

REPORT

COMBINED EVALUATION/REVIEW

of

REGIONAL FRUIT FLY PROJECT
(RAS/90/004)

and

ACIAR FRUIT FLY PROJECT
(Project No. 8920)

by

Mr. T. Passlow
Prof. W. Mitchell
Dr. G. Hooper

UNDP Evaluator
ACIAR Reviewer
ACIAR Reviewer

July, 1993

TABLE OF CONTENTS

	Page
I. Executive Summary and Recommendations	2
Major Recommendations	4
II. Background	
General	6
Regional Fruit Fly Project	6
ACIAR Fruit Fly Project	7
The Pacific Island Countries	7
- Cook Islands	7
- Fiji	8
- Tonga	8
- Western Samoa	8
III. Purpose of the Evaluation/Review	9
IV. Evaluation/Review Programme	10
V. Country Perceptions and Sustainability	11
General	11
Fiji	11
Tonga	12
Western Samoa	13
Cook Islands	14
VI. Terms of Reference	16
Continued Relevance	16
Deficiencies in Project/Design	16
Integration with Related Projects	16
Adequacy of Project Management	18
Future Institutional Arrangements	18
Technical Status of Biological Data	19
Future Requirements for Collection of Additional Biological Data	21
Progress in Research and Development of Pre-Harvest Control	22
Post-harvest Disinfestation Treatments	22
Mix of Pre-harvest and Post-harvest	23
Improvements in Laboratory and Field Facilities	23
Training	24
Impact of Project Achievements	24
Options for Continued Complementary Work	25
Recommendations on Scope of Future Activities	26
Reporting and Publication	28
Return on Funds Invested	28
Environmental and Gender Impact	28

Spillover Benefits	29
VII. Addendum - Country Perceptions for Vanuatu	30
Appendix 1 - Terms of Reference	
Appendix 2 - People interviewed during Evaluation/Review	
Appendix 3 - Program for Evaluation/Review	
Appendix 4 - Agenda for Presentation of Results - Warwick Fiji Resort, 21 - 23 July, 1993.	

I. EXECUTIVE SUMMARY AND RECOMMENDATIONS

The Regional Project on Fruit Fly Control Strategies in the South Pacific (RFFP) was initiated in September 1990 as a one year study under the FAO Technical Cooperation Program (TCP/RAS/0055). The project covered Cook Islands, Fiji, Tonga and Western Samoa. A second component of the first phase (RAS/90/004) was approved for September 1991-93 with funding from the Australian International Development Assistance Bureau (AIDAB), United Nations Development Program (UNDP), and the South Pacific Commission (SPC). The third component (TCP/RAS/2360) was funded by FAO to carry the project to the end of 1993 and to complete a project document for the extension and expansion of the project through to 1996.

The Australian Centre for International Agricultural Research (ACIAR) Project on the Identification and Control of Pest Fruit Flies in the South Pacific (Project No. 8920) for the period of 1991-93 was funded through the Australian overseas aid funds with additional support from the Commissioned Organization, Queensland Department of Primary Industries (QDPI) and local governments in the countries concerned. It operated in the same four countries as the RFFP.

The Program is unique in that two complementary projects with differing international funding bases have been carried out most successfully by the ACIAR technical team, RFFP officers and the diverse Pacific Island Nations. The success, in a large part, has been due to the dedication and commitment of the Chief Technical Adviser and the ACIAR project leader. The commitment, interest, and desire of the United Nations Volunteers of the RFFP and Pacific Island co-operators ensured success at the local level. The organisation and management of projects should be used as a model for future international, complex technical programs.

The RFFP is also unique because of its association and interaction with a wide variety of international projects. The USAID Commercial Agricultural Development Project is designed to assist trade for the benefit of Pacific Island Nations. Close linkages and interdependence in the development of post-harvest quarantine treatments for fruit fly susceptible produce have been noted. We note interest and support from the Horticulture and Food Research Institute (NZ) in the same area. There is also interaction with the Ministry of Agriculture and Fisheries Regulatory Authority (NZ) toward establishment of quarantine standards for non-host status of some produce; with the FAO Fruit Tree Development Project; with SPC Education, Extension and Plant Protection activities through the Agriculture Program; and with the ACIAR Fruit Piercing Moth Project.

These interactions demonstrate the importance with which the project is viewed by Pacific Island Nations and funding bodies.

The two projects were subjected to a combined evaluation by a UNDP nominated Evaluator (Mr. Tom Passlow) and by two ACIAR nominated Reviewers (Dr. Gordon Hooper and Professor Emeritus Wallace Mitchell). The findings of the combined evaluation/review held over the period 9 July-4 August, 1993 are as follows :

1. The standards of technical investigations and project management have been consistently high throughout the project.
2. The pest fauna differs between, and to some extent, within island nations. Major fruit fly species are: *Bactrocera melanotus* and *B. xanthodes* in the Cook Islands; *B. xanthodes* and *B. passiflorae* in Fiji with *B. kirki* recorded from Rotuma; *B. xanthodes*, *B. facialis* and *B. kirki* in Tonga with *B. passiflorae* in the Niuas; and *B. xanthodes* and *B. kirki* in Western Samoa.
3. Basic information on the identity of hosts (both cultivated and wild), distribution, abundance and pest status of economic species has been established.
4. A basic pest monitoring and quarantine surveillance system has been established in each country and will be ready to hand over to local management for maintenance and implementation in 1994-5.
5. A pre-harvest protein autolysate baiting system has been introduced. Field testing to date has been satisfactory. Further testing and demonstration over large commercial areas and "area control", will be required in 1994.
6. Progress to date toward the development of a protein autolysate bait from local brewery waste is satisfactory. Production for field testing of Tonga and Fiji brewery products should occur in 1994.
7. Laboratory colonies of major pest species have been established using locally based diet in each country.
8. Eggging and other laboratory systems for biological studies, host testing and disinfestation studies have been established.
9. A range of host testing has been carried out to meet a series of protocols for fruit fly post-harvest treatments drawn up by New Zealand (in association with RFFP). Some produce should meet NZ non-host status e.g. three cultivars of pineapples and some vegetables in Fiji.
10. Heat tolerance studies of fruit fly eggs and larvae of key species have been initiated using equipment supplied by the CAD Project.
11. With the arrival of High Temperature Forced Air (HTFA) units in Fiji and Tonga (ex CAD) and Cook Islands (ex New Zealand), disinfestation tests using HTFA as well as Hot-water Immersion can be carried out during 1994-1996.
12. Two technical workshops (financed by the Crawford Foundation, Australia, RFFP and SPC) plus field days and discussions at technical, quarantine, extension, export and grower levels have constituted excellent training. Three, largely on-the-job, Masters level courses in post-harvest studies have been planned with the University of South Pacific using CAD funding.

13. Assuming the adoption of bait spray technology and the successful development of alternative post-harvest disinfestation treatments using heat, the project will overcome some constraints on fresh fruit and fleshy vegetable production. These technologies may enhance private sector development and will facilitate the export of fresh fruits and vegetables to Pacific rim countries and between Pacific Island Nations.

14. Governments in each project country are being actively encouraged to progressively assume the responsibility for activities such as fruit fly monitoring and quarantine surveillance and bait spray testing. Providing governments commit human and financial resources to these activities and the project continues to improve the technical skills of counterpart staff through appropriate training, the project activities can be sustainable.

13. Four technical articles have been submitted for publication. More will follow.

MAJOR RECOMMENDATIONS

RFFP

1. The project should be continued in the four countries and expanded to include the Solomon Islands, Vanuatu and the Federated States of Micronesia. The recommendation to expand the project is based on the advantages (as in the existing countries) which can flow to the countries concerned from a thorough knowledge of their fruit fly fauna and of its control for production, quarantine and trade purposes. Also, there are considerable advantages to Pacific rim countries such as Australia and New Zealand, in having up to date knowledge on fruit flies in neighboring countries.

2. In the existing countries emphasis should be placed on transfer of technology on monitoring and surveillance, completion of protein autolysate bait-testing using the commercial Australian product, testing of protein autolysate baits produced from local brewery waste, and the establishment of disinfestation systems.

3. In the new countries emphasis should follow the pattern established in the existing project. Initially, the fruit fly species, hosts and parasitoids will be collected and identified. The distribution, seasonal abundance and pest importance will be established. Monitoring and surveillance systems will be set up. Field control systems using baits developed from appropriate local waste products will be investigated and help will be given to country authorities towards their acceptance and use by growers. To ensure access to export markets, post-harvest disinfestation methods including laboratory methods for rearing economically important species will, where possible, be established.

ACIAR

1. In the existing countries, the development of baits from local brewery wastes or other sources should be a high priority.

2. In the new countries, the pattern of studies as established in the existing countries should be followed. This should be largely as above, with ACIAR undertaking targetted field surveys and supplying the technical

identification of fruit fly species and the development of a detailed data base. Production and testing of a bait from local brewery wastes will be established.

3. In all areas, problems in speciation should be investigated. Variations within the host ranges and lure preferences with both *B. xanthodes* and *B. facialis* constitute issues.

II. BACKGROUND

GENERAL

It has become clear over the past decade, that, if developing countries in very many parts of the tropical and sub-tropical world are to markedly increase the standard of living and well-being of their people, a significant factor will be improvement in the quality and quantity of fruit and fleshy vegetable production. However, irrespective of improvements in varieties and horticultural production systems, fruit flies, which occur in most of these regions, constitute major limiting factors. Presently, these pests account for a high losses of production in most countries. Losses in the Island Nations fit this pattern.

REGIONAL FRUIT FLY PROJECT (RFFP)

In the context of the above, the first phase of the Regional Project on Fruit Fly Control Strategies in the South Pacific was initiated in September, 1990, through a one year project under the Food and Agriculture Organization of the United Nations (FAO) Technical Cooperation Program, (TCP/RAS/0055). FAO provided US\$184,000 for the project.

A second component of the first phase, (RAS/90/004), was approved with funding from the United Nations Development Program (UNDP), Australian International Development Assistance Bureau (AIDAB) and the South Pacific Commission (SPC), (US\$100,000, US\$255,000 and US\$36,000 respectively). This phase is due to finish in September, 1993.

