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Risk Reduction Strategy

Florida Medfly Program

Environmental Assessment
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Agency Contact:
Mike Stefan, Operations Officer
Plant Protection and Quarantine
Animal and Plant Health Inspection Service
4700 River Road, Unit 134
Riverdale, MD 20737-1238
Telephone: 301-734-8247

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I. Background

A. The Medfly Problem

1. The Medfly and its Destructive Potential

The Mediterranean fruit fly or Medfly, *Ceratitis capitata* (Wiedemann) is a major pest of agriculture throughout many parts of the world. Because of its wide host range (over 400 species of fruits and vegetables) and its potential for substantial damage, the Medfly represents a serious threat to U.S. agriculture. Although it has been introduced intermittently to the U.S. mainland several times since its first introduction in 1929, eradication programs have been implemented to prevent it from becoming a permanent pest on the U.S. mainland.

Federal and State agriculture officials believe that a permanent infestation of Medfly would be disastrous to the environment, agricultural commerce, and the agricultural export market of Florida and the United States. Fruit attacked by Medfly is unfit to eat because the Medfly larvae tunnel through the fleshy part of the fruit, damaging it and subjecting it to decay from bacteria and fungi. Although the Medfly is established on the Hawaiian islands, its unchecked presence on the U.S. mainland could result in widespread destruction of citrus and stone fruit crops, including apricot, avocado, cherry, grapefruit, nectarine, orange, and peach. In addition to commercial crops, home production of host fruits would suffer if Medfly were allowed to remain.

2. Medfly Programs in Florida

The Medfly has been introduced into Florida a total of 13 times, including its first introduction into Orlando in 1929. Exclusion, detection, and control activities have prevented it from becoming established in Florida. Over the years, a variety of control technologies have been used for eradication, with application of malathion bait (a chemical pesticide) being used in 12 out of 13 programs, beginning with Miami Shores in 1956. (The first Florida program, in Orlando in 1929, used arsenate and copper carbonate bait, applied with ground equipment.) Recent programs have used integrated control (a variation of integrated pest management or IPM), using methods such as sterile insect technique (SIT) in addition to chemical pesticides.

Following the detection of an adult Medfly in Tampa, Florida, on May 28, 1997, additional adults and larvae were found in nearby communities, confirming the existence of an infestation. Because of the Medfly's potential for agricultural and environmental damage, the United States Department of Agriculture's (USDA) Animal and Plant Health Inspection Service (APHIS) and Florida Department of Agriculture and Consumer Services (FDACS) promptly put in motion a program to eradicate the pest. The program, using integrated pest management, was drawn largely from well-established precedents, and included aerial application of malathion bait as a major component.

The Central Florida Cooperative Medfly Eradication Program concluded pesticide treatments in the fall of 1997. In the spring of 1998, additional Medfly infestations were detected in the vicinities of Miami Heights, Umatilla, and Bradenton, Florida. Despite the apparent success of the programs, some coordination and communication problems were experienced and identified in the 1997 program. The close of the control segment of the 1997 program also coincided with the expiration of exemption authority for aerial and ground use of malathion in Florida and the reassessment by the United States Environmental Protection Agency (EPA) of the human health and environmental risks associated with use of that chemical.

3. Environmental Analyses of Medfly Programs

Environmental impacts of the Medfly program have been thoroughly evaluated in the National Environmental Policy Act's (NEPA) environmental impact statement (EIS) process.[1] Consistent with NEPA's implementing regulations, the EIS explored alternative means of dealing with Medfly infestations, evaluated risks to human health and the environment posed by use of program chemicals, and developed strategies to mitigate adverse impacts associated with administration of the program. The EIS examined the Medfly program as a whole; evaluation of site-specific programs, such as the one conducted in central Florida in the summer of 1997, normally is conducted in the context of an environmental assessment which is "tiered" to the programmatic EIS.

Several environmental assessments (EA's) were prepared for the Medfly eradication programs conducted in Florida in 1997 and 1998. Unique or special characteristics of the human environment in that part of Florida that could influence program operations, protection measures, or other environmental quality concerns were considered. As required by Executive Order No. 12898, "Federal Actions to Address Environmental Justice in Minority Populations and Low-Income Populations," the potential for disproportionately high and adverse human health or environmental effects on minority populations and low-income populations also was examined. The EA's were published in English and Spanish.

Based on evidence presented in the EIS and Florida EA's, the decisionmaker determined that the eradication programs in Florida would not significantly impact the quality of the human environment and that, therefore, preparation of another EIS was not necessary. Consistent with NEPA's implementing regulations and APHIS' procedures, the EA's were made available to the public.

[1] See Medfly Cooperative Eradication Program Final Environmental Impact Statement 1993.

B. Purpose and Need

1. The Program Objective - Risk Reduction

APHIS is committed to re-examining the Florida Medfly program for the primary purpose of achieving maximum risk reduction, consistent with its continued goal of preventing Medfly infestations. This EA, therefore, has been prepared to explore various strategies for risk reduction within the context of exclusion, detection, and control methodologies. Especially, APHIS intends to improve the opportunities for exclusion and early detection of Medfly populations so as to minimize or reduce to a last resort the aerial application of malathion.

As part of the process to renew exemption authority for aerial use of malathion in Florida, EPA has requested that APHIS undertake a re-examination of its Medfly cooperative eradication program. Specifically, EPA has asked APHIS to:

- Consider comments provided by citizens of central Florida during public meetings in early December 1997 and, insofar as possible, incorporate suggested improvements into future program plans;
- Reduce reliance on aerial application of Malathion by, among other means,
    - Increasing use of preventative measures (e.g., releasing sterile insects);
    - Reviewing and, if necessary, adjusting program fruit fly detection trap densities;
    - Developing and using more "environmentally friendly" alternative treatment methods (e.g., SureDye); and
    - Applying the chemical at a reduced rate or concentration for those situations where it must be used;
- Improve program communication strategies, especially with respect to providing notification to potentially affected citizens prior to chemical treatments; and
- Closely monitor control activities in the field, taking positive steps to correct errors and omissions.

APHIS shares EPA's concerns for the human health and environmental effects of its Medfly cooperative eradication program. Indeed, APHIS officials recently made a commitment to employ aerial use of Malathion for the Medfly cooperative eradication program only as a last resort. In order to explore, together with the public and other affected interests, cost-effective ways in which to meet that pledge and to put into place an overall risk-reduction strategy, it was directed that the environmental assessment process be undertaken.

2. The Nature of This Analysis

This EA is designed to aid the planning process by considering various means for the reduction of risk. Its approach is compatible with the NEPA implementing regulations which permit an agency to ". . . prepare an environmental assessment on any action at any time in order to assist agency planning and decisionmaking."[2] This EA is not a "conventional" EA in the sense that it does not consider fixed (inflexible) alternatives for Medfly control. Broad program alternatives have been considered previously within the context of site-specific EA's prepared for the Medfly program in Florida. Those EA's have resulted in findings of no significant impact and, as of the preparation of this EA, there is no new evidence to suggest those findings are no longer relevant.

The EA's preparers believe that there are a number of constraints—budgetary, technological, and other—that influence the ability of planners and policymakers to completely eliminate risk. The EA is intended specifically to facilitate planning through the consideration of new and existing technologies that may be combined by APHIS decisionmakers into a broad, risk reduction strategy. The integration of technologies into an achievable, broad, risk reduction strategy probably would result in a program that, in appearance, would fall in between the existing program and the ideal program.

[2] 40 C.F.R. § 1501.3(b).

II. Medfly Program Options

Alternatives for Medfly control have been considered comprehensively in the past in the context of the EIS and the EA's prepared for various Medfly eradication programs. It is helpful, for the sake of this EA focusing on risk reduction, to consider and characterize three general "options": (1) no action, (2) the existing program, and (3) the ideal program. Each of these is defined briefly below and described in more detail in its following subsection.

No action was described in detail in the EIS, where it was characterized as ". . . no APHIS participation in a Medfly control or suppression program." No action would result in varying degrees of risk (not all quantifiable) to humans and their environment, and would not allow APHIS to meet its statutory responsibilities for protection of the agricultural components of the environment.

The existing program is the same kind of program recently conducted in Florida. Such a program uses established methods (exclusion, detection, and control) to respond in a rapid, coordinated manner to Medfly infestations. The recent Florida program was perceived by some members of the public to have been a response that was neither measured nor environmentally sound.

The third option, the ideal program, would eliminate (to the degree humanly possible) any risk to humans and their environment. Such a hypothetical, ideal program would be precluded by budgetary, technological, and other barriers, and therefore could not be considered a "reasonable alternative" under NEPA. However, its characterization is important in that it would represent all that APHIS and its cooperators conceive could be done to reduce risk.

The advantage of these options becomes apparent when one considers that they can be used as baselines for relative risk determinations and the identification of program components which may be modified, varied, or combined for the purpose of achieving an overall program risk reduction. In general, those program components fall within three areas—exclusion, detection, and control—which are considered within the context of the three options.

A. No Action

The no action option would be characterized by no APHIS participation in a Medfly control or suppression program. Control actions taken in Florida would be under the control of and at the discretion of Florida government, grower groups, and/or individuals. Federal quarantine actions that reduce the spread of Medfly by regulating or otherwise restricting movement of host produce might be rescinded or, at the least, diminished through lack of APHIS involvement. If

Table 1. Program Options

Component Methods	Program Options: No Action	Existing Program	Ideal Program
Exclusion			
Clearance Activities	0	X	X
Airport	0	X	X
Maritime	0	X	X
Transit	0	X	X
Clearance Technologies	0	X	X
Detector Dogs	0	X	X
Irradiation	0	X	0
X-Ray	0	X	X
Investigative Activities	0	X	X
Detection and Prevention			
Preventive Release Program	0	0	X
Detection Trapping	0	X	X
Delimitation Trapping	0	X	X
Control			
Nonchemical Control Methods	0	X	0
Sterile Insect Technique	0	X	0
Physical Control	0	X	0
Cultural Control	0	X	0
Male Annihilation	0	0	0
Biological Control	0	0	0
Biotechnological Control	0	0	0
Cold Treatment	0	X	0
Vapor Heat Treatment	0	X	0
Chemical Control Methods	0	X	0
Aerial Malathion Bait	0	X	0
Ground Malathion Bait	0	X	0
Aerial SureDye Bait	0	0	0
Ground SureDye Bait	0	0	0
Diazinon	0	X	0
Chlorpyrifos	0	X	0
Methyl Bromide	0	X	0

coordinated government efforts to eradicate Medfly diminished, the risk of Medfly spread and additional infestations greatly increases. If no action or insufficient action were taken by the state of Florida, the spread of Medfly would be limited only by the proximity of host plants in suitable climate areas. Expansion of the infestation to adjacent states would be likely under these circumstances. Expansion of the range of Medfly in this manner would ultimately lead to extensive crop losses, lost domestic and foreign agricultural markets, and extensive uncoordinated pesticide use.

B. The Existing Program

The existing program would be characterized by exclusion methods, detection efforts, and emergency eradication responses comparable to those used in the 1997 Florida program. The exclusion methods would continue to intercept most regulated commodities that have potential for being infested with Medfly. The detection methods would remain at present levels of intensity and effectiveness for identifying new introductions. The frequency of Medfly introductions would remain at current levels or increase commensurate with increased transport of infested commodities. All control methods described as available in the EIS and its record of decision could be used in the existing program. These include ground and aerial malathion bait applications, diazinon soil drenches, methyl bromide fumigations, cold treatments, vapor heat treatments, male annihilation, cultural control, physical control, and sterile insect release. In addition, irradiation treatment of commodities, for exclusion purposes, was approved for the existing program and was analyzed previously by APHIS in an October 1997 environmental assessment, “Irradiation for Phytosanitary Regulatory Treatment.” The public outreach activities to inform and communicate program risks to the public would remain at about the level of the 1997 Florida program. Detailed information about program methods is provided in the EIS.

C. The Ideal Program

The objective of a hypothetical ideal program would be to eliminate the use of chemical pesticides, thereby reducing to an absolute minimum the potential risks to human health and the environment. Such an ideal program would be characterized by the optimization of exclusion, detection, and prevention methods. The ideal program would have sufficient personnel and equipment to inspect and clear virtually all commodities, host plants, and conveyances that are capable of bringing Medfly into the United States mainland. Detection trapping would be included strictly to verify that the exclusion methods were working as designed. Prevention methods such as sterile releases would be in place to prevent any accidental introductions from becoming established. It would be very difficult to estimate the personnel, equipment, and other resources for such a program, but program managers believe it would be enormous. Although the ideal program is considered unachievable now because of its prohibitively large cost and inherent logistical problems, it and its underlying objectives are considered relevant for the shaping of future policies and strategies.

III. Consequences of Program Options

A. Comparative Environmental Risks of Program Options

The potential environmental impacts of no action and the existing program (with component treatment methods) have been discussed and analyzed in the EIS and its associated analyses, and in the previous central Florida Medfly program EA. The (hypothetical) ideal program option reduces risk through the elimination of chemical control methods, has not been analyzed previously, but is similar in risk to the existing program with respect to its exclusion and detection components. Table 2, Relative Risks, compares the risks of adverse impact from the components of the program options. SureDye bait is listed because of its potential to reduce risk in future programs, although it is not a component of the existing program or the ideal program. Its use has been analyzed in separate risk assessments, “Risk Assessment: SureDye Insecticide Trials, January 1995" and “SureDye Insecticide Applications Human Health Risk Assessment—May 1995”, incorporated by reference in this EA.

B. Specific Environmental Impacts of Program Options

The potential environmental impacts of the program options are related primarily to their use (or lack of use) of chemical pesticides. The specific areas of concern include (1) potential effects on human health, (2) potential effects on wildlife (including endangered and threatened species), and (3) potential effects on environmental quality. Potential impacts of the no action option are principally the result of the use of pesticides by nonprogram entities. Potential impacts of the existing program are principally the result of the use of pesticides by the program. Potential impacts of the ideal program do not involve the program use of pesticides, because they have been eliminated in that option. The impacts of each of the program options are discussed in relation to their effects on human health, nontarget species, and the physical environment.

1. Human Health

The potential impact on human health varies considerably with the program options; the application method, active ingredient(s), timing, application site, and application rate of the pesticide are factors determining exposure and resulting risk.

Under the no action option, actions to control Medfly would be left to the non-Federal government entities, industry, and homeowners. The state of current biocontrol and other nonchemical technologies makes them inadequate, when used alone, for the protection of fruit and vegetables. The State’s effectiveness in Medfly eradication would depend on the availability of funds and resources.

Table 2. Relative Risks

Component Methods	Program Options		
	No Action	Existing Program	Ideal Program
Exclusion			
Clearance Activities	✱	❍	❍
Airport	✱	❍	❍
Maritime	✱	❍	❍
Transit	✱	❍	❍
Clearance Technologies	✱	❍	❍
Detector Dogs	✱	❍	❍
Irradiation	✱	▲	▲
X-Ray	✱	❍	❍
Investigative Activities	✱	❍	❍
Detection and Prevention			
Preventive Release Program	✱	▲	▲
Detection Trapping	✱	▲	▲
Delimitation Trapping	✱	▲	▲
Control			
Nonchemical Control Methods	✱	▲	✱
Sterile Insect Technique	✱	▲	✱
Physical Control	✱	▲	✱
Cultural Control	✱	▲	✱
Male Annihilation	✱	▲	✱
Biological Control	✱	U	✱
Biotechnological Control	✱	U	✱
Cold Treatment	✱	F	✱
Vapor Heat Treatment	✱	F	✱
Chemical Control Methods	✱	M	✱
Aerial Malathion Bit	✱	M	✱
Ground Malathion Bail	✱	M	✱
Aerial SureDye Bait	✱	✱	✱
Ground SureDye Bait	✱	✱	✱
Diazinon	✱	▲	✱
Chlorpyrifos	✱	▲	✱
Methyl Bromide	✱	▲	✱

✱ = Not Applicable ❍ = No Risk ▲ = Minimal Risk = Higher Risk **U** = Unknown Risk

If those funds and resources were unavailable, it is possible that there would be broader, more widespread, and more uncoordinated use of pesticides by homeowners and commercial growers, with correspondingly greater potential for adverse impact. Those adverse impacts could be expected to increase as the pests would spread throughout its potential range in the United States. In addition, most over-the-counter pesticides are more toxic, more persistent in the environment than those used in the existing program, and are applied in relatively greater quantities. Use of these pesticides would result in adverse impacts of greater magnitude and duration. The potential crop losses, market losses, and other potential impacts resulting from no action are described in detail in the EIS.

The existing program using IPM technologies to eradicate Medfly includes chemical pesticides with potential impacts to human health, which have been determined by the EIS to be insignificant. The existing program may include applications of malathion bait, diazinon and chlorpyrifos (soil drenches), and methyl bromide (a fumigant). The potential exposure is greatest with aerial applications and this has been a frequent concern for programs using malathion bait in suburban and urban areas. The fate of the pesticides in the environment, their toxicity to humans, and their exposure to humans are the three major factors that determine the risk associated with pesticide use. Each of the program pesticides is known to be toxic to humans. Exposure to program pesticides can vary, depending upon the pesticide and the use pattern, but data from the human health risk assessment prepared for the EIS indicates that exposures to pesticides from normal program operations are not likely to result in substantial adverse human health effects. The program adjusts treatments in the spray areas to minimize human exposures through the use of night applications rather than daytime applications, where possible.

For the ideal program, required objectives are the elimination of the use of chemical pesticides and the minimization of potential risks to human health. The absolute optimization (considered unattainable) of pest exclusion, detection, and prevention activities in the ideal program would eliminate the possibility of a Medfly outbreak, thereby eliminating the need for chemical pesticide applications. This would result in less exposure (there may be other pesticide exposure in the environment from nonprogram sources) and lower risk. However, intensified use of pest exclusion techniques may frustrate importers who view any delays or impediments to access of their cargo as undesirable, particularly when importations of perishable items are involved. In particular, the increased inspection of various commodities could irritate importers and the increased inspection of luggage could irritate travelers (including some with anxiety-related medical conditions).

In an ideal program, there would be no need for chemical control measures and the only chemicals used by the program would be those placed in the detection traps. These traps are generally placed out of reach of the general public. As a result, an ideal program would largely eliminate exposure of humans to chemicals except for program personnel who check traps and replace parts. Risk analyses in the EIS determined that the amount of exposure and resultant risk to these persons would be minimal, with adherence to proper handling of traps and wearing of proper protective clothing. The use of sterile insects poses minimal risk to human health.

Environmental Justice

Consistent with Executive Order 12898, "Federal Actions to Address Environmental Justice in Minority Populations and Low-Income Populations," APHIS considers the potential for disproportionately high and adverse human health or environmental effects on minority populations and low-income populations. The population of most sites in recent eradication programs has been diverse and lacked any special characteristics that differ from those described in the EIS. This was true of demographic conditions in Hillsborough County where the first fly finds were made in 1997. There are, however, some areas that have minority communities. In particular, there are areas with large Cuban-American populations that could reside in the vicinity of fly finds. Pertinent documents (environmental documents, precautions, and/or warnings) are translated into Spanish for dissemination in these areas, and application schedules are provided to radio stations and other media in Spanish.

Chemical Hypersensitivity and Notification

A proportion of the population may have unusual sensitivity to certain chemicals or environmental pollutants; program treatments may pose higher dangers for these individuals. Special notification procedures and precautions, as stated in the EIS's recommended mitigations, minimize the risk for this group. In addition, any individual who contacts the program about acute sensitivity to malathion bait spray will also be provided special notification. This notification would not be an issue for the ideal program that uses no chemical control methods, but accurate information about sensitive individuals is critical if any pesticide applications will be made.

2. Nontarget Species

The alternatives were compared with respect to their potential to affect nontarget species. The principal concerns for nontarget species (including endangered and threatened species) also involve the use of pesticides. Paralleling human health risk, the risk to nontarget species is related to the fate of the pesticides in the environment, their toxicity to the nontarget species, and their exposure to nontarget species.

Under the no action option, homeowners and growers in infested areas could use pesticides of greater toxicity and persistence than the chemicals used in the existing program. The state of current biocontrol and other nonchemical technologies makes them inadequate, when used alone, for the protection of fruit and vegetables. If the Federal government were not involved, the State's effectiveness in Medfly eradication would depend on the availability of funds and resources. If those funds and resources were unavailable, it is expected that there would be broader and more widespread use of pesticides by homeowners and commercial growers, with correspondingly greater potential for adverse impacts to nontarget species.

The existing program includes chemical pesticides with potential impacts (determined by the EIS to be insignificant) to nontarget species. All of the program pesticides are highly toxic to invertebrates, although the likelihood of exposure (and thus impact) varies a great deal from pesticide to pesticide and with the use pattern and route of exposure. Malathion bait spray, chlorpyrifos soil drench, and diazinon soil drench applications have high contact toxicity to most invertebrates, so adverse effects can be expected for both contact and ingestion. The aerial application of pesticides such as malathion bait spray have the greatest potential for exposure and potential risk to nontarget species. The soil drenches are watered into the soil, so exposure and potential risks are limited to nontarget species in the soil for these applications. Refer to the EIS, its supporting nontarget risk assessment, and the SureDye risk assessments for more information on risks to all classes of nontarget species.

For the ideal program, the elimination of the use of chemical pesticides and the minimization of potential risks to human health are desired outcomes. The optimization of pest exclusion and detection activities in the ideal program (which is considered unattainable) would eliminate the possibility of a Medfly outbreak, thereby eliminating the need for chemical pesticide applications. This would result in less exposure (there may be other pesticide exposure in the environment from nonprogram sources) and lower risk also to nontarget species.

The only nontarget species affected by techniques used in the ideal program are those species that enter or disturb the Medfly detection traps. Medfly traps do not contain chemical insecticides but rely on lures to detect the Medflies, which are then caught on sticky panels or drown in water. This is limited to relatively few species and the most affected species are those nontarget invertebrates that are attracted by the baits. The enclosed nature of these traps hinders the entry of larger nontarget organisms. The use of sterile insects poses no risk to nontarget species.

Endangered and Threatened Species

APHIS will continue to consult with the U.S. Department of the Interior, Fish and Wildlife Service (FWS), under the provisions of section 7 of the Endangered Species Act of 1973 for new programs. APHIS has prepared a biological assessment for the Medfly Cooperative Eradication Program and FWS has concurred with APHIS' no effect determination, predicated on APHIS' adherence to specific protective measures. Based upon FWS' original concurrence of no effect and the continuing consultation, no adverse impacts to endangered or threatened species, or their habitats, are foreseen.

