border represents a potential route of screwworm introduction into Egypt (Figure 7).
FIGURE 6. MAP OF EGYPT SHOWING BOUNDARIES OF GOVERNORATES.

URBAN GOVERNORATES
1. Cairo
2. Alexandria
3. Port Said
4. Suez

LOWE EGYPT
5. Ismailia
6. Beheira
7. Damietta
8. Kafr El Sheikh
9. Gharbia
10. Dakahlia
11. Sharkia
12. Menoufia
13. Shebin El-Kom
14. Qalyubia

UPPER EGYPT
14. Giza
15. Fayoum
16. Beni Suef
17. Monufia
18. Assuit
19. Bahagh
20. Qena
21. Assuan

FRONTIER GOVERNORATES
22. Red Sea
23. New Valley
24. Marsa Matrouh
25. North Sinai
26. South Sinai

CAPITAL OF GOVERNORATE

▲ Capital of Governorate
FIGURE 7. MAP OF NOMADIC LIVESTOCK ROUTES IN EGYPT.
8.0 THE SCREWWORM THREAT TO EGYPT

At present, there are about 15 species of myiasis-causing flies in Egypt, most in the genera Chrysomya, Calliphora, Lucilia, Musca, Sarcophaga, Phaenicia, and Tabanus. Myiasis is a rare occurrence in Egypt and only 14 cases have been reported in the last 10 months. The NWS, however, is likely to far exceed the damage produced by the above genera collectively, in terms of the number of animals and humans infected. The severity of the injury incurred per animal due to a lack of natural enemies, a largely favorable habitat in the oases, wadis, and the Nile Valley would be enormous.

8.1 Routes of Screwworm Entry into Egypt

Because the NWS is currently restricted to the immediate vicinity of Tripoli, the most likely point of entry into Egypt is through its northwestern border with Libya, near the town of Sallum. The border there is guarded by a police patrol and animals brought into Egypt are inspected. Vehicles arriving from Libya are inspected, and all animals with wounds are reportedly treated with coumaphos (powder) or diazinon (spray) at the border station in Sallum. In addition, Egypt has curtailed livestock imports from all NWS-infected countries, including Libya.

The border further south of Sallum, in the Western Desert, is largely uncontrolled, and nomadic movement across it occurs frequently. It was indicated by the MOA that smuggling is also not unusual across the Egypt/Libya border. Because Tripoli is far from Egypt, and the area between is largely xeric desert, there is a natural barrier of sorts. Nevertheless, aside from the main
east-west highway along the Mediterranean coast, there are unmarked tracks that may provide access to and from Libya.

Based on FAO recommendations, Egypt has been divided into 4 operational zones based on level of risk of NWS introduction. Zone A (highest priority) encompasses the triangular area from Marsa Matruh west to the Libyan border, south to Siwa and northeast to Marsa Matruh. Operational Zone B covers the remainder of Marsa Matruh Governorate. Zone C covers the remainder of the territory west of the Nile River. Finally, and given the lowest priority, Zone D encompasses the remainder of the country (Figure 1).

8.2 Livestock

Most of Egypt's 13 million head of livestock consists of sheep, goats, equines, camels, buffalo, and cattle (Table 2). Much of the livestock at immediate risk is herded by nomads who move in patterns dictated by green vegetation (Figure 7).

A screwworm invasion of Egypt would probably result in catastrophic consequences to livestock and those who depend upon it. There are approximately 12 million head of livestock in Egypt (1.5 million in Zone A alone, mostly sheep and goats). About 13% of Egypt's national economy is supported by animal production.

8.3 Humans

In view of the relatively large number of NWS myiasis cases among humans in the Tripoli area (30 officially identified and up to 300 unofficially identified in 1988 alone), the population of Egypt would be as vulnerable given the urban poverty, the cohabitation of
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</table>
humans with animals among the farmer and nomad populations, and a strained Ministry of Public Health (MOH). The MOH has been notified by the MOA regarding the NWS threat, but future awareness within the MOH should be encouraged. Human myiasis, its diagnosis and remedy are discussed in Appendix F.

8.4 Wildlife

Wildlife in Egypt, especially larger mammals, is sparse, unregulated, and exists mainly in the remote and inaccessible desert areas. As a result of human intervention in oases and riverine habitats, wildlife is already threatened, and some endangered species would likely be exterminated if the NWS were to be introduced into Egypt. A total of 74 mammals have been recorded from Egypt. The larger mammals most likely affected by the NWS include Canis lupaster (jackal), Vulpes vulpes *egyptica* (fox), Hyaena hyaena (hyaena), *Felis lybicus* (lynx), and the gazelles *Gazella africanus* and *G. leptocerus*.