A third component to carry the project to the end of 1993, (TCP/RAS/2360), has recently been approved by FAO. An amount of US\$130,000 is available for this phase.

The whole of the above funding has been provided toward the development of environmentally sound fruit fly control strategies in the Cook Islands, Fiji, Tonga and Western Samoa and specifically to overcome quarantine restrictions on export of fresh fruits and fleshy vegetables.

The project has been executed by the South Pacific Commission, which, has a contractual arrangement with the Food and Agricultural Organisation of the United Nations. FAO provides a Chief Technical Adviser (Mr. A. Allwood), who, since September 1991, has been funded from the AIDAB component of the project. The function of the Chief Technical Adviser is to manage the project both technically and administratively.

Under the Japanese Trust Fund (SPF/89/VO1), US\$96,000 was provided for United Nations Volunteer (UNV) Entomologists (3), in Cook Islands, Fiji, and Tonga for a two year period. In November 1992, the British Government provided an additional United Nations Volunteer for two years in Western Samoa and, in August, 1992, the UNDP approved funding for an extension of the UNV's in the Cook Islands, Fiji, and Tonga for a further 12 months.

ACIAR FRUIT FLY PROJECT

During 1985-88 ACIAR supported a project (Project No. 8343) on Fruit Flies in Malaysia. It provided information on the taxonomy of Malaysian fruit flies, their wild and commercial hosts, levels of infestation in commercial fruits and vegetables, the geographic distribution and the seasonal abundance of species.

It also developed a cheap, simple, and effective field control system using protein baits. More recently (1990-1993), ACIAR has supported an expansion of the project to include Malaysia (Sabah and Sarawak) and Thailand.

These projects were successfully executed, and, in the context of the above and the realization of the importance of fruit flies in Pacific Island Nation economies, the SPC organized an Expert Consultation in August 1989 in Western Samoa. ACIAR agreed to draw up a proposal for support for research to be carried out in parallel with the Regional Fruit Fly Project (see above). The ACIAR Project on Identification and Control of Pest Fruit Flies in the South Pacific (Project No. 8920) envisaged the provision of approximately AUD\$475,000 over 1991-1993 with additional support from the Commissioned Organisation (Queensland Department of Primary Industries) - approximately AUD\$66,500. The Ministries/Departments responsible for agriculture in the Cook Islands, Fiji, Tonga and Western Samoa provided approximately AUD\$217,000.

THE PACIFIC ISLAND COUNTRIES

Island countries are ideally suited to fresh fruit and vegetable production. They are relatively close to markets in Australia, New Zealand, Japan and the USA. There is potential for inter-Island trade and import substitution between South Pacific Island countries. Further, the need to increase the nutritional status of diets of the population is seen in several of the Nations. Most countries, therefore, aim to increase their fruit and vegetable production.

Unfortunately the Island countries have sizeable endemic fruit fly populations. These restrict local production and adversely influence access to export markets. With severe limitation on the use of fumigation (ethylene dibromide), either in force or to be enforced as early as 1 January, 1994, access to markets have been, or are being, limited further. Both improved production systems, including good field control of fruit flies, and alternative disinfestation methods against these pests, are required urgently.

Cook Islands

Horticultural produce is a most important part of the economy, with production (including root crops) comprising 23.7% of total exports in 1986. Major fresh fruits include avocado, banana, pineapple, papaya, custard apple, carambola, guava, orange, mandarin, mango, capsicum, chilli, eggplant, zucchini, cucumber, breadfruit, jackfruit and tomato. Many of these fruits and vegetables are subject to fruit fly attack.

The Government has signed a Bilateral Quarantine Agreement with New Zealand and this may assist in opening up markets, and in re-establishing those which have been lost over recent time.

Fiji

Fiji is the largest and most populous of the South Pacific Nations. It is centrally placed and therefore constitutes an important and focal point for trade between Nations.

Fiji produces a wide range of agricultural and animal produce. Sugar accounts for a major part of its export income (58% in 1986), whilst fruit and vegetables account for only 1.4%. Dependence on the former is declining and expansion in production and export of the latter are most important to the Nation's economy. In the past, mango and papaya have been exported to New Zealand, Australia and

Japan, with jackfruit and breadfruit to Canada and New Zealand. Vegetable exports to New Zealand and Canada include eggplant, chilli, bitter gourd, angle gourd and okra. Unfortunately, the presence, or perception of the presence, of fruit flies in most of these products is now severely limiting export.

Tonga

Tongan agriculture is based on a highly, self-sustaining, small holder farming system with root crops such as taro, cassava and yams under coconuts mixed with cash crops, fruit trees and livestock. Horticulture is most important for home consumption and export. Fruit and vegetable exports amounted to 30.2% of total export values in 1986. Export markets like those of many Pacific Island Countries are particularly associated with Nationals living in other Pacific Islands, New Zealand, Australia and USA. But larger markets, e.g. squash to Japan, are being developed. As in other Island Nations, much of the fruit and fleshy vegetable trade (and production) is at risk from fruit flies and, in trade, perceptions of fruit fly infestations.

Western Samoa

Like other South Pacific Island Nations, Western Samoa grows most horticultural produce for domestic consumption. Most production is at the subsistence level and mechanization is very limited because of the rocky nature of the soils. Nevertheless, horticulture is responsible for 33.8% (1986 figures) of exports. A wide range of fruits and vegetables are produced including citrus, banana, mango, breadfruit, mangosteen, rambutan, papaya, avocado, soursop, passionfruit, pineapple, watermelon, beans, pumpkin, bitter gourd and choko. Again, as in the other countries above, fruit flies limit the production and the export potential of very many of these fruits and fleshy vegetables.

III. PURPOSE OF THE EVALUATION/REVIEW

Tripartite Reviews of RAS/90/004 Regional Project on Fruit Fly Control Strategies in the South Pacific (RFFP) were held in Suva, Fiji, in September, 1991 and November 1992. All Governments urged that the program be extended to the end of June 1996, specifically to ensure the development of 4 to 5 post-harvest disinfestation treatments, and to assist in their implementation and negotiations with importing countries towards their adoption. It was also recommended that the work should be consolidated in the existing countries and expanded into 3 new countries, namely the Solomon Islands, Vanuatu and Federated States of Micronesia.

Towards these ends, it was recommended that UNDP carry out an evaluation of the project in the third quarter of 1993. ACIAR indicated the need for a review of its project, Project Number 8920 - The Identification and Control of Pest Fruit Flies of the South Pacific, during mid-1993. The review in November 1992, therefore, recommended a joint evaluation/review of the projects at the same time.

Appendix 1 contains the Terms of Reference for RAS/90/004 and the ACIAR Project Number 8920.

RFFP

In broad terms, the evaluation is designed to assess the project's effectiveness in realising its immediate objectives and the extent to which it has strengthened capacity in the host countries to handle the long-term development aims; to assess its efficiency in the implementation and management of the project; to identify the major factors relating to the progress of the project, and to make recommendations toward follow-up measures and actions to ensure the advances obtained, are sustained.

ACIAR

The review of the project is designed to meet largely similar objectives to the evaluation of the RFFP.

Additionally, comment was required on the scientific methodology and its implementation, the adequacy and relevancy of reporting, whether or not the project outputs represent a reasonable return for funds invested, and how spillover benefits might be maximised.

IV. EVALUATION/REVIEW PROGRAM

Appendices 2 and 3 contain a list of people consulted during the evaluation/review process and a summary of the Program respectively.

Appendix 4 is the Agenda for the formal presentation of results of both projects held at the Warwick Fiji Resort on 21-23 July, 1993.

V. COUNTRY PERCEPTIONS AND SUSTAINABILITY

General

The evaluation/review team has concluded that there is a widespread view in the four existing countries and among project staff and funding bodies that several officers trained to tertiary level will be required in each country to sustain project results in the long term. We perceive an expectation for one officer to control and organize quarantine systems, monitoring, surveillance and identifications, another for the development of post-harvest systems and a third for pre-harvest research and extension.

Expectations of this nature are financially untenable for each of the countries, in the absence of external funding. In the short term (3 years ?), intensive input from each country plus aid will be required. In the long term, sustainability will depend upon the development of broad based tertiary skills, probably one fruit fly officer per nation with responsibility for all areas. He/she would require good quality technical support in each area.

Fiji

It is clear that Fiji, at the administrative, technical and grower level, sees considerable value in the continuation and extension of the project. The comment of the Fiji government representative at the Tripartite Review in November 1992, put the Fiji attitude into context :

"Of all UNDP projects, the Fiji Government urged that this project continue since it is indispensable that the work goes on."

Fiji also noted at the time that it would be disastrous if a bait was not forthcoming, and that alternatives to fumigants were most critically required.

Growers envisage expansion in production as a consequence of bait development, and look forward to opportunities for export provided by market access following further host testing and/or disinfestation procedures. Technical workers are enthusiastic concerning the continuation of the studies and the maintenance of quarantine now that species/host data and surveillance measures are available. The UNV in Fiji was not replaced following his departure in late 1992. The counterpart staff officer is keen and competent. Advice is available on a day-to-day basis from the CTA. The Fiji staff are considered competent to carry out project activities however to ensure rapid progress in post-harvest disinfestation an additional graduate assistant is seen as essential during the course of the project. Technically, results obtained to date are sustainable in the longer term. Administratively, however, deficiencies exist. Acceptance in the longer term for financial responsibility for monitoring and surveillance activity is essential. Presently, one graduate officer has been trained in the techniques for fruit fly colony maintenance, host testing and basic taxonomy. Training in extension and quarantine requirements is limited but is being given attention.

Tonga

The economy of Tonga is agriculturally based. Major exports are vanilla, fruit and vegetables. Many of the fruit and fleshy vegetables exported are fruit fly susceptible. An exception is squash (pumpkin) which constitutes a lucrative and possibly an expanding export to Japan. Among the fruit fly susceptible export crops of significance are capsicum, watermelon, egg plant and tomato.

