

Report

For

Mid-Term Review of

Project on

**Regional Management of Fruit Flies
in the Pacific**

RAS/97/331

Nadi, Fiji : 6-7 October, 1998.

Compiled by:

Allan Allwood
Chief Technical Advisor
Volunteer

Dr. Barney Stephenson
Entomologist (Fruit Flies)

Luc Leblanc
United Nations

Entomologist (PNG)



New Zealand

Government

CONTENTS

	Page
Introduction	3
History of Fruit Fly Activities in the Pacific	3
Project Execution and Implementation	4
• Basis for Implementation Process	5
- Countries and Territories with Established Fruit Fly Programmes	5
- New Countries Needing High Inputs into Fruit Fly Programmes	5
- Countries with Partial Fruit Fly Programmes	6
• Technical Assistance by Project Staff	6
• Linkages with Other Fruit Fly Activities and Organizations	7
- ACIAR Projects	7
- Quarantine Authorities	7
- Other Organizations	8
Development Objective, Immediate Objectives and Success Criteria	8
• Immediate Objective 1	8
• Immediate Objective 2	9
• Immediate Objective 3	10
• Immediate Objective 4	10
• Immediate Objective 5	11
• Immediate Objective 6	11
Progress, Achievements and Outcomes	11
• Immediate Objective 1	12
• Immediate Objective 2	14
• Immediate Objective 3	16
• Immediate Objective 4	17
• Immediate Objective 5	18
• Immediate Objective 6	19
• Training	19
Benefits and Target Beneficiaries	20
Human Resource Inputs	21
Equipment, Supplies and Facilities	21
Appendices	
• Appendix 1 - Progress Report: May, 1997 – September, 1998	
• Appendix 2 - Status Report : Vanuatu	
• Appendix 3 - Status Report : FSM	
• Appendix 4 - Status Report : Papua New Guinea	
• Appendix 5 - Financial Report	

INTRODUCTION

The activities on understanding and managing fruit flies (family Tephritidae) in the Pacific region commenced in earnest in September, 1990. The justification for this resulted from the loss of ethylene dibromide fumigation as a quarantine treatment for fresh fruits and fleshy vegetables destined for export to Australia, New Zealand and neighbouring Pacific Island countries and territories (PICTs). The overall effects of the loss of this treatment were significant reductions in export markets of fresh commodities and an adverse effect on the earning capacities of the private sector and, consequently, the economies of small PICTs such as Cook Islands, Fiji, Tonga and Samoa. Replacement quarantine treatments needed to be developed or transferred from developed countries such as Hawaii and Australia.

Concurrently, PICTs recognized that, unless fruit flies are managed effectively at all levels in the production and export chain, the prospects for export of horticulture commodities are extremely low. Nations also became acutely aware of the threats posed by the accidental introduction of damaging exotic fruit fly species. This became very obvious as a result of the spread of melon fly (*Bactrocera cucurbitae*) from Bouganville in Papua New Guinea (PNG) and the Western Province of Solomon Islands to Guadalcanal between 1984 and 1995; the introduction of melon fly and Oriental fruit fly (*B. dorsalis*) into Nauru around 1985; the establishment of Asian papaya fruit fly (*B. papayae*) in the Torres Strait Islands and Cairns area of North Queensland in 1993 and 1995 respectively; the introduction of Oriental fruit fly into Tahiti and Moorea (French Polynesia) in 1995-96 and into Palau in the northern Pacific in 1996; and Mediterranean fruit fly (*Ceratitis capitata*) into New Zealand in 1996. As well as these introductions, there have been several incursions of fruit flies into New Zealand as indicated by the quarantine surveillance trapping system and confiscations of fruits illegally imported by passengers.

From September, 1990 to April, 1997, inputs to the fruit fly activities focussed on cataloguing the fruit fly species and their hosts in each country and overcoming constraints to production and export of fresh commodities. While these activities were performed under a regional umbrella, considerable emphasis was placed on developing technologies specifically to solve national problems rather than on adopting a regional approach to the management of the fruit fly problem. This approach was appropriate at the stage of technical expertise and knowledge on fruit flies within each PICT involved in project activities.

The breaches in quarantine security evident during the early 1990s required a change in focus to a broad regional approach to the management of fruit flies. Emphasis on establishing quarantine surveillance in all PICTs, developing emergency response preparedness and capacity both nationally and regionally, transferring technology on control and quarantine treatments developed during earlier phases of the project and increasing substantially public awareness of the dangers of accidental introduction of damaging exotic fruit flies through non-commercial fruit movements, needed to increase. This realization and approach resulted in the formulation of the Project on Regional Management of Fruit Flies in the Pacific – RAS/97/331 (RMFFP). This Project is building on achievements made during previous phases of the project and projects funded under the Australian Centre for International Agricultural Research (ACIAR). This report summarizes the achievements and outcomes of the Project. It also identifies project and national human resources and equipment and supplies provided, and the benefits to target beneficiaries. Problems or constraints faced during the implementation of the project are also identified. Included in the report is a financial statement identifying delivery of services.

HISTORY OF FRUIT FLY ACTIVITIES IN THE PACIFIC

To put the RMFFP into perspective regionally, it is necessary to summarize the history of involvement of the Australian Government (through AusAID), United Nations Development

Programme (UNDP), New Zealand Government, the Food and Agriculture Organization of the United Nations (FAO) and the Secretariat of the Pacific Community (SPC) in fruit fly project activities. The list in Table 1 summarizes the project activities since September, 1990.

Table 1: Summary of fruit fly components, phases and projects since September, 1990.

Dates	Project/Phase	Donors/Countries	Funding
Sept. 1990 to Sept. 1991	TCP/RAS/0055 (Phase 1)	FAO (Cook Islands, Fiji, Tonga, Samoa)	US\$174,000
Jan.1991 to June, 1993	RAS/90/004 (Phase 1)	AusAID/UNDP/SPC (Cook Islands, Fiji, Tonga, Samoa)	US\$554,000
July, 1993 to Dec. 1993	TCP/RAS/2360 (Phase 1)	FAO (Cook Islands, Fiji, Tonga, Samoa)	US\$130,000
Jan., 1994 to April 1997	RAS/93/300 (Phase 2)	AusAID, UNDP, New Zealand Government (Cook Islands, Fiji, Tonga, Samoa, Solomon Islands, Vanuatu, FSM)	US\$1,146,396
May, 1997 to April, 2000	RAS/97/331 (Phase 3)	AusAID, UNDP, New Zealand Government (All 22 SPC countries and territories)	US\$1,770,700

As well as these donors, the Agricultural Experiment Station/College of Micronesia, the Government of Federated States of Micronesia (FSM) and the then South Pacific Commission signed a Memorandum of Understanding for matching funds (US\$131,700) provided by USDA for specific fruit fly activities in FSM during RAS/93/300, with a flow-on to RAS/97/331.

All projects have been executed by the Secretariat of the Pacific Community or its predecessor, the South Pacific Commission, and implemented by FAO.

PROJECT EXECUTION AND IMPLEMENTATION

Table 1 shows the countries in which the previous projects operated and current project operates. RAS/90/004 and RAS/93/300 covered four and seven countries respectively. The RMFFP now operates in all 22 PICTs covered by the SPC, namely:-

Polynesia

American Samoa, Cook Islands, French Polynesia, Niue, Pitcairn, Tokelau, Tonga, Tuvalu, Wallis and Futuna.

Melanesia

Fiji, New Caledonia, Papua New Guinea (PNG), Solomon Islands, Vanuatu.

Micronesia

Commonwealth of Northern Mariana Islands (CNMI), FSM, Guam, Kiribati, Marshall Islands, Nauru, Palau.

Basis for Implementation Process

Due to the complex nature of the Pacific region, it has not been possible or practical to provide all countries and territories with the same level of inputs or services. National inputs were tailored to their respective needs. The level of inputs into each country varied with the complexity of fruit fly problems, the level of horticultural development, potential for export of fresh fruits, the quarantine risk posed by species of fruit flies already present and species that could gain entry, and whether national governments already supported fruit fly programmes. The implementation process and countries can be broadly sub-divided into the following three categories:-

Countries and Territories with Established Fruit Fly Programmes

The countries and territories in this category may be characterised by those supported by the RMFFP (and in some cases by the ACIAR Project) (Solomon Islands, Vanuatu, FSM, Fiji, Tonga, Samoa and Cook Islands) and those which have nationally operated fruit fly programmes (New Caledonia, CNMI, Guam and French Polynesia). In these countries and territories, the RMFFP provided, where necessary, technical assistance and advice, limited funding support, a small number of country visits to assess progress and achievements, and assistance, when requested, in quarantine surveillance and development of emergency response plans. The RMFFP provided technical support in negotiating quarantine protocols for export of fresh fruits and vegetables in Cook Islands, Fiji, Tonga and Samoa. In some instances, the negotiations were initiated by the RMFFP, e.g. recent discussions on the process of gaining entry into Australian markets for papaya, the concept of 'generic' heat treatments with New Zealand, and the use of this concept in opening up markets for mango from Cook Islands.