3. The Physical Environment

The program options were compared with respect to their potential to affect environmental quality. The concerns over environmental quality include issues related to the preservation of clean air, pure water, and a pollution-free environment.

Under no action, it is likely that the homeowners and growers in infested areas would use pesticides of greater persistence than the chemicals used in the existing program. Again, biocontrol and other nonchemical technologies, used alone, are considered insufficient for the protection of fruit and vegetables. A probable outcome, if the State had inadequate resources to eradicate future infestations, would be the broader and more widespread use of pesticides by homeowners and commercial growers, with correspondingly greater potential for adverse impacts to environmental quality. Those adverse impacts would increase as Medfly expanded its range across the United States.

The existing program uses chemical pesticides which have potential adverse impacts to environmental quality, but those adverse impacts were determined in the EIS to be insignificant. Program pesticides remain the major concern of the public and the program in relation to preserving environmental quality. Although program pesticide use is limited, especially in comparison to other agricultural pesticide use, the proposed action would result in release of chemicals into the environment. The fate of those chemicals varies with respect to the environmental component (air, water, or other substrate) and its characteristics (temperature, pH, dilution, etc.). The half-life of malathion in soil or on foliage ranges from 1 to 6 days, and in water from 6 to 18 days. The half-life of diazinon in soil ranges from 1.5 to 10 weeks, and in water at neutral pH from 8 to 9 days. Methyl bromide's half-life is 3 to 7 days, but the small quantities used disperse when fumigation chambers are vented. Refer to the EIS for more detailed considerations of the pesticides' environmental fates.

For the ideal program, the elimination of the use of chemical pesticides and subsequent minimization of risk to human health are necessary objectives. The absolute optimization (considered unattainable) of pest exclusion and detection activities in the ideal program would eliminate the possibility of a Medfly outbreak, thereby eliminating the need for chemical pesticide applications. This would result in less exposure (there may be other pesticide exposure in the environment from nonprogram sources) and lower risk also to the physical environment.

As with human health and nontarget species, the ideal program would result in the least adverse impact to environmental quality. The only chemicals used in the ideal program are those chemicals used as lures in traps. Their effects on environmental quality are negligible. The use of sterile insects also poses minimal risk to environmental quality.

C. Economic Impacts of Program Options

Concurrent with this EA's development, a separate economic impact analysis, "An Economic Assessment of Options for the Medfly Cooperative Program in Florida" (appendix 1) was undertaken to explore the economic impacts of the three program options. The economic analysis parallels the EA's focus by considering the cost-effectiveness of the options to achieve the overall risk reduction strategy. The analysis examines the budgetary costs as compared with the likely potential consequences of pest establishment presented by each program. It estimates expenditures associated with exclusion, detection, and eradication activities, and losses to crop production and trade markets.

A conventional cost-benefit approach was precluded because of the hypothetical nature of the ideal program. In addition, the ideal program was characterized, for the purposes of efficiency in preparing the economic analysis, as a program that would provide 100 percent protection of direct Medfly introduction pathways into Florida. It should be noted that this would not result in 100 percent protection of indirect pathways (which could have substantial contribution to the risk of Medfly introduction) and does not cover the costs needed to protect other States of the Mainland United States which are also susceptible to Medfly invasion. To protect those other States would require considerable and possibly prohibitive expenditures by the Federal Government.

The economic analysis determined that the cost of the existing program would be approximately $15.3 million annually. The analysis determined that the cost of an ideal program, protecting direct pathways, would range annually between $110 million and $111.4 million. Finally, the analysis determined that the cost of no action would range between $46.5 million (if Medfly were not allowed to become established) and $308.1 million (if Medfly became established). The intermediate costs and benefits are explained in the economic analysis, which also discusses the assumptions which it followed.

IV. Strategy for Risk Reduction

A. Lessons Learned From The 1997 Program

One of the inherent difficulties in responding to Medfly outbreaks is that they are almost always sited in urban and suburban areas. The reason for this is that the occasional introductions, thought to occur because of accidental or intentional (smuggling) human intervention, are most likely to occur in areas where there is a large volume of movement of international travelers and commodities, such as in proximity to ports of entry. Thus, in the past, detections and resulting control activities have centered on residential areas. The chief objection to those control activities is over the use of chemical pesticides. Although monitoring results for the 1997 program showed that concentrations of malathion in soil, water, and air were as predicted by the EIS, and corroborated human health effects (demonstrated not to be substantially detrimental overall) did not differ from those predicted by the EIS, opposition to the use of chemicals occurred throughout the program. The public cited human health risks and trespass issues as reasons to discontinue chemical treatments.

There were a number of sensitive sites within the eradication zone. The presence of many bodies of water in Florida made it necessary to employ buffers to avoid drift and minimize contamination of those water bodies. Although there was no evidence of fish mortality in major bodies of water from the malathion bait applications, the monitoring results for the 1997 program indicated that malathion bait applications may have contributed to some fish mortality in shallow bodies of water where high water temperature and low dissolved oxygen were primary risk factors. This was anticipated, based on analyses in the EIS and on similar effects from other programs. Many of the adverse effects could have been eliminated or reduced if the chemical applications could have been replaced by other control methods. The program's ability to replace chemical controls was constrained primarily by the availability and effectiveness of such alternate control methods.

A public insistence on the use of sterile insect technique (SIT) in lieu of chemical applications necessitates an explanation of the technique.   SIT works through a biological process that is similar to attrition. The wild Medflies are eliminated through competition in mating over a protracted period of time. For success, this technique requires a low population of wild flies. Sufficient sterile Medflies were not immediately available for a program the size of Florida's 1997 program, nor could they have been used by themselves to eliminate the Medflies there in a way which reasonably could have worked in time to prevent the pest from spreading to other areas of Florida. SIT was used in California in the Los Angeles Basin, which is isolated by geographical barriers from other susceptible areas. However, it did not totally prevent an outbreak from occurring there, although it may have been a factor in minimizing it. The use of sterile Medflies as a prophylactic measure in Florida (releasing them as a form of "insurance" against Medfly invasion) is an attractive prospect, but the cost of protecting all susceptible areas in Florida that way would be phenomenal. Costs associated with such a SIT program would have to be paid directly through taxation, or indirectly if industry were required to assume the burden. Despite the constraints associated with SIT, APHIS is committed to optimizing and, if possible, expanding its use.

During the 1997 Florida program, program managers examined the treatment area to determine if there were features or characteristics capable of influencing the anticipated environmental effects of program operations, and then responded to them. For example, routine measures to mitigate adverse impacts to bodies of water are described in the EIS. Although the 1997 program used helicopters at an altitude of 200 feet for some malathion bait spray applications (as in previous programs), the program also used DC-3 aircraft at a higher altitude (500 feet). Monitoring reports showed that the higher altitude applications resulted in greater drift of malathion residues. The results of a drift study and coordination with the U.S. Environmental Protection Agency (EPA) prompted the decision to increase the buffer around water from 200 meters to 300 meters, so as to prevent adverse impacts to water quality and nontarget aquatic wildlife.

Also, during the course of the 1997 Florida program, the FIFRA (Federal Insecticide, Fungicide, and Rodenticide Act) section 18 registration for malathion expired and APHIS was required to submit a new application for the continued use of malathion in the program. The EPA, now required to use new standards imbued in the Food Quality Protection Act, initiated a risk assessment for the section 18 registration and communicated its concerns to APHIS over the use of malathion. Although EPA has not yet made a determination, it could, based on new evidence, declare malathion to be a low risk carcinogen and attempt to quantify the risk. Such a determination would affect APHIS' position on the use of malathion and has prompted APHIS to re-evaluate its use of malathion and look diligently for a suitable replacement.

B. The Recommended Risk Reduction Strategy

The program options considered in this EA (no action, the existing program, and the ideal program) leave much to be desired in regard to their expected outcomes. The no action option presents a scenario that could cause great damage to the agricultural industry, with collateral damage to the environment from an uncoordinated use of pesticides. The existing program option is

effective in protecting the agricultural industry and reducing risks to the environment, but uses chemical applications that are unacceptable to many of the public. The ideal program option would protect industry and the environment while reducing risks to a level acceptable to the public, but at a staggering monetary cost.

The objective of reducing risk appears best attained through a program modification that would vary program components (and add new ones) within an overall program strategy that falls somewhere between the existing program and the ideal program. By putting more resources into exclusion and detection (loading the program up front) it is more likely that Medfly would be kept out of Florida and, thus, control methods would never have to be employed. However, because it is not possible to eliminate all risk of Medfly introductions, control methods would have to remain a part of the strategy. Control methods would be re-arrayed and minimized in a way designed to greatly reduce risk. An emergency response communication plan would also be employed to ensure that the members of the public remain fully aware of program operations and are capable of reducing their personal risk.

The "Recommended Risk Reduction Strategy" that will be described next is designed to (1) identify components that can be varied or added so as to reduce risk; (2) identify which of those components are likely to have the greatest relative benefit in reducing risk; and (3) recommend, insofar as possible, the variation that should be made. To a certain degree, site-specific factors will influence the ability to choose from these components in the future, and operational triggers will have to be devised in response to the situation. It is not possible, at this time and within the context of this assessment, to identify those triggers. Components will be discussed within the specific (but sometimes overlapping) and traditional operational areas of exclusion, detection, and control.

1. Exclusion Strategy

Consideration of the distances involved leads to an immediate conclusion that Medfly introductions to the continental United States are wholly the result of human activities. In the United States, we continuously increase the opportunity for those introductions through high volume international travel, agricultural product marketing and importation strategies, agricultural industry demands, and international trade agreements. Unfortunately, in the program's perspective, we have been unable to maintain a corresponding increase in new technologies, legal authorities, funding or staffing, in a timely manner to keep up with the continuous and increasing movement of potentially infested host material.

Medfly introductions occur at ports of entry. Exclusion activities, either prior to arriving or at the first port of entry, are the first line of defense against the Medfly. Risk may be reduced by applying more resources to exclusion activities and by "working smarter." Introductions of exotic pests from Caribbean countries could be reduced if cooperative relationships with those countries were effective in diminishing their pest problems and tightening their exclusion capabilities. Similarly, the risk of Medfly introductions has already been reduced by a cooperative partnership between the United States, Mexico, and Guatemala. That partnership, MOSCAMED (Spanish for Medfly), has eradicated Medfly from Mexico and is working on eradicating it from Guatemala.

In general, resources and inspection technologies can be improved at the ports of entry. Additional X-ray machines, inspectors, detector dogs, and other resources will reduce risk. Heavier fines to smugglers and additional restrictions on host material imports would also reduce risk. However much additional resources would improve risk reduction, those resource needs must be weighed in balance with the resource needs of other important programs in an atmosphere of government streamlining and cost-cutting. One solution may be to gain resources directly from the industry that Medfly exclusion protects.

Recommendations:

- Purchase and deploy X-ray equipment to check baggage at high-risk Florida ports of entry.
- Establish and maintain canine teams at high-risk Florida ports of entry.
- Develop and maintain computer technology for tracking illegal importations.
- Increase inspection on low-risk flights (e.g., Canadian flights that could include transshipped host material.)
- Develop an intensive Caribbean Basin initiative to improve plant protection technologies there, thereby lowering the risk of exotic fruit fly importations from them.
- Obtain legislative priority on introduction and passage of Consolidated Statutes to clarify and strengthen APHIS authorities.
- Explore cooperative funding with industry for Medfly exclusion efforts.
- Complete a pathway study to identify the most likely avenue of introduction for Medfly and commit resources and improve the technology to block those pathways.

2. Detection and Prevention Strategy

a. Strengthened Detection Trapping Program

Effective detection programs are required to limit the impacts to industry and the environment from the introduction of Medfly and other exotic pests. Of concern is the fact that 80 percent of propagative plant material entering the United States does so through the Port of Miami. International travel, trade, and pest interceptions at southern Florida ports all show upward trends.

The National Exotic Fruit Fly Detection Program is a cooperative program between APHIS and several States that are susceptible to fruit fly establishment. A network of traps and attractants are used to detect Mediterranean, Mexican, Queensland, guava, melon, oriental, and other exotic fruit flies. APHIS and State officials developed the “National Exotic Fruit Fly Trapping Protocol” (NEFFTP), a set of guidelines that provides information on fly biology, traps to use, type and dosage of the attractants, trap density, trap inspection, baiting interval, trapping season, selection of trap site, and host plants. Although the guidelines are comprehensive and considered adequate by most experts, they were not effectively implemented in the 1997 Florida program.

Recommendations:

- Implement a cooperative/co-managed detection program for Medfly and other pests that provides an appropriate level of protection.
- Ensure that NEFFTP guidelines are followed, in that the appropriate number of traps are placed and inspected, and that the trapping program is managed properly.

b. Strengthened Delimitation Trapping Program

To the extent possible, the delimitation trapping program (trapping to determine the boundaries of the infestation) should be strengthened by shortening the time frame for implementation, ensuring that Emergency Response Guidelines are met with respect to trap density and management, and implementing newly developed control and detection technologies. A program infrastructure must be maintained that can mobilize as rapidly as possible to deploy delimitation traps. Also, any regulatory controls (quarantines, inspection, and regulatory treatments) should be brought to bear as quickly as possible. Finally, delimitation trapping may be combined with other types of control technologies (such as male annihilation) to minimize the opportunity for the infestation to grow or move.

Recommendations:

- Cooperatively establish and maintain resources for a permanent infrastructure to implement a biologically sound delimitation trapping program.
- Explore use of male annihilation, mass trapping, "elotes", or other control technologies that can be implemented along with delimitation trapping.

3. Control Strategy

a. Sterile Release (SIT) Program

There are two primary ways in which to use SIT—in prophylactic area-wide release programs and in emergency eradication programs. There are advantages, disadvantages, and constraints associated with each.

Using SIT in an area-wide program can greatly reduce the potential for Medfly infestations. Such programs would blanket an area with enough sterile Medflies to provide competition in mating that, through attrition, results in the elimination of Medfly introductions while they are still small. Area-wide sterile release programs, however, are costly and probably could not be implemented in all areas of Florida that are susceptible to Medfly invasion. The use of SIT in all susceptible areas becomes even more complicated when one realizes that there are eight other States with susceptible areas that should be protected from

Medfly also. One kind of sterile release program that could work would be limited to high risk areas. Areas would be included that meet the following criteria: areas where Medflies were detected on an ongoing basis in the past, areas in proximity to ports of entry, and/or areas that are urban and suburban in nature where frequent movement of imported and exotic Medfly hosts occurs.

SIT may also be used in emergency fashion in response to Medfly detections. The availability of sterile insects for use in prophylactic or emergency response procedures, however, is severely limited by production technologies and their locations. Laboratory insect populations must be reared and checked for quality before their release. Because of the ever-present danger of accidental release, APHIS requires that the sterile insects be produced in laboratories in other countries or Hawaii, where Medfly is established.

Recommendations:

- Develop and approve a broad, prophylactic SIT program for Florida.
- Increase Medfly production for prophylactic and emergency response activities.
- Explore and secure new sources of funding for prophylactic programs.

b. Use of Malathion as a Last Resort

The pesticide malathion has been used effectively against the Medfly for many years. It has been a mainstay in most recent Medfly eradication programs because of its proven ability to quickly eliminate pest populations and thereby reduce the likelihood that the infestations would grow larger or be transported to other locations. It also has been used as a means of reducing the wild pest populations to a level where SIT could then be effective. Program officials used malathion fairly early in the 1997 Florida program because the infestation was detected late, was heavy, and was widespread; it was used because, in the program's view, there was no available alternative technology that could have been employed to counter such an intense, expanding infestation.

EPA has communicated to APHIS its view that malathion bait aerial applications should be used only as a last resort. In one respect, APHIS *has used malathion as a last resort* because, in most recent years, exclusion and detection activities have proven effective in holding the line against Medfly and APHIS has not had to implement an eradication program (it was 7 years prior to the 1997 program when a single Medfly was found in Altamonte Springs in Florida). In typical eradication programs, where infestions were small and focused, APHIS successfully limited the use of malathion and maximized the use of SIT. The 1997 Florida program constituted an unusual emergency situation in which the initial use of less effective control measures was not possible. Nevertheless, APHIS program officials have acknowledged the concerns of EPA and of the public over the use of malathion, and concur that its use should be diminished, reduced to a last resort, and eventually replaced.

Recommendations:

- Use aerially-applied malathion only as a last resort in emergency eradication programs.
- Re-evaluate the uses of malathion (aerial and ground), if malathion is designated as a carcinogen.
- Accelerate research into replacement emergency eradication tools for Medfly.

c. Use of SureDye as an Alternative to Malathion

SureDye is a mixture of fluorescein dyes that are U.S. Food and Drug Administration (FDA) approved for use in cosmetics and food products. SureDye bait applications have been proposed as a replacement technology for malathion bait. The dye appears effective against the Medfly, but it has not been proven to be as effective as malathion. Researchers continue to develop bait formulations and application methodology to improve its effectiveness and tests have taken place in California and Guatemala. The environmental effects of SureDye have been analyzed in two APHIS studies, "Risk Assessment: SureDye Insecticide Trials, January 1995" and "SureDye Insecticide Applications Human Health Risk Assessment—May 1995." In general, SureDye appears to have minimal risk to human health, nontarget species (other than insects), and the physical environment. One drawback to the use of SureDye is its property to stain fabrics and other surfaces. Finally, SureDye is not registered at this time as a pesticide for use against Medfly. Because of the research and testing that are required for pesticide registrations, registrations are expensive to manufacturers; the registration of SureDye is no exception.

Recommendations:

- Support and secure pesticide registration for use of SureDye bait against Medfly.
- Develop uses of SureDye bait and evaluate its potential as a substitute for malathion bait.
- Restrict use of SureDye bait, where possible, to ground applications, so as to minimize property damage.

4. Communication Strategy

A communication strategy is a vital part of any emergency action, such as a Medfly eradication program. Such a strategy is used to inform the public of program actions, communicate information about environmental risk, and inform the public of ways to reduce risk. APHIS' communication strategy for the 1997 Florida program was relatively effective in that it provided public announcements of program decisions and actions, provided personal notification of pesticide applications to people on the State's list of chemically sensitive people (and anyone else who wanted to be notified about applications), and provided recommendations for protection measures. In spite of media announcements, emergency phone banks, and a variety of other public information mechanisms, many of the public commented that they did not know where to go to get information. APHIS program managers have responded to public comments by improving on that communication strategy and packaging it in a format that communicates its content more efficiently to the public. The "Emergency Response Communication Plan - Fruit Flies" (appendix 2) contains APHIS' most recent emergency response communication strategy for Medfly programs. Review of that recently developed document indicates that the following risk-reducing recommendations for communications strategy have already been met.

Recommendations:

- Provide a complete, comprehensive package detailing communications policies to the public.
- Describe how members of the public may obtain information pertaining to program risks.
- Describe actions that will take place upon the implementation of an eradication program and the implementation of pesticide applications.
- Describe notification procedures and explain how chemically sensitive members of the public may avail themselves of direct notification.
- Describe established procedures for receiving and resolving complaints.

In conclusion, for the sake of the reader, table 3 presents all of the recommended risk reduction strategies in a single, condensed table.

Table 3. Recommended Risk Reduction Strategy At A Glance

Exclusion Strategy	More X-ray Equipment
	More Canine Detector Teams
	Improved Computer Tracking Technology
	Increased Airline Inspection
	Caribbean Basin Plant Protection Initiative
	Enhancement of Plant Quarantine Laws
	Pathway Study
	Cooperative Funding
Detection and Prevention Strategy	Strengthened Detection Trapping
	Improved Cooperative Program
	NEFFTP Guideline Adherence
	Strengthened Delimitation Trapping
	Permanent Infrastructure
	Integrated Control Technologies
Control Strategy	Sterile Release Program (SIT)
	Broad Prophylactic Release Program
	Increased SIT Production
	New Sources of Funding for SIT
	Malathion as a Last Resort
	Aerially-applied as Last Resort
	Re-evaluate Uses if a Carcinogen
	Expanded Research into Replacements
	SureDye as an Alternative to Malathion
	Registration for Use Against Medfly
	Use as a Substitute for Malathion Bait
	Restrict to Ground Operations
Communication Strategy	Comprehensive Package
	Risk Communication
	Information Resources Communicated
	Description of Program's Planned Response Actions
	Notification Procedures
	Complaint Processing

V. Agencies and Persons Consulted

Larry E. Hawkins
USDA, APHIS, LPA
11946 Franklin
Moreno Valley, CA 92387

Nolan Lemon
Public Affairs Specialist
USDA, APHIS, LPA
Public Affairs
4700 River Road, Unit 51
Riverdale, MD 20737-1232

C. Edward Miller
Senior Entomologist
USDA, APHIS, PPD, PRAS
4700 River Road, Unit 117
Riverdale, MD 20737-1238

Michael Shannon
State Plant Health Director
USDA, APHIS, PPQ
207 N.W. 23rd Avenue
Gainesville, FL 32609

Trang Vo
Supervisory Economist
USDA, APHIS, PPD
Policy Analysis and Development
4700 River Road, Unit 119
Riverdale, MD 20737-1238

Richard Gaskalla
Director
Division of Plant Industry (DPI)
Florida Department of Agriculture and Consumer Services (FDACS)
P.O. Box 147100
1911 S.W. 34th Street
Gainesville, FL 32614-7100

Appendix 1: Economic Analysis

ECONOMIC ASSESSMENT OF OPTIONS FOR THE MEDFLY COOPERATIVE PROGRAM IN FLORIDA

Policy and Program Development
Animal and Plant Health Inspection Service
United States Department of Agriculture

February 1998

Principal Analysts	**Trang T. Vo, Supervisory Economist** Policy Analysis and Development
	Charles E. Miller, Senior Entomologist Risk Analysis Systems
With the assistance of:	**Michael J. Olson, Economist** Policy Analysis and Development

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Executive Summary

Florida is an important state in the production of fruits and vegetables in the United States. The value of Medfly host crops alone in the State is estimated to be $2 billion. The purpose of this assessment is to analyze the economic impact of three general options for controlling Medfly in Florida. These options are (1) no action, (2) the existing program, and (3) the ideal program. Given the intent of the environmental assessment (EA) to explore various means for the reduction of risk from the use of Malathion, the approach taken in this analysis parallels that focus by considering the cost-effectiveness of the options to achieve the overall risk-reduction strategy. For each program option, the analysis examines the budgetary costs as compared with the likely potential consequences of pest establishment presented by each program. Costs considered for each option include expenditures associated with exclusion, detection and eradication activities, and losses to crop production.