The New Zealand intention to terminate acceptance of ethylene dibromide (EDB) treated produce at the end of 1993 is a serious threat to relevant Tongan exports which have already suffered through limited market access and quarantine restrictions. In the event of the unavailability of disinfestation systems based on alternatives to the "bromides", exports of such products will fall further. Technically, the development of practicable heat treatments as alternatives to fumigation will take 2 or more years. The method may be appropriate to some but probably not all fruit fly susceptible produce. The provision of a HTFA unit to Tonga by USAID (CAD project) within the next six months is anticipated and required to meet the two year time frame.

The UNV at interview demonstrated strong interest and capabilities. The counterpart staff officer was unavailable for discussion, being absent on studies in USA. Reports indicate his competence, interest and ability are strong.

Commercial interests in Tonga present a confused picture. One export firm forecasts a bleak future for fruit fly susceptible crops. Proposals toward an extension for use of bromide fumigants seemed the only "constructive" thought. It was suggested that such an extension would allow time for the development of systems for certification of freedom in minor hosts (possibly to New Zealand) and for alternative treatment for major hosts. Additional proposals for inter-island nation trade in appropriate produce were discussed. In view of the range of fruit fly species among the nations, such trade might be difficult to establish. Another exporter (PPEL) was more positive. In addition to being a leader in the squash trade to Japan, PPEL has developed in association with interested growers preliminary shipments of beans to New Zealand. The company is also promoting the production of watermelon, tomato and zucchini for export.

Technical opinion is that commercial use of a locally produced fruit fly bait will require minimal extension to ensure implementation. Mr. Andrew Kylstra, General Manager and Brew-master at Royal Beer Company Limited, Tonga, is keen to become involved in bait production. He has contacted an associated European company which he believes will make existing heat treatment equipment available for the processing of beer production waste. There has, to date, been no response from the company. On assurance of technical feasibility from researchers in QDPI and availability of appropriate equipment, he is anxious to implement the program. We are advised that ACIAR proposes an early specific project on the development of a pilot commercial bait production plant with the Commissioned Organisation QDPI, in association with the RFFP and the Royal Beer Company Limited, Tonga. This development is thoroughly commended and has implications for other countries.

Western Samoa

At the administrative level, Western Samoa sees the RFFP as very important. The production of better quality fruit and vegetables is seen as a high priority. The project is accepted as an important part of the country's path to improved expertise and to achieving better fruit and vegetable production and export. The concept of self sufficiency is accepted but not considered achievable in the near future.

At the technical level, self-sufficiency could be obtained shortly in host survey and lure trapping. There are reservations about self sufficiency in culturing species and host specificity testing and of course in post-harvest treatment areas which have not been initiated in Western Samoa. Western Samoa

presently has no significant export of fruit and vegetables. At the grower level, there is no real perception of quality. Produce is sold in an open market and the perception that quality produce results in quality prices (and the converse) is not apparent to growers.

Extension systems at both government and commercial levels are required to initiate such perception. Fruit flies are one of the factors involved.

Fruit piercing moth populations are high and damage from this pest in susceptible produce is severe. With quality improvement (varieties) and the introduction of new tropical fruits, losses may become more severe. A local perception is that the biological control program presently in progress will solve the fruit piercing moth problem. Much value from the fruit fly project will be lost if this perception is not achieved. As a result of cyclone damage in late 1991, the length (and to some extent the intensity) of trapping and host collecting has been of shorter duration in Western Samoa than in the other 3 countries. Survey therefore should be continued at the present level until at least June, 1994, then scaled down to constitute a permanent monitoring and surveillance system.

Laboratory life history studies and host status investigations remain to be carried out in Western Samoa. These require the maintenance of laboratory colonies (and provision of routine supplies). Presently, *B. xanthodes* and *B. kirki* are being cultured satisfactorily. A culture of *B. samoae* is being developed.

Host status studies should be carried out on banana and plantain varieties in Western Samoa. Host heat tolerance studies should follow as required.

With regard to the continuation of the project in Western Samoa, a potential UNV problem exists. The UNV's two year contract concludes with home leave from mid-September 1993. Reappointment is vital to project continuance and an alternative UNV untrained in project systems would result in further delays in developing the Samoan position.

An issue which has not yet been addressed is "area control" with baits. The Samoan position involves farms with small areas of mixed horticultural crops. Some areas of an half a hectare or more of a single host exist. For these, baiting systems evolved elsewhere should prove satisfactory. But only "area control", i.e. applying protein bait sprays over both target host and surrounding host/vegetation, will be appropriate in most Western Samoan village and farm situations of mixed horticultural crops. For area control to be successful, the whole village will have to co-operate and apply bait to host vegetation and not leave it to a single farmer or farm in the area.

The counterpart officer is developing skills to carry on the project in the absence of a UNV. These, in the context of the range of activities required, are presently seen as not fully developed.

Prior to the initiation of host status studies and heat tolerance investigations, if required, it is recommended that the senior technician receive 2 to 3 weeks training in Fiji under guidance of staff from the RFFP.

The FAO Fruit Tree Development Project (FTDP) will, to a significant extent, rely for viability, on fruit fly control strategies. Presently good relations exist. Workshops are essential to ensure that extension officers in this project are fully cognizant of fruit fly control methods. These are proposed.

Similarly at an early stage, grower education should include, as a vital component, fruit fly control systems.

The Fruit Piercing Moth Biological Project has probably resulted, or will result, in the establishment of parasites. These will reduce the numbers of fruit piercing moths invading crops. Unless this reduction is marked, the reduction in damaged fruits will be minimal. A perception of major success exists. This may not be achieved. Nevertheless, the fruit piercing moth program should be encouraged and supported. The moth is possibly the more serious of the two fruit pests in Western Samoa and in the context of this, successful adoption of fruit fly bait sprays may depend, to a large degree, upon success in piercing moth control.

Cook Islands

The Cook Islands was not visited by the UNDP evaluator. The following is a summary of Cook Island perceptions drawn from the paper presented at the "Presentation of Results" and from limited discussions with Dr. Purea and others during that meeting.

The Cook Islands have had a long association with New Zealand in both trade and development. It is apparent that, in the absence of the bromide fumigants, Cook Islands export trade in fruit fly susceptible fruits and vegetables is at risk.

The Cook Islands strongly supports continuation of the projects. It is noted that the counterpart officer in day-to-day charge of the project has been moved completely to quarantine treatment development. Our comments in "General" above may be relevant to this situation in the long term. The UNV and technical support staff would appear to be doing a most satisfactory job, particularly in relation to species definition, host ranges, host status testing, biological studies and pre-harvest control systems. It is noted that, in the draft expanded project, the CTA proposes the transfer of the UNV to Vanuatu. In the context of the development of technical skills in the Cook Islands, the support received from the New Zealand Government, and the stage of project development, this is seen as an appropriate step.

It is concluded that the Cook Islands seem to be in an equal to better position than that of the other 3 countries in the existing project in staffing, training facilities and progress, but should be included in the expanded project to ensure protein bait development and establishment. An advisory role in these activities and in post-harvest studies is likely to be necessary.

VI. TERMS OF REFERENCE

The following discussion constitutes a combination of the fifteen detailed terms of reference by the United Nations Development Program (UNDP) for the Regional Fruit Fly Project (RFFP) and the eleven listed by the Australian Centre for International Agricultural Research (ACIAR) for its fruit fly project. Each are identified as U1 to U15 (UNDP Terms of Reference) and A1 to A11 (ACIAR Terms of Reference) after the heading.

Continued Relevance (A6 U1)

The two projects have resulted in the identification of fruit fly species, their periods of activity, hosts, both cultivated and wild, and the status of the host/species combinations in each of the four countries.

There is every indication that control of the bulk of the species with baits will be effective. The manufacture of a protein bait spray within the region seems assured in the near future. This will reduce costs to growers and make bait applications even more attractive. The use of baits will keep insecticide load per production unit low. This must result in conservation of beneficial species, including pollinators. Overall bait spray control of fruit flies presents a real improvement in production, with no real environmental disadvantages. Should a change in toxicant be considered, the probability of phytotoxicity in a number of tropical crops should be investigated prior to large scale use.

Project data very significantly enhance the technical information base in each country. Training activities of the project have successfully upgraded institutional capabilities.

These results, given that motivation persists in each country, ensure sustainability, and total relevance toward improved production of fruits and fleshy vegetables, improved nutritional status in each country, and improved opportunity for export. It is recommended that the commercial development of an appropriate local protein autolysate bait produced from brewery waste and its adoption by farmers, proceed as rapidly as possible.

Deficiencies in Design of the Current Project (A2 U2)

Deficiencies of a technical nature are not apparent. The experimental work has been appropriately planned, implemented and the results disseminated among project officers and more widely.

Integration with Related Projects (A3 U3)

(a) The planning and execution of the RFFP and ACIAR 8920 projects have been nearly totally integrated. The expertise in each has complemented the other. Success in execution is very largely seen to be the result of having a Chief Technical Adviser (CTA), with a thorough understanding of both projects, permanently stationed within the project area. This arrangement could be followed to upgrade the output of a wide range of projects.

(b) United States Agency for International Development (USAID) Commercial Agricultural Development Project (CAD) is designed to assist in technology transfer and the commercialization of technology in developing countries. It relates to the present projects in the development of suitable post-harvest treatments to enable access to export markets. CAD has provided, therefore, the

equipment which allows studies of heat tolerance in both the fruit fly stages and the hosts and it will supply experimental high temperature forced air (HTFA) units to ensure continued RFFP studies in Tonga and Fiji. The projects and the CAD objectives are very closely related in post-harvest studies and effectively interdependent.

(c) The Horticulture and Food Research Institute (HFRI) (NZ), is involved in the development of post-harvest treatments for export commodities in the Cook Islands. The RFFP assisted HFRI and Cook Island authorities with resources designed to accelerate the production of data and, by co-operation, ensure there is no duplication of effort. This co-operation and integration is most satisfactory.

(d) Ministry of Agriculture and Fisheries (MAF) (Regulatory Authority) NZ with the RFFP, has developed standards for testing of susceptibility of fresh fruits and fleshy vegetables to fruit flies. As a consequence, the RFFP is testing the procedure on a range of produce including several varieties of pineapples, eggplants, chillies, bitter and angle gourd, cucumber, zucchini, tomato, capsicum, papaya at color break and watermelons. It is clear that some products may be declared non-hosts to fruit fly. Acceptance of the procedures by more importing countries will widen export opportunities. Again, co-operation and integration of the projects are seen as very satisfactory.