Because the Western border of Egypt is only sporadically controlled, except perhaps at Sallum, NWS infected wildlife movement could occur without restriction into Egypt from Libya. The threat of this possibility at present is unlikely because of the distance from Tripoli, but should the NWS spread beyond its current range to Benghazi, the chances of NWS introduction to Egypt on wildlife will increase. Still another threat to wildlife in Western Egypt exists; the Egyptian military border patrols have been instructed to shoot wildlife on sight, and to set strychnine bait at night.

The contingency measures for preventing the NWS from entering
Egypt involve the use of diazinon and coumaphos, the treatments are applied only to the target animal by way of dipping, directed sprays on the animal, or application of coumaphos powder to wounds. Therefore, pesticide use in this manner presents little or no risk to non-target organisms and the environment except where dipping vat and spray tank rinsates, and empty pesticide containers are improperly disposed (Section 9.5).

9.0 INFRASTRUCTURE IN EGYPT

For discussion of the MOA, especially the Veterinary Branch, see Appendix G.

9.1 Survey

Survey is generally conducted in three ways in Egypt; inspection stations, mobile veterinary inspection teams, and reports of myiases obtained from those herders and farmers who have observed myiases among their animals. It has been previously reported that the Egyptian military monitors animals for myiasis, the border patrols have mainly been instructed to shoot and poison wildlife that traverse the Egypt/Libya border. It is unlikely that the military patrols are knowledgeable in screwworm identification, as indicated by their lack of awareness at the Sallum Border Station.

The Veterinary Stations (1,300 total) in most Egyptian towns are the mainstay of survey. Animals are reportedly checked when brought to the veterinary clinics. Each veterinary clinic has at least one veterinarian and one or two assistants. Most or all of the clinics have been provided with NWS information booklets and posters in Arabic produced by the MOA (Appendix H, I). The FAO is in the
process of producing and distributing similar materials.

Some of the veterinary clinics observed in Zone A have a light pickup truck for mobile survey. FAO provided an additional two heavy duty pick-up trucks. The areas that need to be surveyed, however, are quite large, rugged, and isolated. Pickup trucks should be 4X4, and heavy duty. The mobile units usually are composed of one veterinarian and one driver, with a veterinarian or an assistant to run the clinic while the mobile team is in the field. The mobile units are supposed to check all herds once each 14 days, but this is most improbable given the limited logistic capacity of each clinic. The task is challenging, given the slow pace of work in the Egyptian countryside. The MOA and the clinics that were visited were all in agreement that mobile "caravans" are needed for long-range reconnaissance that would require at least 3-4 days in the desert at a time. The recommendations for the AID purchase of 5 3/4 ton - 4X4 pickup trucks, 20 1/2 ton pickup trucks, 3 truck houses, and 300 liter containers, as modified in the recommendations listed in Section 13.0 of this EA, are therefore acceptable.

While the Bedouin cooperatives have been notified about the possibility of NWS in Egypt, they have not received the FAO posters or booklets. The cooperatives are supposed to report myiasis to the local veterinary clinics, but given their wide-ranging habits; and general illiteracy, it is very unlikely that most Bedouin groups have been well informed. Increased efforts to strengthen the education of Bedouin on NWS should be a priority.

USAID should suggest that the MOA negotiate the use of a light Egyptian military helicopter (e.g., alouette and pilot) for rapid border surveillance in remote regions, and especially to monitor the
movement of game animals. An MOA veterinarian or entomologist should accompany the pilot to conduct inspections and to provide information to the nomads.

9.2 Control Practices, Pesticide Use, and Quarantine

Screwworm control is based on reducing the number of wounds on potential hosts and in minimizing wound attractiveness to screwworm infestation. The inspection and treatment of livestock will insure a reduction of susceptible wounds. Successful implementation rests on informing livestock owners of proper surveillance and control procedures and to actively encourage their participation. Control procedures and practices have been summarized by FAO in their, "Manual for the Control of the Screwworm Fly, Cochliomyia hominivorax Coquerel" (Appendix J).

According to FAO guidelines the following activities are reportedly on-going in Zone A: 1) mobile patrols inspect, treat wounds and spray all animals, 2) all livestock moved by vehicles are inspected and treated, 3) all livestock owners receive treatment sampling kits, 4) veterinary assistants are present at all markets to individually inspect animals, 5) veterinary inspectors inspect animals at oases and watering points, 6) informational/extension campaign, 7) samples are identified, 8) veterinary service notified of inspection being done, 9) slaughterhouse alert, and 10) liaison medical personnel.

The quarantine and inspection procedures observed at Sallum were less than satisfactory. The police at the first check point in Egypt who inspect vehicles coming in from Libya had only limited
information on the screwworm and of the measures necessary to prevent its introduction. The MOA screwworm poster and pamphlet were not visible at either the border or at the veterinary office at Sallum. Greater public relations efforts in the Sallum area with an intensified education program, especially for the police and military at the border is strongly encouraged. Posters should be posted on buildings (police, military, immigration and quarantine check points and veterinary clinics) at the border. Pamphlets should be freely distributed to schools, government offices, and to livestock producers including the nomadic herders.