A conventional benefit-cost approach (where benefits are explicitly quantified) is precluded because of the hypothetical nature of the scope of the ideal option. The presentation of this option, however, serves as a baseline for which a relative risk reduction program, lying somewhere between the existing and the ideal program, can be determined.

The cost of three program options for controlling Medfly in Florida is presented in Table 5. Under no action, APHIS would not participate in any program to eradicate a Medfly outbreak in Florida. The State of Florida would take over APHIS' role in eradication, which is currently a cooperative arrangement. The State would incur an annual cost of $7.2 million if eradication were successful. APHIS would continue to provide exclusion measures for exotic pests and diseases at Florida ports, at a cost of $8.1 million annually. The cost to producers is estimated to range annually between $32 million if eradication were successful to $300 million if Medfly were to become established in Florida.

The existing program, consisting of Agricultural Quarantine and Inspection (AQI), detection trapping, and eradication activities, currently cost APHIS and the State $15.3 million annually. Given a typical outbreak in noncommercial areas, producers suffer minimal losses in crop production and trade markets. In order to achieve eradication, the existing program option relies on the use of Malathion, for which the external cost to humans and the environment cannot be determined.

The ideal program option relies on enhanced quarantine, detection trapping, and preventative sterile release measures in order to reduce the risk of a Medfly outbreak. The cost of this option is estimated to range between $110 million (enhanced AQI program plus preventative sterile release program) and $111.4 million (enhanced AQI program plus increased detection trapping) annually. The bulk of this cost, about $90 million, is for an AQI program that would provide 100 percent coverage for direct foreign pathways into Florida. These pathways are air passenger baggage, cargo and mail. The total cost estimate of this program, however, is underestimated as it does not consider the cost to eradicate outbreaks which could still occur under the enhanced AQI and trapping program combination, and the risk of Medfly introduction from other pathways not assessed in this study. These include pathways from Hawaii, and indirect routes via Canada and other U.S. states. As evident in table 1, the cost to achieve the level of risk reduction in order to avoid the use of Malathion would be at least seven times the amount of the existing program.

Table 1. Summary of Costs of Options: No Action, Existing Program, Ideal Program

Cost to	I-a. No Action-Medfly not established ($ million)	I-b. No Action-Medfly established ($ million)	II. Existing Program ($ million)	III-a. Ideal Program-Enhanced Detection ($ million)	III-b. Ideal Program-Preventative Release of Sterile Flies ($ million)
APHIS	8.1	8.1	11.7	100.7	100
State of Florida	7.2	0	3.6	10.7	10
Total APHIS and State	**15.3**	**8.1**	**15.3**	**111.4** [1/]	**110** [1/]
Producers	**32**	**300**	**0**	**0**	**0**
TOTAL COST	**47.3**	**308.1**	**15.3**	**111.4** [1/]	**110** [1/]

[1/] These estimates do not include: (1) costs to provide other AQI services such as secretarial support, managerial staff, vehicles, increased office space and additional space at international ports associated with a 10-fold increase in baggage inspection; and (2) cost to eradicate outbreaks which could still occur under the enhanced AQI and trapping program combination.

An Economic Assessment of Options for the Medfly Cooperative Program in Florida

The purpose of this assessment is to analyze the economic impact of three general options for controlling Medfly in Florida. These options are (1) no action, (2) the existing program, and (3) the ideal program. Given the intent of the environmental assessment (EA) to explore various means for the reduction of risk from the use of Malathion, the approach taken in this analysis parallels that focus by considering the cost-effectiveness of the options to achieve the overall risk-reduction strategy. For each program option, the analysis examines the budgetary costs as compared with the likely potential consequences of pest establishment presented by each program. Costs considered for each option include expenditures associated with exclusion, detection and eradication activities, and losses to crop production.

A conventional benefit-cost approach (where benefits are explicitly quantified) is precluded because of the hypothetical nature of the scope of the ideal option. The presentation of this option, however, serves as a baseline for which a relative risk reduction program, lying somewhere between the existing and the ideal program, can be determined.

I. No Action

Under no action, APHIS would not participate in any program to eradicate or suppress a Medfly outbreak in Florida. Federal quarantine actions that reduce the spread of Medfly might be rescinded or, at the least, be diminished through lack of APHIS involvement. The state of Florida would likely take over APHIS' role in eradication and suppression, which is currently a cooperative arrangement. The cost of a Medfly outbreak to the State would increase as it assumes APHIS' share of costs. The action on the part of growers to assume some of these costs is uncertain. It is possible that without APHIS' involvement, Medfly would be more difficult to contain by the State as it spreads to a wider area (or takes longer to control) than that seen in recent outbreaks. This may in effect require increased usage of chemical pesticides resulting in higher economic and environmental costs to the State.

In the event of a typical outbreak, as in the recent occurrence in Tampa, one likely outcome would be that the State would be able to contain the spread largely to noncommercial fruit growing areas, with minimal field loss of commercial crop. However, while the eradication is in progress, some export markets for Florida crops may be lost as certain countries would not recognize control efforts by Florida alone as sufficient to maintain a Medfly-free status.

Another possible outcome under this option is that in the absence of Federal intervention, actions by the State of Florida alone would not be able to prevent Medfly from becoming permanently established throughout the State. The economic consequence of this establishment to the private sector would be immense as Florida is a primary producing area of many important crops that are also hosts of Medfly.

Cost to APHIS

No cost would accrue to APHIS as it would not participate in the eradication and detection programs in Florida. In FY 1996-1997, APHIS contributed $1.2 million towards the detection program, and over $10 million for the eradication program associated with the Medfly outbreak in Tampa. These costs would likely be assumed by the State of Florida. APHIS would continue its exclusion activities by inspecting and regulating passenger baggage and cargo at U.S. ports of entry for exotic animal and plant diseases and pests, including Medfly. In FY 1996-1997, the cost of the Agricultural Quarantine and Inspection (AQI) services was estimated as $8.1 million (table 2).

Cost to the State of Florida

Under this option, Florida would take over APHIS' share of the detection and eradication costs. As detection activities are on-going, the cost to the State of Florida would be $2.4 million annually. In the absence of APHIS' matching contributions towards the emergency program, Florida would incur the total cost of eradication of $24 million (the cost of the recent outbreak in Tampa) in the event of a Medfly outbreak. Given that the probability of an outbreak is about 0.2 per year, and assuming the same efficiency in operation, the cost of eradication is expected to be $4.8 million annually.[1] In the absence of APHIS participation, the total cost to the State is at least $7.2 million per year.

Cost to Producers

The primary Medfly host commodities that are grown in Florida are oranges (valencia, temple, tangerine and tangelo), grapefruit, avocado, pepper, mango and guava. Other crops considered to be secondary hosts by some countries and would be subject to export quarantine and/or treatment include cucurbits (squash, cantaloupes, watermelons), lime, and ripe tomato. The total value of these commodities is estimated to average about $2 billion between the 1994/95 and the 1996/97 crop seasons (see appendix I).

A summary of the potential annual value of losses due to field damages and trade restrictions should Medfly become established in Florida is presented in table 1. These figures are updated estimates based on a 1993 study which evaluated the economic impact of the overall Medfly Eradication Program and its alternatives, and incorporated into the Environmental Impact Statement (EIS) of the Program [1]. The study examined the potential economic consequences of a Medfly establishment in various high-risk states, including Florida. A detailed discussion of the calculations of the updated Florida estimates is provided in appendix I.

[1] Since 1929, the year that the first outbreak of Medfly was detected in Florida, nine outbreaks have occurred subsequently. These occurred in 1956, 1962, 1963, 1981, 1984, 1985, 1987, 1990, and 1997. There was one outbreak in the last 5 years, two in the last 10 years, and eight in the last 40 years, thus giving an outbreak frequency of 0.2 outbreak per year. Based on this history, it is predicted that given no major changes in APHIS' exclusion activities, the probability of an outbreak of Medfly in Florida is about 0.2 per year (or once every 5 years).

The total value of the loss to Florida producers if Medfly were to become established in the State is estimated at $300 million annually. Forty-five percent of this amount is attributable to field loss and control costs, while 55 percent of the loss would be due to trade restrictions and quarantine.

In sum, under this option, no program cost would accrue to APHIS as the State of Florida would likely assume APHIS' share of the costs of detection and control of Medfly. Without APHIS' participation, the cost to the State is estimated to be at least $7.2 million per year. In the event of a Medfly outbreak, producers could incur losses ranging between $156 million to $161 million per outbreak due to trade-related restrictions (items 3, 4 and 5 in table 1). Assuming a probability of a Medfly outbreak of 0.2 per year, the annual cost to producers of an outbreak is about $32 million (0.2 times $161 million). The combined cost of a Medfly outbreak to the State and producers would therefore total $39.2 million ($7.2 million in costs to the State plus $32 million in producer losses).

At the high range, producers could suffer close to $300 million in losses if Medfly were to become established in Florida. In this case, the State would not be engaged in detection or eradication activities for Medfly.

Table 1. Summary of the Potential Annual Value of Field Damages and Trade Losses due to Medfly Establishment in Florida

Type of Loss /Cost	Value of Loss /Cost ($1,000)
1. Field Loss Value of Crop	88,295
2. Cost of Field Treatment	41,367
3. Loss in Export Revenue due to Trade Embargo	118,136
4. Range of Costs due to Export Treatment Damage	2,779 - 7,455
5. Cost of Export Quarantine Compliance Treatment	35,212
Total Loss	**285,789 - 290,465**

II. The Existing Program Option

The existing Medfly program in Florida is a cooperative program in detection and control between the State and APHIS. Agricultural Quarantine and Inspection (AQI) activities to regulate and inspect imported cargo, and screen carriers and mail are administered by APHIS and funded through user fees. These exclusion activities are targeted to prevent a wide complex of exotic animal and plant diseases and pests, including Medfly.

The AQI Program

AQI activities directed towards the inspection and regulation of passenger baggage, cargo, mail and other pathways for Medfly is presented in table 2. It is estimated that 187 staff years were dedicated to AQI activities in Florida in FY 1996-1997, at a cost of $8.1 million.

Table 2. Plant Protection and Quarantine (PPQ) Staffing for AQI Activities in Florida (as of January 1, 1997)/1

Type of Activity	Staff Years	Total Cost ($)
Air passenger baggage clearance	89	3,863,490
Foreign air cargo clearance	11	477,510
Foreign maritime cargo clearance	24	1,041,840
Foreign mail clearance	2	86,820
Other Medfly-related activities /2	41.5	1,801,515
Non-Medfly related activities /3	19.5	846,495
TOTAL	**187**	**8,117,670**

/1 Staffing includes technicians, PPQ officers, identifiers, and supervisors. Salaries are averaged based on a GS-9/4 level in 1997, at $34,728 plus 25% benefits ($8,682). Total salary plus benefits are therefore $43,410 per staff year.

/2 This activity includes ship-boarding, inspection of aircrafts, safeguarding garbage, and clearance of cruise ship passengers.

/3 This activity includes export certification and inspection of propagative material shipments.

Medfly Detection Program

The Medfly detection program is designed to provide early detection of Medfly introductions. It provides traps, lures, equipment and personnel to install and service traps for early detection. The program in Florida is operated under a cooperative agreement between APHIS and the State.

In FY 1996-1997, 12,431 Medfly traps were placed in 24 counties in Florida.[1] This represented 4,490 square miles in total area to be trapped. Approximately 4 percent of this area is considered to be high risk areas, 76 percent medium risk and 20 percent low risk. The current national protocol calls for 10 traps per square mile for high risk areas, five traps for medium risk and one trap per square mile for low risk.[2]

The total cost of trapping to the State and APHIS was $2.4 million (including materials and personnel). APHIS contributed 26 staff years in personnel time; the same amount of staff years was matched by the State.

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[2] Over 96 percent of the traps were Jackson Trimedlure bait traps; the remaining 4 percent were McPhail traps.

[3] High risk areas were located in the following counties: Pinellas, Hillsborough, Orange, Palm Beach, Dade, and Broward.

Medfly Eradication Program

The current eradication strategy consists primarily of three components: (1) early detection and intensive delimiting survey, followed by (2) aerial and ground applications of pesticides and the release of sterile flies, and (3) regulatory control on the movement of Medfly host commodities.

During the peak of the 1997 outbreak, the total regulated area consisted of 918 square miles in five counties (Hillsborough, Polk, Manatee, Orange, and Sarasota). Approximately 3.4 billion sterile flies were released over 313 square miles, and Malathion bait spray was applied aerially over 453 square miles.[3] Eradication is achieved when detection reveals no Medflies over a period of three life cycles from the last detection. The program in Florida is expected to end in early spring of 1998.

The total cost of eradication to APHIS and the State was roughly $24 million (with cost shared on an equal basis). APHIS was responsible for the supply and release of sterile flies, and regulating host commodities. The cost associated with sterile fly release was $1.5 million for 3.4 billion flies. The State provided for Malathion and application related-expenses which amounted to nearly $6 million.

It is assumed that at existing levels of activity and funding, the probability of a Medfly outbreak is 0.2 per year (see footnote 1). Assuming that outbreaks would occur in noncommercial areas, the cost of this option would be public costs borne by APHIS and the State. The cost per year of this option is composed of expenditures for AQI, detection and eradication, which is estimated at $15.3 million ($8.1 million for AQI, $2.4 million for detection, and $4.8 million for eradication).[4]

III. The Ideal Risk-Reduction Option

The objective of the risk reduction option is to scope a program that would eliminate any risk to humans and the environment from the use of the pesticide Malathion. Without the availability of Malathion, the only proven effective control tool currently, the risk management of Medfly must place greater reliance on exclusion measures of passengers, cargo and other pathways for Medfly, either prior to arriving or at first port of entry into the mainland United States. It must also emphasize the detection trapping program in order that an introduced population be detected as early as possible, and to ensure that sterile fly releases are effective. The following discussion describes the maximum enhancements that could be undertaken by APHIS and the State in order to reduce the risk of a Medfly outbreak in Florida. This assessment only considers improvements in exclusion, detection and prevention measures conducted within the United States, and does not address other risk-reduction strategies such as the elimination of Medfly from neighboring countries in, for example, Central America.

[4] About 38,000 gallons of Malathion (active ingredient) was applied in total.

[5] The cost of eradication per year, $4.8 million, is calculated by multiplying the probability of an outbreak per year, 0.2, by the cost of an eradication, $24 million.

AQI Program

The risk of Medfly introduction can be lessened through increased inspection and regulation of various direct pathways into Florida:

1. International Air Passenger Baggage

International air passenger baggage is a high risk pathway for Medfly into Florida. About 8.8 million air passengers arrive in Florida per year [2]. About 5 million of these passengers arrive from Medfly countries [3]. It is estimated that in 1994, over 40,000 small lots of Medfly host materials destined for Florida arrived through this pathway [3]. In FY 1996-1997, an estimated 89 staff years was dedicated to baggage clearance (Table 2).

Currently, about 15 percent of the international arrivals are sent to secondary inspection where the baggage is x-rayed. Out of this amount, one-third is opened and inspected. Therefore, baggage from 440,000 passengers are currently opened and inspected, some of which are from Medfly countries while others are not. In order to achieve 100 percent inspection of passengers arriving from Medfly countries, a large work-load increase would occur. All 8.8 million air passengers arriving into Florida would have to be interviewed. The baggage of 5 million passengers from Medfly countries would need to be opened and inspected (as x-ray technology is currently far less than 100 percent effective). In order to open and inspect all baggage from Medfly countries, the inspection staff would have to increase 20-fold.

2. Foreign Maritime Cargo Clearance

About 25,000 maritime cargo shipments are inspected by PPQ in Florida ports per year. The majority of these are fruits and vegetables. Most of these arrive in 20 or 40 ft sea containers. The clearance commonly consists of the removal and inspection of boxes from the tailgate of the containers. An estimated 24 staff years was used for foreign maritime cargo clearance in FY 1996-1997.

Approximately 20,000 refrigerated sea containers arrive at Florida ports per year from Medfly countries [3]. These containers generally contain fresh, frozen or processed food. It must be assumed that Medfly host material could be smuggled or not properly declared in these containers. Surveys in Florida of this pathway show that prohibited agricultural commodities are smuggled into the State [3][4]. To achieve 100 percent coverage of this pathway, the 20,000 refrigerated containers would have to be opened and a PPQ officer would then need to determine whether the cargo was in a hard frozen state. If this were not the case, much of the cargo would have to be removed from the container to determine whether Medfly host material was present. To achieve this level of coverage, the inspection staff would have to be increased about 4 times the current level.

3. Foreign Air Cargo Clearance

About 120,000 air cargo shipments are inspected per year by PPQ officers at Florida ports of arrival [2]. Most of these are cleared at Miami and are manifested as some type of USDA regulated material. Most of these shipments are either cut flowers or fresh produce. It can be assumed that Medfly host materials are not being smuggled in these shipments based on the PPQ inspection of smaller lots of fruits and vegetables, and the inspection by PPQ, and x-ray examination by U.S. Customs of cut flower shipments.

Only a small amount of non-regulated air cargo shipments are inspected by PPQ; less then 1,000 shipments per year [2]. Since air cargo shipments can be shipped from origin to destination within a day or two, it can be assumed that Medfly host material can be smuggled in any shipment arriving from Medfly countries. A survey of air cargo at Miami International Airport found smuggled and mismanifested agriculture material in these shipments including prohibited Medfly host material [3]. An estimated 600,000 air cargo shipments arrive in Florida from Medfly countries per year [3]. An estimated 11 staff years was used for air cargo clearance in Florida in FY 1996-1997. To achieve 100 percent coverage of this pathway, the inspection staff would have to increase 6 times the current level.

4. Foreign Mail Clearance (parcel)

Medfly host material and fruit fly infested fruits have been found arriving in foreign mail parcels arriving in Miami, Florida. A large proportion of the parcels arriving in Miami are from Medfly countries. Currently, 2 PPQ staff years are allocated to mail clearance in Miami. To provide 100 percent coverage of this pathway, all parcels from Medfly countries would have to be x-rayed and a large number of these would need to be opened for inspection. This would require an increase of 4 staff years to achieve 100 percent coverage.

5. Other Medfly Pathways into Florida

Additional pathways into Florida and ones that are generally considered minor for Medfly are:

- Aircraft stores, quarters, holds and garbage;
- Ship stores, quarters, garbage and baggage;
- Yachts.

A large number of the ships and aircrafts is boarded by PPQ inspectors, and at least the high risk areas within these vessels are inspected. Garbage are generally well-managed. Only a few yachts are boarded. The baggage of cruise ship passengers are generally not inspected.

An estimated 41.5 PPQ staff years was used to provide coverage of this group of pathways in FY 1996-1997. In order to provide 100 percent coverage of these pathways for Medfly, the current 41.5 PPQ staff years would need to be doubled.

A summary of the additional staff years that would be needed over the current level to provide 100 percent coverage of Medfly pathways is presented in table 3. It is estimated that the total number of staff years would have to increase ten-fold overall, from the existing 187 to 2,075. The projected total cost of the staff years is $90 million annually.

The above section identifies four direct Medfly pathways into Florida, and the resources necessary to provide 100 percent coverage in order to reduce risk to near zero. However, there are other pathways not explicitly considered in this analysis, for which resources that would be needed to provide full coverage would likely be large. These pathways, from Hawaii and via Canada and other U.S. states, are discussed in appendix II. The portion of risk attributed to these other pathways are not assessed; however, there is evidence that it is significant.

Detection Program

A risk-reduction strategy that would avoid the use of pesticides, especially aerial application, would need to place greater emphasis on strengthening the detection trapping program. The strategy calls for a greater increase in the density of traps over the existing trapping area. The rationale behind this approach is to ensure that any new outbreak would be detected at the earliest possible stage so that eradication without the use of Malathion would be possible.

Currently, 12,500 traps are placed over 4,490 square miles. It is estimated that 25 traps per square mile would be needed over the same area in order to reduce the risk of Medfly introduction.

The cost of the current detection trapping program (APHIS' and the State's share) is estimated to be $2.4 million in FY 1996-1997. The cost of the additional traps to bring trapping density to 25 traps per square mile would be roughly $19 million per year. Thus, the total cost of this enhanced detection program would amount to $21.4 million annually.

Preventative Release of Sterile Flies Program (PRP)

An alternative strategy to the trapping approach for risk-reduction described above is the area-wide release of sterile Medflies in areas with a high risk of introduction. This approach is based on the ability of the sterile insects to disrupt the normal mating patterns of the wild Medflies that are introduced, thus interfering with their ability to colonize. Sterile flies are successful without pesticides in this situation because the number of wild flies is very low at introduction. APHIS and the State of California have recently been successful in utilizing the area-wide release of sterile Medflies as a preventative/exclusionary measure in the Los Angeles (LA) Basin. This area had been plagued with repeated outbreaks since 1987 until continuous area-wide releases were started in 1994. However, even with PRP, a Medfly outbreak was discovered in LA County in 1997.

Table 3. Additional AQI Staff Years Needed for Maximum Risk-Reduction

Type of Activity/Pathway	Current Staff Years	Cost at Current Staffing Level	Additional Staff Years Needed	Projected Total Cost ($) [1/]
Air Passenger baggage clearance	89	3,863,490	1,691	$77,269,800
Foreign air cargo clearance	11	477,510	33	1,910,040
Foreign maritime cargo clearance	24	1,041,840	120	6,251,040
Foreign mail clearance	2	86,820	2	173,640
Other Medfly-related activities	41.5	1,801,515	41.5	3,603,030
Other Non-Medfly related activities	19.5	846,495	0	846,495
TOTAL	**187**	**8,117,670**	**1,887.5**	**90,054,045**

[1/] The total projected cost is calculated by multiplying the projected number of staff years needed to reduce the risk of these pathways to near zero (the current staff years added with the additional staff years), times the salary and benefits of a GS9/4 at $43,410.

It is estimated that 125,000 flies per week per square mile would be needed over 5,501 square miles. The area-wide sterile release would include areas that meet the following criteria: areas where Medflies were detected in the past, areas in proximity to ports of entry, and/or urban or suburban areas where frequent movement of imported and exotic Medfly hosts occurs.

Given a 70 percent survival rate of pupae, approximately 46.5 billion flies would be needed per year. The cost of pupae is estimated at $431 per million pupae, yielding a total cost of sterile flies of $20 million per year.[5] This estimate does not include the cost of eclosion facilities to produce adult flies, the initial cost of which is about $1 million per facility.

For this analysis, it is assumed that APHIS and the State will continue their current 50-50 cost-share arrangement for the ideal program option. The annual cost of activities for the ideal program option as compared with the no action and existing program options is summarized in table 4.