(e) Food and Agriculture Organization of the United Nations (FAO) Fruit Tree Development Project. Many different tropical fruit trees are being selected and propagated for distribution to villagers and farmers in Western Samoa. Very many of the fruits concerned will be susceptible to fruit flies. As the project develops, and it may be expanded to other South Pacific Nations, co-operation between the projects will be essential to minimize fruit fly losses and maximize production from many of the propagated varieties.

(f) South Pacific Commission (SPC)-Extension and Education Activities in Agriculture. SPC is responsible for a wide range of education and extension activities. The RFFP has produced information on fruit flies and their control. These have been applied by SPC toward education and extension in very many South Pacific countries. We note that a most extensive data base on fruit flies in the region has been developed and we recommend that SPC should be responsible for the maintenance, updating and the dissemination of the data.

(g) Ministries, Departments of Agriculture etc. - Education Activities . The RFFP and ACIAR project, assisted by funding from the Crawford Foundation for International Agricultural Research (Australia) and SPC (for Fiji course only), have jointly developed training courses on fruit fly technology at Fiji and Brisbane, (and also in S.E. Asia), toward the education of governmental staff from South Pacific Nations. All reports show that these were very effective in extending knowledge on fruit fly issues ranging from identification of species, population monitoring, laboratory rearing of colonies to pre-harvest control systems and post-harvest treatment systems. Integration of effort has been most impressive. An important consideration in developing the scope of the training was to ensure that the content of the courses was topical, by including results obtained from the project activities in the South Pacific.

Adequacy of Project Management (A7 U4)

Project management of RFFP in terms of co-ordination and association with other related programs and projects, as outlined in "Integration with Related Projects" above, has been very satisfactory. The support given by UNDP and FAO

has been appropriate. An impression of minor friction, as a result of conflict of interest between the dedication of the CTA on the one hand and administrative requirements of UNDP on the other, has arisen during the review. Reviewers see this as inevitable but note that problems have been satisfactorily resolved.

United Nations Volunteers (UNV's), have been employed in each country during the project. Discussions with the CTA, Volunteers and country officers, result in the clear conclusion that their contribution has been very positive. Their work has markedly augmented the technical input of local staff. A tendency for the UNV's to organize local inputs rather than to assist local staff to arrange, co-ordinate and carry out daily operations was noted. This, no doubt, relates to the personalities of the people concerned. There can be no doubt, however, that the UNV's contributed markedly to the current success of the project and to the establishment of long term stability in national programs. It is recommended that every effort should be made to place a UNV in each of the new countries in an expanded project.

The accounting of money by the Commissioned Organization in the ACIAR project has been unsatisfactory and we note deficiencies in financial accountability among some of the participating countries.

Future Institutional Arrangements (U5)

The implementing agency for the RFFP, the South Pacific Commission, would appear to have had minimal input to the day to day operation of the project. It is noted that the CTA arranged his headquarters at the Ministry of Agriculture, Forest and Fisheries (MAFF) Research Station at Koronivia. This divorced, to some extent, operations from SPC, but at the same time, placed the CTA in direct daily contact with MAFF staff working on the project. This has had a most favorable influence on the project not only in Fiji, but in each of the other countries. It allowed immediate, daily contact between the CTA and a group of researchers. An immediacy of advice, particularly in problem areas, resulted.

It was noted that SPC provided adequate administrative and technical support through its office in Suva and strongly supported the continuation and expansion of the project in its current form. Therefore, it is recommended that SPC should continue as the implementing agency. The project, and its implementation, fits directly within the Agricultural Goals of the Commission:

- (a) To promote agricultural management practices which are currently acceptable and both economically and environmentally sustainable in Pacific Island Countries.
- (b) To strengthen national capabilities to reduce losses due to crop pests.
- (c) To facilitate trade through improved quarantine procedures.
- (d) To strengthen access to and use of credible agricultural information by national agricultural services.

Further, it is recommended that SPC, as a technically based organization spread across the South Pacific, should be encouraged to promote vigorously, the technical results of the project through normal SPC supported channels.

We compliment MAFF authorities for making office and laboratory space available for the CTA. In regards to participating countries, the co-operation between researchers is great. However a commitment and involvement by country project leaders is critical to the success of the projects. Regrettably, in some countries, this is not evident.

Technical Status of Biological Data (A1 U6)

(a) Fruit Fly Fauna

The tephritid fauna of the four countries has been established and the important economic species in each country designated.

In Fiji, *Bactrocera passiflorae* and *B. xanthodes* are major pests, with *B. kirki* occurring in Rotuma. In Tonga, *B. facialis*, *B. kirki* and *B. xanthodes* are major pests; *B. passiflorae* is important in the Niua's. In Western Samoa, *B. kirki* and *B. xanthodes* are major pests. *B. melanotus* and *B. xanthodes* in the Cook Islands are major pests. There appears to be species complex problems in *B. xanthodes* and *B. facialis*. The issue of sibling species in several areas has been given some attention by ACIAR. It is our understanding that DNA analyses will be conducted in the future to clarify the problem and this is recommended.

The definition of pest species was necessary before pre-harvest control procedures could be effectively developed and before post-harvest techniques could be investigated.

The above identifications have been based on adult characters. Additionally, studies in the ACIAR project on fruit fly larvae have developed systems for the identification of third instar larvae of the 6 most common species encountered in commercial fruits, those listed above plus *B. distincta*.

Identification of first and second instar larvae was discussed and discouraged. The characters of first and second instar larvae are small and variable and would require great skill and higher magnification than generally available. Pupal identification is not possible at this time but worthy of investigation in the future.

As the larvae are very often the first stage to be encountered in quarantine monitoring operation, it is important to be able to recognize the species at the earliest possible time. It is recommended that larval identification studies should be continued toward the development of keys to identify all major pest species in the region.

However, it is recommended that larval identifications should, at this stage in the development of the technology, be verified by specialists prior to any significant decisions being taken by quarantine authorities. The consequence of incorrect decisions based on such identifications in isolation, could be disastrous.

(b) Geographical Distribution & Seasonal Abundance:

Data were developed following the establishment and maintenance of lure trapping and comprehensive host fruit collecting programs, initiated in April 1991, in each of the four nations for a least one full year. In Western Samoa for example, trapping was based on 25 sites each with a cue-lure and a methyl eugenol lure trap. They were spread over sites on three islands. However, following cyclone damage in December, 1991, sites were reduced to 17 to represent urban, horticultural and forest areas.

Host surveys were carried out in each country for at least two years. Standardized systems were used throughout in both host collection, laboratory methods and handling of material for host identification. The biological information obtained is valid. But to ensure the abundance and distribution data

are relevant in the long term, it is recommended that continued lure trapping and targetted host collecting are needed. These data have quarantine significance.

The parasitoid composition within each country has been established. It is clear that whilst parasitoids may have some impact on total fruit fly population, they are unable to provide economic control.

The economic impact of fruit flies on production and trade in the project countries is variable. Some hosts are seriously damaged in most seasons e.g. guavas. On the other hand, damage can be so slight that a host may barely meet the specifications of "host" e.g. eggplant, watermelon and zucchini in Tonga. It is also noted that some fleshy vegetables in Fiji, can probably be defined as non-hosts. Overall studies on host status are not complete and it is recommended that further work through 1994 will be required.

Future Requirements for Collection of Additional Biological Data (A9 U7)

(a) Existing Countries

The major pest species, their hosts, host status and distributions have been established for Fiji, Cook Islands and Tonga. Lure trapping and host collecting at the present level should continue in Western Samoa at least until the end of June 1994 to ensure that the species list, host and seasonal patterns are fully established. It is recommended as being essential, however, that monitoring be continued with lure trapping and host collecting on a regular and organized fashion in the long term in all four countries. This will ensure that up to date knowledge of the status of local species is maintained. Similarly, it is recommended that quarantine surveillance should be maintained against the possibility of entry and establishment of exotic species. It would be useful to carry out some trapping with liquid protein autolysate lures to ensure that there are not some species present which do not respond to male attractants.

At an early date, total responsibility for these tasks should be accepted by relevant Department/Ministries of Agriculture. It is recommended that this occur in Fiji, Tonga and Cook Islands during 1994 and in Western Samoa in 1995.

It is strongly recommended that the efficacy of bait spraying be demonstrated on a larger range of host crops in all countries. The RFFP should have a supervisory role and the work should be completed during 1993-95. Similarly pest assessment data are not complete for some pest/hosts situations. Where the possibility exists that such studies may result in freedom from fruit fly infestation at export, totally or at a specific stage of development, the RFFP should continue to have an active supervisory role in the work and it is recommended that such studies should be scheduled for early implementation.

It is recommended that heat tolerance studies should be accelerated with direct inputs from the RFFP. Results will indicate whether or not heat treatment disinfestation programs are possible.

(b) Additional Countries

We recommend that an expanded project should include Vanuatu, Solomon Islands and the Federated States of Micronesia and studies in these countries should follow the pattern developed in the RFFP and ACIAR projects. That is, surveys using lure trapping and host collection to establish the pest species, hosts,

distribution patterns and pest status should be the first priority. Other studies, again as in the 1990-93 program, would then follow logically. Maximum benefit would require that ACIAR support a parallel project with the Commissioned Organization, Queensland Department of Primary Industries (QDPI) providing relevant taxonomic expertise. Hence, we recommend that ACIAR support a 3 year program in Vanuatu, Solomon Islands and the Federated States of Micronesia with the first four objectives of ACIAR Project 8920.

These recommendations are based on the need for a comprehensive fruit fly data base development in the new countries, the need for cheap local and environmentally sound control systems to upgrade production for local consumption and export development. Further the information is critical to the 4 existing countries and others in, and on the rim of the Pacific. The project will establish distribution data on pests such as the Queensland fruit fly, (*B. tryoni*) and the melon fly (*B. cucurbitae*) and thus allow strengthening of quarantine barriers.