New Countries Needing High Input into Fruit Fly Programmes

The countries in this category include Niue, Nauru and Papua New Guinea. Niue was identified as a country which showed great interest in setting up a permanent quarantine surveillance system and developing an emergency response plan and in this respect it could be used as a model or example to the new countries to the project. Also and very importantly, Niue was ideally suited to undertake or demonstrate field control of fruit flies using an integrated approach at the whole village level. The objective is to better utilize fruits and vegetables as a component of improving food security and human nutrition.

Nauru fits into this category because Nauru lacked adequate agricultural quarantine legislation and had no plant protection or agricultural quarantine human resources. Added to this situation was the fact that the presence of Oriental fruit fly, melon fly, mango fruit fly (*B. frauenfeldi*) and *B. xanthodes* posed a serious quarantine threat to other PICTs and, consequently, provided justification to conduct an eradication campaign. The eradication campaign is an ideal opportunity to provide regional training in techniques of eradication and to ensure that representatives of PICTs who attend the training develop draft emergency response plans for their respective countries.

PNG was included in this category because of the large effort needed to understand and manage the fruit fly problem there. With over 180 species present and about 15 species of major economic importance, the fruit fly fauna in PNG represents an enormous quarantine risk to the advances in fruit fly management made in other areas of the Pacific, including Australia and New Zealand. The combined activities of the RMFFP and the parallel ACIAR/AusAID funded project were designed to tackle this problem under the umbrella of the PNG Fruit Fly Project, executed in PNG by the National Agricultural Research Institute (NARI).

Countries with Partial Fruit Fly Programmes

The countries and territories that fall into this category are American Samoa, Kiribati, Marshall Islands, Palau, Pitcairn, Tokelau, Tuvalu and Wallis and Futuna. The involvement of these countries is recognised as being critical to the regional quarantine surveillance. Not having quarantine surveillance capacity for exotic fruit flies poses a significant threat to other PICTs, Australia and New Zealand. Increasing tourism to all PICTs makes it imperative that the quarantine surveillance capacity is established and maintained. Emergency response preparedness and capacity is also required to cope with the likely incursions or outbreaks of exotic fruit flies that may occur. This capacity, together with appropriate field control technology, is necessary to ensure food security in small islands or atolls. Hence, a transfer of technology from more developed PICTs is a high priority.

It is likely that high profile, specific programmes may be initiated in some of these countries as the project progresses. The best example would be the possible eradication of Oriental fruit fly from Palau, using male annihilation.

Technical Assistance by Project Staff

In past projects, heavy reliance was placed on United Nations Volunteer Entomologists (UNV) to implement the project activities within country. Under ideal conditions, this took place in close association with national counterpart plant protection or quarantine staff. The aim of this scenario was to ensure that the programme is sustained when the RMFFP ceases or the UNV leaves the scene and that national staff are adequately trained to take over responsibilities well before the project ceases. The only countries that now have UNV positions are PNG and Solomon Islands.

The PNG UNV was recruited in August, 1997 and is located at the Lowland Agricultural Experiment Station (LAES), Kerevat. Initially, the intention was to locate two UNVs in PNG, but discussions with the PNG Government resulted in replacing one UNV position with national Junior Scientific Officers (JSOs), to be based at Kerevat (Rabaul), Bubia (Lae) and Laloki (near Port Moresby). Two JSOs have been appointed and undergone about 3 months training under the UNV. One of these JSOs has been relocated to Bubia. The third JSO will be recruited before December, 1998 and located at Laloki after training. These positions will be supplemented with three technical assistants funded by the ACIAR Project.

The UNV in Solomon Islands resigned in April, 1998 and a new UNV for the Solomon Islands is being recruited. This will be the third UNV for the Solomon Islands and indicates the degree of difficulty of this posting. Discussions with Ministry of Agriculture and Fisheries staff have resulted in a significant change in responsibilities of the UNV. The UNV will perform in a more supervisory/advisory role than previously. He/she will become involved in day-to-day research work in specialized areas only, such as developing heat tolerance data for immature stages of fruit flies and non-host testing. The project in Solomon Islands will be run by a National Technical Coordinator, who will operate full-time on RMFFP activities. The aim of these changes is to focus the responsibility for the project on the Government staff to increase ownership and commitment. Activities will focus on quarantine surveillance and field control demonstrations in liaison with Non-Government Organizations, such as the Solomon Island Development Trust. In Solomon Islands, the Project has provided, since 1995, funding support for a part time laboratory assistant to help with trapping, fruit surveys, rearing of flies from samples and general laboratory tasks. This arrangement will continue for the next year.

In April, 1998, the RMFFP recruited an Entomologist (Fruit Flies) under the Plant Protection Service of SPC in an effort to improve regional sustainability and coordination. This position is funded for three years by the RMFFP. It is expected that SPC will fund the position after this time. The New Zealand Government has agreed to fund a Pacific Island scientist as a trainee, commencing in July, 1999 within the SPC Plant Protection Service structure to ensure there is technical capacity in the fruit fly area from within the PICTs.

The RMFFP is still implemented by a Chief Technical Advisor provided by FAO, Bangkok. FAO also provides technical backstopping from FAO, Rome, especially in areas of project review, technical advice and the Global Plant and Pest Information System, and from the Sub-Regional FAO Office in Apia.

Linkages with Other Fruit Fly Activities and Organizations

One of the great strengths of the RMFFP is its ability to promote linkages with other projects and expertise in fruit fly research and management and quarantine authorities with the PICTs and internationally. This enabled the RMFFP to have direct, regular access to some of the best fruit fly expertise in the world. Most notable amongst these linkages since May, 1997 were:-

ACIAR Projects in Vanuatu, Solomon Islands and FSM, in Tonga and in PNG.

The RMFFP and the ACIAR Projects cooperated very closely, operating almost as one project in these countries. Of particular importance was the provision of specialist services and expertise by the ACIAR Project that were lacking within the RMFFP, e.g. fruit fly identification services, microbiological and research inputs into protein bait spray development in Tonga. Also, the ACIAR Project was able to provide funding for travel by national staff to accompany the UNVs on trapping and fruit surveys and training assistance. This close cooperation between ACIAR and the RMFFP may be used as a model for other projects because the association has resulted in a catalytic effect linking research and development.

The RMFFP and the ACIAR/AusAID Project in PNG will cooperate very closely under the umbrella of the PNG Fruit Fly Project, executed by NARI. The RMFFP's role is to establish facilities and trained national counterparts through the JSOs, assist with fauna and quarantine surveys, conduct field control trials and demonstrations, and develop data on heat tolerances of the immature stages of fruit flies in PNG.

Quarantine Authorities

Close liaison with New Zealand Ministry of Agriculture and Forestry (MAF) Regulatory Authority benefited the project and countries in the region. Good working relationships with MAF Regulatory Authority aided discussions on the concept of generic quarantine heat treatments for fresh fruit and vegetable exports from some PICTs. Acceptance of this concept will reduce the human and financial resources needed to be put into research across the region. MAF Regulatory staff have provided assistance in developing quarantine pathways for commodities in Fiji, Tonga and Cook Islands and advice on non-host status research and resultant pathways in Vanuatu.

Recently, positive interactions with officers in the Australian Quarantine and Inspection Service (AQIS) and the Office of the Chief Plant Protection Officer in Australia have occurred. The liaison includes greater information exchange, through a regional web page on fruit flies. Also, AQIS is contributing through the Crawford Fund for International Agricultural Research – Queensland Branch (CFIAR) to the eradication effort in Nauru.

Conducting a training workshop on Pest Risk Analysis (PRA) involving resource people from AQIS, SPC and the RMFFP in early 1999 and using the data on fruit flies from the PICTs during the training is another example of cooperation internationally.

Other Organizations

The RMFFP facilitated cooperation and liaison between a range of organizations to ensure the project and the PICTs benefited from external expertise. Some of these associations included:-

- Lincoln University, New Zealand (Dr. Karen Armstrong) on DNA analysis of fruit fly adults and immature stages for quarantine identifications and supporting evidence for generic heat treatments;
- United States Department of Agriculture – Agricultural Research Services Laboratory in Hilo, Hawaii (Dr. Jack Armstrong, Dr. Eric Jang) on fruit fly control and eradication research and techniques, quarantine treatments using forced hot air, and setting up a Memorandum of Understanding on technology transfer between the RMFFP (SPC) and USDA-ARS, Hilo;
- Environmental Sciences Faculty, Griffith University, Brisbane, Australia (Prof. Dick Drew) on fruit fly taxonomy, control and eradication methods and training and entering into a Memorandum of Understanding on data and technology transfer;
- Various organizations in Malaysia, Thailand and Vietnam for information and technology exchange and training prospects;
- Hort + Research Institute, New Zealand (Mr. Bob Macfarlane, Dr. Barbara Waddell) on developing quarantine heat treatments and other quarantine issues.

DEVELOPMENT OBJECTIVE, IMMEDIATE OBJECTIVES AND SUCCESS CRITERIA

Development Objective

To strengthen the technical capacity of the Governments and Administrations and the private sectors in PICTs to manage fruit flies regionally in order to protect fresh fruit and vegetable production and export and to enhance farmers' incomes, food security and rural employment.