In sum, the ideal risk reduction option would cost annually between $110 million (enhanced AQI program plus preventative sterile release program) and $111.4 million (enhanced AQI program plus increased detection trapping). Increased expenditures of at least these magnitudes would be necessary in order to reduce the frequency and severity of Medfly introduction to a level lower than the 0.2 probability of an outbreak per year posed by the existing program, thereby minimizing the reliance on malathion.

It must be noted that these cost estimates are understated as they do not consider two potentially significant sources. These are (1) costs to provide other AQI services which would increase ten-fold, such as secretarial support, managerial staff, vehicles, increased office space; and a 20-fold increase in space at international ports associated with baggage inspection; and (2) cost to eradicate outbreaks which could still occur under the enhanced AQI and trapping program combination. The risk of Medfly introduction is not completely eliminated as it could still be generated from other pathways that are not assessed in this study.

IV. Conclusion

The cost of three program options for controlling Medfly in Florida is presented in table 5. Under no action, APHIS would not participate in any program to eradicate a Medfly outbreak in Florida. The State of Florida would take over APHIS' role in eradication, which is currently a cooperative arrangement. The State would incur an annual cost of $7.2 million if eradication were successful. APHIS would continue to provide exclusion measures for exotic pests and diseases at Florida ports, at a cost of $8.1 million annually. The cost to producers is estimated to range between $32 million if eradication were successful to $300 million if Medfly were to become established in Florida.

[6] The $431 cost per million pupae includes the cost of flies, aircraft, personnel, shipping , materials, vehicles, utilities and other miscellaneous costs.

Table 4. Annual Cost of Activities for Each Option to APHIS and the State of Florida (million dollars)

Types of Activities	I-a. No Action Medfly not established	I-b. No Action Medfly established	II. Existing Program	III-a. Ideal Program - Enhanced Detection	III-b. Ideal Program - Preventative Release of Sterile Flies
AQI	(8.1)	(8.1)	(8.1)	(90)	(90)
APHIS	8.1	8.1	8.1	90	90
Detection	(2.4)	(0)	(2.4)	(21.4)	(0)
APHIS	0	0	1.2	10.7	0
Florida	2.4	0	1.2	10.7	0
PRP	(0)	(0)	(0)	(0)	(20)
APHIS	0	0	0	0	10
Florida	0	0	0	0	10
Eradication	(4.8) [1/]	(0)	(4.8) [1/]	(0)	(0)
APHIS	0	0	2.4	0	0
Florida	4.8	0	2.4	0	0
TOTAL COST	**(15.3)**	**(8.1)**	**(15.3)**	**(111.4)**	**(110)**
APHIS	**8.1**	**8.1**	**11.7**	**100.7**	**100**
FLORIDA	**7.2**	**0**	**3.6**	**10.7**	**10**

[1/] The cost of eradication per year, $4.8 million, is calculated by multiplying the probability of an outbreak per year, 0.2, by the cost of an eradication, $24 million.

The existing program, consisting of AQI, detection trapping, and eradication activities, currently cost APHIS and the State $15.3 million annually. Given a typical outbreak in noncommercial areas, producers suffer minimal losses in crop production and trade markets. In order to achieve eradication, the existing program option relies on the use of Malathion, for which the external cost to humans and the environment cannot be determined.

The ideal program option relies on enhanced quarantine, detection trapping, and preventative sterile release measures in order to reduce the risk of a Medfly outbreak. The cost of this option is estimated to range between $110 million (enhanced AQI program plus preventative sterile release program) and $111.4 million (enhanced AQI program plus increased detection trapping) annually. The bulk of this cost, about $90 million, is for an AQI program that would provide 100 percent coverage for direct Medfly pathways into Florida. The total cost estimate of this program, however, is underestimated as it does not consider the cost to eradicate outbreaks which could still occur under the enhanced AQI and trapping program combination, and the risk of Medfly introduction from other pathways not assessed in this study. As evident in table 5, the cost to achieve the level of risk reduction in order to avoid the use of Malathion would be over seven times the amount of the existing program.

Table 5. Summary of Costs of Options: No Action, Existing Program, Ideal Program

Cost to	**I-a. No Action-Medfly not established ($ million)**	**I-b. No Action-Medfly established ($ million)**	**II. Existing Program ($ million)**	**III-a. Ideal Program-Enhanced Detection ($ million)**	**III-b. Ideal Program-Preventative Release of Sterile Flies ($ million)**
APHIS	8.1	8.1	11.7	100.7	100
State of Florida	7.2	0	3.6	10.7	10
Total APHIS and State	**15.3**	**8.1**	**15.3**	**111.4** [1/]	**110** [1/]
Producers	**32**	**300**	**0**	**0**	**0**
TOTAL COST	**47.3**	**308.1**	**15.3**	**111.4** [1/]	**110** [1/]

[1/] These estimates do not include: (1) costs to provide other AQI services such as secretarial support, managerial staff, vehicles, increased office space and other space at international ports associated with a 10-fold increase in baggage inspection; and (2) cost to eradicate outbreaks which could still occur under the enhanced AQI and trapping program combination.

REFERENCES

1. U.S. Department of Agriculture. Animal and Plant Health Inspection Service (APHIS). **An Economic Impact Assessment of the Mediterranean Fruit Fly Cooperative Eradication Program**, Policy and Program Development, March 1993.

2. U.S. Department of Agriculture. Animal and Plant Health Inspection Service. **WADS Analysis/Comparison Report: 1997**, Plant Protection and Quarantine.

3. U.S. Department of Agriculture. Animal and Plant Health Inspection Service. **Medfly Exclusion Evaluation, An Analysis of Potential Pathways for Entry of Medfly into the United States**. Policy and Program Development, January 1996.

4. Florida Department of Agriculture and Consumer Services and Plant Protection and Quarantine, APHIS. **Cooperative Agreement for Pest Exclusion, Final Report on Cooperative Efforts to Minimize Pest Risk in Florida.** October 1996.

5. U.S. Department of Agriculture. Animal and Plant Health Inspection Service. **Mediterranean Fruit Fly Risk Assessment.** Policy and Program Development. July 1992.

APPENDIX I

ECONOMIC LOSSES DUE TO MEDFLY ESTABLISHMENT IN FLORIDA

Appendix I - Estimation of Economic Losses

This appendix focuses on the estimation of losses to producers in the event that Medfly becomes permanently established in the State of Florida. The methodology in this study was established in a previous analysis to assess the impact of Medfly on susceptible States in the United States, including Florida [1]. Detailed discussions of the methodological bases for the calculations can be found in that study.

The following estimates of loss and costs are considered: (1) loss in value of host crops that sustain field damage; (2) cost of field treatment; (3) costs associated with export quarantine compliance treatments; (4) loss in value of host commodities damaged during quarantine compliance treatments; (5) loss in export revenue due to export prohibition. The analysis assumes that all changes in production are marketed at average 1994-1996 crop season prices. Only direct costs to producers are considered; the impact on consumers are not specifically addressed.

Loss in Value of Medfly Host Crops Grown in Florida

A list of Medfly host crops grown in Florida is presented in table 1. Most of these crops are likely to require routine field treatment to prevent damage.

Table 1. Crops Produced in Florida That Would Likely Sustain Economic Damage from Medfly.

Common Name	Scientific Name
Avocado	*Persea americana*
Guava	*Psidium guajava*
Grapefruit	*Citrus paradisi*
Lime	*Citrus aurantiifolia*
Mango	*Mangifera indica*
Orange	*Citrus sinensis*
Pepper	*Capsicum sp.*
Tangerine	*Citrus reticulata*
Tangelo	*Citrus paradisi x C. reticulata*
Temple	*Citrus temple*
Tomato	*Lycopersicon esculentum*

Although lime and tomato are listed as hosts in the literature, these crops are attacked under rare conditions. Lime is susceptible to Medfly only in the injured or partially decaying state, while tomato is attacked only when ripe. These crops would therefore not likely be field treated.

Florida ranks as one of the top 10 States in the production of most of the Medfly host crops. Much of the winter supply of oranges and tomatoes in the United States are from Florida. Lime and temple oranges are only grown in the State. The value of production of host crops are presented in table 2.

It is assumed that the change in the pest management practice of growers will involve the use of Malathion and protein hydrolyzate bait. The assumption is made that, even with the added control treatment, there will be a 2.5 percent fruit loss in the field through a corresponding increase in culls.

Moreover, the disruption of current pest management practices will reduce the levels of various parasitoids and predators and cause an additional 2.5 percent annual crop loss. Insect predators such as coccinelids, and parasitoids such as Aphytis holoxanthus, an important control agent of Florida red scale, are shown to be susceptible to Malathion bait spray.[6] Thus, an additional annual loss of 2.5 percent is used to represent damage caused by other pests as a result of the destruction of natural enemies. With the exception of lime and tomato, this culminates in a total field loss of 5 percent for Medfly host crops listed in table 1.

Table 2. Quantity and Value of Host Commodities Likely to Sustain Field Damage due to Medfly, Average 1994/95 - 1996/97 Crop Season

CROP	TOTAL PRODUCTION (1,000 lbs)	VALUE OF PRODUCTION ($1,000)	ESTIMATED VALUE OF FIELD LOSS (@5%)
Orange	19,050,120	1,246,233	62,312
Grapefruit	4,642,417	214,697	10,735
Tangelo	286,501	16,617	831
Tangerine	454,417	66,617	3,308
Temple	213,000	13,637	682
Pepper [1/]	981	189,202	9,460
Avocado	41,667	12,017	601
Mango	6,417	1,575	79
Guava [2/]	5,000	5,750	288
TOTAL	**24,700,520**	**1,766,345**	**88,296**

[1/] Statistics on peppers are based on average 1994/95-1995/96 crop season.
[2/] Statistics on guavas are based on 1995/96 crop season.

[7] Reference sources: [2,3,4,5,7,8,9,10,11,12,13,14,15,16]

Cost of Field Treatment

The actual insect management programs (number of applications and pesticide used) for host crops would vary from area to area and farm to farm depending on such factors as Medfly population level, availability of alternate hosts, pesticide regulations, and susceptibility of the cultivar. It is assumed that Malathion will be applied once a week during the time the fruit is susceptible to attack. The estimated number of applications for each type of fruit is then determined by reviewing government recommendations and other literature on the subject from Australia, South Africa and Israel [1,3,4,7,8,9,10,11,12,13,14,15,16].

Table 3 details growers' cost of controlling Medfly in primary host commodities based on the required number of applications. Most of the fruit requires 6 applications, with the exception of citrus which requires twelve applications because of the long growing season.

The cost of applying Malathion bait spray is based on a study conducted on the economic impact of Medfly in California [17]. The average per acre cost of pesticide application (including material and application costs) was estimated as $30 for non-citrus tree crops and vines, and $45 for citrus and avocados in 1990. These estimates, adjusted to reflect 1996 prices using the GDP implicit price deflator, may be high as California's strict environmental laws may cause application costs to be higher than in other states [17]. The total cost of field control is estimated to be $41.4 million per year.

Table 3. Grower's Cost of Field Control of Medfly

CROP	TOTAL NO. OF APPLICATIONS	CONTROL COSTS PER APPLICATION PER ACRE	TOTAL AREA REQUIRING CONTROL (ACRES)	TOTAL COST OF FIELD CONTROL (DOLLARS)
Orange	12	53	594,167	31,282,893
Grapefruit	12	53	133,100	7,007,715
Tangelo	12	53	12,800	673,920
Tangerine	12	53	24,300	1,279,395
Temple	12	53	6,700	355,100
Avocado	6	53	5,733	301,842
Mango	6	35	1,833	64,338
Guava	6	35	200	7,020
Pepper	6	35	21,350	749,385
TOTAL			**800,183**	**41,721,608**

Loss in Export Revenue Due to Trade Restrictions

If Medfly were to become established in Florida, current trade patterns of fruit and vegetables would be disrupted. Exports of products from Florida to many countries would be affected to various degrees. This would range from additional certification, to quarantine treatment such as cold treatment and/or fumigation, to prohibition. The quantity of commodities subject to quarantine is determined by assessing the likely behavior of export markets in the event of an infestation in Florida. In predicting how specific countries will react, current regulations and the reaction to past Medfly outbreaks in the United States, including the recent outbreak in Tampa, Florida, are taken into consideration. The following assumptions are made in estimating the impact of a general infestation in Florida.

In many countries where Medfly is, or will be, common and widespread, no significant change would occur that would effect exports from Florida. These countries would include Africa (other than South Africa), Central America, Ecuador, Peru, Brazil, Bolivia and Uruguay.

In certain Middle Eastern countries where Medfly occurs, or which do not generally regulate for fruit flies, there would be no significant impact on export from Florida. This would include Israel, Jordan, and all countries in the Arabian Peninsula.

In certain locations that do not generally restrict imports for tropical and subtropical fruit flies, or for specific countries that do not generally regulate fruits and vegetable, there would be little impact. These countries include Canada, Iceland, and Singapore.

It is assumed that China (including Hong Kong), Japan, South Korea, South Africa, and the Caribbean nations would prohibit the importation of all Medfly hosts including marginal hosts for a number of years. Marginal hosts include lemon, sour lime, non-ripe tomatoes, eggplant, strawberries, and cucurbits. It is also assumed that these established markets would be lost by the time these prohibitions could be mitigated.

Certain countries would require treatment of Medfly hosts (not including marginal hosts) from Florida. These countries are assumed to include Mexico, Argentina, Chile, Taiwan, Australia, and New Zealand.

For all other countries now importing Medfly host materials from Florida, it is assumed that fruit from Florida (excluding marginal hosts) would be treated. These countries are either free of Medfly, Medfly occurs but is not widespread (as in Columbia), or are members of the European Community which consider Medfly a significant quarantine pest whether or not the fruit fly occurs in the specific country.

The predicted impacts by various countries based upon the above assumptions are presented in appendix III. Because information on exports from Florida is not readily available, the export of fresh commodities from the State is assumed to be proportional to Florida's fresh production.

The predicted trade impacts are sorted into three categories: prohibited (P), requiring treatment (T), and no change in trade (X).

It is estimated that the average 1994/95-1996/97 value of exports from Florida that would be considered as Medfly hosts is $300 million (table 4). If Medfly were to become established, the value of exports that would be lost due to export prohibition is nearly $120 million, or 40 percent of total export from Florida.

Loss in Value of Host Commodities Damaged During Quarantine Compliance Treatments

For this study, it is assumed that countries that require quarantine compliance treatment for certain U.S. fruits and vegetables would accept the current USDA approved treatments. For those commodities with more than one treatment available, the most common treatment is assumed to be used. This would generally be the treatment that causes the least damage to the commodity.

The available treatment and estimated damage range for each of the commodities requiring treatment is presented in table 5. Damages could result from scald, cold damage or other treatment-related problems, or from increased deterioration resulting in decreased shelf-life of the commodity.

Table 4. Quantity and Value of U.S. Exports Subject to Quarantine Compliance

Crop	Commodity Loss due to Export Prohibition		Commodities Requiring Treatment		Commodities Not Requiring Treatment		Commodity Losses due to Unavailable Treatment		Total Trade	
	Quantity	Value	Quantity	Value	Quantity	Value	Quantity	Value	Quantity	Value
	(lbs)	($1,000)	(lbs)	($1,000)	(lbs)	($1,000)	(lbs)	($1,000)	(lbs)	($1,000)
Avocado	671,308	244	3,053,480	455	1,990,926	374	-	-	5,715,714	1,073
Cantaloupe	9,307	3	20,808	4	1,084,262	234	-	-	1,114,377	241
Cucumber	22,764	5	-	-	28,238,934	6,596	-	-	28,261,698	6,601
Grapefruit	399,960,503	92,390	230,217,789	44,120	114,807,369	19,020	-	-	744,985,661	155,530
Lime	116,035	195	-	-	14,133,902	4,509	-	-	14,249,937	4,704
Orange	104,422,900	18,542	20,860,178	3,203	75,732,688	11,320	-	-	201,015,766	33,065
Pepper	166,071	100	-	-	-	-	748,427	360	914,498	460
Tangerine	1,641,881	885	1,684,003	617	16,115,456	6,648	-	-	19,441,340	8,150
Temple	15,786,039	4,730	24,257,320	6,340	2,092,944	513	-	-	42,136,303	11,583
Tomato, ripe	721,589	216	5,241,588	1,738	76,368,357	27,349	-	-	82,331,534	29,303
Tomato, green	721,589	216	-	-	81,609,945	29,087	-	-	82,331,534	29,303
Water-melon	1,154,076	250	-	-	40,830,047	5,229	-	-	41,984,123	5,479
TOTAL	**525,394,062**	**117,776**	**285,335,166**	**56,477**	**453,004,830**	**110,879**	**748,427**	**360**	**1,264,482,485**	**285,492**

For commodities where treatment is not available, or the available treatment is cost-prohibitive or causes extensive damage to the fruit, it is assumed that the export market of these commodities which quarantine for Medfly would be lost. While ripe tomato, assumed to be imported by the Caribbean Islands, are treated, the market for untreated green tomato will remain unchanged. The export market for peppers would be lost as there are no economical treatment available. The value of this market loss is $360,000 (table 4).

Where treatment is available, the value of exported host commodities damaged during quarantine compliance treatment is obtained by applying the estimated range of damage to the value of export commodities requiring treatment. The value of this loss is estimated to range from $2.8 million to $7.5 million (table 6).

Cost of Export Quarantine Compliance Treatments

The last major category of costs associated with a Medfly infestation in Florida involves the cost of export quarantine compliance. This section draws heavily on the study by Galt and Albertson (GA) [3] in the construction of the expenses involved in each of the five quarantine treatment classes.

Two types of costs are incurred in conforming to the quarantine regulations: initial costs and recurrent costs. Initial costs are one-time outlays involved in the fumigation and storage of crops subjected to export quarantine. These include costs to construct fumigation and cold storage facilities, and costs to upgrade existing packing and shipping facilities.

Recurrent costs are defined as those costs that are incurred annually in the fumigation and cold storage processes. Some of these costs are comprised of costs of fumigants, cold storage costs, annual wages of fumigators, truck drivers, and increased hauling expenses.

Fruits in treatment class I (orange, tangerine, temple), and class II, consisting of grapefruit, require cold storage. Grapefruit comprises an 80 percent share of the volume to be treated. Avocado in class III requires fumigation and cold storage for varying periods. Class IV, comprised of ripe tomato, requires fumigation with no follow-up cold storage.

Table 5. Available Treatment and Estimated Damage Range for Medfly Host Commodities

Commodity	Treatment Available	Estimated Loss (Percent)
I. Orange Tangerine Temple Tangelo	Cold Treatment, T107, 10 to 16 days	0 - 5
II. Grapefruit	Cold Treatment, T107, 10 to 16 days	6 - 15
III. Avocado	Fumigation with methyl bromide (2 ½ hours) and refrigeration (7 days), T102 (A)(1)	6 - 15
IV. Tomato, ripe	Vapor heat treatment (T106 (B)) is available but has not proven economical in the past. Fumigation with methyl bromide (3 ½ hours) is approved but treatment is considered marginal as to host tolerance. It is assumed that only ripe tomatoes would be treated by fumigation.	0 - 5
V. Pepper	Vapor heat (T106 (B)) treatment is available but has not proven economical in the past. Thus, it is assumed treatment would not be used.	
VI. Cucurbit	No treatment available except for zucchini squash, which can be treated with vapor heat. This treatment, however has not proven economical in the past and assumed would not be used.	

Table 6. Value of Host Commodities Damaged During Quarantine Treatment

Commodity	Quantity Treated (lbs)	Value of Treated Commodity ($1,000)	Range of Treatment Damage (Percent)	Cost of Treatment Damage	
				Low Estimate	High Estimate
Avocado	3,053,480	455	6 - 15	27,300	68,250
Grapefruit	230,217,789	44,120	6 - 15	2,647,200	6,618,000
Orange	20,860,178	3,203	0 - 5	0	160,150
Tangerine	1,684,003	617	0 - 5	0	30,850
Temple	24,257,320	6,340	0 - 5	0	317,000
Tomato, ripe	5,241,588	1,738	6 - 15	104,280	260,700
Total	**285,314,358**	**57,473**		**2,778,780**	**7,454,950**

Details of the construction of the costs of treatments for each class are found in tables in appendix IV. Initial costs associated with fumigation and cold storage are those costs involved in the construction of new facilities. It is assumed that all the tonnage for fumigation will require new fumigation chambers for the application of methyl bromide treatments. The total construction cost of temporary or semi-permanent, tarpaulin fumigation structures is estimated to be $7,500.

It is assumed that no excess cold storage capacity exists in Florida to meet current export quarantine compliance if Medfly were to become established in the State. Permanent cooling facilities will also have to be constructed fruits requiring cold storage. Because the cost of constructing each facility is high, the total expenditure for these facilities, $27.5 million, accounts for 98 percent of the initial costs. The calculations of the construction cost of these facilities are presented in table A-5 of appendix IV.

Existing facilities which pack and ship fresh commodities under Medfly export quarantine will be required to have screens installed in and around the facility where fruit is being transferred from the field to shipping cases. The upgrading is assumed to occur only once with no additional maintenance or repair of facilities. Following Galt and Albertson, the cost of upgrading facilities is comprised of materials (screen, forced-air fans, etc.) and installation labor. The GA study estimated that the material cost to upgrade 134,192 car equivalents was $9 million in 1990 prices, or about $10.5 million in 1996 prices.[7] Therefore, the material cost of upgrading 7,133 car equivalents for the 142,657 tons of fruit under consideration in this study would amount to $558,000. A similar proportioning method is used to estimate the labor cost needed to upgrade facilities. Wage increases of nearly $300,000 are expected. This yields a total of $621,000 to upgrade packing/shipping facilities.

The total initial cost for export quarantine compliance is estimated to be approximately $28 million (table 7). The bulk of this amount, 98 percent, is attributed to the construction cost of cold storage facilities. The cost of upgrading packing and shipping facilities contributes 2.2 percent, followed by the construction cost of fumigation facility (less than 0.03 percent).

Recurrent costs associated with export quarantine compliance are provided in table 7. Details of the construction of the three categories of recurrent cost estimates are provided in appendix IV and in the GA study [3].

The annual expenses for fumigation, estimated at $22,500, is composed of the cost associated with the fumigant and the cost of staffing the fumigation facilities. For this study, it is assumed that methyl bromide will be available for fumigation.