Currently, the veterinary field offices and quarantine stations use diazinon (Neocidol 60EC, Ciba-Geigy) supplied in 1 liter cans for general ectoparasite control, and coumaphos (Asuntol 5% WP, Bayer) supplied by FAO in 5 g packets for wound treatment. The insecticide packet is part of a kit, stored in a ziplock polyethylene bag (10 x 16 cm), which includes an instruction sheet (Arabic/French) and a tube with methanol for preserving larval samples (Appendix K). Through mid-April 1990, 3,400 kits have been supplied to the Matruh area. No forceps for removing larvae from the wounds are provided with the sampling kit. If these kits are distributed to nomadic herders and others, an inexpensive forceps (packaged with the kit) would greatly facilitate removal of larvae from small wounds.

Larval samples from the field arrive in Cairo within 48 hours. If the field veterinarian suspects the sample to be NWS, he telephones ahead to Cairo. Identification takes place at a diagnostic laboratory, a part of the Parasitology Department, Faculty of Veterinary Medicine, Cairo University.
The pesticide coumaphos [chemical name: o,o-diethyl 0-(3-chloro-4 methyl-2-oxo-2H-1-benzopyran-7-yl) phosphorothioate] proposed for use in this project is an organophosphate registered for a variety of ectoparasites including screwworms (Appendix E). It is sold under various trade names including, 1) Asuntol, 2) Co-Ral, 3) Muscatox, 4) Meldane, 5) Negashunt, and others. Coumaphos is applied as a direct animal treatment for control of screwworm, face flies, horn flies, other fly larvae, cattle grubs, ticks, lice, mites, sheep keds and fleeceworms. Based on the results of acceptable laboratory data, technical coumaphos is characterized as highly to very highly toxic to birds, moderately toxic to fish and highly toxic to aquatic invertebrates. Restricted-use classification is required for coumaphos 11.6% EC and 42% flowable concentrate formulation. Labels bearing directions for use on sheep and goats must be amended to specify a preslaughter interval (PSI) of 3 days.

Each of the veterinary field units visited had 1-3 sprayers varying in capacity from 100-600 liters. Usually the newest sprayer was not being used, presumably being saved for an emergency. Spraying duties (under veterinary supervision) are the responsibility of the various assistants at each station. Actual spraying of animals was not observed at any station. We were told that the Bedouin and others are anxious to have their herds sprayed. When a sheik comes to the veterinary office, an appointment is set for inspection and spraying. On the appointed day the veterinary crew goes out to where the sheik has assembled those animals to be sprayed.

The spraying routine is haphazard and no field station was able to provide a list of herders' names and numbers of animals treated.
There is no system in place where an area is divided into manageable units and then visited on a regular basis.

The use of spray rigs and portable dipping vats as proposed under this project represents a departure from the simple treatment of individual wounds. Although the spraying and dipping of animals is not new to Egypt, the MOA will have to intensify its efforts through a training course to insure the safe handling, application, and disposal of insecticide. A through knowledge of dip vat operation and management is essential to minimize detrimental impact on the environment (Appendix L).

The MOA has airport quarantine stations at Cairo and Tenth of Ramadan. Sea port quarantine is conducted at Alexandria (3 stations), Suez, Nowebe, and Safage. Inland quarantine and inspection stations are at Cairo (2 stations), Oujah, Esna, Darwa, Aswan, and Sallum (Figure 8). Recent reintroductions of the screwworm into the U.S. were in part because of lax airport quarantine inspection. It is strongly encouraged that in addition to livestock on the hoof, quarantine stations (sea, land and air) be especially diligent in the inspection of pets (dogs, cats, others) as well as individual sheep or goats destined as gifts.

9.3 Human Safety During Pesticide Application

It has been reported by the MOA that the veterinarians and their assistants are equipped with rubber gloves, boots, coveralls, and respirators for spray applications of Diazinon, and that these are worn during the treatment process. The coumphos packets provided by FAO have warning and remedy labels in Arabic (Appendix K). Atropine
FIGURE 8. MAP OF QUARANTINE AND INSPECTION STATIONS IN EGYPT.
is available to the veterinarians as an antidote for organophosphate pesticide intoxication. The MOH and MOA should be encouraged to be in close collaboration so that the MOA personnel are instructed on pesticide poisoning treatment. MOH personnel should periodically accompany the survey teams to inform the Bedouin on safe use of the coumaphos packets. While USAID is not providing pesticide, the contribution of spray equipment and dipping vats involve the direct use of pesticides. USAID should suggest that FAO provide additional safety clothing, atropine, and first aid kits to the MOA for distribution to Bedouin and the Government veterinary clinics.

The MOA indicated that the AChE tests are done routinely on pesticides handlers, nevertheless, USAID/Cairo should attempt to ascertain the validity of such claims. If AChE tests are not provided, USAID/Cairo should recommend that FAO provide AChE test kits with instructions to the MOA to initiate a test program in affiliation with FAO's donation of organophosphorus pesticides.