Immediate Objectives

Immediate Objective 1

To overcome constraints on production and export of fresh fruits and vegetables in FSM, Solomon Islands and Vanuatu caused by the presence of damaging fruit fly species. (Continuation of activities of RAS/93/300 in Solomon Islands and Vanuatu until at least December, 1998, with technical back-stopping in FSM until commitment is assessed in June, 1997).

Success Criteria for Objective 1

The following success criteria may be used to assess achievements relevant to Objective 1 :

- User friendly database containing information on species, host range, seasonal abundances, geographic distributions, parasitoids lodged with SPC, FAO and the countries;

- . Increased confidence in discussing quarantine issues related to fruit fly host commodities with trading partners;
- . Operational quarantine surveillance system (early warning system) for introductions of exotic fruit fly species, funded by Governments;
- . Improved preparedness to cope with outbreaks of exotic fruit fly species;
- . ERP agreed to and financially supported (or at least in part) by Governments;
- . Techniques for area control of fruit fly, resulting in increased production of fresh fruits and vegetables;
- . Biological control agents established in Solomon Islands and FSM as part of integrated pest management;
- . Data on heat tolerances of immature stages of 4-5 species of fruit flies, resulting in a secure quarantine treatment based on forced hot air;
- . Removal of constraints on export markets for squash, pineapple, limes, Yapese lemon, and other fruits; and
- . Increased technical capacity of national staff on fruit fly identification, control techniques and quarantine treatment development in FSM, Solomon Islands and Vanuatu.

Immediate Objective 2

To improve substantially the quarantine preparedness of PICTs to cope with inevitable outbreaks of exotic fruit flies regionally.

Success Criteria for Objective 2

The following success criteria may be used to assess achievements or progress relevant to Objective 2 :

- . Permanent operational quarantine surveillance systems for fruit flies on a regional basis, funded by the Governments by December, 1998;
- . Increased capacity to respond to outbreaks of an exotic fruit fly species, including ERPs accepted by Governments and ready accessibility to supplies required to run eradication programmes;
- . Successful eradication of Oriental fruit fly and melon fly from Nauru, together with an upgraded quarantine capability in Nauru;
- . Greater awareness by the public and private sectors of the problems caused by fruit flies to production, trade, and the livelihood of people;
- . Pacific Fruit Fly Database lodged at SPC and covering data on fruit flies in all PICTs.

Immediate Objective 3

To enhance the production and export of fresh fruits and vegetables regionally in order to increase farmers' incomes and to assist in providing food security, particularly in those countries not included in the previous fruit fly projects.

Success Criteria for Objective 3

The following success criteria may be used to assess achievements or progress relevant to Objective 3 :

- . Report on the benefits of the adoption of field control techniques on the production of fresh fruits and vegetables at all levels of production.
- . Staff from about 21 PICTs participating in monthly sessions of PEACESAT 'FLYNET';
- . Manual on Fruit Flies in the Pacific completed by December, 1997;
- . Improved information transfer on fruit flies and their control to Governments and the private sector at all levels, through producing advisory leaflets, publishing scientific papers and transferring technology via sub-regional workshops;
- . Home Page for Internet on the project and fruit flies;
- . Reduced losses to fruits and vegetables caused by fruit flies by adoption of an integrated pest management approach;
- . Local protein source available for protein bait spraying by modifying waste yeast from breweries in Fiji, Solomon Islands, Vanuatu, PNG and other countries by December, 1998;
- . Database on the heat tolerances of immature stages of at least 10 species of fruit flies in the PICTs by December, 1998.

Immediate Objective 4

In cooperation with ACIAR, to develop a separate multi-disciplinary fruit fly programme to address the enormous risk of fruit fly spread through and from PNG into the rest of the region.

Success Criteria for Objective 4

The following success criteria may be used to assess the progress relevant to Objective 4:

- . Suitable laboratories in Bubia and Keravat for fruit fly activities by July, 1997;
- . Adoption of the protein bait spray technology by farmers by December, 1998;
- . Established laboratory colonies of major fruit fly species by December, 1997;
- . Completion of biological studies on life cycles and rate of development of fruit flies on artificial diets by June, 1998;
- . Initiation of the generation of heat tolerance data by 1 January, 1998;

- . Staff who have received intensive training on fruit fly identification, fruit fly surveillance, laboratory rearing, field control methods, and generation of data on heat tolerance by November, 1997;
- . Production of a video on the fruit fly problem in the Pacific, posters for ports of entry, and other materials to increase public awareness of the fruit fly problem.

Immediate Objective 5

To ensure sustainable technical capacity for coordination of future activities on fruit flies within the Region.

Success Criteria for Objective 5

The following success criteria may be used to assess the achievements or progress relevant to Objective 5 :

- . Entomologist (Fruit Flies) to be trained for regional coordination of fruit fly activities appointed into the SPC Plant Protection Service by June, 1997;
- . Approval for core funding for this position by 1 January, 2000;
- . Awarding of two post-graduate scholarships for a Masters Degree, on a cost-sharing basis, during the next three years to national plant protection staff based on merit and contribution to the project.

Immediate Objective 6

To promote private sector involvement in sustaining quarantine surveillance and research into fruit fly control and quarantine treatments for commodities destined for export.

Success Criteria for Objective 6

The following success criteria may be used to assess the achievements or progress relevant to Objective 6 :

- . System for using industry funds provided by a levy on exportable commodities to support quarantine surveillance and research by December, 1997 (Applicable only to countries that export fresh commodities.);
- . Private sector and Government advisory group to identify high priority fruit fly activities for funding.

PROGRESS, ACHIEVEMENTS AND OUTCOMES

Appendix 1 (Progress Report : May, 1997 – September, 1998) contains a tabulated summary of the major activities and achievements of the RMFFP against the Development and Immediate Objectives. The summary identifies the Expected Outputs as defined in the Project Document and the Actual Outputs, resulting from activities performed over the past 17 months.

Immediate Objective 1

Appendices 2 and 3 are progress reports on the activities and achievements of the RMFFP in Vanuatu and FSM respectively.

With respect to Vanuatu, the project has made considerable progress in activities such as faunal surveys, quarantine surveillance, maintenance of laboratory colonies of fruit flies, host status testing, generation of heat tolerance data, field control, analysis of data to aid Vanuatu in presenting sound technical information during quarantine negotiations on trade, compilation of a Fruit Fly Manual and training of national staff. The project is at a stage that demonstrates high prospects of sustainability of activities. It is currently staffed by national staff who are well trained in all aspects of fruit fly identification, biology and control. In most PICTs, sustainability is dependent on the level of funding provided by governments and the commitment by national staff to maintain work programmes. In the case of Vanuatu, the commitment of staff is very high and it is expected that the government commitment to funding will also be maintained at an acceptable level.

One of the major reasons for this level of staff and government commitment is the way in which the project was developed in Vanuatu. Great emphasis was placed on the ownership of the project activities and outputs resting fully with national staff. Linking the outputs to quarantine negotiations, improving production at the subsistence and commercial levels and enhancing prospects of export of fresh products through the private sector created an output driven attitude amongst national staff. This is reflected in staff keenness to sustain project activities with limited supervision.

The situation in FSM is quite different to that in Vanuatu in that, despite the RMFFP producing valuable, sound technical information on the fruit fly situation in FSM, there is, currently, less private sector pressure to maintain quarantine surveillance systems, to provide field control technology and to develop quarantine treatments than in Vanuatu. Nonetheless, there is commitment from Government to maintain the fruit fly activities and increasing private sector pressure in Kosrae. This was demonstrated during the Workshop on Quarantine Treatment Development held in Pohnpei in May, 1998. Efforts are being made to involve USDA-Agricultural Research Service Laboratories in Hilo, Hawaii in developing quarantine heat or cold treatments for citrus and mango exports to Guam, CNMI and other island countries.

The greatest constraint to continued commitment in FSM is the lack of adequately trained technical or professional staff. Until this problem is addressed, there is only limited scope for sophisticated research necessary to generate data on cold or heat tolerance of immature stages of fruit flies. However, with technical assistance from the SPC Plant Protection Project (Micronesia), quarantine surveillance in all four States of FSM and laboratory colonies will be maintained.

In the Solomon Islands, the level of fruit fly activities has been quite variable. Like FSM, this activity level is determined, to some extent, by the limited prospects for export of substantial fresh fruits and vegetables and the degree of importance placed on fruit fly activities by Research and Plant Protection staff in the context of limited human and financial resources to cover a wide range of pest problems. In spite of this situation, good progress in activities has been made. The following summarizes the major activities and achievements:-

- Trapping has comprised up to 117 trap sites spread between the nine Provinces. 1,724 trap collections have been made between June, 1994 and June, 1998. However, from 62 of the 117 trap sites, five or less than five trap collections were made over the period. At the other end of the scale, 87-104 collections were made from only 6 trap sites and these were primarily in northern Guadalcanal. These figures show that there has been a concentration of quarantine surveillance in Guadalcanal and, to a lesser extent, in the Western, Central and Isabel provinces.