Progress in Research and Development of Pre-Harvest Control (U8)

Attractancy testing of baits has been carried out in 3 of the 4 countries and demonstrates that all damaging species in the area are attracted to the bait. Bait spraying field trials have commenced and have given encouraging results. However, it is recommended that progress in field trials should be accelerated during the last 6 months of the project. ACIAR has agreed to support the commercial development of yeast autolysate made from waste yeast from local breweries, by establishing a prototype production plant in Tonga in 1994.

Post-Harvest disinfestation treatments (U9)

Prior to the commencement of the RFFP/ACIAR project, only Tonga had any experience in developing post-harvest technology. A first requirement in post-harvest studies is the development of viable insect colonies for induced oviposition studies and commodity treatment research. Colonies of the two major pest species have been established and maintained in Fiji, Cook Islands and Western Samoa. There are four species in culture in Tonga. Establishment of these colonies followed from the successful development of appropriate locally based artificial diets, development and testing of eggging devices, determination of the optimum number of eggs per gram of diet, identification of conditions for pupation, isolation of fruit fly bacteria as part of the diet and other issues. Life cycle studies in all countries except Western Samoa were concluded as necessary precursors of host status testing and quarantine treatments.

Some host status studies, to decide the need for post-harvest treatments have been carried out. These were based on the New Zealand National Agricultural Security Service (NASS) Standard 155.02.01.08-Specification for Determination of Fruit Fly Host Status. It was developed in association with the RFFP. The standard outlines laboratory and field cage protocols for testing commodities at defined maturity standards. Whilst biased in favor of the importing country, determinations of non-host status will be most valuable to the exporting nation. The tests are practicable and can be carried out within the Island countries.

Host status testing indicates that some vegetable produce ex Fiji could be declared fruit fly free at export. Tonga appears less fortunate. Some produce ex Cook Islands may be found fly free but further tests are required. No data have been obtained from Western Samoa although the CAD project will support host status tests on bananas and plantains. It is recommended that these studies be given high priority.

Heat tolerance tests for the key stage in some pest species have commenced in Fiji and Tonga. Similar tests on *B. melanotus* and *B. xanthodes* have been completed in the Cook Islands. These will form an excellent and necessary basis for post-harvest quarantine treatments, e.g. Hot Water Immersion or High Temperature Forced Air (HTFA) treatment. Bearing in mind the difficulties and complexities in the area involved, progress to date is seen as most satisfactory and it is recommended that these activities be continued.

Mix of Pre-Harvest and Post-Harvest (U10)

As noted earlier, the need for pre-harvest control studies in Tonga, Fiji and the Cook Islands should reduce rapidly. In lure trapping, host survey and quarantine surveillance, a simple advisory service from the project should be adequate in these countries after 1994. In Western Samoa, the same position should be reached at the end of 1995.

The mix of pre and post-harvest has been appropriate and a similar mix is recommended for the 3 new countries to be included in the expanded project. However in the existing countries, whilst further work is required to ensure the implementation of bait sprays in the new project, it is recommended that the emphasis should move to post-harvest investigations.

Improvements in Laboratory and Field Facilities for Fruit Fly Studies (U11)

The contributions in these areas, whilst not of great financial value, are very significant to the host countries. In the Cook Islands, support from New Zealand, resulted in excellent facilities prior to the present studies. In Tonga, Fiji and Western Samoa, facilities designed for and dedicated to fruit fly studies were, for practical purposes, non-existent. The projects have endeavored to supply essential items for fruit fly studies. In Tonga for example, the items supplied included a controlled temperature cabinet, a laboratory refrigerator, an air conditioner for the culture laboratory, 2 small pressurized sprayers, 2 motor cycles and a photocopier. Additionally, USAID (CAD) program provided a water bath and will provide a computerized heater for post-harvest hot temperature studies. Basic laboratory and field equipment is now available in each country for fruit fly studies. However, any delay in provision of the high temperature forced air units (to be provided by CAD) will delay progress.

Training (A4 U12)

Training from the outset, was a high priority in both projects. Specific training was designed for counterpart staff in plant protection, quarantine and extension services. This is the basis for long term sustainability of the project. Also workshops, seminars and field days on the importance of fruit flies were held to increase awareness in exporters and producers.

Two international training courses on Understanding and Managing Fruit Flies were held, the first in Brisbane, 5-23 November, 1990 and the second in Suva, 23 November- 4 December, 1992. These courses were attended by 38 representatives from the Pacific Island countries.

The RFFP commenced using the PEACESAT Satellite system for training in 1992. One session on Fruit Flies in Quarantine in early 1993 involved 57 participants from SPC countries, New Zealand and Hawaii. Regular monthly liaison between project and counterpart staff has been developed (for one hour per month) using the system. This has resulted in excellent training in problem solving and routine project management.

Workshops for counterpart staff, quarantine officers, plant protection officer, farmers and exporters in each of the countries have been held, with Western Samoa receiving somewhat less attention than the other countries, a consequence of the December 1991 cyclone. Individual counterpart staff received special training as required. Three overseas study tours (external to the four countries) have been provided through the project and it is planned to have 3 staff commence Masters level studies shortly at the University of the South Pacific. Much of the Masters courses will be on-the-job based so that the program will enhance training whilst continuing to implement within country project objectives. Overall the training component is considered most satisfactory. It will have strong and positive influence on the long term viability of fruit fly knowledge in the Pacific Region. To strengthen this viability, it is recommended that refresher workshops should be held within the four countries at least every two years to provide updated information and technology. More intensive use of the PEACESAT satellite system might also be considered.

Impact of Project Achievements (U13)

(a) Impact on Prospects for Increased Production at Commercial and Village Levels

Potential impact is already apparent, particularly in Fiji and Tonga, where commercial growers have investigated avenues for the importation of the Australian protein autolysate bait. Trials have indicated yield increases of 40% and more. With availability of a cheaper locally produced bait, adoption will be wider and further increases in production should almost inevitably follow.

At the village level, use of baits will await production of local material and further demonstrations of smaller scale and "area control" methods. Project results indicate these will be successful.

(b) Impact on the Capacity of Project Countries to Negotiate Quarantine Requirements and Ultimately Increase Markets

The project has assembled evidence that some fruits and vegetables suspected as hosts, can be produced free of fruit fly. As no attempts have yet been made to export produce on this basis, the capacity is difficult to judge. However, with the assistance of the CTA during the expanded project, difficulties should not be expected, particularly for relevant produce into New Zealand.

Also, the availability of valid data on the species present, their host ranges and economic significance places the Pacific Island Nations in a more technically sound position to negotiate quarantine requirements with importing countries than previously. This is evidenced by the positive responses during joint discussions with New Zealand and the USA.

(c) Environmental Considerations

Introduction of protein bait sprays should preclude the use of cover sprays and the environmental disadvantages which could follow. The use of brewery waste as a source of protein will reduce the discharge of environmentally polluting waste material into rivers, seas and reefs in the region. The processing of brewery waste as animal feeds will eliminate this pollution source further.

(d) Agricultural Diversification

There are presently a wide diversity of horticulture crops, many fruit fly susceptible, grown on the islands. Adoption of successful project systems in both pre and post-harvest may not significantly alter agricultural diversity. Adoption will, however, increase the area under production and values of relevant horticultural crops with consequences in improved nutritional standards and higher export incomes.

Options for Continued Complementary Work (U14)

(a) USAID Commercial Agricultural Development (CAD) Project

In fruit fly susceptible crops, the commercial aims of the CAD project are directly dependent upon results in the present and expanded projects. If suitable post-harvest disinfestation methods are not developed, most CAD efforts in the area will be valueless. It is recommended that this co-operation is essential to the enhancement of export possibilities.

(b) United Nations Food and Agriculture Organization (FAO)

The Fruit Tree Development Project funded by FAO in Western Samoa involves the selection, development and dispersal into villages and onto farms of fruit cultivars, many of which will be susceptible to fruit fly. In the absence of project results, production from such cultivars will be poor and they will contribute little to either national economies or nutritional standards.

There are complementary aspects of the fruit fly project and ACIAR studies toward biological control of the fruit piercing moth. In areas where fruit piercing moth may be a pest of equal or greater severity than fruit fly (e.g. Western Samoa), control of the latter will have little economic or production significance in the absence of fruit piercing moth control.

It is recommended, therefore, that ACIAR be encouraged to continue effort toward finding systems for moth control.

The proposed fruit and nut tree development project in Vanuatu is also relevant. Many of the fruits which may be selected for distribution to growers are likely to be fruit fly susceptible. Their success will be, as noted above, dependent upon control methods developed in these projects.

Recommendations on the Scope of Future Activities (U15)

A. Benefits and relevance of extending the project in the four existing countries are:

(a) To ensure the early transfer to complete responsibility for, and operation of, monitoring and quarantine surveillance systems.

(b) To ensure that the data base on fruit fly species presence, hosts, distribution and seasonal patterns of pest species in Western Samoa is completed.

(c) To advise and assist toward the completion of field, experimental and demonstration work on the efficacy of protein autolysate baits.

(d) To ensure the smooth introduction and adoption of locally produced baits.

(e) To advise and assist toward the completion of pest and host heat tolerance tests in major pest/host situations relevant to each country.

(f) To advise and assist toward carrying out of relevant disinfestation research.

(g) To assist in the compilation, presentation and acceptance of such data to allow relevant produce entry to specific export markets.

(h) To ensure that the fruit fly data base is technically complete and is transferred to SPC.

B. Benefits and relevance of extending the project to other Pacific Island Countries such as Vanuatu, Solomon Islands and the Federated States of Micronesia are:

(a) To introduce and assist, with ACIAR, in the establishment of an information system on fruit flies as developed in the four countries during the 1991-1993 RFFP project.

(b) to include developments largely as above.

C. The draft project document.

The draft project document proposes that the existing project in Tonga, Fiji, Cook Islands and Western Samoa be carried to its logical conclusion. That is data should be generated to allow the completion of monitoring and surveillance systems (Western Samoa only), the completion of protein autolysate bait testing, the utilisation of local brewery wastes, and the completion of disinfestation

systems to meet quarantine standards in regional and Pacific rim countries. Emphasis should be placed on technology transfer as above. This approach is strongly recommended.