After the animals are sprayed or dipped, they are allegedly marked by a small brand near the mouth, and they are not slaughtered until at least one week after treatment. USAID, along with its contribution of sprayers, should provide a warning pamphlet in Arabic to emphasize the need for a post-treatment safety interval.

9.4 Storage

Visits to 3 veterinary field offices in Zone A (Marsa Matruh, Sidi Barrani, and Sallum) revealed a wide range of pesticide storage practices. General observations include the following:

1. Most storage facilities appeared to be adequately ventilated.
2. Different pesticides and other veterinary supplies were stored in separate areas of the same room.
3. Labels were generally visible and readable.
4. Limited protective gear (gloves) were available but in short supply.
5. Storage facility entrances were secured by padlock.
6. Most facilities were separated from office and living quarters.
7. No warning signs were posted at the storage facility entrance.
8. Inventory records of pesticide stocks were nonexistent.

It appeared that the veterinary field staff involved have had only cursory training in pesticide storage. Given the current state of the storage facilities, the facilities should be upgraded and improved before new stocks arrive. Simple storage safety measures, such as keeping accurate stock records, posting warning signs, and preventing cohabitation in the facility should be required and monitored for all pesticides used.

The central storage facility for livestock pesticides is in Cairo on the grounds of a research complex, part of the Faculty of Veterinary Medicine at Abbasia. The brick building is roofed, open window ventilated, locked when not in use, and inventory records are kept. The diazinon currently used for ectoparasite control is stored in well labelled boxes on pallets or on shelves. The storage facility is not posted with warning signs and the GOE is strongly encouraged to do so. In another room of the facility is stored the separate components for the sample treatment kit. The tubes,
stoppers, methanol, instruction sheets, and packets of coumaphos are packaged by hand. The methanol tubes are filled by a hand operated pipette. The kits are then boxed and shipped to the field stations.

The veterinary staff felt there was adequate space to handle the influx of 1.5 million sample treatment kits and the 24,000 liters of coumaphos as requested for the program (Appendix C). Since the NWS is not in Egypt it would be prudent to bank the pesticide in Europe or arrange for periodic partial shipments as the needs of the program dictate.

9.5 Disposal of Pesticides and Empty Containers

The MOA and the veterinary clinics visited in Zone A are not aware of how to properly dispose of the rinsate from dipping vats and spray tanks, empty packets, or plastic and metal pesticide containers. The veterinary clinics burn the paper and plastic packets of pesticides, and pour gasoline into barrels, and set them alight. The barrels are then placed in insecure areas where pilferage by the local populace can occur. The danger, of course, is that the drums will be used for the storage of consumable items.

USAID/Cairo should urge the EEC or the manufacturer to provide instructions on how to safely dispose of empty pesticide containers. Until a better method is devised, barrels should be rinsed (with water or petrol, according to the solubility of the pesticide) punctured at least six times, flattened, and buried in a pit (at least 3 meters deep, with a layer of lime at the bottom), secured with a fence and posted with "toxic waste" signs in Arabic.
Paper and plastic containers can be buried with the barrels. The pit should be located outside of urban areas, and the water table should be low.

Similarly, sumps should be excavated in an area where the water table is low. The sump should be at least 10 meters deep, and filled with alternating layers of soil and lime, and fenced securely. Each veterinary clinic that engages in dipping and spraying should have one such sump. The area of the sump should be large enough to accommodate a dipping vat, and the area where the animals emerge from the vat. Spray tank residue and rinsate can be poured in the same sump. After each dipping or spraying operation, the soil surface should be sprinkled with lime, which is readily available in Egypt.

When spray tanks are taken to the desert for treatment of Bedouin livestock, the rinsate should be poured in an area clearly away from wells and sources of water (i.e., areas with a low water table), and the soil surface treated with lime.

The technical assistance of a hydrogeologist would be highly desirable to locate appropriate empty container burial sites and sump sites, and to show the spray operators who work in the field how to identify areas where ground water is least likely to be contaminated by rinsate.

10.0 INTEGRATED PEST MANAGEMENT

Integrated pest management (IPM) is the judicious use of a combination of control methods and may include chemical, biological, mechanical and cultural control practices. The key to successful
IPM is monitoring and surveillance of the insect pest and then the application of the least intrusive control methods that will minimize detrimental effects on humans and the environment.

Screwworm eradication is dependent on the use of sterile insect technology (SIT), which does not rely on insecticides, and the insecticidal treatment of animals and their wounds. Screwworm control is based on early detection, wound treatment, and when appropriate, whole herd insecticidal treatment.

Cultural practices can also be altered to reduce the risk of infestation by the timing of shearing, dehorning, castration, and branding operations so as not to coincide with the peak screwworm populations. There are several other surveillance and control strategies which could also be considered as a part of an integrated approach to screwworm control in Egypt.