- The trapping system has been revised to reflect a quarantine surveillance need as opposed to a faunal survey need. The proposed network has identified high priority/high risk quarantine sites (Priority 1 sites) and lower priority faunal survey and lower risk quarantine sites (Priority 2 sites). Priority 1 sites include four sites in Western Province (Munda and Noro in New Georgia, Korovou in Shortland Islands, and Gizo), one site in Choiseul Province (Choiseul Bay), four sites in Guadalcanal (Honiara, Henderson Airport, Ranadi Refuse Dump, Wharf area), two sites in Central Province (Tulagi, Yandina) and one site in Temotu Province (Lata). Priority 2 sites include sites in Choiseul Province (1 site), Western Province (2 sites), Isabel Province (3 sites), Malaita Province (2 sites), Makira Province (3 sites), Renbel Province (1 site), Temotu Province (1 site) and Guadalcanal Province (5 sites).
- The Government nominated Provincial Fruit Fly Coordinators, whose responsibility it is to ensure quarantine surveillance activities are performed regularly. Varying levels of success has been evident for a wide variety of reasons.
- Despite deficiencies in the quarantine surveillance system, our knowledge of the fruit fly fauna is vastly better now than it was prior to the RMFFP and ACIAR Project. A consolidated list of 57 species from Solomon Islands and Bougainvillea has been provided by the ACIAR Project. 11 of these are undescribed. Of the 57 species, 4 species are of economic importance in Solomon Islands – *B.frauenfeldi*, *B.cucurbitae*, *B.umbrosa* and *Dacus solomonensis*.
- The responsibility for quarantine surveillance (all Priority 1 sites and some Priority 2 sites) is being handed over to Quarantine.
- 2,527 fruit samples have been collected between 1994 and 1998. Most were collected in Guadalcanal Province (2,222 samples), Central Province (14), Malaita Province (32), Temotu Province (36) and Western Province (97). Less than 100 fruit samples were collected in other Provinces.
- Of the 40 species of commercial fruits collected, fruit flies were reared from 24 species (38%). *B.fraunfeldi* (mango fruit fly) was by far the most common species recovered. *B.cucurbitae* (melon fly) and *D.solomonensis* were commonly reared from cucurbits such as scarlet ivy gourd (*Coccinia grandis*), bitter gourd (*Momordica charantia*), snake gourd, pumpkin, cucumber and watermelon. Melon fly is distributed in six of the nine provinces.
- Of the 233 non-commercial fruit species collected, 27 species produced fruit flies. Again, the most common recovery was mango fruit fly.
- Data on the incidence of fruit flies in fruit samples have been collected. 56-67% of guava samples were infested with 29.9-36.8 flies emerging per kilogram of fruit. 67% of mango samples are infested with up to 13.6 flies emerging per kilogram of fruit. Similarly, 25-41% of papaya samples were infested, with 8.1-12.0 flies emerging per kilogram of fruit. For non-commercial fruits, 33-67% of Pacific almond fruit (*Terminalia catappa*) samples were infested, with 62.6-117.6 flies emerging per kilogram of fruit. In all instances, mango fruit fly was the offending fly.
- Laboratory colonies of mango fruit fly, *B.umbrosa* and *D.solomonensis* have been maintained at Dodo Creek Research Station (DCRS) and colonies of melon fly in the Admiral Health Laboratory in Honiara. The later colony was maintained to rear the parasitoid, *Psytalia fletcheri*, introduced from Hawaii to augment melon fly control in Honiara and the Western Province.

- The melon fly parasitoid was introduced and released at three sites in Honiara and four sites on Kolombangera Island in the Western Province between 27 June, 1997 to 18 August, 1997. 3,075 parasitoids were released in the Honiara area and 2,400 in the Western Province. Recoveries of the parasitoid have been made at four sites in the Honiara area, but in very low numbers.
- Host status testing of 'Queen' pineapple, Lisbon lemon and Mexican lime were conducted at DCRS. Only mango fruit fly was tested. Laboratory tests using punctured fruits showed that all fruits were potential hosts under the New Zealand Ministry of Agriculture and Forestry – Regulatory Authority Standard 155.02.02: Specification for Determination of Fruit Fly Host Status as a Treatment. Further laboratory tests using unpunctured fruits showed that none of the fruits produced adult flies and so are not hosts under this Standard.
- Preliminary testing to generate data on the heat tolerance of immature stages of mango fruit fly was done, but was postponed when the UNV resigned and departed. These tests will not be resumed until a new UNV is appointed.
- The UNV and national staff produced a Manual on Fruit Flies for Solomon Islands. It contains information on the major species of fruit flies found in traps, biology, field control and quarantine treatments. 200 copies were produced for distribution to field staff in all Provinces. It was funded by RMFFP and ACIAR.
- A Pest Advisory Leaflet on melon fly was drafted and is to be typeset and printed by the RMFFP using photographs taken during mid-1998 by Mr. Steve Wilson of the Queensland Museum.
- Staff training comprised attendance at the Workshop on Identification and Quarantine Surveillance in Brisbane (May, 1997); at Symposium on Eradication of Oriental Fruit Fly in Tahiti and Moorea in November, 1997; national training on identification of fruit flies sampling trap catches and preservation of specimens in January, 1998 (ACIAR).

In summary, the progress of activities in Solomon Islands and FSM has been adequate. The removal of technical advice by a resident UNV certainly caused a downturn in activities in these countries. There is still adequate time to resurrect these activities with changes to priorities and responsibilities and the appointment of a new UNV in Solomon Islands. In contrast, the activities in Vanuatu are sustainable in the long term, providing the Government provides funding and resource support.

Immediate Objective 2

The expected and Actual Outputs are covered in detail in Appendix 1. However, there are several items that need clarification or more emphasis than is given in the appendix.

During 1997 – 1998, considerable effort was put into establishing quarantine surveillance in all 22 PICTs. Table 2 contains a list of countries and the distribution of traps in each country, that have been established by the RMFFP, the governments or another agency, such as the Northern Australian Quarantine Strategy (NAQS).

Table 2: Numbers and distributions of fruit fly trapping sites in the Pacific Island countries and territories (September, 1998).

Country	No. of Trap Sites	No. of Islands
---------	-------------------	----------------

		Covered
Cook Islands	27	6
Fiji	94	6
Tonga	25	5
Samoa	32	2
FSM	54	4
Solomon Islands	30	14
Vanuatu	42	18
American Samoa	36	3
CNMI *	200 (3)	3
French Polynesia *	169 (1)	5
Guam *	10 (2)	1
	20-25(3)	1
Kiribati	36	2
Marshall Islands	6	1
New Caledonia *	45	3
Niue	10	1
Palau	5	2
Papua New Guinea	50-60 (4)	8
Pitcairn	3 (Not permanent)	1
Wallis and Futuna	4-5	2
Tokelau	5	1
Tuvalu	5	2

Notes:

- (1) - Part of eradication programme of Oriental fruit fly
- (2) - Methyl eugenol traps
- (3) - Cure-lure traps
- (4) - Part set up by AQIS-NAQS
- * - Established by Government

Quarantine surveillance kits containing traps, lures, specimen boxes, plastic containers for rearing flies from fruits, and an instruction booklet were distributed to FSM, American Samoa, Kiribati, Marshall Islands, Niue, Nauru, Palau, Wallis and Futuna, Tokelau and Tuvalu during 1998. Permanent trap sites on Pitcairn Island have not been established; trapping surveys will be done whenever SPC surveys for other pests and diseases of plants or animals are done. Positive responses from Niue, Nauru, Marshall Islands, American Samoa, Palau, Tuvalu and Kiribati indicate that these countries are committed to the regional quarantine surveillance for exotic fruit flies.

As identified in Appendix 1, the documentation of Emergency Response Plans (ERP) is of high priority. Many countries commenced the documentation process, resulting from the Workshop on Identification of Papaya Fruit Fly, Quarantine Surveillance and Emergency Response Planning held in Cairns in May, 1996. It was jointly funded by the RMFFP and ACIAR. Finalization of these draft national ERPs will be done during the eradication programme for fruit flies in Nauru. The eradication campaign will be used as a major training exercise for plant protection and quarantine staff from all PICTs. National staff will spend 2-4 weeks in Nauru, gaining hands-on-experience with all facets of the planned eradication campaign. At the same time, all national staff will be expected to complete, in detail, the ERP for his/her country before leaving Nauru.

Other activities of this Objective, such as providing a stockpile of supplies for eradication campaigns, public awareness programmes, providing training on fruit fly identification and

eradication techniques, and upgrading the regional databases on fruit flies, have shown considerable advances during 1997 and 1998 – See Appendix 1.

Immediate Objective 3

This Immediate Objective contains activities that relate to the transfer of technologies between countries such as Tonga, Fiji and Cook Islands and the relatively new countries in the RMFFP. Technologies include quarantine surveillance, host surveys, laboratory rearing of flies and parasitoids, field control of fruit flies using bagging and protein bait spraying, development of protein bait from waste yeast produced by national breweries, and quarantine treatments based on forced hot air and non-host status. These activities focussed on the countries and territories other than Solomon Islands, Vanuatu and FSM.