In the new countries the draft indicates an emphasis similar to the pattern established in the existing project. The document includes a timetable and proposed outputs would appear reasonable, providing that:

- UNV's are available for placement in each country at an early date;
- appropriate and interested counterpart staff can be found in each country;
- the governments are keen for the development of the data and probable increase in production and export which should follow; and
- difficulties are not encountered in gaining access to sufficient areas of the Solomons and the Federated States of Micronesia (FSM) to ensure that data are representative.

A detailed data base developed in the three new countries will be of considerable value to those countries, the four existing project countries, other Pacific and the Pacific rim countries. Data on, for example, the real distribution of the Queensland fruit fly and the melon fly in these countries will be of great value to all the nations indicated above.

It is recommended that the expanded project should proceed. However, should the CTA, in preliminary investigations, note a lack of interest or support by FSM, Vanuatu or the Solomons or should the CTA perceive that access to parts of a country is limited, the project might be reorganized to include each country where cooperation and access are appropriate and only survey (at the exclusion of other activities) in parts of the country where difficulties are perceived. Under such circumstances, an additional country, e.g. New Caledonia, might be added. It is noted that the project cost as proposed is high. This is to be expected as travel within the Solomons and to and within FSM will be expensive. Also, the availability of local equipment is likely to be low. Nevertheless the draft is highly commended. It is recommended that continued commitment by ACIAR and its Commissioned Organization, QDPI, is essential. The draft presupposes commitment from these sources.

Reporting and Publication (A5)

Based upon presentations of data at the Mid-term Review (18 November, 1992) and at the Combined Review ACIAR and RFFP (21-23 July, 1993), the reporting is perceived as clear, accurate and candid. Four manuscripts have already been submitted for publication. This is excellent progress and many further papers are clearly anticipated.

Return on Funds Invested (A8)

Based on the economic status of the pests and their quarantine significance on the one hand and the biological knowledge of the pests, their field control with a fairly novel, environmentally sound product and the potential for post-harvest control developed in this project on the other, the only reasonable conclusion is that return for investment is likely to be excellent.

Environmental Impacts and Differential Impacts on Men, Women and Children. (A10)

Environmental impacts have been discussed under "Impact of Project Achievements" above. With regard to gender impacts, it is noted that women are heavily involved in subsistence agriculture. They are involved in fresh fruit and vegetable production for family and village use and for sale. In a subsistence system, women are more likely to be influential in implementing a new control system than men. There is, therefore, a significant gender impact in the implementation of pre-harvest control with the use of protein autolysate baits.

Spillover Benefits (A11)

In the long term, major spillover benefits lie with the data base. With advances in the technology of pre and post-harvest pest management and with possible changes in fruit fly pest fauna, the data base can be readily updated to accommodate the changes. It can be expanded to accommodate the management of fruit fly species in other countries and may serve as a model for other pests in many countries.

Efforts of the RFFP in the South Pacific and the ACIAR fruit fly projects in Malaysia, Thailand and the South Pacific have resulted in the development of a format for implementing and undertaking research into fruit flies. The format results in the accumulation of reliable basic data on the fruit fly faunas of countries, their biologies and control systems, all of which are critical to quarantine decision making. We consider that this format is now a proven and reliable model for fruit fly research that can be applied to any developing country, which is interested in compiling an information base on fruit flies.

Additionally, the technologies on quarantine monitoring and surveillance, host surveys, bait spray development and field control, culturing of fruit flies, and post-harvest treatments developed during the first phase of these two projects, are directly applicable to new countries. In particular, the technology on bait spray development using waste yeast from local breweries is applicable to all countries that have breweries. This technology also has commercial implications for the private sector.

ADDENDUM

COUNTRY PERCEPTIONS FOR VANUATU

The economy of Vanuatu is clearly agriculturally based but there appears to be little co-ordinated effort towards the development of horticulture. The vegetables which are grown are primarily root crops such as taro and yams, and leafy vegetables, such as lettuce, cabbage and Chinese cabbage.

Nevertheless, there are small local markets where trading exists in a variety of fruits and vegetables, including mandarin, orange, lime, lemon, pomelo, papaya, soursop, banana, chilli (2 varieties), pumpkin/squash (various types), snake gourd, choko, bush tomato and tomato. These are mostly produced at a standard a little above the subsistence level, where some reliance upon a cash economy is developing.

All reports indicate that, relative to size, large areas of excellent soil suitable for horticulture development exist and the climate is tropical and appropriate for development of a strong horticulture industry.

The 1993 Statistics-Facts and Figures for Vanuatu reveal that the imports of horticultural produce including fresh cucurbits, tomatoes, bananas, plantains, pineapples, avocados, guavas, mangoes, citrus, grapes, melons, papaya, deciduous fruits and stone fruits and processed and semi-processed fruits and vegetables were valued at over US\$500,000. Exports of horticultural produce is limited to small consignments of watermelons, tomatoes, papaya and root crops to New Caledonia and Wallis and Futuna, amounting to less than US\$1,000. Additionally, the population has grown by 9% over the past 3 years and tourism is increasing. Visitor arrivals have increased by 24% between 1990 and 1993.

A major horticultural industry, therefore, based on import substitution would be of great value to the local economy. Development in this area is only now starting to take off. Expansion of the RFFP would, therefore, be very timely in that it would remove one major constraint to fruit and vegetable production.

Knowledge of the local fruit fly species is poor. The Vanuatu Quarantine Officer trained at the Third International Training Course on Understanding and Managing Fruit Flies held in Fiji in November- December, 1992, has carried out some lure trapping and host collections. It is clear from this limited data that populations are high and losses severe. These data, plus limited historical information, indicate that development of fruit fly susceptible fruits and vegetables will be challenged by high pest numbers and, in the absence of adequate control systems, severe losses will occur. Together with known restrictions on the export of fruit fly susceptible products, this may be one of the reasons for the limited development of horticultural production to date.

Government resources in technically trained staff are very limited. The Plant Protection and Quarantine Service, for example, has one trained entomologist as the Principal Plant Protection Officer and two sub-tertiary trained officers among his staff of 15. Activity seems to be almost totally confined to quarantine related duties.

Developed opinion in the Government area is that diversification in agriculture is urgent and essential. There is Government support for expansion of the horticultural industry. Not a lot of technical and resource support could be

anticipated for the RFFP in the first instance. This is the major reason for the provision of an experienced United Nations Volunteer Entomologist to support for the project. The provision of a UNV under the project would not, however, negate the need for the Vanuatu Government to commit counterpart staff to full-time participation in project activities.

There is a small but very active group of primary producers interested in the development of export of horticultural produce. They are aware of the severe limitations which fruit flies pose to both production and export of such products. Some trade in squash is already underway and there is keen interest in papaya, capsicums, chillis and cucurbits. Direct assistance to the RFFP would be available in the production of crops for host studies, and labour may be possible either direct or through grants via the Government.

While transport between islands would not pose problems, transport and technical support for lure trapping, host surveys and the development of field control systems based on bait sprays, would face greater difficulties on the outer islands than on Efate. Early workshops and on-the-job training in lure trapping and fruit survey techniques for extension staff would be essential as most staff are trained in, and primarily responsible for, animal industry related tasks.

While problems exist, the extension of the project to Vanuatu, and by association, to FSM and Solomon Islands is recommended. The advantages of a strong fruit and fleshy vegetable industry lie in the diversification in agriculture, private sector development, improved self-sufficiency, import substitution and, in the longer term, enhancement of export development.

APPENDIX 1

TERMS OF REFERENCE

EVALUATION OF RAS/90/004

REGIONAL PROJECT ON FRUIT FLY CONTROL STRATEGIES IN THE SOUTH PACIFIC

BACKGROUND

The South Pacific Island countries recognised that, unless they understood and managed fruit flies effectively, the prospects for improving the quality and production of fresh fruits and fleshy vegetables and trade in these commodities, were limited. This situation was exacerbated by the virtual loss of ethylene dibromide fumigation as a treatment to guarantee quarantine security for commodities such as these.

As a result, a regional project (TCP/RAS/005) under the auspices of FAO's Technical Co-operation Program was established in September, 1990. The current project (RAS/90/004 and RAS/90/A04) was commenced in January, 1991 and is due to terminate in September, 1993. It is jointly funded by AIDAB, UNDP and SPC and is being executed by SPC under a Co-operating Agency Agreement between SPC and FAO to provide the Chief Technical Adviser and technical backstopping.

The project's development objective to :

To increase the level of production and quality of fresh fruits and vegetables, leading to enhanced prospects for increased exports, greater availability for local consumption, and higher farmer's incomes.

To achieve this development objective, the immediate objectives are :

1. To upgrade the technical knowledge and understanding of plant protection, quarantine and extension services staff in the countries of the impact of fruit flies in the production of fresh fruits and vegetables in the four countries identified.
2. To develop new techniques for pre-harvest control of fruit flies, leading to the dissemination of information in control strategies and reduced levels of damage to fruits and vegetables by these techniques.
3. To strengthen the capacity of quarantine services and industry in the participating countries to overcome restrictions on fruits and vegetables susceptible to fruit flies, by importing countries.

During the last Tripartite Review Meeting (TPR) which was held in November, 1992 in Suva, Fiji, all Governments present urged that this programme be extended to the end of June, 1996 to develop post harvest disinfestation treatments and assistance in the implementation, put the data in acceptable forms and assist in the negotiations with importing countries. It was further recommended that the fruit fly activities be continued in the four project countries and that the project be expanded into Vanuatu, Solomon Islands and Federated States of Micronesia. This has also been done formally through the conference on the

Permanent Heads of Agriculture and Livestock Production Services (PHALPS), CRGA and the South Pacific Conference during 1992.

PURPOSE OF EVALUATION

The purpose of the evaluation is to review the achievements of the project against its development and immediate objectives and the expected outputs. The evaluation will be forward thinking and as well as focussing on progress of activities in Fiji, Tonga, Cook Islands and Western Samoa, it will address the technical and developmental benefits of extending the project's activities in the current countries and expanding activities into other Pacific Island Countries.