The annual cold storage treatment cost is calculated following GA's lower of two estimates of representative cold storage facilities. All price estimates are adjusted by an implicit price deflator to reflect current prices. The cost to cold store commodities is estimated to be $6.3 million.

[8] Each car is assumed to carry a 20-ton load of fruit.

The last category of recurrent costs is related to increased transportation due to the additional haul time necessary to meet export quarantine compliance. The two types of expenses generated are the increased cost of fuel and the wages paid to truckers for the extra haul time. The combined costs are estimated to be $750,000.

The annual total recurrent costs for export quarantine compliance is estimated to be $7 million. Cold storage related charges represent 89 percent of the total recurrent costs. The cost of increased transportation and fumigation costs represent 10.5 and 0.5 percent of annual total costs, respectively.

Table 7. Cost of Export Quarantine Compliance By Types of Expenditures for All Classes of Treatment

	INITIAL COSTS	RECURRENT COSTS	TOTAL COST
FUMIGATION COSTS	(7,463)	(22,485)	(29,948)
New Construction Costs	7,463	-	7,463
Fumigant Cost	-	12,733	12,733
Wages and Certification	-	9,752	9,752
COLD STORAGE COSTS	(27,500,506)	(6,317,803)	(33,818,309)
New Construction Costs	27,500,506	-	27,500,506
Cost of Cold Treatments	-	6,317,803	6,317,803
INCREASE TRANSPORTATION COSTS	-	(742,576)	(742,576)
Fuel Cost	-	445,804	445,804
Wages	-	296,772	296,772
UPGRADING PACKING/SHIPPING FACILITIES	(620,816)	-	(620,816)
Material Costs	558,230	-	558,230
Wages	62,586	-	62,586
TOTAL COST	**28,128,785**	**7,082,864**	**35,211,649**

Summary of the Economic Impact of a Medfly Establishment in Florida

Florida's production of Medfly host commodities is estimated at nearly $2 billion, while exports of these commodities are valued at $300 million annually The estimated range of annual costs to producers if Medfly were to become established in Florida is summarized in table 8. The cost is estimated to range between $286 million and nearly $300 million annually. Forty-five percent of this amount ($130 million) is attributable to field loss and control costs, while 55 percent (about $160 million) would be due to trade-related restrictions and quarantine. Seventy-five percent of this amount, or $118 million, would be lost due to export prohibition.

Table 8. Summary of the Potential Annual Value of Field Damage and Trade Loss due to Medfly Establishment in Florida

Type of Loss/Cost	Value of Loss/Cost ($1,000)
1. Field Loss Value of Crop	88,295
2. Cost of Field Treatment	41,367
3. Loss in Export Revenue due to Trade Embargo	118,136
4. Range of Costs due to Export Treatment Damage	2,779 - 7,455
5. Cost of Export Quarantine Compliance Treatment	35,212
Total Loss	**285,789 - 290,465**

REFERENCES

1. United States Department of Agriculture. Animal and Plant Health Inspection Service. **"An Economic Assessment of the Mediterranean Fruit Fly Cooperative Eradication Program"**. Policy and Program Development, March 1993.

2. Dowell, Robert V. **"The Medfly in California: The Threat"**. Hortiscience 18(11), pp. 40-44, February 1983.

3. Galt, Daniel and B. Albertson. **"The Potential Economic Impact of the Mediterranean Fruit Fly, *Ceratitis capitata* (Wied.), Upon Establishment in California".** Cooperative Extension and Giannini Foundation of Agricultural Economics, University of California, December 1981.

4. Liquido, N.J., Shinoad, L.A. and Cunningham, R.T. **"Host Plants of the Mediterranean Fruit Fly (Dipteria: Tephritidae): An Annotated World Review".** Miscellaneous publications of the Entomological Society of America, Number 77, Lanham, Maryland, September 1991.

5. Weems, Jr., H.V. **"Mediterranean Fruit Fly, *Ceratitis capitata* (Wiedemann)".** Florida Department of Agriculture and Consumer Service, Division of Plant Industry, Entomology Circular No. 230, September 1981.

6. United States Department of Agriculture. Animal and Plant Health Inspection Service. **"Host List of the Mediterranean Fruit Fly, *Ceratitis capitata* (Wiedemann)".** Prepared by the Biological Assessment and Taxonomic Support, National Program Planning Staff, Plant Protection and Quarantine, September 1985.

7. Annecke, D.P. and V.C. Moran. **"Insects and Mites of Cultivated Plants in South Africa".** Butterworths and Co., South Africa, 1982.

8. Barnes, B.N., D.J. Rust, and I.P. Bosman. **"Fruit Fly Brought to Bay".** Deciduous Fruit Grower, 25(5):pp. 126-129, 1975.

9. Bot, J., J.B. Vermeulen, N. Hollings. **"A Guide to the Use of Pesticides and Fungicides in the Republic of South Africa".** Section for Technical Advice on Pesticides, Plant Protection Research Institute, Department of Agriculture and Fisheries, Republic of South Africa, August 1980.

10. Department of Primary Industry. **"Uses of Insecticides in Australia, 1974".** Australian Government Publishing Service, Canberra, 1976.

11. Avidov, Zvi and Issac Harpaz. **"Plant Pests of Israel".** Israel Universities Press, Jerusalem, Israel, 1969.

12. Georgala, M.B. and C.H. Buitendas. **"Recommendations for the Control of Major Citrus Pests and Diseases on Bearing Trees During the 1975-1976 Season, Parts I and II".** Citrus and Subtropical Fruit Journal, No. 500, 1975.

13. Lotter, J. de V. “The Kiwifruit Industry in South Africa - A New Evaluation”. The Deciduous Fruit Grower, pp. 366-383, September 1982.

14. Myburg, A.C. and V.B. Whitehead. **“Pests of Peaches, Apricots and Plums in South Africa”.** Fruit World Annual, 74(12):pp. 6-8, December 1973.

15. Swart, P.L., B.N. Barnes, and A.C. Myburgh. **“Pests of Table Grapes in the Eastern Cape”.** Deciduous Fruit Grower, 26(5): 169-195, 1976.

16. White, L.D. Personal communications. Area director, Region II, International Service, Animal and Plant Health Inspection Service, United States Department of Agriculture, The Hague, Netherlands.

17. Siebert, J. and V. Pradhan. **“The Potential Impact of the Mediterranean Fruit Fly, *Ceratitis capitata* (Wied.), Upon Establishment in California: An Update”**, Working Paper No. 547. California Experiment Station and the Giannini Foundation of Agricultural Economics, July 1990.

APPENDIX II

MEDFLY PATHWAYS NOT CONSIDERED IN THIS STUDY

The following Medfly pathways are not covered in this study:

1. Pathways from Hawaii

Hawaii is the only area in the United States where Medfly is established. There is currently less than one hundred percent coverage of domestic mail packages, express carriers, cargo and air passenger baggage, all of which are at least minor pathways for Medfly into Florida. For example, of the 7 million air passengers departing Hawaii per year, about 70,000 are destined for Florida [3]. The pathways from Hawaii are currently mitigated by pre-departure activities in Hawaii by PPQ.

2. Pathways through Canada

Canadian plant protection regulations do not restrict the entry of foreign fruit for tropical and subtropical fruit flies including Medfly because the pest would not become permanently established in a northern climate. Large volumes of Medfly host material are imported into Canada from various countries and Hawaii. The most important pathways for Medfly-infested fruit entering the United States from Canada includes:

- Commercial lots, mismanifested or undeclared, moving as cargo;
- Aircraft stores;
- Baggage of car, train, bus or plane travelers.

These pathways were previously thought to be minor pathways for Medfly [5], but are now believed to be important. For example, it is known that commercial shipments of Medfly host material is being smuggled from Canada and that air passenger commonly arrive at Florida airports with citrus fruits from the Mediterranean region. A 100 percent coverage of these pathways would be extremely costly to provide as 5 million cargo trucks, 112 million passenger cars and a large number of air passengers cross into the United States from Canada yearly.

3. Pathways from foreign travelers and commodities arriving in Florida indirectly through other U.S. States.

One important pathway in this group are commercial shipments of Medfly host material smuggled in cargo that arrive at ports other than Florida before transiting to Florida ports. The other pathway of importance is air passengers destined for Florida after arriving and passing through foreign clearance in other states. Passenger baggage may be the most significant pathway in this group. Ten percent of all passengers from Medfly countries destined for Florida arrive at non-Florida ports. The John F. Kennedy (JFK) international airport in New York is the most common “backdoor” port [3].

APPENDIX III

PREDICTED IMPACT OF MEDFLY ON EXPORTS FROM FLORIDA

	Export Destination	Value of Export ($ million)		Quantity (pounds)	
AVOCADOS		*U.S. 1994-1996 average*	*Florida (5% of US Total)*	*U.S. 1994-1996 average*	*Florida (12% of US Total)*
	WORLD TOTAL	21.463	1.073	47,630,955	5,715,715
Status /1					
P	DOMINICAN REPUBLIC	0.001	0.000	14,135	1,696
P	HONG KONG	0.078	0.004	157,966	18,956
P	JAPAN	4.677	0.234	5,285,556	634,267
P	KOREAN REPUBLIC	0.131	0.007	136,579	16,389
P	**TOTAL**	**4.887**	**0.244**	**5,594,236**	**671,308**
T	AUSTRALIA	0.011	0.001	5,883	706
T	BELGIUM	0.055	0.003	122,204	14,664
T	CHILE	0.005	0.000	14,500	1,740
T	DENMARK	0.005	0.000	13,663	1,640
T	FRANCE	3.370	0.168	9,256,528	1,110,783
T	GERMANY	0.045	0.002	84,087	10,090
T	MEXICO	0.015	0.001	19,554	2,346
T	NETHERLANDS	3.768	0.188	10,915,762	1,309,891
T	NEW ZEALAND	0.001	0.000	367	44
T	NORWAY	0.005	0.000	14,683	1,762
T	SOUTH AFRICA	0.001	0.000	800	96
T	SPAIN	0.055	0.003	171,172	20,541
T	SWEDEN	0.385	0.019	1,252,031	150,244
T	SWITZERLAND	0.010	0.001	7,350	882
T	TAIWAN	0.002	0.000	683	82
T	THAILAND	0.001	0.000	400	48
T	UNITED KINGDOM	1.371	0.069	3,566,001	427,920
T	**TOTAL**	**9.104**	**0.455**	**25,445,667**	**3,053,480**
X	BRAZIL	0.022	0.001	30,986	3,718
X	CANADA	7.422	0.371	16,521,391	1,982,567
X	EGYPT	0.006	0.000	8,887	1,066
X	KUWAIT	0.004	0.000	5,517	662
X	LEBANON	0.001	0.000	1,505	181
X	SAUDI ARABIA	0.001	0.000	1,784	214
X	SINGAPORE	0.014	0.001	20,982	2,518
X	**TOTAL**	**7.471**	**0.374**	**16,591,052**	**1,990,926**

	Export Destination	Value of Export ($ million)			Quantity (pounds)	
		U.S.	*Florida*		*U.S.*	*Florida*
CANTALOUPES		*1994-1996*	*(1%*		*1994-1996*	*(1%*
		average	*of US total)*		*average*	*of US total)*
	WORLD TOTAL	33.804	0.237		156,224,096	1,093,569
Status /1						
P	CHINA	0.008	0.000		13,130	92
P	HONG KONG	0.108	0.001		364,397	2,551
P	BAHAMAS	0.006	0.000		20,216	142
P	JAPAN	0.258	0.002		928,745	6,501
P	BERMUDA	0.001	0.000		3,089	22
P	**TOTAL**	**0.380**	**0.003**		**1,329,577**	**9,307**
X	BAHRAIN	0.001	0.000		588	4
X	BELGIUM	0.015	0.000		79,200	554
X	CANADA	32.833	0.230		151,882,429	1,063,177
X	COSTA RICA	0.004	0.000		16,130	113
X	FRANCE	0.002	0.000		14,112	99
X	GERMANY	0.027	0.000		151,199	1,058
X	KUWAIT	0.003	0.000		22,796	160
X	MEXICO	0.345	0.002		2,138,925	14,972
X	NETHERLANDS	0.102	0.001		246,937	1,729
X	RUSSIA	0.004	0.000		28,367	199
X	SWEDEN	0.002	0.000		13,200	92
X	TAIWAN	0.010	0.000		58,387	409
X	UNITED KINGDOM	0.066	0.000		217,536	1,523
X	VENEZUELA	0.008	0.000		24,714	173
X	**TOTAL**	**33.423**	**0.234**		**154,894,518**	**1,084,262**

	Export Destination	Value of Export ($ million)			Quantity (pounds)	
		U.S.	*Florida*		*U.S.*	*Florida*
CUCUMBERS/GHERKINS		*1994-1996*	*(29%*		*1994-1996*	*(29%*
		average	*of US total)*		*average*	*of US total)*
	WORLD TOTAL	22.761	6.601		97,454,130	28,261,698
Status /1						
P	CHINA	0.006	0.002		40,000	11,600
P	JAPAN	0.004	0.001		11,687	3,389
P	KOREAN REPUBLIC	0.008	0.002		26,811	7,775
P	**TOTAL**	**0.018**	**0.005**		**78,498**	**22,764**
X	CANADA	22.466	6.515		95,842,290	27,794,264
X	COLOMBIA	0.004	0.001		12,122	3,515

X	ECUADOR	0.001	0.000	9,918	2,876
X	GERMANY	0.003	0.001	16,889	4,898
X	MEXICO	0.088	0.026	462,221	134,044
X	RUSSIA	0.016	0.005	92,119	26,715
X	SINGAPORE	0.010	0.003	58,018	16,825
X	SPAIN	0.001	0.000	6,927	2,009
X	TAIWAN	0.139	0.040	828,491	240,262
X	UNITED ARAB EMIRATES	0.014	0.004	46,638	13,525
X	**TOTAL**	**22.742**	**6.595**	**97,375,632**	**28,238,933**

GRAPEFRUIT	Export Destination	Value of Export ($ million)		Quantity (pounds)	
		U.S. 1994-1996 average	*Florida (64% of US total)*	*U.S. 1994-1996 average*	*Florida (70% of US total)*
	WORLD TOTAL	244.596	155.527	1,070,997,212	744,985,661
Status /1					
P	ANTIGUA AND BARBUDA	0.004	0.002	4,777	3,323
P	BAHAMAS	0.004	0.001	1,153	802
P	BERMUDA	0.039	0.025	148,206	103,092
P	CHINA	0.038	0.024	165,693	115,256
P	DOMINICAN REPUBLIC	0.001	0.001	1,150	800
P	HONG KONG	3.722	2.367	14,387,065	10,007,642
P	JAPAN	136.579	86.844	539,681,616	375,402,532
P	KOREAN REPUBLIC	4.912	3.123	20,589,327	14,321,936
P	NETHERLANDS ANTILLES	0.001	0.001	7,361	5,120
P	**TOTAL**	**145.296**	**92.387**	**574,986,348**	**399,960,503**
T	ARGENTINA	0.086	0.054	436,005	303,285
T	AUSTRALIA	0.408	0.259	1,389,983	966,872
T	BELGIUM	5.973	3.798	28,494,165	19,820,541
T	DENMARK	0.193	0.123	995,586	692,530
T	FINLAND	0.198	0.126	938,986	653,159
T	FRANCE	20.911	13.296	102,593,897	71,364,315
T	GERMANY	5.537	3.521	28,716,658	19,975,307
T	INDONESIA	0.014	0.009	46,962	32,667
T	IRELAND	0.021	0.014	112,612	78,333
T	ITALY	0.006	0.004	28,370	19,734
T	MALAYSIA	0.148	0.094	339,255	235,986
T	MEXICO	0.275	0.175	2,173,984	1,512,223
T	NETHERLANDS	17.349	11.031	83,860,274	58,333,206

T	NEW ZEALAND	1.123	0.714	1,995,519	1,388,083
T	NORWAY	0.018	0.011	82,797	57,593
T	POLAND	0.072	0.046	346,903	241,306
T	RUSSIA	0.025	0.016	77,800	54,118
T	SPAIN	0.008	0.005	43,729	30,418
T	SWEDEN	0.466	0.297	1,878,263	1,306,519
T	SWITZERLAND	0.298	0.189	1,273,560	885,888
T	TAIWAN	10.603	6.742	48,047,260	33,421,674
T	THAILAND	0.027	0.017	114,910	79,931
T	UNITED KINGDOM	5.631	3.580	26,975,415	18,764,099
T	**TOTAL**	**69.389**	**44.121**	**330,962,893**	**230,217,789**
X	BRAZIL	0.025	0.016	105,422	73,331
X	CANADA	29.232	18.587	162,709,116	113,180,461
X	GUATEMALA	0.010	0.006	47,880	33,305
X	HONDURAS	0.033	0.021	67,210	46,751
X	ICELAND	0.042	0.027	150,144	104,440
X	KUWAIT	0.001	0.001	565	393
X	NIGERIA	0.006	0.004	12,243	8,516
X	PANAMA	0.014	0.009	68,039	47,328
X	PERU	0.004	0.002	14,400	10,017
X	SAUDI ARABIA	0.008	0.005	26,663	18,547
X	SINGAPORE	0.524	0.333	1,773,759	1,233,827
X	UNITED ARAB EMIRATES	0.001	0.001	6,237	4,338
X	URUGUAY	0.012	0.007	66,294	46,114
X	TOTAL	29.913	19.020	165,047,971	114,807,369

	Export Destination	Value of Export ($ million)		Quantity (pounds)	
LIMES		*U.S. 1994-1996 average*	*Florida (100% of US total)*	*U.S. 1994-1996 average*	*Florida (100% of US total)*
	WORLD TOTAL	4.703	4.703	14,249,937	14,249,937
Status /1					
P	BAHAMAS	0.002	0.002	16,464	16,464
P	JAPAN	0.192	0.192	99,571	99,571
P	**TOTAL**	**0.195**	**0.195**	**116,035**	**116,035**
X	AUSTRIA	0.002	0.002	2,093	2,093
X	CANADA	4.455	4.455	13,942,361	13,942,361
X	GERMANY	0.011	0.011	25,317	25,317
X	MEXICO	0.018	0.018	120,937	120,937
X	NETHERLANDS	0.009	0.009	16,410	16,410

X	NEW ZEALAND	0.003	0.003	836	836
X	RUSSIA	0.001	0.001	3,016	3,016
X	SINGAPORE	0.001	0.001	2,499	2,499
X	SWITZERLAND	0.003	0.003	4,185	4,185
X	TAIWAN	0.003	0.003	8,982	8,982
X	UNITED KINGDOM	0.003	0.003	7,266	7,266
X	**TOTAL**	**4.508**	**4.508**	**14,133,902**	**14,133,902**

	Export Destination	Value of Export ($ million)		Quantity (pounds)	
ORANGES		*U.S. 1994-1996 average*	*Florida (11% of US total)*	*U.S. 1994-1996 average*	*Florida (17% of US total)*
	WORLD TOTAL	291.84533	33.066	1,169,716,414	201,015,766
Status /1					
P	ARUBA	0.014	0.002	112,939	19,409
P	BAHAMAS	0.003	0.000	7,969	1,369
P	BARBADOS	0.003	0.000	17,252	2,965
P	BERMUDA	0.002	0.000	6,815	1,171
P	CHINA	0.109	0.012	292,625	50,288
P	GUADELOUPE	0.006	0.001	20,476	3,519
P	HONG KONG	58.136	6.587	253,854,511	43,624,898
P	JAPAN	98.329	11.141	328,306,542	56,419,479
P	KOREAN REPUBLIC	7.036	0.797	24,980,765	4,292,944
P	NETHERLANDS ANTILLES	0.009	0.001	18,921	3,252
P	ST. LUCIA	0.004	0.000	15,108	2,596
P	TRINIDAD AND TOBAGO	0.005	0.001	5,879	1,010
P	**TOTAL**	**163.657**	**18.542**	**607,639,802**	**104,422,900**
T	ARGENTINA	0.007	0.001	37,800	6,496
T	AUSTRALIA	1.416	0.160	4,935,484	848,163
T	BELGIUM	0.038	0.004	348,853	59,950
T	CAMBODIA	0.021	0.002	69,304	11,910
T	CHILE	0.003	0.000	7,027	1,208
T	COLOMBIA	0.061	0.007	205,606	35,333
T	DENMARK	0.019	0.002	76,492	13,145
T	FIJI	0.004	0.000	9,764	1,678
T	FINLAND	0.008	0.001	35,467	6,095
T	FRANCE	0.109	0.012	248,115	42,639
T	FRENCH POLYNESIA	0.072	0.008	185,849	31,938
T	GERMANY	0.114	0.013	144,098	24,763

T	INDIA	0.008	0.001	3,307	568
T	INDONESIA	1.594	0.181	6,567,220	1,128,577
T	IRELAND	0.004	0.000	17,280	2,970
T	MALAYSIA	7.608	0.862	33,472,631	5,752,272
T	MALTA AND GOZO	0.011	0.001	61,593	10,585
T	MARSHALL ISLANDS	0.003	0.000	11,875	2,041
T	MEXICO	1.086	0.123	4,569,964	785,348
T	NETHERLANDS	0.741	0.084	3,069,762	527,539
T	NEW ZEALAND	1.793	0.203	7,667,833	1,317,717
T	NORWAY	0.003	0.000	15,398	2,646
T	PAKISTAN	0.002	0.000	11,715	2,013
T	PHILIPPINES	3.589	0.407	16,140,285	2,773,708
T	RUSSIA	1.165	0.132	3,685,202	633,302
T	SPAIN	0.032	0.004	149,255	25,649
T	SRI LANKA	0.062	0.007	260,638	44,791
T	SWEDEN	0.014	0.002	64,069	11,010
T	SWITZERLAND	0.005	0.001	6,030	1,036
T	TAIWAN	8.305	0.941	37,769,328	6,490,659
T	THAILAND	0.105	0.012	373,996	64,271
T	UNITED KINGDOM	0.230	0.026	994,191	170,852
T	VIETNAM	0.042	0.005	170,532	29,306
T	**TOTAL**	**28.274**	**3.203**	**121,385,964**	**20,860,178**
X	BRAZIL	0.012	0.001	27,137	4,664
X	CANADA	90.454	10.248	402,346,993	69,143,331
X	COSTA RICA	0.009	0.001	53,237	9,149
X	ECUADOR	0.128	0.015	403,000	69,256
X	EL SALVADOR	0.001	0.000	312	54
X	GUATEMALA	0.008	0.001	46,866	8,054
X	ICELAND	0.041	0.005	119,067	20,462
X	ISRAEL	0.003	0.000	4,528	778
X	PERU	0.020	0.002	83,600	14,367
X	SINGAPORE	9.227	1.045	37,561,858	6,455,005
X	UNITED ARAB EMIRATES	0.003	0.000	16,000	2,750
X	URUGUAY	0.009	0.001	28,052	4,821
X	**TOTAL**	**99.916**	**11.320**	**440,690,648**	**75,732,688**