One of the most important developments in the Pacific Region is the adoption of non-chemical quarantine treatments. Commercial hot forced air units are now installed in Cook Islands, Fiji, Tonga and New Caledonia, with countries such as Samoa, Vanuatu and PNG showing keen interest in being part of this technology development. This technology has resulted in increased export earnings. For example, during 1997-98, Fiji exported 130 tonnes of eggplant (F\$520,000), 15 tonnes of pickling mangoes (F\$52,500), 30 tonnes of fresh mangoes (F\$135,000) and 150 tonnes of papaya (F\$675,000). This export totals F\$1,382,500. The estimate for 1998-99 for export of mangoes is about 300 tonnes and for eggplant is 250-300 tonnes; this will amount to F\$2.3 million. Though the values of export are small compared to developed countries, they are significant to small island economies. They impact very positively on prospects for expansion of small farming enterprises.

The forced hot air technology and the quarantine pathways that are integral parts of the export chain have real potential to open up markets into Australia, mainland USA and Canada via transshipment through Hawaii. The discipline needed by farmers and exporters to maintain control of their crops under an holistic quarantine pathway has resulted in vastly improved quality of produce, necessary to compete in overseas markets.

The development of Royal Tongalure made from waste yeast from the Royal Beer Company in Tonga is a model that can be adopted in any country in the Pacific with a brewery. Using Tongalure to control fruit fly damage in capsicum has resulted in high quality capsicum being available in local markets and for the hotel and restaurant trade in Tonga. Tongalure is being sold at about F\$2.90 per litre, compared to F\$30.00 per litre for the protein autolysate imported from Australia. Even though it is necessary to use twice as much Tongalure as the Australian product, it is still vastly cheaper. The price differential is so marked that Fiji farmers and exporters have approached the Royal Beer Company in Tonga, to supply Tongalure to Fiji. Cook Islands farmers have made similar enquiries. This situation and interest in the use of protein bait sprays, especially as part of quarantine pathways, may entice larger breweries such as the Fiji Bitter Brewery, to establish plants to modify their waste yeast rather than disposing of it into the ocean.

The consultancy to carry out a study on the value of fresh fruit and vegetable production at the subsistence level in four sample countries commenced formally in September, 1998. This consultancy will provide valuable information on losses resulting from fruit flies and the impact that adoption of control techniques will have on increasing production. Pilot studies on the adoption of bagging of fruit, protein bait spraying and combinations of these are planned for villages in Solomon Islands, Vanuatu, Samoa and Fiji. This work will be done using a combination of Non-Government Organizations and Governments staff. These field studies will provide valuable information of the impact of fruit flies at the village level and also the prospects for adoption of these techniques.

This study fits in with a study by the RMFFP and the Niue Government on control of fruit flies using a combination of destruction of over-ripe, damaged, fallen fruit and protein bait sprays in

four villages. The aim is to control fruit flies in whole villages and measure increases in fresh fruit availability as a result.

On a much larger scale, the eradication of fruit flies from Nauru, commencing in October, 1998, will demonstrate the value of fruit and vegetable production in the absence of fruit flies. Currently, Oriental fruit fly, mango fruit fly, melon fly and *B.xanthodes* are present in such high numbers that production of fruits and vegetables is in jeopardy. This is in a country that imports almost all of its fresh commodities and where inadequate diets have resulted in a high incidence of nutritional diseases, such as diabetes and coronary disease.

Transfer of technology has been hampered by the gradual loss of PEACESAT facilities in many PICTs. The use of this satellite communication facility was relied upon to get fruit fly workers or coordinators together on a monthly basis. PEACESAT facilities in countries such as PNG, Solomon Islands, Vanuatu, Tuvalu, Kiribati are no longer functional. Other conference technologies need to be investigated. The technology needs direct voice to voice contact, preferably in groups, where common problems or constraints can be discussed. As a result of the progressive loss of PEACESAT, the costs of communication has doubled. Email and facsimile are effective when available, but still does not replace voice to voice contact.

In general, the Expected Outputs are being achieved and can be translated into outcomes such as increased food production and increased exports and income earnings for small farmers and exporters.

Immediate Objective 4

Immediate Objective 4 covers the development of a multi-disciplinary fruit fly programme in PNG, in conjunction with ACIAR and executed nationally by NARI and the Department of Agriculture and Livestock (DAL). Appendix 1 provides a summary of activities, while Appendix 4 provides technical details of the activities and outputs. Comments in this section will only highlight the important advances and any constraints.

The project activities commenced in August, 1997. Overall, the level of activity in PNG has been more than satisfactory, especially in the Kerevat and Bubia areas. Laboratories at the Lowlands Agricultural Experiment Station (LAES) and Bubia have been modified by the RMFFP. The laboratory at Laloki near Port Moresby will be modified by 30 November, 1998. Fruit fly surveys have been activated out of the three centres, Kerevat, Bubia and Laloki.

One of the innovative approaches used in PNG was to appoint a UNV Entomologist and three national Junior Scientific Officers to undergo intensive training for 3-4 months under the UNV at Kerevat, before being located at Kerevat, Bubia and Laloki. This approach shows tremendous promise as indicated by the level of interest by the Junior Scientific Officers already appointed and operating. It will give greater assurance of sustainability of fruit fly activities.

Emphasis has been placed on getting information on fruit flies, their quarantine and economic importance, and control technology out to the farming community and to national and provincial government field operatives. Four strategies made up the suite of materials compiled and distributed. These were:-

- publication of a practical guide for fruit fly surveys in PNG, targeting quarantine, plant protection and advisory staff and private sector cooperators;
- publication every two months of a newsletter 'Infofly PNG' for wide distribution to the private sector and government;

- translation of a Pest Advisory Leaflet on mango fruit fly and its control into Pidgin for distribution to the private sector and government; and
- production of an audiotape on fruit flies, their importance and control in Pidgin for use by radio stations across PNG.

Field work on trapping, host surveys, assessment of levels of damage caused by fruit flies, and field control using bagging and protein bait sprays have commenced and are reported on in Appendix 4.

Two areas of activity that have been delayed are the establishment of fruit fly colonies in laboratories at the centres and the provision of identification services for fruit flies by the ACIAR project. The delays in the establishment of laboratory colonies of fruit flies at Kerevat relate to the lack of an appropriate room being allocated to the RMFFP for these activities by LAES. The reason for this delay relates to the slowness in the vacating existing laboratory space by staff of the Cocoa and Coconut Research Institute. This will be resolved by November, 1998. In the meantime, RMFFP staff have established a small colony of mango fruit fly in a renovated greenhouse. Now that a laboratory is available at Bubia, colonies of species there can be set up once the economic species are enunciated. Unfortunately, these delays have meant that time-consuming research into the heat tolerance of immature stages of fruit flies will not commence until early 1999.

The delay in fruit fly identification is tied to the delay in obtaining approval for the ACIAR Project CS2/96/225: Identification, Biology, Management and Quarantine Systems for Fruit Flies in Papua New Guinea from AusAID. It means that there is a large backlog of pinned and unpinned specimens, particularly at LAES, from the RMFFP trapping and host survey activities over the past year. Nevertheless, this backlog will be processed through the laboratory at Griffith University in Brisbane and will help to form the baseline for the database on PNG fruit flies, together with fruit fly material collected under NAQS and the ACIAR Project.

In general, the progress in PNG, a country that is diverse in geography, biology and sociology, has been very good. Deficiencies in communication, travel and, to some extent, security make operating in this large country more difficult than that in smaller PICTs.

Immediate Objective 5

This objective is concerned with guaranteeing that the fruit fly activities are sustained with a regional framework, i.e. within SPC, the executing agency for the RMFFP. An Entomologist (Fruit Flies) with particular expertise in documenting quarantine surveillance systems and emergency response plans and in data analysis with the view of producing status reports on fruit flies for PICTs, was appointed in April, 1998. The expansion of quarantine surveillance systems into new countries fell under the responsibilities of this position and was achieved by August, 1998.

Data on fruit fly trapping and host surveys have been requested from counterparts in Cook Islands, Fiji, Tonga and Samoa in an effort to consolidate status reports for each country. The status reports for FSM and Vanuatu are completed and the report for Solomon Islands is in draft form. These reports may be used by countries as the basis of quarantine negotiations with potential importing countries, especially for fruit fly host and non-host commodities.

Immediate Objective 6

Immediate Objective 6 aims to promote the involvement of the private sector in sustaining research effort into quarantine treatment development, quarantine surveillance associated with quarantine pathways and fruit flies generally. There has been limited activity, except for maintaining contact with industry groups in Fiji, Tonga and Vanuatu. Support was given to establish a Fruit and Vegetable Council in Fiji. It is envisaged that this Council may administer levies that may be imposed to help fund research.