The evaluation should :

1. Assess the effectiveness of the project in realising its immediate objective(s) and the extent to which it has strengthened the technical and institutional capacity of the host governments and other organisations concerned in contributing towards the long term development objective.
2. Assess efficiency in the implementation and management of the project, including support given by the governments, donors and FAO.
3. Identify major factors that have facilitated or impeded the progress of the project in achieving the intended outputs and its effects (planned and unplanned) on direct beneficiaries and on the ultimate target group(s).
4. Based on the above, make specific recommendations for any reorientation of the project or follow-up measures, taking into account the sustainability of project results.

In particular, the evaluation mission will pay special attention to the following aspects:

1. Examine the continued relevance of project's immediate and long term development objectives to government priorities, needs of the target group(s) and environmental considerations;
2. Identify deficiencies or gaps in the design of the current project, especially as it relates to the achievement of its objective.
3. Evaluate the extent to which the project is integrated with other related projects and into the national development programme.
4. Assess the adequacy of project management, including co-ordination with other relevant programmes and projects, adequacy of support given by the participating countries, UNDP and FAO and the effectiveness of using UNVs to initiate and implement activities of the project and their contribution toward the long-term sustainability of the national programmes;
5. Evaluate and recommend on the future institutional arrangements with the implementing agency, the South Pacific Commission, which will contribute to the long term sustainability of the regional backstopping responsibility required by Governments.

6. Assess the technical status of biological data on fruit flies in the project countries, including species composition within each country, geographical distributions, seasonal abundances, parasitoid compositions and the economic significance of fruit flies to production and trade.

7. Identify future requirements for collection of additional biological data in Fiji, Tonga, Cook Islands and Western Samoa and other countries in the South Pacific as a basis for controlling fruit flies, for overcoming impediments to trade and for promoting awareness of the risk of spread of exotic damaging fruit flies within the South Pacific.

8. Evaluate the progress of the research and development of pre-harvest control systems, primarily based on the use of protein bait sprays and sound crop hygiene practices.

9. Evaluate the results of research into the development of post harvest quarantine treatments to replace the use of fumigants such as ethylene dibromide and methyl bromide, including the establishment of laboratory colonies and biological studies that are precursors to post harvest research.

10. Assess the mix of pre-harvest and post harvest research and recommend an appropriate emphasis for the next project.

11. Assess the contributions made by the project in improving laboratory and field facilities for fruit fly work within the project countries.

12. Evaluate the relevance of training provided to Government and industry personnel by the project and the impact that training has had on improving the capacity of countries to undertake fruit fly work to ensure the sustainability of the project.

13. Identify the impact of the project activities and achievements on :

. the prospects for increased production of fresh fruits and vegetables at the commercial and village level;

. the capacity of project countries to negotiate quarantine requirements with prospective importing countries and ultimately increasing trade, particularly into niche markets;

. environmental considerations, such as reduced insecticide usage and use of waste products from breweries as a protein source of bait sprays; and

. the effects that project results may have on agricultural diversification in the broadest sense.

14. Comment on and make recommendations on the options for continued complementary work with other projects related to fruit fly control strategies and fruit and vegetables production in the South Pacific.

15. On the basis of the evaluation results, make recommendations on the scope of future activities on fruit fly control strategies in the current and future Pacific Island Countries.

. Identification of the benefits and relevance of extending the project in Fiji, Tonga, Cook Islands and Western Samoa and expanding the

activities into other Pacific Island Countries such as Solomon Islands, Vanuatu and Federated States of Micronesia; and

. Review of the draft project document, which has been prepared by the project manager and suggestions to ensure its appropriateness for future work in Pacific Island Countries.

FORMAT OF EVALUATION

The Tripartite Review of this project held in Suva, Fiji on 19 November, 1992 recommended that the RFFP should be evaluated concurrently with a complementary project on fruit fly biology and control in the South Pacific funded by the Australian Centre for International Agricultural Research (ACIAR). In this respect and as a result of ACIAR's requiring two reviewers to carry out its review, ACIAR has nominated two reviewers, viz.

. Dr. Gordon Hooper, Director of the Australian Plague Locust Commission and formerly a world renowned worker in fruit fly biology and control; and

. Dr. Wally Mitchell, retired Professor of Plant Protection at the University of Hawaii and also a world renowned fruit fly researcher.

The ACIAR project review will take place at the Warwick Fiji Resort on 21-23 July, 1993 and will entail formal presentations of results of the project. As the results of both the ACIAR project and the RFFP have many areas of commonality, the evaluation of the RFFP dovetail into this format.

UNDP will appoint one reviewer who will work in cooperation with the ACIAR Review Team. The UNDP reviewer will have added responsibilities and will visit Tonga and Western Samoa as well as Fiji to assess the impact and progress of the RFFP. Also, the UNDP reviewer will visit Vanuatu to assess the future benefits of expansion of the RFFP into new countries in the South Pacific.

This approach would mean that the ACIAR Review Team would have access to first-hand information from three of the four project countries provided by the UNDP reviewer as well as get further information on the requirements for the expansion of the project into new countries, eg. Vanuatu. Also, collectively, the UNDP reviewer and the ACIAR Review Team will be able to assess the results of both projects at the formal presentation of project results on 21-23 July, 1993.

The aim is to produce one report if possible that covers both projects, satisfies the evaluation process of both UNDP and ACIAR and emphasises the beneficial complementarity of the two projects.

TIMETABLE AND ITINERARY OF EVALUATION

1. Briefing

The UNDP reviewer will visit Fiji prior to visits to other countries and be briefed by :

- . UNDP Resident Representative and program staff
- . AIDAB Counsellor in Suva
- . SPC Agricultural Program Coordinator and project staff.

2. Tentative Itinerary/Program

The duration of the consultancy shall be a maximum period of 4 weeks. The following itinerary should be used as a guide to the UNDP reviewer and should be finalised before 31 May, 1993.

Date	Location/Activity
5-6 July	Fiji for briefing by UNDP, AIDAB, SPC and for holding discussions with Fiji Government authorities and the private sector.
7-9 July	Western Samoa - discussions with DAFF, FAO, UNDP and the private sector.
10-14 July	Tonga - discussions with MAF (Research), MAF (Quality Management), private sector.
15-19 July	Vanuatu - discussions with agriculture and planning authorities and private sector.
20 July	Fiji (Warwick Fiji Resort) - brief ACIAR Review Team on findings in other countries.
21-23 July	Fiji (Warwick Fiji Resort) - formal presentation of results by staff of ACIAR Project and RFFP and visit to Koronivia Research Station, Suva.

3. Participation in Evaluation

The formal presentation of results on 21-23 July will be attended by representatives of the Governments of Fiji, Tonga, Western Samoa and Cook Islands, UNDP, FAO, SPC, AIDAB and the ACIAR project and RFFP. Donor agencies who have had recent discussions with UNDP and project personnel regarding future support for the project will be invited to attend as observers at their own cost.

4. Reports

A draft report and recommendations will be presented, at least in summary, as part of the sessions on 21-23 July.

A final report will be completed and submitted to UNDP by 31 July 1993. This report will be distributed to FAO, Governments of project countries, AIDAB and SPC for comment.

APPENDIX 2

PEOPLE INTERVIEWED/CONTACTED DURING EVALUATION/REVIEW

FIJI

RFFP Mr Allan Allwood - Chief Technical Adviser

UNDP Mr. Somsey Norindr - Resident Representative

Mr. Nurul Alam - Deputy Resident Representative

Ms Sabine Roth - Program Officer, Regional

SPC Dr Malcolm Hazelman - Acting Agricultural
Co-ordinator

Dr Semisi Pone - Plant Protection Officer

AIDAB Mr Richard Harman - Councillor

USAID Dr Andrew McGregor - Co-ordinator

Mr John Kreag - Commercial aspects of CAD Project

Ministry of Agriculture, Forests and Fisheries

Mr Nemani Buresova - Permanent Secretary

Mr Jai Kumar - Director of Research (Koronivia)

Mr Vilisoni Fauoro - A/Principal Res. Officer, Pl.Prot.

Mr Sada Nand Lal - Entomologist

Ms Ema Tora - Entomologist , Fruit Flies

Ms Laisa Ralulu - Technician, Fruit Flies

Mr Asea Waqa - Chief Quarantine Officer

Farmers and Exporters

Mr Alf Hazelman - Ginger/vegetable exporter, Suva
Mr Graham Thorpe - Balthan Indus., exporter/farmer, Suva
Mr Trevor Connelly - Nadi farmer/exporter and President of
Fresh Fruit Exporters Association
Mr Anil Kumar - Farmer/exporter, Sigatoka Valley

TONGA

Ministry of Agriculture

Mr Haniteli Fa'anunu - Director
Mr Ofa Fakalata - Head of Research, Vaini Research Station
Mr Konrad Engleberger - Chief Quarantine Officer, Quarantine and
Quality Management
Mr Sione Foliaki - Entomologist, Quarantine and Heat Treatment
Mr Pontiano Nemeve - UNV Entomologist RFFP
Mr Tupulotu Langi - Entomologist, Fruit Flies
Ms Sutoni Tupou - Technician, Fruit Flies

Australian Quarantine Inspection Service

Mr Allan Chambers - Export & Import Branch, New South Wales
Department of Agriculture

Royal Beer Company Limited

Mr Andrew Kylstra - General Manager/Brewmaster
Friendly Islands Marketing Co-Op - Export Company
Mr Ma'u Havea - Secretary/Manager
Mr Alipate 'U. Vaka - Produce Manager PPEL Enterprises
Mr Hopoate Moengangongo - Manager

WESTERN SAMOA

United Nations Development Program (UNDP)

Ms Sarwar Sultana - Resident Representative
Food and Agriculture Organisation

Mr Lars Jacobsen - FAO Representative a.i.