PEPPERS	Export Destination	Value of Export ($ million)		Quantity (pounds)	
		U.S. 1994-1996 average	*Florida (26% of US total)*	*U.S. 1994-1996 average*	*Florida (26% of US total)*
	WORLD TOTAL	57.123	14.852	140,266,562	36,469,306
Status /1					
P	BAHAMAS	0.006	0.001	12,028	3,127
P	CHINA	0.017	0.004	13,757	3,577
P	DOMINICAN REPUBLIC	0.003	0.001	6,979	1,815
P	HONG KONG	0.025	0.006	66,436	17,273
P	JAMAICA	0.001	0.000	276	72
P	JAPAN	0.305	0.079	489,986	127,396
P	KOREAN REPUBLIC	0.026	0.007	48,906	12,716
P	NETHERLANDS ANTILLES	0.001	0.000	367	96
P	**TOTAL**	**0.384**	**0.100**	**638,734**	**166,071**
T*	AUSTRALIA	0.024	0.006	34,368	8,936
T*	AUSTRIA	0.001	0.000	955	248
T*	BELGIUM	0.019	0.005	11,030	2,868
T*	EL SALVADOR	0.290	0.075	493,923	128,420
T*	FINLAND	0.006	0.002	7,820	2,033
T*	FRANCE	0.002	0.001	3,599	936
T*	FRENCH POLYNESIA	0.001	0.000	6,975	1,813
T*	GERMANY	0.011	0.003	10,897	2,833
T*	ITALY	0.014	0.004	9,079	2,361
T*	MEXICO	0.758	0.197	1,867,110	485,448
T*	NETHERLANDS	0.034	0.009	69,937	18,183
T*	NEW CALEDONIA	0.004	0.001	5,576	1,450
T*	NEW ZEALAND	0.007	0.002	13,428	3,491
T*	NORWAY	0.001	0.000	948	246
T*	PHILIPPINES	0.027	0.007	29,337	7,628
T*	RUSSIA	0.016	0.004	20,142	5,237
T*	SPAIN	0.002	0.001	2,421	629
T*	SWEDEN	0.034	0.009	31,473	8,183
T*	SWITZERLAND	0.005	0.001	6,492	1,688
T*	UNITED KINGDOM	0.109	0.028	215,565	56,047
T*	VENEZUELA	0.007	0.002	14,367	3,735
T*	VIETNAM	0.011	0.003	23,126	6,013
T*	**TOTAL**	**1.384**	**0.360**	**2,878,566**	**748,427**

X	CANADA	55.316	14.382	136,691,970	35,539,912
X	GUATEMALA	0.015	0.004	17,637	4,586
X	HONDURAS	0.003	0.001	7,867	2,045
X	ICELAND	0.015	0.004	26,580	6,911
X	KUWAIT	0.002	0.001	588	153
X	SINGAPORE	0.002	0.001	3,444	895
X	UNITED ARAB EMIRATES	0.002	0.000	1,176	306
X	**TOTAL**	**55.355**	**14.392**	**136,749,261**	**35,554,808**

	Export Destination	Value of Export ($ million)		Quantity (pounds)	
TANGERINES		*U.S. 1994-1996 average*	*Florida (60% of US total)*	*U.S. 1994-1996 average*	*Florida (56% of US total)*
	WORLD TOTAL	13.582	8.149	34,574,674	19,441,339
Status /1					
P	BAHAMAS	0.008	0.005	20,805	11,699
P	BARBADOS	0.003	0.002	4,364	2,454
P	BERMUDA	0.008	0.005	6,215	3,495
P	JAPAN	0.806	0.483	1,664,719	936,072
P	KOREAN REPUBLIC	0.649	0.389	1,222,512	687,418
P	TRINIDAD AND TOBAGO	0.002	0.001	1,323	744
P	**TOTAL**	**1.475**	**0.885**	**2,919,938**	**1,641,881**
T	AUSTRALIA	0.354	0.213	1,043,632	586,834
T	BELGIUM	0.007	0.004	21,354	12,008
T	FRANCE	0.008	0.005	33,974	19,103
T	FRENCH POLYNESIA	0.003	0.002	2,294	1,290
T	INDONESIA	0.004	0.003	10,266	5,773
T	MALAYSIA	0.014	0.009	27,363	15,386
T	NETHERLANDS	0.039	0.024	172,295	96,881
T	NEW ZEALAND	0.105	0.063	308,812	173,645
T	RUSSIA	0.096	0.057	203,174	114,245
T	SWEDEN	0.011	0.006	34,459	19,377
T	TAIWAN	0.058	0.035	38,950	21,902
T	UNITED KINGDOM	0.329	0.197	1,098,274	617,559
T	**TOTAL**	**1.028**	**0.617**	**2,994,848**	**1,684,003**
X	BRAZIL	0.005	0.003	5,345	3,006
X	CANADA	11.072	6.643	28,652,850	16,111,497
X	SINGAPORE	0.001	0.001	1,312	738

X	UNITED ARAB EMIRATES	0.001	0.001	382	215
X	**TOTAL**	**11.079**	**6.6474**	**28,659,889**	**16,115,456**

	Export Destination	Value of Export ($ million)		Quantity (pounds)	
TEMPLES		*U.S. 1994-1996 average*	*Florida (100% of US total)*	*U.S. 1994-1996 average*	*Florida (100% of US total)*
	WORLD TOTAL	11.583	11.583	42,136,304	42,136,304
Status /1					
P	CHINA	0.136	0.136	536,537	536,537
P	DOMINICAN REPUBLIC	0.004	0.004	18,667	18,667
P	GUADELOUPE	0.072	0.072	290,116	290,116
P	HONG KONG	2.255	2.255	7,821,342	7,821,342
P	JAPAN	1.010	1.010	2,169,243	2,169,243
P	KOREAN REPUBLIC	1.234	1.234	4,852,986	4,852,986
P	MARTINIQUE	0.018	0.018	94,453	94,453
P	NETHERLANDS ANTILLES	0.002	0.002	2,695	2,695
P	**TOTAL**	**4.730**	**4.730**	**15,786,039**	**15,786,039**
T	AUSTRALIA	3.513	3.513	13,524,380	13,524,380
T	CHILE	0.002	0.002	6,626	6,626
T	COLOMBIA	0.036	0.036	26,074	26,074
T	FRENCH POLYNESIA	0.001	0.001	2,162	2,162
T	INDONESIA	0.043	0.043	142,003	142,003
T	MALAYSIA	0.072	0.072	336,602	336,602
T	MEXICO	0.073	0.073	420,922	420,922
T	NETHERLANDS	0.013	0.013	44,984	44,984
T	NEW ZEALAND	1.154	1.154	4,153,243	4,153,243
T	PHILIPPINES	0.012	0.012	31,984	31,984
T	RUSSIA	0.036	0.036	124,874	124,874
T	SRI LANKA	0.005	0.005	44,650	44,650
T	TAIWAN	1.381	1.381	5,398,816	5,398,816
T	**TOTAL**	**6.340**	**6.340**	**24,257,320**	**24,257,320**
X	CANADA	0.396	0.396	1,715,215	1,715,215
X	ECUADOR	0.005	0.005	12,666	12,666
X	SINGAPORE	0.112	0.112	365,063	365,063
X	**TOTAL**	**0.513**	**0.513**	**2,092,944**	**2,092,944**

		Ripe Tomatoes		50% of total	
	Export Destination	Value of Export ($ million)		Quantity (pounds)	
		U.S.	*Florida*	*U.S.*	*Florida*
TOMATO,FRESH/CHILLED		*1994-1996*	*(46%*	*1994-1996*	*(46%*
		average	*of US total)*	*average*	*of US total)*
	WORLD TOTAL	63.702	29.303	178,981,597	82,331,534
Status /1					
P	ANGUILLA	0.001	0.000	225	103
P	ANTIGUA AND BARBUDA	0.045	0.021	106,221	48,861
P	ARUBA	0.009	0.004	42,202	19,413
P	BAHAMAS	0.044	0.020	140,063	64,429
P	BARBADOS	0.005	0.002	9,040	4,159
P	BERMUDA	0.055	0.025	168,586	77,550
P	CAYMAN ISLANDS	0.014	0.006	21,144	9,726
P	DOMINICAN REPUBLIC	0.003	0.002	39,570	18,202
P	GUADELOUPE	0.002	0.001	3,647	1,678
P	HONG KONG	0.264	0.121	972,976	447,569
P	JAPAN	0.016	0.007	32,589	14,991
P	NETHERLANDS ANTILLES	0.006	0.003	11,522	5,300
P	ST. LUCIA	0.003	0.001	8,549	3,932
P	TRINIDAD AND TOBAGO	0.003	0.001	12,340	5,676
P	**TOTAL**	**0.469**	**0.216**	**1,568,672**	**721,589**
T	ARGENTINA	0.002	0.001	6,944	3,194
T	BELGIUM	0.464	0.213	638,256	293,598
T	CHILE	0.017	0.008	74,269	34,164
T	COLOMBIA	0.008	0.004	26,742	12,301
T	FRANCE	0.009	0.004	15,180	6,983
T	GERMANY	0.044	0.020	82,082	37,758
T	ITALY	0.001	0.001	4,564	2,100
T	MALAYSIA	0.001	0.000	3,259	1,499
T	MEXICO	2.932	1.349	9,974,374	4,588,212
T	NETHERLANDS	0.018	0.008	93,869	43,180
T	RUSSIA	0.093	0.043	226,971	104,407
T	SPAIN	0.007	0.003	6,840	3,146
T	SWITZERLAND	0.003	0.001	2,149	989
T	TAIWAN	0.002	0.001	9,150	4,209
T	UKRAINE	0.003	0.001	8,334	3,834
T	UNITED KINGDOM	0.176	0.081	221,771	102,015
T	**TOTAL**	**3.779**	**1.738**	**11,394,756**	**5,241,588**

X	CANADA	59.446	27.345	165,997,380	76,358,795
X	LEBANON	0.004	0.002	12,660	5,824
X	SINGAPORE	0.004	0.002	8,128	3,739
X	**TOTAL**	**59.454**	**27.349**	**166,018,168**	**76,368,357**

		Green Tomatoes		50% of total	
	Export Destination	Value of Export ($ million)		Quantity (pounds)	
		U.S.	*Florida*	*U.S.*	*Florida*
TOMATO,FRESH/CHILLED		*1994-1996*	*(46%*	*1994-1996*	*(46%*
		average	*of US total)*	*average*	*of US total*
	WORLD TOTAL	63.702	29.303	178,981,597	82,331,534
Status /1					
P	ANGUILLA	0.001	0.000	225	103
P	ANTIGUA AND BARBUDA	0.045	0.021	106,221	48,861
P	ARUBA	0.009	0.004	42,202	19,413
P	BAHAMAS	0.044	0.020	140,063	64,429
P	BARBADOS	0.005	0.002	9,040	4,159
P	BERMUDA	0.055	0.025	168,586	77,550
P	CAYMAN ISLANDS	0.014	0.006	21,144	9,726
P	DOMINICAN REPUBLIC	0.003	0.002	39,570	18,202
P	GUADELOUPE	0.002	0.001	3,647	1,678
P	HONG KONG	0.264	0.121	972,976	447,569
P	JAPAN	0.016	0.007	32,589	14,991
P	NETHERLANDS ANTILLES	0.006	0.003	11,522	5,300
P	ST. LUCIA	0.003	0.001	8,549	3,932
P	TRINIDAD AND TOBAGO	0.003	0.001	12,340	5,676
P	**TOTAL**	**0.469**	**0.216**	**1,568,672**	**721,589**
X	ARGENTINA	0.002	0.001	6,944	3,194
X	BELGIUM	0.464	0.213	638,256	293,598
X	CANADA	59.446	27.345	165,997,380	76,358,795
X	CHILE	0.017	0.008	74,269	34,164
X	COLOMBIA	0.008	0.004	26,742	12,301
X	FRANCE	0.009	0.004	15,180	6,983
X	GERMANY	0.044	0.020	82,082	37,758
X	ITALY	0.001	0.001	4,564	2,100
X	LEBANON	0.004	0.002	12,660	5,824
X	MALAYSIA	0.001	0.000	3,259	1,499

X	MEXICO	2.932	1.349	9,974,374	4,588,212
X	NETHERLANDS	0.018	0.008	93,869	43,180
X	RUSSIA	0.093	0.043	226,971	104,407
X	SINGAPORE	0.004	0.002	8,128	3,739
X	SPAIN	0.007	0.003	6,840	3,146
X	SWITZERLAND	0.003	0.001	2,149	989
X	TAIWAN	0.002	0.001	9,150	4,209
X	UKRAINE	0.003	0.001	8,334	3,834
X	UNITED KINGDOM	0.176	0.081	221,771	102,015
X	**TOTAL**	**63.232**	**29.087**	**177,412,924**	**81,609,945**

	Export Destination	Value of Export ($ million)		Quantity (pounds)	
		U.S.	*Florida*	*U.S.*	*Florida*
WATERMELONS		*1994-1996*	*16%*	*1994-1996*	*16%*
		average	*of US total)*	*average*	*of US total)*
	WORLD TOTAL	34.238	5.478	262,401,150	41,984,184
Status /1					
P	BERMUDA	0.067	0.011	662,523	106,004
P	CAYMAN ISLANDS	0.003	0.000	36,224	5,796
P	HONG KONG	0.078	0.013	347,286	55,566
P	JAPAN	1.413	0.226	6,166,941	986,711
P	**TOTAL**	**1.561**	**0.250**	**7,212,974**	**1,154,076**
X	BELGIUM	0.001	0.000	12,899	2,064
X	CANADA	32.286	5.166	252,258,091	40,361,295
X	FINLAND	0.006	0.001	25,587	4,094
X	FRANCE	0.012	0.002	62,198	9,952
X	GUYANA	0.001	0.000	8,593	1,375
X	ICELAND	0.012	0.002	77,101	12,336
X	MEXICO	0.175	0.028	1,868,704	298,993
X	RUSSIA	0.082	0.013	412,693	66,031
	TAIWAN	0.100	0.016	448,262	71,722
X	UNITED KINGDOM	0.004	0.001	13,665	2,186
X	VENEZUELA	0.000	0.000	0	0
X	**TOTAL**	**32.678**	**5.228**	**255,187,794**	**40,830,047**

APPENDIX IV

EXPORT QUARANTINE COMPLIANCE TREATMENT COSTS

Table A-1. Permanent Cooling Facilities

Commodity	No. of Tons to be Treated (tons) a.	No. of Car Equivalent [1/] (a./20 tons per car equivalent) b.	No. of Days Turnaround Per Load [2/] (days) c.	No. of Loads Per Trailer (365 days/yr*0.25)/ c. [3/] d.	Total Cold Storage Construction Cost (b. * $25,740 per car equivalent)/ d. [4/] e.
I. Orange	10,430				
Tangerine	842				
Temple	12,129				
Total Orange	23,401	1,170	14	6.52	4,620,654
II. Grapefruit	115,109	5,755	14	6.52	22,729,118
III. Avocado	1,527	76	7	13.04	150,733
TOTAL	**163,438**	**7,001**			**27,500,505**

[1/] A car equivalent is assumed to equal a loaded semi truck-trailer of fruit or vegetables in 40 one-half ton bins or 20 tons.

[2/] This represents the average number of days needed to load, cool, hold, unseal and unload a load of fruit.

[3/] The number of loads that may be treated per year is based on an assumed yearly utilized capacity of 25 percent per cold storage trailer.

[4/] The cost of a permanent cooling facility is estimated to cost $15,538 per car equivalent (20 tons of fruit) in 1981. The same facility would cost $25,720 in 1996 prices.

Table A-2. Fumigation Cost

Commodity	No. of Tons to be Treated	No. Of New Facilities Needed	Total New Fumigation Facility Cost	Fumigant Cost	No. Of Hours Required for Fumigation Per Load	Wages and Certification	Total Cost of Fumigation
	(tons)	(a./3,926.28 tons per facility) [1/]	(b. * $7,065 per facility) [2/]	(a./20 tons per load)*20 lbs a.i. methyl bromide per load * $3.07 per lb. [3/]		(a./20 tons per load) * (e. * $18.81 per hour) [4/]	(c. + d. + f.)
	a.	b.	c.	d.	e.	f.	g.
III. Avocado	1,527	0.39	2,747	4,687	2.5	3,590	11,024
IV. Tomato, ripe	2,621	0.67	4,716	8,046	2.5	6,162	18,924
TOTAL	**4,148**		**7,463**	**12,733**		**9,752**	**29,948**

[1/] 3,936.28 is obtained from the GA study by proportioning the estimated number of tons that each fumigation facility can handle to the number of new facilities needed.
[2/] $7,065 is obtained by adjusting to 1996 prices the 1981 estimate for the cost of a fumigation facility for methyl bromide treatment given in the GA study
[3/] The GA study estimated that a fumigation chamber large enough to hold a semi truck-trailer is approximately 10,000 cubic feet (12' x 15' x 60'). The fumigation requirement for these commodities is 2 lbs a.i. of methyl bromide per 1,000 cubic feet. Thus, to treat each load will require 10,000 cubic feet per load x 2 lbs a.i. methyl bromide per load.
[4/] The $18.81 per hour is obtained by adjusting the GA's estimate of $11.50 per hour in 1981 by an implicit price deflator.

Table A-3. Increased Transportation Costs

Commodity	No. of Tons	No. of Car Equivalent	Annual Cost of Increased Fuel Consumption	Annual Cost of Increased Wages	Total Increased Transportation Cost (Fuel plus Wages)
	(tons)	(a./20 tons per car equivalent)	(b. * no. of miles per load * $1.25 per gallon)/4 mpg [1/]	(b. * no. of hours per load * $19.66) [2/]	(c. + d.)
	a.	b.	c.	d.	e.
I. Orange	10,430				
Tangerine	842				
Temple	12,129				
Total Citrus	23,401	1,170	73,127	46,006	119,133
II. Grapefruit	115,109	5,755	359,715	226,304	586,019
III. Avocado	1,527	76	4,771	9,005	13,776
IV. Tomato, ripe	2,621	131	8,190	15,457	23,647
TOTAL	**142,657**	**7,133**	**445,804**	**296,772**	**742,576**

[1/] It is assumed that round trips to cold storage facilities for oranges and grapefruit average 50 miles per load; round trips to fumigation facilities are also assumed to average 50 miles per load.
[2/] It is assumed that 2 hours are added to the haul time of the average load of oranges and grapefruit for the extra 50 miles trip.

The cost of diesel fuel is estimated to be $1.25 per gallon and an average semi truck-trailer is assumed to average 4 miles per gallon. Six hours extra drive time is needed for avocado and tomato (1-hour driving time to fumigation facility, one-half hour for sealing and unsealing the load in the facility, 2 ½ hours average for fumigation, one-half hour for venting the load following fumigation, and one hour driving time from the facility to the packing/shipping point.

Drivers are assumed to be paid $12.50 in 1981 which is estimated to be $19.66 in 1996 prices.

Table A-4. Upgrading of Packing/Shipping Facilities

Commodity	No. of Tons to be Treated	No. of Car Equivalent	Material Costs	Wages to Upgrade Packing/Shipping	Total Cost of Upgrading Facilities
	(tons)	(a./20 tons per car equivalent)	(b. * $10,502,098 total material costs)/ 134,192 car equivalent [1/]	(b. * $1,177,438 total wages)/ 134,192 car equivalent [2/]	(c. + d.)
	a.	b.	c.	d.	e.
I. Orange	10,430				
Tangerine	842				
Temple	12,129				
Total Citrus	23,401	1,170	91,569	10,266	101,835
II. Grapefruit	115,109	5,755	450,431	50,500	500,931
III. Avocado	1,527	76	5,974	670	6,644
IV. Tomato, ripe	2,621	131	10,255	1,150	11,405
TOTAL	**142,658**	**7,133**	**558,230**	**62,586**	**620,816**

[1/] The GA study estimated that the material cost of 134,192 car equivalents was approximately $9 million (1990 prices) to upgrade. This proportioning, adjusting for current prices, is applied to the 7,133 car equivalents under consideration in this study.
[2/] The total wages required to upgrade facilities is obtained by applying a similar proportioning method for labor cost.

Table A-5. Cost of Cold Storage Facility

Commodity	No. of Tons to be Treated	Average No. of Days to be Treated	Cost of Cold Storage (@$3.28 per day) [1/]	Cost of Handling In and Out of Storage (@ $1.52 per day) [2/]	Cost of Racking (Stacking Cases on Second Row @ $1.17 per net ton) [3/]	Total Cost of Cold Storage
	(tons)	(days)	(a. * b. * $3.28)	(a. * $1.52)	(a. * $1.17)	(c. + d. + e.)
	a.	b.	c.	d.	e.	f.
I. Orange	10,430					
Tangerine	842					
Temple	12,129					
Total Citrus	23,401	13	997,808	35,569	27,379	1,060,756
II. Grapefruit	115,109	13	4,908,243	174,966	134,677	5,217,886
III. Avocado	1,527	7	35,054	2,321	1,786	39,161
TOTAL	**152,166**		**5,941,105**	**212,856**	**163,842**	**6,317,803**

[1/] The $3.28 per day cost of cold storage is adjusted to 1996 prices from $2.80 in 1990.
[2/] The $1.52 cost per day for handling charges is in terms of 1996 prices, adjusted from $1.30 in 1990.
[3/] The $1.17 cost of racking is adjusted from 1990 price level of $1.00.

Appendix 2: Emergency Response Communication Plan

Emergency Response Communication Plan
Fruit Flies

As an agency concerned about pest and disease situations that can occur or change rapidly, the Animal and Plant Health Inspection Service (APHIS) has a vital need to effectively communicate program activities to its target audiences using a wide variety of informational materials. During emergency situations, such as fruit fly outbreaks, effective and timely communication becomes even more crucial. APHIS provides onsite support during fruit fly outbreaks, serving along with state officials as primary liaisons with the news media to provide accurate information to stakeholders, industry, and the public.