Training

Training of national staff has been recognized as a high priority and essential if sustainability of activities is a primary aim of the RMFFP. The following training activities were carried out during 1997 and 1998:-

- A workshop on Identification of Fruit Flies and Quarantine Surveillance was conducted under the auspices of the RMFFP and ACIAR for fruit fly workers from Solomon Islands (2), Vanuatu (2) and Papua New Guinea (2) at Griffith University, Brisbane in June, 1997. At this Workshop, the use of pictorial keys was used very successfully for the first time by Prof. Dick Drew. The Cabikey for fruit flies was tested using the participants from the Pacific Islands and some participants from New Zealand, who had received specific training in Cabikey. The results of this field test were poor, indicating that there are some basic faults with the key.
- Hands-on training for national staff in Vanuatu in October, 1998 on fruit fly identifications and preservation and curation of insect specimens conducted by ACIAR in October, 1997.
- A Regional Symposium on the Eradication of Oriental Fruit Fly in Tahiti and Moorea in Papeete, French Polynesia on 24-27 November, 1997. Fourteen countries (PNG, Solomon Islands, Vanuatu, New Caledonia, Fiji, Tonga, American Samoa, Samoa, Wallis and Futuna, Nauru, Tuvalu, Niue and Cook Islands) were represented. Participants received details of the eradication campaign and were able to see the process of blocking using coconut husk blocks soaked in methyl eugenol and malathion applied from the ground and aerially. This was funded by the RMFFP and the EU/SPC Plant Protection Service.
- Training on identification of fruit flies and quarantine surveillance conducted by ACIAR in Solomon Islands in January, 1998.
- Steering Committee Meetings were held in September, 1997 and March, 1998. These meetings gave national staff an opportunity to be briefed on activities of the RMFFP, to receive information originating from the work programme of the RMFFP, and to determine the direction of activities.
- An Implementation Workshop for the PNG Fruit Fly Project was held in Port Moresby in late August, 1997 in an effort to ensure cooperation between the RMFFP and the proposed ACIAR Project. This was followed up by a Planning Workshop in Port Moresby in June, 1998 after the ACIAR Project was approved. This workshop focussed on technical details associated with trapping and fruit surveys. Both workshops were jointly funded by the ACIAR Project and the RMFFP.
- A Workshop on Quarantine Treatment Development was held in Pohnpei, FSM on 12-13 May, 1998. It was jointly funded by the RMFFP, College of Micronesia/Land Grant Program and the FSM Government. Participants from Palau, Marshall

Islands and FSM (Pohnpei, Kosrae, Yap, Chuuk) attended. Resource personnel were drawn from the RMFFP, USDA-Agricultural Research Service, Hilo and Guam.

- The RMFFP sponsored Ms. Ema Tora Vueti to attend the Workshop on Tropical Fruit held in Nouméa on 20-24 July, 1998. This sponsorship was part of training Ms. Vueti in presentation of a scientific paper at an international conference.
- The largest training exercise to be performed under the auspices of the RMFFP, the Crawford Fund for International Agricultural Research, AQIS and private enterprise companies in Australia is in conjunction with the eradication campaign for fruit flies in Nauru, commencing on 13 October, 1998. This programme will allow at least 30 national plant protection and quarantine staff to be trained in eradication techniques and emergency response planning.

BENEFITS AND TARGETS BENEFICIARIES

The RMFFP and the national governments have increased the knowledge on the fruit fly fauna and parasitoids in 22 PICTs. In accumulating this information, the determination of losses to fruit and vegetable production caused by fruit flies has been possible. For example, 90-95% of guavas are infested by various fruit fly species in FSM, Vanuatu, Samoa and FSM and Fiji. Production of capsicum or some chilli varieties in Tonga is not feasible without field control. 89-100% of capsicums are lost if control is not implemented soon after fruit sets. Melon fly in Solomon Islands has caused very heavy losses to snake gourd (>90% loss) and to squash/pumpkin (60-87% damage). The loss has been such that production of snake gourd in villages in the Western Province has almost ceased.

By using control methods such as bagging of fruits with double layered paper bags, destruction of over-ripe, damaged or fallen fruits and application of protein bait sprays, it is possible to reduce the damage mentioned above to acceptable levels. For example, application of protein bait sprays to every third row of capsicum or chilli on a weekly schedule in Tonga will reduce levels of damage from 89-100% to less than 10%. These three techniques are as appropriate for subsistence or village production as they are for commercial production. Reduction of losses to less than 10% for all fruit and vegetable crops would significantly increase the availability of fresh produce for local consumption, for marketing and, if appropriate, export.

On this basis, the beneficiaries of the results of the RMFFP are subsistence and commercial farmers, the exporters and the consumers. More fruit and vegetable availability at possibly lower prices may help to alleviate health problems such as diabetes and coronary disease caused by deficient diets. The positive effects on food security and improvement to rural incomes are demonstrable.

The methods of control of fruit flies being recommended by the RMFFP comply with an integrated pest management approach and, consequently, will reduce the quantity of pesticides being used in fragile island environments. Similarly, the use of quarantine treatments, based on physical treatments such as forced hot air or non-host status of fruits or vegetables, results in less environmental pollution and a healthier product. The successful conversion of waste yeast from the Royal Beer Company and its subsequent testing and commercial release means that waste yeast will no longer be disposed of in the lagoon.

The RMFFP and associated projects have provided training on fruit flies to a wide range of plant protection, quarantine and advisory staff in up to 18 PICTs. The Governments and Administrations of the PICTs therefore benefit considerably. The body of trained professional

and technical staff guarantees sustainability of fruit fly activities both nationally and regionally. The SPC provides additional support regionally in a coordination and advisory role, essential to harmonization and standardization of quarantine protocols and disinfestation treatments. The high priority attributed to training will culminate in training of national staff in quarantine surveillance, emergency response preparedness and eradication procedures in Nauru from October, 1998 through 1999.

Trading partners such as Australia, New Zealand, Japan, Canada, USA and Pacific neighbors are more confident with the quality of information on fruit flies provided now than previously. This is likely to make negotiations easier, with greater transparency than previously.

HUMAN RESOURCE INPUTS

National Governments and Administrations have identified plant protection, quarantine and/or advisory staff to operate as counterpart staff. They assist in servicing of traps, collecting fruit samples and rearing flies, sorting and identifying flies and parasitoids, culturing of flies in the laboratory, and undertaking research into field control systems and quarantine treatments. The project aims to ensure that national staff are capable of analyzing data so that they can interpret results without the dependence on outside technical expertise.

Many PICTs nominated a coordinator as a focal point for fruit fly activities. Countries such as American Samoa, Cook Islands, FSM, Fiji, Solomon Islands, Vanuatu, Guam, Tuvalu, Kiribati, Niue, Nauru, Palau, New Caledonia, French Polynesia and PNG have nominated coordinators. Most of these countries also committed several staff to fruit fly quarantine surveillance and other activities. This approach ensures continuity of activities and a good prospect for sustainability in the long term.

In countries such as Solomon Islands and PNG, Coordinating Committees have been set up to steer the project activities in the direction required by the national governments,

EQUIPMENT, SUPPLIES AND FACILITIES

Countries such as Cook Islands, Fiji, Samoa and Tonga required virtually no equipment and were basically self-sufficient in supplies as one would expect in countries that have been involved in fruit fly activities since September, 1990. These countries were able to provide their own quarantine surveillance supplies.

Countries that have traditionally run their own fruit fly programmes, e.g. Guam, CNMI, New Caledonia and French Polynesia, were self sufficient and required no support with equipment or supplies.

The countries that have been with RMFFP for around four years (FSM, Solomon Islands and Vanuatu) still needed support in purchase of supplies and equipment. This support was in the form of purchasing of traps, lures, specimen boxes, plastic containers, chemicals, laboratory supplies, minor equipment particularly for undertaking research into heat tolerances of immature stages, and stationery. Generally, the laboratories in these countries are well set up with equipment supplied by the RMFFP and ACIAR and facilities developed by the RMFFP.

The countries that are relatively new to fruit fly activities such as American Samoa, Palau, Nauru, Tuvalu, Tokelau, Niue, Wallis and Futuna, Kiribati and Marshall Islands, needed more supplies. Quarantine surveillance kits have been supplied to all of these PICTs. In addition, funds have been provided to Niue for minor modifications to laboratories for rearing fruit flies from fruit samples as part of quarantine surveillance and assessment of damage levels in fruit

in the whole village control trials. Substantial equipment and supplies will be provided to Nauru as part of the fruit fly eradication campaign.

The greatest input to provision of equipment, supplies and facilities was in PNG. Laboratories at Kerevat and Bubia have been modified so that fruit fly colonies can be set up and fruit samples can be held for emergence of flies. The laboratory at Laloki will be modified within the next two months. All laboratories are air-conditioned and have computers and printers, refrigerators for storing fruits and diet, freezers and supplies required for trapping, fruit surveys, culturing of fruit flies, and field control. High quality cameras and global positioning systems are to be purchased. ACIAR will provide considerable support in PNG, with purchase of a vehicle for fruit fly work in Bubia and laboratory supplies.

PROGRESS REPORT : MAY, 1997 – SEPTEMBER, 1998.