10.1 Wind Oriented Trap (WOT)

As an aid to NWS population monitoring, the wind oriented trap (WOT) has been effectively employed in areas of the southern U.S. and northern Mexico. The trap is hung 1.5 - 2.0 meters above ground level and is oriented according to wind direction by a pair of vanes. An attractant is placed at one end of the trap and an inverted cone at the other with a hole for flies to enter. The attractant used in Swormlure, the ingredients for which are listed in Table 3.
Table 3. Ingredients for the NWS Attractant Swormlure.

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<td>187 ml</td>
</tr>
<tr>
<td>iso-butyl alcohol</td>
<td>18.7</td>
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<tr>
<td>dimethyl disulfide</td>
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<td>187 ml</td>
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<tr>
<td>acetic acid</td>
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<td>butyric acid</td>
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<tr>
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<td>12 g</td>
</tr>
<tr>
<td>indole</td>
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<td>12 g</td>
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</table>

If the MOA decided to use the WOT baited with Swormlure as part of a population monitoring program, an amendment to the environmental assessment will need to be prepared and sent to the Bureau Environmental Coordinator for approval.

Decomposing liver, either in traps or placed on the ground, can be used to attract NWS and has been used to monitor and study NWS population dynamics. Although less technically complex than the use of Swormlure, it is labor intensive and requires dedicated technicians to capture the adults, store them for later study, keep accurate records, and be trained in blowfly identification. Contrary to the belief of some MOA staff interviewed, sugar is not an effective bait to attract screwworms.

10.2 Sentinel Animals

The FAO has suggested to the MOA that sentinel sheep be employed to monitor the presence and distribution of the NWS in the Sallum border area, and in other areas should the fly enter Egypt. Using sentinel sheep involves confining 2 animals in a small fenced
enclosure and providing them with food and water. One animal is artificially wounded by making a small incision with a scalpel in the upper fore or hind leg. The wound is checked twice daily for presence of NWS eggs. If found, the eggs are removed, incubated and allowed to hatch. Larvae can be reared until they can be identified to confirm the presence (or absence) of NWS.

Rearing screwworms in the field from eggs collected off sentinel animals is an activity which GOA veterinarians and field staff have not been trained. The rearing routine is not complicated, but it does require diligence on the part of supervisory and rearing personnel. Equipment and supplies such as a dissecting microscope, small petri dishes, rearing containers, formol, water, and a source of ground meat for diet is all that is minimally required.

The GOA should consider sentinel sheep pens as part of their surveillance and monitoring program, especially if the NWS is introduced into Egypt.

10.3 Screwworm Adult Suppression System (SWASS)

The Screwworm Adult Suppression System (SWASS) was used successfully in the arid southwestern U.S. and northern Mexico, areas not dissimilar to those of North Africa. Its primary use, however, was to reduce NWS populations to levels which made subsequent treatments with sterile flies more effective. SWASS is a bait/toxicant system applied either aerially or ground dispersed. Components of the SWASS pellet are listed in Table 4.
Table 4. Ingredients to make Screwworm Adult Supression System (SWASS) Pellets

<table>
<thead>
<tr>
<th>Ingredient</th>
<th>Percentage</th>
</tr>
</thead>
<tbody>
<tr>
<td>Powdered Dry Blood</td>
<td>30.5%</td>
</tr>
<tr>
<td>Sucrose</td>
<td>30.5%</td>
</tr>
<tr>
<td>Swormlure</td>
<td>23.6%</td>
</tr>
<tr>
<td>Corn Cob Grits</td>
<td>7.5%</td>
</tr>
<tr>
<td>KSL Wax</td>
<td>5.9%</td>
</tr>
<tr>
<td>Pesticide</td>
<td>2.0%</td>
</tr>
</tbody>
</table>

The production, packaging, storage, and dispersal of SWASS is complex and would first require considerable review of MOA capabilities. Briefly, the pellet ingredients are mixed and pelletized in a special machine, then packaged and stored under refrigeration. The pellets are usually dispensed by aircraft over established flight lanes. The pellets need to be used in a timely manner as both the swormlure and pesticide degrade over time. The application of SWASS pellets should only be considered as a possible component of a well organized control or eradication campaign. Again, an amendment to the environmental assessment will need to be prepared and sent to the Bureau Environmental Coordinator for approval.

10.4 Ivermectin

Ivermectin is a microbial fermentation product of *Streptomyces avermitilis*. Commercial preparations of ivermectin can be administered either orally or as an injectable and have been used to reduce infestations of Old World Screwworm in cattle in southern Africa, Asia and Australia.

Research results from studies in Mexico by the U.S. Department of Agriculture, Agricultural Research Service (USDA/ARS) using sheep
as hosts were mixed. In the laboratory, the LD50 for ivermectin against NWS larvae was 0.05 parts per million (ppm), a concentration 5 times less that observed for coumaphos. However, when oral and injectable ivermectin was administered to sheep in the field, both were ineffective in either preventing or controlling NWS infection (unpublished data). The MOA and MOH may want to consider being part of a collaborative research effort with other area countries to test the efficacy of ivermectin for NWS in North Africa.