Audiences:

- Media
- State, city and county governments
- Industry/stakeholders
- Environmental groups
- General public
- Special interest groups
- Trading partners
- Congress
- Other Federal government counterparts
- Agency headquarters personnel

Goals:

1. To provide accurate, timely information to all identified audiences.

2. To proactively inform and involve identified audiences about program activities.

3. To be responsive to inquiries from various audiences about program activities.

4. To create and disseminate informational materials on program activities to increase awareness.

5. To communicate information to all identified audiences about program risks and risk-reducing measures.

Ongoing Communications Actions:

- APHIS conducts an ongoing national educational campaign aimed at increasing awareness about the importance of protecting American agriculture from foreign pests and diseases, such as Medfly. The campaign receives funding annually to support various communications activities, such as developing informational materials, staffing industry shows, and holding press conferences, designed to increase awareness and ultimately prevent agriculture pest and disease outbreaks.

- APHIS will explore forming an information technology response team that will identify personnel and equipment needed to establish effective and timely communication at an emergency project site in the event of an outbreak. The option of using video teleconferencing to better link field program activities to headquarters will be reviewed.

- APHIS continually updates existing informational materials, such as fact sheets, photos, pre-written advisory letters, and video footage on potential pests, such as Medfly, so accurate information can be distributed in a timely manner in case an outbreak occurs.

- APHIS continually maintains and updates lists of national and local industry and state representatives as well as cooperators so contact can be made quickly to the appropriate people should an outbreak occur.

Actions Occurring Upon Detection of a Fruit Fly Outbreak:

(It should be noted that whether state or federal officials take the primary responsibility for the following actions will depend on circumstances and resources at the time of the outbreak.)

- Establishes immediately an onsite emergency response team with a public affairs contact, who acts as liaison between the program and state information and program officers, industry, the public, media, and other interested parties. Additional project personnel should be identified immediately to assist with public communications efforts.

- Establishes immediately all technology links onsite, including obtaining and setting up equipment, to expedite communication efforts.

- Establishes a phonebank ( ) staffed by project personnel to answer inquiries about ongoing program activities and provides general training for those answering phones.

[See the attached appendix for more in-depth information on the subject.]

- Provides local city and government officials and Congressional representatives with pertinent program information and continual updates.

- Issues a joint press release ( ) that has been approved by the project leader announcing the area of the outbreak, any actions taken, and the potential impact.

- Updates and distributes informational materials, such as fact sheets, radio and television public service announcements, photographs, exhibits, brochures, and feature articles to appropriate audiences in appropriate languages if needed to inform them of program activities.

- Sets up an Internet Web page with continually updated information on the progress of the program and any new information or press releases.

- Holds a meeting with major industry/stakeholder groups, including public interest groups and members of the public health community, to inform them of current and planned program activities and potential impacts.

- Establishes immediate, regular briefings (daily at first, then on an as needed basis) where interested stakeholders and the media ( ) can obtain current program information.

- Establishes contact with federal and state airport authorities and their public affairs personnel to increase outreach efforts, such as a press conference and amnesty bins, that are aimed at advising those traveling outside the quarantine area not to take agricultural products with them.

- Compiles daily reports ( ) on all aspects of program activities that are circulated to internal audiences and used to update media.

- Maintains chronology of program events, documenting all important activities.

Actions Occurring with the Commencement of Fruit Fly Chemical Treatments:
(These actions will be in addition to the above actions, which will continue to occur.)

- Ensures that notices announcing the publishing of environmental documents, such as an environmental assessment and environmental impact statement, are published prior to any treatment procedures.

- Coordinates with state officials to identify appropriate spokespersons to respond to inquiries about the program from target audiences and reviews handouts for accuracy.

- Obtains a list of chemically sensitive individuals from the appropriate State Health Agency and ensures these individuals are personally notified of program treatment activities a minimum of 24 hours in advance. APHIS maintains this list of individuals and adds any individuals that indicate they should be included.

- Ensures all identified audiences are notified (   ) at least 24 hours in advance via various informational tools, such as local access cable channels, normal media outlets, phone calls, or door-to-door visits, of the program's intent to treat a specific area. Specific audiences, such as chemically sensitive individuals, are also given additional information, such as medical information describing expected health effects of the treatment, means to mitigate impact of the treatment, the program hotline number, questions and answers about the program, and information listing risk involved in the treatment.

- Holds a public meeting/gathering (   ) for all audiences to proactively explain program activities and give those impacted an opportunity to express concerns or opinions.

- Notifies all local hospitals, public health centers, local veterinarians, schools, day care centers, police, fire agencies, physicians, and other special needs audiences of pesticide treatment schedules and the type of pesticides being used in treatments.

- Provides target audiences with a hotline number or an entity, such as a poison control center, where they can express their health and environmental concerns (   ) about the program. These concerns are gathered and provided to identified entities for evaluation of adverse impacts of program activities. Provides assistance to these entities in setting up data-gathering instruments, such as a questionnaire. Solicits weekly evaluations from these entities and uses them to appropriately mitigate potential problems.

- Establishes a network with appropriate local entities to address local health and environmental issues. Provides assistance to these entities in setting up data-gathering instruments, such as a questionnaire.

- If aerial applications are necessary, the project will provide a 10-day period to make necessary public announcements, conduct press conferences, and hold public meetings. The project will work with local public health agencies to establish data-gathering capabilities on possible public health effects within this same 10-day period. Operationally, this 10-day period will allow the project to have the public notices printed and distributed door-to-door, transport the chemical to the operations base, locate an airport that has the necessary facilities and security, and work with the contractor to install the specialized guidance and spray equipment.

Appendix

I. Phone Banks

In a effort to answer basic questions about program activities, a pre-recorded message will run on all phone bank “hotline” lines, with callers having the immediate option to speak with a person about various concerns, such as environmental, health, or property damage or select other options from a system menu. The general message will be time dated so callers will know that the information is current. The “hotline” is staffed by personnel trained to answer questions from the public about treatment schedules and pesticide usage. Written material is provided that anticipates common questions and details the history and protocol of the project as well as the biology of the pest. Specialists, such as a toxicologist/epidemiologist, are identified at the outset and are available during treatment to answer questions throughout the business day and at least 1 hour before treatment begins and several hours after treatment ends. Standardized forms and routing are used to document complaints and threats. The recorded message will take calls after office hours that will be returned the next day. The phone bank will remain operational during the entire period that pesticides are being applied.

Callers are provided with appropriate phone numbers or an entity, such as a poison control center, where they can express their health and environmental concerns about the program. These concerns are gathered and provided to identified entities for evaluation of adverse impacts of program activities. The project solicits weekly evaluations from these entities and uses them to appropriately mitigate potential problems

II. Press Releases

Both national and local project joint press releases will be issued in the event of a fruit fly outbreak. Those to be issued at the national level include the initial detection of a fruit fly outbreak, the declaration of an emergency situation, the initial decision to conduct aerial treatment to combat the outbreak, and the eradication of the outbreak. All other program developments will be publicized in joint press releases distributed locally.

The overall procedure for press releases will be as follows:

1. The project federal or state information officer prepares a daily release detailing the impact of the pest, the mode of treatment, treatment area boundaries, scheduling and duration of treatment, and appropriate referral phone numbers. Information will be verified by the treatment management staff and approved by the project leader.

2. Releases will be distributed to local media, particularly those that cover the treatment area. Foreign language releases will be prepared if a significant portion of the resident population in the treatment area does not speak English.

3. In each release, a media contact is named with a phone number. This person supplies the press with regular progress reports or information on significant developments.

4. Daily press briefings will be held and local interviews, stock footage, photos, graphics, and other special requests generated by the press release will be filled by the information officer.

III. Media Contact

Creating a rapport with local media results in accurate coverage of a program. To avoid conflicting and confusing statements, all outgoing information should be processed through a central clearinghouse or designated spokespersons from either the county, federal, or state government. The spokesperson's job is to be thoroughly briefed and current on particular aspects of the program, such as treatment, regulatory activities, or public health issues. Specialists, such as a toxicologist/epidemiologist, are identified at the outset and are available to answer questions throughout the program. All program personnel should refer questions to these spokespersons.

IV. Information Collection and Reporting

Project leaders will initiate timely daily staff meetings in order to provide accurate and current information for daily project reports that are disseminated throughout internal audiences and are used to brief the media. An administrative officer is identified at the outset to gather and coordinate program information into the daily report of activities by 9:00 a.m. each day and write/update the project chronology. These reports summarize the previous day's activities as well as progress made in various program areas. Topics include: trapping, regulatory activities, entomology, treatment, environmental monitoring, public health issues, and media. Information gleaned from reports is used to keep impacted trading partners and other stakeholders apprised of program activities.

V. Notification

The purpose of notification is to comply with federal and/or state law and present accurate information in an understandable and non-threatening format to all concerned groups. Local and state elected representatives of the residents in the treatment area will be notified and apprised of major developments before and during treatment. Any resident whose property will be treated with foliar sprays or soil drenches will be notified 24 hours in advance.

Treatment notices include the name of the pest to be eradicated, the material to be used, the boundaries and a phone number to call in case of additional questions on project operations, and the numbers of local health/environmental entities. Following treatment, a completion notice is left detailing any precautions the homeowner should take, including harvest intervals on treated fruit. Treatment without prior notification may be necessary on a small number of properties if active larvae are detected. However, reasonable efforts will be made to contact the homeowner.

Notification of aerial treatment will be given in compliance with state law or at least 24 hours before the first pesticide application begins, whichever is greater. Notification can occur by various information tools, such as mass mailing or door-to-door contact.

VI. Public Meetings/Gatherings

Public meetings/gatherings need to be scheduled prior to the target date for treatment. Door-to-door or direct mail notification of affected residences prior to the meeting is preferable to notices published in local papers. Prior to a meeting, any special political, social, economic, and environmental concerns of the community should be identified in order to select a suitable panel. A suggested formula for a panel is:

1. A moderator who can ensure orderly conduct of the meeting and direct questions to appropriate persons for answers.

2. Representatives from the local government office who are familiar with local concerns.

3. Representative from the project who can answer specific questions about the biology of the pest, the detection history, quarantine restrictions, proposed treatment, and its impact.

4. Specific area experts, especially from public health, toxicology, environmental hazards assessment, fish and game, water resources, and private industry.

Issues that usually surface at meetings are pesticide usage (toxicity, drift, and persistence); alternatives to pesticides; human health and environmental concerns; public water supply contamination; hazards to bees and wildlife; damage to homes, cars, and crops; hazards to pets and livestock; and organic farming concerns. The panel should be prepared to effectively address these concerns.

Meeting sites should be centrally located and have accommodations for physically challenged, translations, adequate parking, seating, electrical outlets, lighting, ventilation, and audio equipment. A suggested procedural format begins with the moderator’s statement of purpose and announcement of the time allotment (2 to 3 hours) followed by short presentations by each panel member addressing obvious questions. Members of the public are then allotted 5 minutes to express their concerns or ask questions. The ability of the moderator to restrict outbursts is critical.

All concerns expressed at the meeting will be thoroughly evaluated and the project will respond appropriately, such as by publishing an editorial in local papers, airing a commentary piece on local television, or issuing a press release. Another possible follow-through to a public meeting is to have spokespersons from small groups with specific concerns meet again with the project management to discuss those concerns. Meetings with community leaders may also foster cooperation with the project.

Another option to holding a public meeting is to hold more of an informal gathering where the Federal and State officials proactively inform audiences about program activities, such as treatment, trapping, regulatory, environmental monitoring, animal health, and human health. The gathering should also have a place where audiences can express and register their complaints and concerns, whether verbally or in writing, about all aspects of the program.

VII. Complaints & Concerns

The project should immediately identify appropriate county and State agencies and entities that will address complaints with regard to the project, such as environmental and health concerns and property damage. All identified audiences will be provided with phone numbers of these agencies and entities so they can express their concerns appropriately. The project is responsible for obtaining weekly reports from these entities, evaluating the data, and taking appropriate action to mitigate program activities if necessary. They will also provide these entities with any needed tool for gathering information that will be useful for evaluating program effects.

Appendix 3: Public Comments

Analysis of Public Comment on the Draft EA

I. Introduction

We would like to thank all those who reviewed the draft EA and provided their comments. We have analyzed the written and oral comments received from the public (individuals, organizations, and government). Three series of public meetings were held, culminating in a group of meetings in Miami (March 24, 1998), Orlando (March 25, 1998), and Tampa (March 26, 1998). Additional separate meetings also were held with industry and local interest groups so that they could provide their organizational perspectives. The recommendations of those groups are summarized in a table which appears later in this appendix. We are pleased to note that, in general, commenters concurred with the recommendations for risk reduction in the draft EA.

The predominant issue of concern remains the potential of pesticides (especially malathion) used in the program to cause adverse effects on human health and safety. Industry representatives generally advocated the use of program pesticides, and stated that the failure to react promptly and efficiently would result in greater economic and environmental harm, and even greater use of pesticides. Critics of the program generally advocated the abandonment of malathion (with some advocating abandonment of all chemicals) as a treatment alternative, stating that a preponderance of scientific evidence exists to corroborate the harmful effects of the pesticides.

II. The Public's Issues and Recommendations

The public comments were categorized into "issues" or "recommendations," analyzed, and addressed. Many, if not most, of the issues that were raised have not changed substantially since they were identified and addressed by APHIS in the "Medfly Cooperative Eradication Program, Final Environmental Impact Statement —1993" (EIS). Responses in this appendix include the relevant EIS citations, where applicable. Public comments that included recommendations that contribute toward risk reduction were considered seriously by APHIS and have been forwarded for consideration by the program decisionmaker.

A. Issues

1. Malathion is a toxic chemical and it should not be applied in situations where it could directly or indirectly come into contact with humans and/or their environment.

We recognize the concerns and apprehensions of the public regarding program use of pesticides, and acknowledge potential for adverse impacts associated with pesticide use, if not concurring entirely with some perceptions of the severity of those potential impacts. This EA and its process do not attempt an "end all" quantification of the risks of using those pesticides (probably an impossible task), but instead concentrate on the things that can be done to minimize risk. [EIS, 88-98, A-8, A-11, A-12, A-14, A-15]

2. Malathion is a carcinogen and it should never be applied in situations where it could directly or indirectly come into contact with humans.

Carcinogenicity studies of malathion remain equivocal at this time. (As with many other substances, there are studies which conclude that it is a low-level carcinogen and studies which conclude that it is not.) Refer to the human health risk analysis incorporated by reference in the EIS. APHIS has received a risk assessment recently done by the U.S. Environmental Protection Agency (EPA) and is awaiting EPA's determination or reclassification of malathion with respect to its potential carcinogenicity. Upon such reclassification, APHIS immediately would review malathion's suitability for continued program use. [EIS, 89, A-15]

3. There is no scientific evidence (no scientific studies) to show that malathion is safe.

There are quantifiable risks associated with the use of malathion, and they have been reported to the best of APHIS' ability in previous risk analyses, EA's, and the EIS. Medfly program officials regret if any individuals associated with the program may have stated there is no risk, for their official position is that there *are* risks, which must be managed. Similarly, risks must be managed for other activities in life (flying and driving cars also are *not safe*). Some commenters referred to studies that report adverse effects of program pesticides, and provided citations for those studies. Those citations were provided to APHIS managers for their consideration. Where the scientific evidence is equivocal, APHIS follows the recommendations of the EPA. [EIS, 183]

4. Ample data on environmental impacts (fish kills, invertebrate losses, and human health effects) were collected during the 1997 program to demonstrate that malathion is not safe.

Extensive monitoring showed results that were consistent with those predicted by our risk assessments and EIS. More than 1,500 monitoring samples were analyzed and none contained more malathion than predicted in the EIS. There were 41 cases of fish mortality reported and investigated. In most cases, obvious stress factors such as high water temperature, low dissolved oxygen and/or heavy algal blooms were the likely primary causes. Program use of malathion may have provided additional stress in most of these cases; in only one or two cases were no stress factors identified other than program-applied malathion. The method of application (as a bait mixture) precluded exposure to nontarget terrestrial invertebrates, and aquatic macro-invertebrates were affected only minimally and transiently. Public health agencies received 550 illness reports during program operations. Those reports are being evaluated by a panel of university, State, and public health experts; to date their evaluations have been inconclusive. [EIS, 179, 180]

5. The risk assessments are not accurate; for example, degradation of malathion takes longer than predicted in environmental documents.

The risk assessments combine hazard and exposure information to determine risk. One comment in particular cited a study (Brown et al., 1993) which predicted a half-life greater than 4 years under conditions of acid hydrolysis (pH 4). That laboratory test was conducted in the absence of sunlight, under acidic conditions, and in the absence of microbial degradation–environmental conditions that tend to retard degradation and that do not occur normally in nature. The same study (in the same paragraph) reported that the magnitude of microbial degradation is probably far greater than that of hydrolytic degradation, and that alkaline hydrolysis is much faster [than acid hydrolysis] and probably is a significant environmental degradation route. Even though the protein bait is slightly acidic, its contact with environmental water and alkaline soils under field conditions results in a predicted half-life within the 1- to 7-day range. The same study, which pooled data from an actual program, gave half-life figures that ranged between 5 and 9 days, depending on the method.

6. Notification does not constitute "protection" for people who are chemically sensitive.

Medfly program managers acknowledge the concern for the welfare of chemically sensitive people and concur with the comment that notification is not protection. However, notification is an essential aspect of any actions that are necessary to protect the chemically sensitive. The nature of chemical sensitivity is so variable that it would be difficult to develop mitigation measures that would accommodate all potential situations. Chemically sensitive individuals should use, based on their individual needs, the same precautions that they would for other low-level chemicals (such as lawn chemicals or mosquito control chemicals) present in their environments. [EIS, A-24]

7. Government officials (Federal, State, and/or local) are unresponsive or have attempted to mislead the public about the true nature of the risks associated with the use of malathion.

Review confirms that APHIS and State of Florida officials were responsive and proactive in communications with the public. We have seen no evidence that State or local officials acted otherwise. In 1997, phone banks set up for the public fielded thousands of calls from citizens. Public meetings were scheduled for the express purpose of providing opportunities for public comment and interaction. It is possible that some program critics may have misinterpreted the program officials' inability to concur with perceptions of risk or unwillingness to halt programs as being unresponsive. APHIS also has prepared an "Emergency Response Communication Plan" which has as one of its goals, "To communicate information to all identified audiences about program risks and risk-reducing measures. Finally, the Medfly program harbors no government conspiracies, concealment of information, testing of nerve gas on human populations, or other sinister motivations. There is no basis in fact for any of those concerns and APHIS would prefer to focus on *real* issues and reducing risks. [EIS, A-18]

8. Use of agricultural chemicals over urban areas constitutes "chemical trespass."

The concept ultimately requires weighing the "rights" of an individual (to be left alone) with the "rights" of society (to plentiful, inexpensive, and pest-free food). Although in the past, the courts generally have held that such trespass must be determined to be *unlawful* interference with one's property (and Government programs such as the Medfly eradication program are conducted under lawful authorizations), we have referred the matter to our Office of General Counsel for consideration.

9. APHIS' avowed goal of reducing risks associated with Medfly programs is not compatible with its actions to remove restrictions on the importation of Medfly host material from infested countries.

A grower criticized APHIS for proposed rules that would allow the importation of Medfly host material (papayas from Brazil; tomatoes from France, Spain, Morocco, and Western Sahara), saying that APHIS, under pressure for trade liberalization, is weakening standards for phytosanitary security at great risk to American agriculture and the environment. APHIS has acknowledged some increased risk associated with those proposed importations, but would establish controls and quarantine safeguards to mitigate that increased risk. APHIS is compelled to ensure that quarantines are imposed for sound biological reasons, rather than for protectionist trade barriers.

10. Use of aerial malathion may not promote "environmental justice" in that there is probably a greater percentage of low-income jobs that require outdoor work, where workers are not at liberty to avoid the applications or their residues.

We have not seen statistics that would support the claim that a greater percentage of low-income jobs are outdoor jobs, nor do our analyses confirm that any disparate environmental impact exists for any low-income group. APHIS considered environmental justice for this proposal, recognized diverse populations in the area, and recommended that pertinent announcements and documents (environmental documents, precautions, and/or warnings) be translated into Spanish.

11. It is the government's responsibility to keep out harmful exotic pests, and the government should do its duty.

APHIS has been given authority by Congress to prevent the introduction and establishment of exotic plant pests. We have undertaken this administrative process specifically to reduce the environmental risks in connection with those authorities.

12. Aerial applications of malathion bait in the 1997 program lacked precision, with the result that sensitive sites and water bodies were sprayed.

Environmental monitoring of water bodies showed the anticipated low residues of program pesticides. Precision of the applications was ensured using computer-assistanced guidance systems to confirm the deposition of material by aircraft. Several eyewitness and video reports which alleged such lack of precision were determined to be unreliable because of the position of the observer. One such example was a photograph of an aircraft that made it appear as though it was making an application over a river–the photograph exhibited obvious signs of a parallax condition (based on size and perspective) that misrepresented the aircraft's true position with respect to the river. Finally, there was no evidence whatsoever that public safety was compromised.

B. Recommendations

1. Trapping protocols should be strictly followed to avoid a reoccurrence of the massive 1997 outbreak.

Recommendations in the EA (page 19) specify that the "National Exotic Fruit Fly Trapping Protocol" (NEFFTP) guidelines be followed and that resources be garnered for a permanent infrastructure to implement a biologically sound delimitation trapping program. It is a fact of life, however, that resources are always limited. The purpose of this EA is to identify activities that will prevent future outbreaks and suggest the most productive use of those limited resources.

2. APHIS should "Develop an ongoing [comprehensive] educational program . . ."

Cooperative Medfly eradication programs have used a broad array of educational materials that include pamphlets, booklets, fact sheets, bumper stickers, posters, photos, videos, press conferences, news releases, and even Internet web pages. Public information activities have been designed to educate the traveling public about the dangers and liabilities of bringing Medfly host material into the country. They also inform the public about eradication treatment schedules, potential impacts of treatments, and protection measures. Unfortunately, the incidences of smuggling and seizures of Medfly host material are evidence that some people understand the risks associated with Medfly host material and choose to ignore them. The "Emergency Response Communication Plan," appendix 2 of the EA, discusses in depth the public information activities that are recommended for Medfly programs.

3. Program officials should consult with international experts and experts in California who have developed effective Medfly control programs without the use of toxic chemicals.