Project : **REGIONAL MANAGEMENT OF FRUIT FLIES IN THE PACIFIC**

Project : **RAS/97/331**

Funding Sources : **COST-SHARED BY AusAID and UNDP. NEW ZEALAND GOVERNMENT DIRECT TO SECRETARIAT OF THE PACIFIC COMMUNITY (SPC)**

Executed By : **SECRETARIAT OF THE PACIFIC COMMUNITY (SPC)**

Implemented By : **FAO**

Expected Outputs	Actual Outputs
Immediate Objective 1 : To overcome constraints on production and export of fresh fruits and vegetables in FSM, Solomon Islands and Vanuatu caused by the presence of damaging fruit fly species.	
<p>Output 1.1 Valid data on fruit flies and parasitoids in each country, their host ranges, seasonal abundances, and assessment of losses caused.</p>	<ul style="list-style-type: none"> • Completed status report on fruit flies and quarantine surveillance in Vanuatu in December, 1997. • Revised trapping programmes in Vanuatu and Solomon Islands to quarantine surveillance focus during 1997 and 1998, respectively. • Trapping and host surveys in Solomon Islands not sustained after departure of UNV. To be handed over to Quarantine with some assistance from Non-Government Organization – Solomon Island Development Trust. Recommended 30 trap sites, made up of 12 sites in 5 Provinces in Priority 1 and 18 sites in 8 Provinces in Priority 2 sites. • Quarantine surveillance in FSM limited to Pohnpei. Traps being re-established on Chuuk, Yap and Kosrae by SPC. • Accurate information on fruit flies in Vanuatu (14 species) and FSM (1 species) • More work needed in Solomon Islands particularly on host surveys, but already recorded 57 species of which 11 are undescribed species.
<p>Output 1.2 Quarantine surveillance systems/early warning systems to record introductions of exotic fruit fly species and emergency response plans to cope with any outbreak of exotic fruit flies</p>	<ul style="list-style-type: none"> • Quarantine surveillance systems in place in Vanuatu and in Pohnpei (FSM), based on trapping and host surveys. See Output 1.1 for Solomon Island status. • Procedures for quarantine surveillance documented in Vanuatu – as model for other countries • No action on emergency response plans. (To be done in association with Nauru eradication exercise in late 1998.) • Fruit fly identification workshops in Brisbane (June, 1997) and in Solomon Islands (January, 1998) with ACIAR.

<p>Output 1.3 Environmentally sound inexpensive, effective field control systems adopted by subsistence and commercial farmers in order to increase production and incomes of farmers.</p>	<ul style="list-style-type: none"> • No specific activities on protein bait spray development from brewery waste yeast until research is completed in Tonga or Fiji • Consultancy arranged to establish pilot demonstrations of protein bait spraying and bagging at village level in Ambrym in Vanuatu and on protein bait spraying for cucurbits in Western Province of Solomon Islands. Involvement of Solomon Island Development Trust network. • Assisted with introduction, rearing and release of the parasitoid <i>Psytalia fletcheri</i> for melon fly control in Solomon Islands and <i>Fopius arisanus</i> and <i>Diacasamimorpha longicandata</i> into Pohnpei and Kosrae respectively for control of mango fruit fly. Low levels of recovery of <i>P.fletcheri</i> and <i>F.arisanus</i> during 1997.
<p>Output 1.4 Laboratory colonies of economically important fruit fly species for research into non-host status and quarantine treatments</p>	<ul style="list-style-type: none"> • Maintained colonies of <i>Bactrocera cucurbitae</i> (melon fly), <i>B. frauenfeldi</i> (mango fruit fly), <i>Dacus solomonensis</i> in Solomon Islands, <i>B. trilineola</i>, <i>B. umbrosa</i> and <i>B.sp.near paraxanthodes</i> in Vanuatu. Colonies in Solomon Islands in poor state in August, 1998. • Colonies of mango fruit fly in FSM died; but have been re-established in 1998.
<p>Output 1.5 Increased technical capacity of national staff to be able to identify fruit fly species and develop quarantine treatment based on non-host status and heat.</p>	<ul style="list-style-type: none"> • Training workshops in Brisbane (June, 1997) by RMFFP and ACIAR and in Solomon Islands (January, 1998) by ACIAR. • Contact with ACIAR project for in-country hands-on training in Vanuatu in October, 1997 and January, 1998. • Host status reports on pineapple, squash and cucumbers completed in Vanuatu and submitted to NZ. Squash and cucumber data accepted at this stage. • Host status tests on limes, lemons, pineapples completed in Solomon Islands. • Heat tolerance testing for <i>B. trilineola</i> in Vanuatu underway and <i>B. frauenfeldi</i> in Solomon Islands commenced but postponed until new UNV arrives. • Discussions on a small forced hot air unit for testing 300-500kg of produce in Vanuatu in progress. Useful for small countries. To be private sector operated. • Conducted Workshop on Quarantine Treatment Development in Pohnpei (FSM) for representatives from FSM, Palau, Marshall Islands, and Guam in conjunction with SPC Plant Protection Project in Micronesia and College of Micronesia in May, 1998.
<p>Immediate Objective 2: To improve substantially the quarantine preparedness of PICTs to cope with inevitable outbreaks of exotic fruit flies regionally.</p>	
<p>Output 2.1 Quarantine surveillance/early warning systems in all PICTs.</p>	<ul style="list-style-type: none"> • Quarantine surveillance maintained wholly by Governments in New Caledonia, French Polynesia, Guam, CNMI, Fiji, Tonga, Cook Islands. • Quarantine surveillance established and partly maintained by RMFFP in Samoa, FSM, Vanuatu, Solomon Islands. • New surveillance systems established in PNG, Niue, Nauru under RMFFP (NAQS also in PNG). • Quarantine surveillance kits comprising trapping materials, host survey supplies and instruction booklet distributed to American Samoa, Tuvalu, Tokelau, Wallis and Futuna, Palau, Kiribati, Marshall Islands and to FSM for Chuuk, Yap, Kosrae. Completed in July, 1998. • Trapping on Pitcairn Island done – <i>B. tryoni</i>, <i>B.setinervis</i> recorded.

<p>Output 2.2 Emergency Response Plans and eradication strategies to cope with outbreaks of exotic fruit fly species, in conjunction with disaster relief groups.</p>	<ul style="list-style-type: none"> • Emergency Response Plans (ERP) for exotic fruit flies in draft form in Cook Islands, Fiji, Tonga, FSM, Niue, American Samoa, French Polynesia, New Caledonia, Vanuatu as a result of Cairns Workshop in 1996. • Plans for national staff from each PICT that is involved in Nauru eradication programme to complete ERP for their country while in Nauru. • Appointed Entomologist (Fruit Flies) in Project to assist with formulation of country ERPs.
<p>Output 2.3 Readily available stockpiles of traps, attractants, protein antolysate, plastic containers and insecticides necessary to commence on eradication effort quickly.</p>	<ul style="list-style-type: none"> • RMFFP purchased traps; lures purchased as part of Nauru eradication campaign. To be stored in Fiji with SPC. • Initial discussions with New Zealand MAF Quality Management and Regulatory Authority to access these stocks – MOU to be developed.
<p>Output 2.4 Effective, high profile regional and national public awareness programmes using videos, television, radio, posters at ports of entry and other media.</p>	<ul style="list-style-type: none"> • Drafts of Pest Advisory Leaflets (PALs) on Queensland fruit fly (<i>B. tryoni</i>), <i>B. facialis</i>, <i>B. passiflorae</i>, melon fly completed. • Drafting of PALs on <i>dorsalis</i> complex, protein bait spraying and bagging of fruit is in progress. • Decision taken to produce PALs on fruit flies and their control on a country basis rather than a fruit fly species basis. To avoid duplication of information and recommendations on control. To be completed by December, 1998. • Manuals on fruit flies completed for Vanuatu (RMFFP) and Solomon Islands (RMFFP & ACIAR). 200 copies produced in Solomon Islands. • Discussions with UNDP and AQIS to set up Webpage for RMFFP and fruit flies in the Pacific commenced. • High quality photographs of fruit flies and damage for PALs posters and brochures for public awareness now available. • Negotiations with SPC Media Centre on production of video on fruit flies, their quarantine and economic importance and control commenced. Video by July, 1999. • Purchase of posters on Australian fruit flies and exotics for distribution to PICTs.
<p>Output 2.5 Improved technical capacity to identify exotic fruit fly species at a national and regional level and to undertake eradication procedures if an outbreak of an exotic species of fruit fly occurs.</p>	<ul style="list-style-type: none"> • See Output 1.5 and 2.2. • Eradication programme for at least melon fly and Oriental fruit fly in Nauru and on training of national staff in eradication techniques to commence in mid-October, 1998. • Conducted Regional Symposium on Eradication of Oriental Fruit Fly in Tahiti and Moorea in Papeete on 24-27 November, 1997 - 14 countries involved. • Provided advice to French Polynesia on eradication of Oriental fruit fly.