11.0 INTERNATIONAL MOBILIZATION

International funds have been committed to the North African countries at greatest risk for the purchase of vehicles and equipment, training courses, information and education materials, and sample treatment kits for individual wounds. Various expert consultants have been contracted by FAO, IAEA, and IFAD to develop plans for the eradication of NWS from Libya (See Section 11.3).

11.1 Libya

Funds committed to the Libyan surveillance and control program have amounted to $2 million in the form of technical and emergency assistance programs sponsored by FAO, IAEA, and UNDP. In addition, the Government of Libya (GOL) has provided support in the form of laboratory facilities and equipment, 2 vehicles and drivers for field survey, a secretary, and Libyan counterparts for visiting technical advisors.

The NWS presently occupies an area from 14 - 20,000 km square around Tripoli (Figure 9). There is currently an FAO technical
FIGURE 9.
MAP OF MWS DISTRIBUTION AND LOCATION OF QUARANTINE STATIONS IN LIBYA.
advisor in Tripoli but an Arabic speaker with knowledge of the Libyan governmental system is also needed. Better coordination of FAO and GOL activities now and during the eradication program is essential for the effort to succeed.

11.2 Egypt

Egypt has participated in the regional FAO/TCP/RAB/8955(e) and a national FAO/TCP/EGY/8952(e) with a budget of $250,000. Two heavy duty pickups have been provided plus 200,000 sample treatment kits, 2 microscopes for identification, 250,000 5g packets of coumaphos insecticide for wound treatment, and 5 livestock sprayers. Egypt has also participated in a limited radio and television public relations campaign started in 1989.

11.3 Eradication Plan

Through the efforts of international organizations FAO, IAEA, IFAD and various cooperating national governmental departments and agencies plans have been developed for the eradication of the NWS from Libya.

The NWS has been eradicated from the U.S. and most of Mexico using the sterile insect technique (SIT). The SIT involves rearing large numbers of NWS, sterilizing them, and distributing them by air or land in infested areas. Sterile males mate with fertile females which lay sterile eggs. Hence, that female does not contribute to the next generation. Factors which contribute to the techniques success are: 1) screwworms can be reared in the laboratory on artificial medium, 2) females mate once in their lifetime, 3)
trained and dedicated people at all program levels, and 4) funding. The technology was originally developed in the U.S. and U.S. Congressional authorization has been secured to allow the technology transferred to North Africa.

The FAO funding estimates for the eradication program call for a budget of US$85 million during the program's two years of operation. Funding has not yet been secured and every effort should be made to encourage all potential donors to contribute. The NWS poses a potential threat to a wide geographical area, a fact that many still do not fully understand.

The eradication plan calls for sterile screwworms, produced at the Mexico-American Commission rearing facility near Tuxtla Gutierrez, Chiapas, Mexico, be used to eradicate the NWS from Libya. Flies would be packaged and flown to a central distribution center in North Africa. They would be off loaded onto smaller aircraft for distribution over infested areas of Libya and perhaps along border areas of Tunisia and Egypt.

12.0 TRAINING

An FAO consultant, during 3 trips to over 15 Governorates, met with interested veterinarians, showed a video of the U.S.-Mexico eradication program, explained the NWS life cycle and the measures required for its control and eradication.

Egypt sent 3 participants to the two FAO-sponsored screwworm training courses held in Tripoli. The most recent was held 17-22 March 1990 (FAO/TCP/RAB/8955). Training has emphasized screwworm biology, identification, myiasis, survey, and economic considerations (Appendix M).
Following their training in Libya, members of the veterinary faculty at Cairo University held 9 training courses for veterinarians from the Governorates. There appears to be close collaboration between staff veterinarians and veterinary entomologists. To date, 260 veterinarians have been trained in subjects such as NWS biology, lifecycle, identification, surveillance, myiasis, differential diagnosis, and steps to take if the fly invades Egypt. Teaching facilities and equipment are at a premium. There is no pinned insect reference collection which the students can readily use. Insect pins, pinning boxes, and preserved larval specimens are in short supply. Some of the items could perhaps be provided through USAID (to assure proper delivery) from USDA screwworm research facilities.

Based on discussions with MOA officials and veterinarian field staffs, it appears that very few have been adequately trained in the proper storage, application, and disposal of pesticides. The training received consists of what they learn about pesticides and pesticide poisoning in the course of their regular parasitology curriculum. The use of spray rigs and dipping vats, often in ecologically fragile areas of the country, would make a pesticide use and disposal training course in Arabic a necessity.