Program managers routinely consult with experts in other agencies, States, and countries on Medfly control. APHIS cooperates with the California Department of Food and Agriculture (CDFA) on eradication programs for Medfly and other exotic fruit fly species in that State. Commenters referred frequently to the Los Angeles Basin sterile release program, a program jointly implemented by APHIS and CDFA, but seemed unaware of APHIS' participation in that program.***** APHIS also cooperates with the Governments of Guatemala and Mexico in Medfly eradication programs in those countries. It is true that many other countries have Medfly programs underway that employ various (nonchemical) alternatives for Medfly control. However, most of those countries (because Medfly is endemic) employ those control alternatives for a different objective–suppression rather than eradication. Those countries already have lost much of their large and potentially valuable export market. APHIS remains interested in constructive dialog with experts on Medfly control, but focuses on alternatives that will help the United States remain free of Medfly, rather than mitigating an enduring presence of the pest.

*** In March 1998, APHIS and ARS convened a National Fruit Fly workshop in San Diego to review current research on fruit fly controls. A special Science Advisory Panel, chaired by Pat Minyard of the California Department of Food and Agriculture, applies its expertise to Medfly program issues.

4. Program officials should develop an improved trapping program, possibly contracted from private sources.

As presented in the EA, an enhanced trapping program is considered an activity that would play a beneficial role in managing the risk of Medfly. APHIS and cooperators are examining the privitization of many of their activities, but because of the potential consequences of a Medfly introduction, believe that they must continue to have direct involvement in the trapping program.

5. The program should adopt effective alternatives to malathion and diazinon, including (1) sterile releases, (2) predators, (3) Neem and/or Champon, (4) SureDye, and (5) fruit stripping.

In 1993, APHIS' record of decision for the EIS stated that ". . . selection of an alternative (and associated control methods) for future Medfly programs will be on an individual basis, made only after site-specific assessment of the individual program areas. The selection of an alternative (and control methods) will consider the findings of the EIS, the site-specific assessment, the public response, and any other relevant information available to APHIS at the time." APHIS has taken an integrated control approach, using such things as fruit stripping and sterile releases wherever appropriate. Biological control, including use of predators, has been ruled out for Medfly eradication programs because of its unproven efficacy and lack of immediate results (needed to prevent infestations from expanding rapidly). APHIS continues to investigate new alternatives to malathion, and is accelerating its evaluation of SureDye. [EIS, A-9, A-11, A-12]

6. The ideal program shown in the EA, table 1, should include things like cultural control, male annihilation, biological control, and biotechnological methods.

The ideal program was hypothesized, solely for the sake of comparison, as a program that would be so successful at exclusion, detection, and prevention activities that no control activities would be necessary. While there could be some justification for integrating those control methods into the "prevention" component of an ideal program (and varying opinions on how that could be done), there is no question that such an ideal program would still be prohibitively expensive. It seems more appropriate for us to focus on what can be done to reduce risk in an achievable program rather than attempt to further define the structure of a fictional one.

7. APHIS should explore ways to increase funding for Medfly programs, especially for permanent sterile fly release laboratories and programs in Florida.

APHIS continues to explore innovative and traditional means of funding Medfly activities. Ultimately, the Federal funding for the program is appropriated by Congress. APHIS policy does not allow field research and/or rearing of exotic quarantine pests in areas of the United States where the pests are not established. Examples of insects that were brought into the United States for research and which later escaped into the surrounding environment include the gypsy moth and Africanized honey bee.

8. Enforcement activities should be stepped up to prevent travelers and smugglers from bringing Medfly host material into the United States.

We will consider the recommendations as to where the emphasis in enforcement should be placed. APHIS has already increased some enforcement activities since the 1997 program: new inspectors have been hired, x-ray machines are being installed at airports, seizures are being made, and fines are being levied against smugglers. APHIS also organized an investigative team to determine the most probable source of the 1997 outbreak and to make recommendations about eliminating such sources in the future.

9. Any future Medfly programs should include control methods that provide rapid destruction of Medfly populations, such as were experienced in 1997; continued availability of malathion or an equally-effective alternative(s) is essential.

We concur that control measures should be available that would promote rapid destruction of Medfly; they are essential if we are to minimize the spread of Medfly (thereby minimizing the need for extensive control measures) and maintain valuable internal and external markets for produce. APHIS supports research into effective and environmentally-sound alternatives for pest control and is receptive to change if the new alternatives are (1) effective, (2) logistically feasible, (3) environmentally safe, and (4) registered.

10. User fees and fines (where appropriate) should be levied on international travelers to fund increased inspections and personnel.

APHIS collects some user fees (principally for inspections) and has the authority to levy fines on travelers who smuggle prohibited items. However, the money is required to be turned into the general treasury, and only a portion ultimately returns to APHIS. The United States Customs Service also has the authority to levy fines on travelers who smuggle prohibited agricultural items; the services often coordinate in the collection of penalties, based on the severity of the cases.

11. If malathion is eliminated as an alternative for combating Medfly, then it should also be eliminated from aerial spraying for mosquito control.

The formulations and usage patterns are different for Medfly and mosquito control programs. APHIS minimizes impact on the human environment in Medfly programs through the use of mitigative measures and environmental monitoring requirements that are not an integral part of mosquito control programs. It is possible that, if malathion were eliminated as a Medfly control alternative based on environmental objections, similar objections might be raised over its use for mosquito control. APHIS has no authority or responsibility for mosquito control in Florida, however, and any concerns over alternatives in use for mosquito control there should be raised to the appropriate authority.

III. Organizational Recommendations on Program Components

The following table, based on table 1 of this EA, compares the perspectives of organizations representing the Florida citrus industry with the perspectives of an environmental organization, with regard to the components that should be employed in future Medfly programs. Industry groups and the environmental organization generally agree on the need to exclude or control Medfly, but disagree on the use of chemical control methods and irradiation treatments.

Table 1. Commenters' Perspectives

Recommended Component Methods	Industry[1]	SCRAM[2]
Exclusion		
Clearance Activities	X	X
Airport	X	X
Maritime	X	X
Transit	X	X
Clearance Technologies	X	X
Detector Dogs	X	X
Irradiation	X	0
X-Ray	X	X
Investigative Activities	X	X
Detection and Prevention		
Preventive Release Program	X	X
Detection Trapping	X	X
Delimitation Trapping	X	X
Control		
Nonchemical Control Methods	X	X
Sterile Insect Technique	X	X
Physical Control	X	X
Cultural Control	X	X
Male Annihilation	X	X
Biological Control	X	X
Biotechnological Control	X	X
Cold Treatment	X	X
Vapor Heat Treatment	X	X
Chemical Control Methods	X	X
Aerial Malathion Bait	X	0
Ground Malathion Bait	X	0
Aerial SureDye Bait	X	0
Ground SureDye Bait	X	X
Diazinon	X	0
Chlorpyrifos	X	0
Methyl Bromide	X	0

[1] Averaged perspective, from comments of Brooks Tropicals, Inc.; Citrus Grower Associates, Inc.; Florida Citrus Mutual; Florida Citrus Packers; and Florida Fruit & Vegetable Association.
[2] Perspective of Sarasota/Manatee Citizens Rally Against Malathion, from fax from Susan McMillan, dated 04/19/98.

Strategy: Risk Reduction in Florida Medfly Eradication Programs January 1999

Introduction

The Animal and Plant Health Inspection Service (APHIS) of the U.S. Department of Agriculture cooperates with State Departments of Agriculture, like the Florida Department of Agriculture and Consumer Services, in programs to eradicate or otherwise manage the impacts of invasive alien pest species, including the Mediterranean fruit fly (Medfly), *Ceratitis capitata,* (Wiedemann). Because of the Medfly's wide host range, its potential for devastating crop damage, and its propensity for rapid range expansion, Medfly outbreaks in Florida represent major threats to Florida's agriculture (and to other U.S. mainland States), environment, and quality of life. All Medfly outbreaks in Florida have been successfully eradicated using a combination of nonchemical and chemical control methods, including aerially-applied malathion bait (an organophosphate pesticide).

The Organic Act (7 U.S.C. 147a) authorizes the Secretary of Agriculture to cooperate with States to detect, control, and eradicate plant pests. The Plant Quarantine Act and the Federal Plant Pest Act authorize the Secretary to take measures to prevent the dissemination of plant pests new to or not widely distributed throughout the United States. The Secretary of Agriculture has delegated these authorities to APHIS, and in carrying them out, APHIS must comply with a variety of other statutes, including the National Environmental Policy Act (NEPA), which ties environmental analysis to Federal decisionmaking, and the Federal Insecticide, Fungicide, and Rodenticide Act (FIFRA), which regulates pesticides.

APHIS is committed to re-examining its Florida Medfly eradication programs for the purpose of minimizing environmental and human health effects. APHIS has prepared environmental analyses and risk assessments, held a number of public meetings, and analyzed the comments of the public (including industry and public interest groups). The environmental assessment, "Risk Reduction Strategy, Florida Medfly Program, Environmental Assessment, June 1998," focuses on the identification of options for the reduction of environmental risk, taking into consideration technological, logistical, and budgetary constraints.

Prior Environmental Analyses

In 1993 APHIS published the "Medfly Cooperative Eradication Program, Final Environmental Impact Statement-1993." This programmatic environmental impact statement (EIS) is intended to apply to APHIS' nationwide activities. The EIS analyzed a range of alternatives and related control methods, and the environmental consequences of each alternative. APHIS concluded that each alternative would have some potential adverse environmental consequences, but that chemical control methods would present the best chance of eradicating the Medfly.

The record of decision on the 1993 EIS gave public notice that, “In all cases, a site-specific assessment will be made prior to the time a decision is made on the control methods that will be used on a particular program.” These site-specific environmental assessments (EAs) are intended to address unique and sensitive aspects of the specific area involved, new developments in environmental science or control technologies, and the adequacy of or need for additional mitigative measures to reduce or eliminate adverse environmental consequences. The site-specific analysis process is described fully in the EIS.

In 1997 and 1998, several Medfly outbreaks occurred in Florida. The site-specific EAs that were prepared and used in those programs are the following:

1. “The Medfly Cooperative Eradication Program, Hillsborough County, Florida, Environmental Assessment, June 1997”;
2. “The Medfly Cooperative Eradication Program, Central Florida, Environmental Assessment, June 1997”;
3. “The Medfly Cooperative Eradication Program, Southern Florida, Environmental Assessment, April 1998"; and
4. “The “Medfly Cooperative Eradication Program, Central Florida, Environmental Assessment, April 1998.”

Each of those EAs was made available to the public, was translated into Spanish, and was published on the Internet. In addition, several public meetings were held in conjunction with the publication of those Florida Medfly program EAs.

Risk Reduction Options

The purpose of the “Risk Reduction Strategy, Florida Medfly Program, Environmental Assessment, January 1999" was to re-examine the Florida Medfly program for the primary purpose of achieving maximum environmental risk reduction, consistent with the continued goal of preventing Medfly infestations. For the sake of comparison, the EA analyzed and considered three program options: (1) no action, (2) the existing program, and (3) the ideal program. Those options were analyzed as “baseline” for comparing risks and identifying program components that could be modified, varied, or combined for the purpose of achieving eradication, while reducing environmental risks.

Based on APHIS’ responsibilities for pest control and on the Medfly’s potential to cause great agricultural damage, the Agency recognizes that to take no action would be irresponsible. After analyzing the mitigation measures of the existing program (the program as it existed in June 1997 and April 1998, because some improvements in risk reduction have already been made) with an ideal program (not economically feasible), the Agency determined that the most appropriate option would include components of both the existing and ideal programs.

The EA describes a risk reduction strategy which identifies the components for Florida that can be varied (and how that variation should be made) or added to minimize or reduce risk. Based upon our analyses of the risk reduction components, the optimum risk reduction could be obtained if exclusion and detection methods are sufficient to prevent the introduction of Medflies into Florida, thereby precluding the need for more drastic control measures. The EA outlines (pp. 16-23) a broad range of risk reduction strategies in the following areas: (1) exclusion strategy, (2) detection and prevention strategy, (3) control strategy, and (4) communication strategy. These four categories are outlined in attachment I.

Resolved Strategy

APHIS' first objective is the interdiction of exotic pests at Florida's borders or before they reach Florida's borders. To accomplish this objective, APHIS shall continue to use available resources to improve and implement a broad range of risk reduction strategies for exclusion and detection technologies. Exclusion technologies include, among others, tomographic x-ray equipment, additional canine teams, and increased airline inspection through additional inspections at Florida's major ports. Detection will require: (1) the strengthening of the current detection trapping; (2) improved cooperation with the Florida Department of Agricultural and Consumer Services, Division of Plant Industry; (3) effective implementation of the National Exotic Fruit Fly Trapping Policy guidelines (NEFFTP); (4) strengthening delimitation trapping; and (5) maintaining a working relationship with the Agriculture Research Service (ARS), as well as other research facilities, on new control technologies to ensure that any potential control technology is fully exploited in an expeditious manner. APHIS is pursuing the development of efficacious alternatives to malathion.

Because the Medfly continues to gain entrance into the United States, it is necessary to have these control strategies available. When an outbreak occurs, APHIS will evaluate all available control and eradication options as delineated in the risk reduction strategy, as well as any emerging technologies, and identify the program components that will likely afford the greatest benefit for minimizing any potential adverse environmental effects on human health, nontarget species or any physical component of the environment, and, at the same time, maximize the potential for successful control of the Medfly. In making the final determination on the level of control for an outbreak, the Agency will continue to consult with scientific, technical, ecological and health experts, Federal and State regulatory officials, and other available resources, as deemed appropriate.

This strategy was based on available environmental documents, public comments, and scientific literature, along with numerous consultations with technical and environmental experts. The environmental process undertaken for this program is consistent with the principles of "environmental justice" in Executive Order No. 12898. There is no reason to believe that the adoption of this strategy, designed expressly to reduce risks and improve environmental quality, will significantly impact the quality of the human environment or that it would necessitate the preparation of an environmental impact statement. A site-specific EA shall be prepared prior to the time a decision is made on the control methods (and risk reduction methods embraced in this strategy) that are to be used on a particular program. Site-specific EAs shall be made available to the public, and APHIS shall consider the public's perspective prior to its implementation. APHIS will continue to adhere to all standard operational procedures and program mitigative measures developed for the Medfly Cooperative Eradication Program as described in the EIS.

Michael J. Shannon
Michael Shannon
State Plant Health Director

1/26/99
Date

ATTACHMENT I

Specific Activities for Reducing Risk in the Eradication of the Mediterranean Fruit Fly in Florida

A. Introduction

The environmental assessment "Draft Risk Reduction Strategy, Florida Medfly Program, Environmental Assessment, January 1999," identified several potential components of an overall strategy to reduce risk. Four major categories were described: exclusion, detection, control, and communications. To have an effective safeguarding system in Florida, APHIS believes it is prudent to implement new risk reduction strategies and/or strengthen existing activities in each of these categories. The following paragraphs outline recent and ongoing actions and activities to enhance risk reduction.

B. Risk Reduction Strategies

1. Exclusion

In most cases, we have selected exclusion activities that not only reduce the risk of introduction of Medfly, but also exclude other exotic pests.

a. More X-ray Equipment

APHIS added new x-ray machines at airports in Orlando, Miami, Ft Lauderdale, Jacksonville, and Tampa during 1997. Also, new, tomographic x-ray machines (using a layered imaging technology) will be field tested this year in Puerto Rico.

b. More Canine Detector Teams

In 1996, APHIS added one canine team in Miami, and an additional position is planned for Tampa if funds become available. These additional canine teams will enhance and support the effectiveness of passenger baggage inspection.

The National Detector Dog Training Center in Orlando, Florida was established in 1996 and dedicated in 1997. This center will greatly enhance the availability and placement of canine teams in Florida and throughout the nation. The center plans to add two training officers, if funds become available.

c. Improved Computer Tracking Technology

A comprehensive, state-of-the-art, wide area network computer system is being implemented nationwide in 1998. The network will improve data management controls over imported perishable commodities. It will support analysis and systems to assess cargo risk and management, as well as facilitate and resolve risk factors at the point of origin. New digital video systems are being tested to improve and facilitate identification and confirmation of intercepted pests.

d. Increased Airline Inspection

In 1996 and 1997, 93 employee staff years were added to pest exclusion activities in Florida. These additional employees have led to a significant and measurable increase in pest interceptions. In the Port of Miami, we have recorded the following increases in interceptions during a recent 12-month period: air baggage, 30.3%; air cargo, 51.2%; maritime, 58.8%; international mail facility, 1100%; and plant inspection station, 40.8%.

APHIS has identified the need for an additional 122 employees in Florida to meet port staffing criteria and to keep pace with the increase in trade and foreign travel. We are exploring means to meet these needs.

e. Caribbean Basin Plant Protection Initiative

There is a clear pattern of exotic organisms entering the Caribbean area and subsequently invading Florida. The area is highly vulnerable to fruit fly invasions. When these occur, Florida is in an untenable position. APHIS will continue to press for infrastructure improvement in these nations to protect our long term interests.

Also, on a global basis, APHIS is continuing to encourage and support activities against fruit flies in Mexico and Central America through the Moscamed program. By suppressing or eradicating fruit fly populations in these areas, we hope to reduce the opportunity for fruit flies to be brought into the United States. Also, in cooperation with the International Atomic Energy Agency, we have provided technical experts to assist in the set up of Medfly eradication and management programs in the Mediterranean and South Africa.

f. Enhancement of Plant Quarantine Laws

APHIS is working closely with legislators to introduce and pass the Plant Protection Act which streamlines and updates plant quarantine authorities including increased fines for smuggling. The fate of this legislative proposal is uncertain at this time.

g. Pathway Study

APHIS continues to collect and analyze interception data to identify the most high risk pathways to best use limited resources. Continued use and refinement of DNA technology for determining the origin of detected flies remains a high priority. Data from Medfly captures in recent outbreaks has enabled APHIS and the State to focus their investigations regarding recent pathways for Medfly entry into the United States.

h. Cooperative Funding

Pest exclusion at ports is already funded by user fees paid by those involved in international travel and using phytosanitary export certificates. In spite of this, inspection resources have not kept pace with increased trade according to a recent General Accounting Office report. APHIS is proposing to increase fees to provide additional funds. In addition, APHIS is cooperating with the production industry to provide the public with educational materials to explain the threat of exotic pests and ways to exclude them.

2. Detection and Prevention

Historically, APHIS has relied on its national cooperative exotic fruit fly detection program to detect new outbreaks of fruit flies, including Medfly. In some areas that have annual fruit fly outbreaks, such as the lower Rio Grand Valley of Texas (Mexican fruit fly), the Tijuana area of Mexico (Mexican fruit fly), and the Los Angeles Basin (Medfly), we have used the release of sterile flies over a large area to suppress or preclude the establishment of any accidentally introduced flies. These areas require a large expenditure of resources to manage a single species of fly. At this time, no area in Florida has an annual pattern of outbreaks. Therefore, we intend to invest available resources into the overall fruit fly detection program in Florida. Additional activities will benefit the detection capabilities for most exotic fruit flies, thereby, increasing our ability to detect an outbreak while it is small. This should allow us the most flexibility in the choice of control measures and minimize our use of pesticides.

a. Strengthened Detection Trapping Program

(1) APHIS has filled 37 new positions exclusively for fruit fly detection activities and is attempting to acquire eight additional positions next fiscal year. The Florida Agricultural and Consumer Services, Division of Plant Industry, was authorized to hire 27 new personnel for this activity in July, 1998.

(2) A Federal/State analysis indicates 90 trappers are needed to meet the national trapping guidelines. The new positions will move closer to that goal. An improved quality control program and a statewide data management system will enhance the overall efficiency of the detection trapping program

(3) In fiscal year 1999, we are planning to conduct a review of the national exotic fruit fly trapping protocol to include newly developed traps, lures, servicing and baiting intervals, and distribution. Also, we are including a section with minimum standards for quality assurance.

3. Control Strategy

APHIS supports an integrated pest control philosophy which includes the judicious use of chemicals. Recent infestations in Florida have shown the explosive biotic potential of Medfly in Florida's environment. We intend to use ground applications of pesticide in our eradication programs as part of our initial response to a confirmed outbreak. Subsequent control activities such as additional pesticide applications by ground or air, fruit stripping, and/or sterile releases will depend primarily upon the frequency and pattern of distribution of detections. Aerial application of malathion remains an essential tool when other strategies such as ground applications of pesticide and/or sterile releases are insufficient to contain spread and accomplish eradication.

We have developed and continue to develop new technologies and techniques to combat fruit flies that are less intrusive on the public and the environment. Examples of successes include the male annihilation technique for oriental fruit flies and other flies that are attracted to methyl eugenol, and the sterile insect technique that we use against the Medfly and Mexican fruit fly. These techniques and technologies are very complex and have limitations in their effective use. We continue to refine these technologies and place a high priority on devising new, effective and more acceptable ones to integrate into our control program.

a. Quick Response

APHIS has long recognized the need for a quick response to emergency outbreaks and has established Rapid Response Teams, corps of trained and experienced employees who are willing to respond immediately when an outbreak occurs. Some areas of expertise include trapping, environmental monitoring, aircraft application equipment, sterile insect technique, communications, and regulatory activities. The activation of personnel for emergency programs requires redirection from other survey and exclusion activities. Neither APHIS nor the State has the luxury of holding staff in readiness for outbreaks.

b. Integrated Control Technologies

The outlook for new types of control methods to be used on Medfly and related pests was recently the subject of a special USDA-ARS-APHIS Fruit Fly Workshop March 10-12, 1998, in San Diego, California. Research status was reviewed with national and international experts, priorities established, and commitments to accelerate certain technologies made.

c. Sterile Release Program

(1) APHIS equipped a fourth module at the El Pino rearing facility in Guatemala increasing its production capacity by 250 million flies per week.

(2) In the Umatilla, Florida program, APHIS incorporated a recently developed male-only strain of Medfly that is more effective and reduces costs. As we learn how to handle the strain, which is temperature sensitive, we will expand its use into other program areas.

(3) APHIS is renovating its Waimanalo, Hawaii, rearing facility to produce newly developed genetic strains of Medfly.

d. Alternatives to Malathion

APHIS supports registration of efficacious alternatives to malathion. APHIS and ARS have identified a few potential substitutes. We are working with EPA to obtain appropriate permits to conduct field tests. In addition, APHIS and the States of California and Florida are conducting tests to answer concerns about staining and phytotoxicity and to develop improved ground application methods.

C. Communication Strategy

1. Emergency Response Communications Plan

APHIS developed a communications plan to communicate risk and program information during an outbreak. The plan was adopted and implemented by APHIS and the State of Florida and is included as an appendix in this document.

2. Public Outreach

APHIS has located a full time public affairs specialist in Florida to coordinate activities that promote public awareness of exotic pest issues, such as Medfly, and to inform the public of APHIS’ role in preventing pest introductions.