<p>Output 2.6 An upgraded, expanded database on fruit fly species in the PICTs, their host ranges, parasitoids, seasonal abundances and levels of damage caused by fruit flies.</p>	<ul style="list-style-type: none">• Negotiated with Queensland Department of Primary Industries for release of database for Fiji, Tonga, Samoa, Cook Islands, Vanuatu, Solomon Islands, FSM.• Memorandum of Understanding between RMFFP (Pacific Community) and Griffith University regarding database on fruit flies being discussed.• Vanuatu, Fiji, Solomon Islands, Tonga, Samoa, Cook Islands, FSM and PNG using EXCEL spreadsheet for recording data nationally.• Status report on fruit flies completed for Vanuatu and FSM, in draft form for Solomon Islands, and being compiled in Fiji, Tonga, Samoa, Cook Islands. Status reports to be used as basis for quarantine negotiations.
--	---

Immediate Objective 3: To enhance production and export of fresh fruits and vegetables regionally in order to increase farmers' incomes and to assist in providing food security, particularly in those countries not included in the previous fruit fly project.	
<p>Output 3.1 An assessment of effects of transfer and adoption of fruit fly control in sustaining livelihoods in PICTs.</p>	<ul style="list-style-type: none"> • Consultancy to carry out study on the value of fresh fruit and vegetable production at the subsistence level and the impact of increases in fruit and vegetable production on poverty and the rural labour market, commenced in September, 1998. • Identified sample countries for consultancy - Vanuatu, Solomon Islands, Fiji, Tuvalu, Samoa. • Pest Advisory Leaflets production – See Output 2.4 • No PEACESAT 'FLYNET' sessions run in early 1998 due to difficulties in access to sites. Recommended in April, 1998, but limited number of countries. • Need to identify an alternative method of communications, apart from email. Maybe tele-conferencing or new satellite system. • Proceedings of the Symposium on Regional Management of Fruit Flies in the Pacific released 52 papers; 22 of which were written by national staff. Released in October, 1997. Already out of print. ACIAR to do another run.
<p>Output 3.2 Transfer of technology related to fruit flies and methods of trapping, host surveys, laboratory rearing of flies and parasitoids, host status testing, heat tolerance testing of immature stages and field control.</p>	<ul style="list-style-type: none"> • One field demonstration of protein bait spray technique in Fiji (Sigatoka Valley) in July, 1997. • Modification of waste yeast for protein baiting based on Tongan procedure continued in Fiji. Tests on guava to be done in March-April. • Field testing of Royal Tongalure on capsicum in Tonga gave excellent results - commercially released in March, 1998. • Discussions on generic heat treatments held with NZ MAF Regulatory Authority – concept accepted. • Forced hot air treatments for papaya, fresh and pickling mangoes, eggplant for Fiji. Breadfruit tested in February, 1998 and is likely to be cleared. • Heat tolerance data from Tonga and Samoa (done by NZ Hort+Research) accepted by NZ. • Cook Islands obtained clearance for heat treatment of mangoes under generic concept. • Hot forced air facility in Tonga certified for export of papaya to New Zealand. Facility established in New Caledonia by Government and private sector. • Vanuatu has clearance to export squash and cucumbers under non-host status. Need to document quarantine pathway.
<p>Output 3.3 Reduced losses caused by fruit flies at subsistence and commercial levels of production due to adoption of protein bait spraying regionally.</p>	<ul style="list-style-type: none"> • Recommended bait spray trial at village level in Niue to test the effectiveness of destruction of fallen fruits and protein bait spraying - To be done in second half of 1998 due to shortage of fruits caused by drought. • Completed testing of Royal Tongalure on capsicums in 1997. Untreated plots 97-100% damage treated plots less than 10% damage. Royal Tongalure release commercially. • As part of consultancy in Output 3.1, field pilot studies on protein bait spraying in Solomon Islands and Vanuatu and on bagging techniques in Solomon Islands, Vanuatu and Fiji planned to commence in September, 1998. Focus is to test level of adoption of technology and estimate increases in production of various fruits.
<p>Output 3.4 An inexpensive, locally available protein manufactured by national breweries or other private companies from brewery waste in Fiji, Samoa, Vanuatu, Solomon Islands and PNG.</p>	<ul style="list-style-type: none"> • Work completed in Tonga and product to be released in March, 1998. • Research on conversion of waste yeast from Fiji Bitter Brewery continuing. • In interim, Fiji growers and exporters want to import Tongalure for fruit fly control in export crops because of price advantage. • Vanuatu Brewery interested in process.

<p>Output 3.5 Regional database on the heat tolerance of fruit fly species with the aim of formulating generic heat treatments to cope with a range of fruit fly species and commodities.</p>	<ul style="list-style-type: none"> • No formal activities on establishing database, except for preliminary discussions with NZ and USDA-ARS, Hawaii on a MOU. • Concept of generic or recipe heat treatments accepted by NZ MAF Regulatory Authority.
<p>Immediate Objective 4: In cooperation with ACIAR, to develop a separate multi-disciplinary fruit fly programme to address the enormous risk of fruit fly spread through and from PNG into the rest of the region.</p>	
<p>Output 4.1 Increased knowledge of the species of fruit flies and their parasitoids in PNG, particularly adjacent to the Irian Jaya border, and of quarantine risks of these species to the rest of the PICTs.</p>	<ul style="list-style-type: none"> • Established quarantine surveillance in the East New Britain area, by basing a UNV Entomologist there and setting up trapping and host surveys. See Appendix 4 for details. • Trapping systems established in Buka, Manus Island, New Ireland, Lihir, East and West New Britain, Lae, Bulolo and Wau. See Appendix 4 for details of species and distributions. • Supplied traps to the Post Moresby area in support of the NAQS programme. • Provided two staff with training on fruit fly identification in Brisbane. See Output 1.5. • Conducted with ACIAR, an Implementation Workshop on Fruit Fly Projects in PNG in August, 1997 and a Planning Workshop on 15-16 June, 1998. • Recruited and funded two national Junior Scientific Officers with DAL (later with NARI) to be located initially at LAES for training and then to be located at Bubia, Lae and LAES, Kerevat. Third JSO to be recruited for Laloki by December, 1998. • Publication of a practical guide for fruit fly surveying in PNG released. • Produced newsletter 'Infofly PNG' for wide distribution to government and private sector every two months. • Produced audiotape on fruit flies, their importance and control in pidgin for radio stations in PNG. • Translated Pest Advisory Leaflet on mango fruit fly into pidgin.
<p>Output 4.2 Dedicated facilities for undertaking fruit fly research at Bubia Research Station (Lae), Keravat (New Britain) and at Laloki (Port Moresby)</p>	<ul style="list-style-type: none"> • Buildings at Keravat (Lowland Agricultural Experiment Station) and Bubia modified as fruit fly laboratories. • Buildings at Laloki assessed by the UNV for renovations and modifications. Modifications to be completed by 30 November, 1998. • Supplies (traps, lures, plastic containers, rearing materials) and equipment (computers, refrigerators, cameras) provided to laboratories.
<p>Output 4.3 Reduced losses caused by fruit flies by adoption of a whole system approach for the control of fruit flies, including protein bait spraying, bagging of fruits and cultural and biological control methods.</p>	<ul style="list-style-type: none"> • Assessments of damage levels to fruits and vegetables done at LAES area. 2112 fruits, representing 10 commercial fruit species have been collected. • Levels of damage to guava (78%) cashew apples (66%), pumpkin (50%) yellow mangosteen (18%) and carambola (13%) assessed. See Appendix 4 for details. • Field demonstrations on bagging of fruit and protein bait spraying commenced at prison at Kerevat on guavas. Initial results look very promising – See Appendix 4 for detail.
<p>Output 4.4 Improved technical capacity to develop data on heat tolerances of economically important species of fruit flies and to undertake host status testing of particular commodities not regarded as hosts to fruit flies.</p>	<ul style="list-style-type: none"> • Laboratory colonies of <i>B. decipiens</i> and <i>B. frauenfeldi</i> established at LAES. • No other activities at this stage.

Output 4.5

National staff trained in fruit fly identifications and pre and post-harvest control strategies.

- Two of three National Junior Scientific Officers (JSOs) appointed and trained at Kerevat by UNV.
- Two national staff attended training on fruit fly identifications and quarantine surveillance in Brisbane in June, 1997.
- Contact with staff of National Agricultural Quarantine and Inspection Agency (NAQIA) and provincial Departments of Primary Industries and training on trapping provided to staff in island areas of PNG by UNV and JSOs.

Immediate Objective 5: To ensure sustainable technical capacity for coordination of future activities on fruit flies in the Region.	
Output 5.1 A scientific officer within the Pacific Community trained in all aspects of fruit fly taxonomy, biology, ecology, control and quarantine treatments	<ul style="list-style-type: none"> • Entomologist (Fruit Flies) commenced duties in April, 1998. • Coordination of quarantine surveillance in new countries to the project – see Output 2.1.
Output 5.2 Core funding for scientific officer position from SPC at the completion of the project.	<ul style="list-style-type: none"> • No activities necessary until 1999. • Funding for a national trainee under SPC obtained from New Zealand – trainee to be appointed in July, 1999.
Output 5.3 Two post-graduate scholarships for national staff, awarded on the basis of contribution to the achievements of the project.	<ul style="list-style-type: none"> • No activities planned until 1999.
Immediate Objective 6: To promote private sector involvement in sustaining quarantine surveillance and research into fruit fly control and quarantine treatments for commodities destined for export.	
Output 6.1 In countries that are exporting fresh commodities, a scheme of industry levies to support financially surveillance and research and development in field control and quarantine treatment development.	<ul style="list-style-type: none"> • Supported the formation of a Fruit and Vegetable Council in Fiji through which levies may be administered. • Discussed the prospects of imposing levies at export in Fiji and Tonga – generally, there is support.
Output 6.2 Private sector advisory groups to determine how funds derived from levies should be spent to benefit research for farmers and exporters at all levels.	<ul style="list-style-type: none"> • No activities, other than those of Output 6.1