13.0 RECOMMENDATIONS

Cable Cairo 01570, 24 January 1990 (Appendix C) should be amended as follows:

Item 1 A: Although the EEC is supplying the pesticide, USAID
should have input into the process. The manufactures recommended application rates should conform with USEPA guidelines. The coumaphos should be supplied in small, easily used and in as conveniently to dispose of packages as possible. The EEC should make prior arrangements with the manufacturer concerning the timing of the partial shipments and USEPA approved package labelling.

Item 1 B: The 5 gm packets of coumaphos supplied by FAO with Arabic instructions are currently supplied by Bayer AG. To expedite the acquisition of the packets, the EEC and USAID should consider continuing this arrangement.

Item 2 A: Five 3/4 ton pickups, 4 x 4, 4 speed manual transmission with a front seat passenger capacity of two. The stretch cab arrangement would be appropriate. The two petrol tanks should have a total capacity of 120 liters. The two spare tires per vehicle should be fit for desert conditions. Air conditioning in two of the five pickups is acceptable but should be considered optional. Camping gear can be side-slung or stored behind the passenger seats, and should not be place in the rear bed with pesticide or spray units.

Item 2 C: Acceptable, except that the spray tanks should have a 200 liter capacity instead of 400 liter. The 400 liter spray units are too large and considered unsafe for easy transport. The smaller tank capacity will require more frequent spray preparation.
Item 2 D: The cost of the portable dipping vats ($500) seems too high, especially if they are to be constructed locally.

Item 2 E: Should include an inexpensive forceps packaged with the treatment kit for removing myiasis-causing larvae from animal wounds. If the price per microscope can be reduced, consideration should be given to providing basic supplies (insect pins, pinning boxes and additional training materials) to the Diagnostic Laboratory in Cairo.

Item 2 H: That Egyptians visit the NWS facility in Tuxtla Gutierrez, Mexico, alone is of limited value. It is recommended that the 2 participants spend 1 week in Tuxtla and 1 week in Costa Rica where NWS research programs are ongoing. It is recommended that a veterinary entomologist be one of the participants.

Item 2 I: Technical assistance by a USDA/PASA for one month per quarter per year is too much. A one-month visit every six months is more reasonable, given that the NWS threat is still in Tripoli. Priority for initial TA should be placed on obtaining a hydrogeologist or toxic waste disposal expert to locate sumps and burial sites for disposal of pesticide rinsate and empty pesticide containers, respectively (Section 9.5).


Given the potential catastrophic consequence that would result
from a NWS infestation of Egypt, the above items should be delivered to the MOA, under periodic USAID/Cairo and AID/Washington scrutiny, as quickly as possible.

14.0 OTHER RECOMMENDATIONS

1.) Border police and inspection stations, especially at Sallum, should be well informed on the NWS and the MOA and/or FAO posters and booklets (in Arabic) on NWS should be liberally posted and distributed.

2.) The MOA should negotiate the use of a light, long-range military helicopter (e.g., alouette) for livestock and wildlife survey in the remote Libya/Egypt border area south of Sallum. Terrestrial vehicles are useful, but limited in their capacity to conduct rapid survey. The helicopter should have a military pilot, a veterinarian, coumaphos packets, and an air-to-ground radio to call in terrestrial control units if necessary.

3.) FAO should be urged by AID/Cairo to supply all AChE test kits with technical assistance to explain their use to the MOA and MOH.

4.) The shooting and poisoning of wildlife along the Egypt/Libya border should be discontinued immediately. To continue this practice poses an unacceptable risk to not only target species (gazelles, fox, jackels) but to non-target species (i.e., carrior feeders) as well. USAID/Cairo should contact Dr. Mohamed Amer,
Director General of Giza Zoological Garden, and Director, Egyptian Wildlife Service or other appropriate GOE authorities to discuss protection measures for wildlife along the border.

5.) MOA mobile survey units should be encouraged to stay in close contact with Bedouin groups and to distribute the NWS information provided by MOA and/or FAO.

6.) Disposal of empty pesticide packets, bags, cartons and/or drums should not involve burning. The drums should be punctured at least six times, crushed and buried along with the paper containers and plastic packets. The burial pit sites should be located by and designed by a hydrogeologist or, preferably, a toxic waste disposal specialist as soon as possible. They should be located in areas away from habitation, securely fenced, and posted with "toxic waste" signs in Arabic. If possible, the pits should be large, lined with water-impermiable cement, with lime at the bottom and layered with the soil used for burial.

7.) Dipping vats should be used over sumps that should also be located and designed according to a toxic waste disposal specialists' specifications. The sumps could be 10 meters deep, and wide/long enough to accommodate the vat and the areas where the livestock emerge from the vat. The pit should be lined with water-impermiable cement, when used in areas with a low water table. The sump should be filled with alternating layers of lime and soil. Spray tank rinsate can also be poured into the sump. After each dipping operation, or spray tank rinse, the sump should
be treated with lime on the surface. The sumps should be securely fenced and posted with "hazardous materials" signs in Arabic.