Mr Brian Watson (FAO) - Chief Technical Adviser, Fruit Tree
Development Project

Department of Agriculture, Forestry & Fisheries

Mr Sofara Aveau - Director

Dr Semisi T. Semsi - A/Director, Nu'u Research Station

Mr Albert Peters - Chief Crops Officer

Ms Carol Quashie-Williams - UNV Fruit Flies

Mr Billy Enosa - Fruit Fly Officer
University of the South Pacific, Alafua Campus

Dr James Epela-Otara - Lecturer, Crop Sciences

Mr Michael W. Brown - USAID CAD Project (Marketing Coordinator)

PARTICIPANTS LIST - PRESENTATION OF RESULTS

(Warwick Fiji Resort : 21-23 July, 1993.)

Australian Centre for International Agricultural Research (ACIAR)

Dr Paul Ferrar - Coordinator, Crop Sciences, Canberra

Food and Agriculture Organisation for the United Nations (FAO)

Mr Lars Jacobsen - FAO Representative, a.i.

United Nations Development Program (UNDP)

Mr Nurul Alam - Deputy Resident Representative, Suva

Ms Sabine Roth - Program Officer-Regional, Suva

USAID Commercial Agricultural Development Program

Mr Andrew MacGregor - Program Co-ordinator

South Pacific Commission (SPC)

Mr Semisi Pone - Plant Protection Officer, Suva

Ms Paulini Naituivau - Program Assistant, Agriculture Program

ACIAR Fruit Fly Project

Dr Richard Drew - Project Leader, Plant Protection Division,
Queensland Department of Primary Industries

Dr Annice Lloyd - QDPI, Brisbane

Ms Meredith Romig - QDPI, Brisbane

Regional Fruit Fly Project (RFFP)

Mr Allan Allwood - Chief Technical Adviser, Suva

COUNTRY REPRESENTATIVES

Cook Islands - Ministry of Agriculture

Dr Matarangi Porea - Director of Research, Totokoitu Research Station,
Rarotonga

Fiji - Ministry of Agriculture, Forests and Fisheries

Mr Fauoro Vilisoni - A/Principal Research Officer (Plant Protection)
Koronivia Research Station
Mr Sada Nand Lal - Entomologist
Mr. Moti Autar - Entomologist
Ms Ema Tora - Entomologist, Fruit Flies

Tonga - Ministry of Agriculture, Fisheries and Forests

Mr Ofa Fakalata - Head of Research, Vaini Research Station,
Tongatapu

Western Samoa - Department of Agriculture, Forests and Fisheries

Dr Semisi T. Semisi - A/Director Research, Nu'u Research Station, Apia

PROJECT EVALUATION TEAM

Mr Tom Passlow - Retired Director of Entomology Branch
Queensland Department of Primary Industries, Brisbane
Dr Gordon Hooper - Director, Australian Plague Locust Commission, Canberra
Dr. Wallace C. Mitchell. - Professor Emeritus, Department of Entomology,
University of Hawaii, Honolulu.

APPENDIX 3

PROGRAM FRO EVALUATION / REVIEW

It is a requirement of UNDP projects that an evaluation be carried out by at least one independent authority during the third quarter of the final year of a project. Similarly the ACIAR system requires a review late in the final year of its projects. As the projects are closely allied, it was agreed at the Tripartite Review of RFFP in November 1992 that a joint evaluation/review be carried out, and that, as far as possible, a joint report be presented.

A program was developed to allow the UNDP evaluator to visit Fiji, Tonga, Western Samoa prior to the formal presentation of results at the Warwick Fiji Resort on July 21-23, 1993. The RFFP brought the UNDP Evaluator to Fiji using project funds to allow adequate familiarization with this administratively complex project from 4-9 July, 1993. Vanuatu was visited by the UNDP Evaluator on 1-4 August.

As a result, project activities, their background and the implications of the results would be available to the RFFP/ACIAR evaluation/review team. The information, it was proposed, would put data presented on July 21-23 into perspective and allow the evaluation team to reach more meaningful recommendations.

Additionally, the review team would have the opportunity to interview and discuss issues with the Cook Islands representative during the July 21-23 period.

A draft report was compiled and a debriefing was provided to representatives of UNDP, AIDAB, SPC and the RFFP on 29 July, 1993.

The program as implemented was as follows:

UNDP EVALUATOR

Saturday July 3	Travel ex Brisbane to Nadi, Fiji
Sunday July 4	Travel ex Nadi to Suva, Fiji
Monday July 5	Fiji - Briefings with UNDP Briefings with SPC Agriculture Program Briefings with AIDAB, Suva
Tuesday July 6	Discussions with USAID, particularly the Commercial Agricultural Development Program (CAD) Discussions with Permanent Secretary, Ministry of Agriculture, Forests and Fisheries Visit Koronivia Research Station for discussions with Director (Research), other MPIF&F staff and project officers.
Wednesday July 7	Discussions with MAFF Quarantine Discussions with industry representatives Study of background documents
Thursday July 8	Discussions with UNDP re schedule

Study and commencement of write up.

Friday July 9 Further discussions with regional project staff and the CTA, study and further write up.

Saturday July 10 Free Day

Sunday July 11 Study and write up of information

Monday July 12 Further discussions with CTA and Travel to Tonga.

Tuesday July 13 Discussion with Head of Research, inspection of project facilities and activities at Vaini Research Station and discussions with research team.

Discussions with Director of Agriculture at Headquarters.

Discussions with Quarantine officer and inspection of facilities.

Wednesday July 14 Visit Royal Brewery - Discussions with Manager concerning conversion of brewery wastes to bait.

Discussions with exporters of horticultural products.

Further discussions with project staff.

Thursday July 15 Travel to Apia, Western Samoa, arrive 6.55am - Wednesday 14.

Wednesday July 4 Discussions with UNDP, Apia
Discussions with FAO, Apia
Discussions with Department of Agriculture, Forests and Fisheries, Director at Headquarters.

Thursday July 15 Visit Nu'u Research Station, DAFF, inspect facilities and discuss project activities with staff and project officers. Fruit collecting and general observations.

Friday July 16 Visit University of the South Pacific, Alafua Campus to hold discussions on project interactions with the University staff and with Samoa based CAD officer. Visit Nafanua Research Station - FAO Project on Fruit Tree Development - Discussions re project interactions.

Saturday July 17 Report Writing

Sunday July 18 Travel to Nadi (depart 10.35pm (arr. 11.35pm Sunday 18.))

Monday July 19 Travel Nadi to Warwick Resort, enroute -
 Sigatoka.
 Visit plus discussions with Mr Trevor
 Connelly - Nadi farmers/exporter and
 President of Fresh Fruits Exporters
 Association.
 Visit Sigatoka Valley. Discussions with Mr
 Anil Kumar, farmer/exporter.

Tuesday July 20 Briefing and discussions with
 Professor W. Mitchell
 Dr. G. Hooper

 Discussions with
 Dr. P. Ferrar, ACIAR
 Mr. A. Allwood, RFFP
 Dr. R. Drew, QDPI

Wednesday July 21 }
Thursday July 22 }Presentation of Data at Warwick Resort.
Friday July 23 }

Friday July 23 To Suva.

Saturday July 24 Report Formulation discussions (with Dr. Hooper
 and Professor W. Mitchell)

Sunday July 25 }
Monday July 26 }Report preparation
Tuesday July 27 }

Wednesday July 28 First draft copy review.

Thursday July 29 Second draft copy and debriefing with UNDP, AIDAB,
 SPC and the Chief Technical Adviser.

APPENDIX 4

Agenda for presentation of results

Review of ACIAR Project No. 8920 "The identification and control of pest fruit flies of the South Pacific" and

Evaluation of Project No. RAS/90/004 "Fruit fly control strategies in the South Pacific"

Warwick Fiji Resort, Fiji
21 - 23 July, 1993

Day 1

- | | | |
|---------------------|-----|--|
| 9.00am - 9.30am | 1. | Opening remarks |
| | . | UNDP Mr. Nurul Alam |
| | . | SPC - Mr. Semisi Pone |
| | . | FAO - Mr. Lars Jacobsen |
| | . | ACIAR - Dr. Paul Ferrar |
| | . | USAID - Dr. Andrew McGregor |
| 9.30am - 10.00pm | 2. | Overview of objectives and activities of projects and linkages between related projects - Allwood. |
| 10.00am - 10.30am | | Morning Tea |
| | 3. | Presentation of results of projects. |
| 10.30am - 11.15am | (a) | Taxonomy/Pest species - their distributions and pest status - Drew. |
| 11.15am - 12.00noon | (b) | Identification of larvae of pest species - Drew |
| 12.00noon - 1.15pm | | Lunch |
| 1.15pm - 4.30pm | (c) | Computer database |
| | . | Methods of field surveys and laboratory procedures |
| | . | Structure of database |
| | . | Trapping data |
| | . | Host data |
| | . | Parasitoid data |
| | . | Damage Assessment |
| | | - Drew/Allwood |

Day 2

- | | | |
|-------------------|-----|--|
| 9.00am - 9.45am | (d) | Video on adult feeding
Testing of attractancy of protein baits - Lloyd |
| 9.45am - 10.30am | (e) | Development of new bait spray formulations and techniques for increasing shelf-life - Lloyd. |
| 10.30am - 11.00am | | Morning Tea |

11.00am - 12.00noon (f) Results of pre-harvest control trials using bait sprays - Allwood

12.00noon - 1.15pm Lunch

1.15pm - 3.00pm (g) Results of post-harvest studies
. Laboratory culture techniques
. Comparisons of artificial diets
. Life history studies
. Host status testing
. Heat treatment developments
- Allwood/Tora

3.00pm - 3.30pm Afternoon Tea

3.30pm - 4.15pm (h) Training - Allwood

4.15pm - 5.00pm 4. Proposals for future extension and/or expansion of projects - Drew/Allwood.

Day 3

8.30am - 9.15am 5. Project Management
(a) Project travel
(b) Budget reports
(c) Problems and solutions - Drew/Allwood

9.15am - 10.00am 6. Country perceptions
. Cook Islands
. Fiji
. Tonga
. Western Samoa

10.00am - 10.30am Morning Tea

10.30am - 11.15am 7. Further comments by donor agencies.

11.15am - 12.30pm 8. Final question time for reviewers. Report summary and draft recommendations (Reviewers).

12.30pm - 1.30pm Lunch

1.30pm - 5.00pm 9. Travel to Suva and visit fruit fly laboratories Koronivia Research Station.