8.) The MOA should be encouraged to intensify their efforts regarding the use of safety clothing for the pesticides applicators, and EEC should be urged to follow up their contributions of pesticide with USEPA approved safety equipment.

9.) Technical assistance is recommended for training in Arabic for all field assistants and veterinarians on the safe storage, handling, use and disposal of pesticides. Pesticide applicators should be given additional instructions on spray calibration and technique.

10.) The GOE should take it upon themselves to approach and strongly encourage Saudi Arabia and other potentially NWS threatened Arabian Peninsula countries to contribute to the FAO NWS eradication plan in Libya.

11.) NWS posters, plasticized to be weather resistant, should be posted at oases and wadis that are frequented by nomads in the desert areas.

12.) FAO should be encouraged to also provide periodic technical assistance in the form of a NWS veterinary entomologist (ie. not only veterinarians), to advise Egypt on program planning and implementation.
13.) Mobile units that move deep into the desert should consist of two vehicles with at least one radio between them.

14.) USAID/Cairo program managers should periodically review the field activities of the GOE screwworm control program.

15.) The MOA veterinary field units in Marsa Matruh, Sidi Barrani, Sallum and Siwa are strongly urged to develop management units within their areas of jurisdiction. Maps should be prepared showing location of watering areas utilized by nomadic herders, off road tracks, etc. A monthly timetable and a system of accurate record keeping should be developed for areas visited and numbers of livestock inspected and sprayed.

16.) Pesticide storage and handling facilities, especially in the field, need to be upgraded. Warning sings should be clearly posted at the entrance and the inventory system improved.

17.) USAID should review carefully with the Government the possible need for local currency funding of in-country operating cost and activities such as fuel, subsistence allowances, posters/publications, etc., and to the extent not available from other sources, should provide these cost under NARP.

18.) All of these recommendations and other aspects of the EA should be incorporated into the documentation of the "Egyptian Screwworm
Control Campaign" and then monitored closely to insure compliance throughout implementation of the program.

19.) USAID/Cairo should provide the Bureau Environmental Coordinator with a status report every 6 months which summarizes implementation of all recommendations. USAID/Cairo may wish to use the USDA/PASA to prepare these reports.
15.0 REFERENCES

Bayer AG Asuntol package labelling found in wound treatment packets. (English/Arabic), and FAO instruction sheet for collection of larval samples from wounds (French/Arabic).


Food and Agriculture Organization, FAO/Rome:


Screwworm Control (Libya), 1989, FAO/TCP/LIB/7951(E).


International Fund for Agricultural Development, IFAD/Rome.


Ministry of Agriculture (Veterinary Service), Government of Egypt. Various Documents including the following:

1. Map of nomadic livestock routes, quarantine stations.
2. List of larvae and adults identified from samples received from governorates.
3. List of mammals of Egypt.
4. Map of protected areas of Egypt
5. Informational Pamphlet. Published by GOE for distribution to schools, health centers, civic organizations, veterinary offices, border/quarantine stations and to livestock interest groups.
6. Poster. Published by GOE for distribution as listed for informational pamphlet.


U.S. Environmental Protection Agency. Washington, D.C.

Coumaphos - Leaching Assessment for Second Round Review. Various documents including information on leaching studies, generic data requirements, environmental fate.


16.0 APPENDICES

A. People Contacted:

U.S. Agency for International Development:

F. Kenneth Lyvers, Director, Office of Agriculture, USAID/Cairo.

Kenneth P. LuePhang, Environmental Officer, USAID/Cairo.

Nasr El-Deen M. Rohaiem, Program Specialist (Screwworm), Office of Agriculture, USAID/Cairo.

William H. Smith, Director, Office of Engineering, USAID/Cairo.

Ministry of Agriculture, Government of Egypt:

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Adel Mohamed Nour, Veterinary Services, MOA, GOE.

Abdel-Kareem, Veterinary Services, MOA, GOE. M. S. Adl El Rahman, Dean, Faculty of Veterinary Medicine, Cairo University.

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Ahmed El-Kenawy, Director of Veterinary Medicine, Marsa-Matrouh.

Moustafa Daubar, Veterinary Services, MOA, Chief of Animal Health Center, El-Sallum.

Food and Agriculture Organization:

Yahya Salah, FAO Representative, Arab Republic of Egypt, Cairo.

Robert E. Reichard, Senior Officer, Animal Health Services, Animal Production and Health Division, FAO/Rome.


International Atomic Energy Agency:

Bjorn Sigurbjornsson, Director, Joint FAO/IAEA Division of Nuclear Techniques in Food and Agriculture, IAEA/Vienna.

D. A. Lindquist, Head, Insect and Pest Control Section, Joint FAO/IAEA Division. IAEA/ Vienna.

Mohammed Ridwan, Director, Division of Technical Co-Operation Programmes. IAEA/Vienna.

Other:

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Adel Roushdy, Manager, Scientific Office, Bayer AG, Cairo.