

REGIONAL SEAS

UNITED NATIONS ENVIRONMENT PROGRAMME

D. L. Mowbray:

Pesticide use in the South Pacific

UNEP Regional Seas Reports and Studies No. 89

SPREP Topic Review No. 26

Prepared in co-operation with



SPC



SPEC



ESCAP

UNEP 1988

PREFACE

Sixteen years ago the United Nations Conference on the Human Environment (Stockholm 5-16 June 1972) adopted the Action Plan for the Human Environment, including the General Principles for Assessment and Control of Marine Pollution. In the light of the results of the Stockholm Conference, the United Nations General Assembly decided to establish the United Nations Environment Programme (UNEP) to "serve as a focal point for environmental action and co-ordination within the United Nations system" [General Assembly resolution 2997(XXVII) of 15 December 1972]. The organizations of the United Nations system were invited "to adopt the measures that may be required to undertake concerted and co-ordinated programmes with regard to international environmental problems", and the "intergovernmental and non-governmental organizations that have an interest in the field of the environment" were also invited "to lend their full support and collaboration to the United Nations with a view to achieving the largest possible degree of co-operation and co-ordination". Subsequently, the Governing Council of UNEP chose "oceans" as one of the priority areas in which it would focus efforts to fulfill its catalytic and co-ordinating role.

The Regional Seas Programme was initiated by UNEP in 1974. Since then the Governing Council of UNEP has repeatedly endorsed a regional approach to the control of marine pollution and the management of marine and coastal resources and has requested the development of regional action plans.

The Regional Seas Programme at present includes ten regions[1/] and has over 130 coastal States participating in it. It is conceived as an action-oriented programme having concern not only for the consequences but also for the causes of environmental degradation and encompassing a comprehensive approach to combating environmental problems through the management of marine and coastal areas. Each regional action plan is formulated according to the needs of the region as perceived by the Governments concerned. It is designed to link assessment of the quality of the marine environment and the causes of its deterioration with activities for the management and development of the marine and coastal environment. The action plans promote the parallel development of regional legal agreements and of action-oriented programme activities[2/].

The idea for a regional South Pacific Environment Management Programme came from the South Pacific Commission (SPC) in 1974. Consultations between SPC and UNEP led, in 1975, to the suggestion of organizing a South Pacific Conference on the Human Environment. The South Pacific Bureau for Economic Co-operation (SPEC) and the Economic and Social Commission for Asia and the Pacific (ESCAP) soon joined SPC's initiative and UNEP supported the development of what became known as the South Pacific Regional Environment Programme (SPREP) as part of its Regional Seas Programme.

1/ Mediterranean, Kuwait Action Plan Region, West and Central Africa, Wider Caribbean, East Asian Seas, South-East Pacific, South Pacific, Red Sea and Gulf of Aden, Eastern Africa and South Asian Seas.

2/ UNEP: Achievements and planned development of UNEP's Regional Seas Programme and comparable programmes sponsored by other bodies. UNEP Regional Seas Reports and Studies No. 1, UNEP, 1982.

The Conference on the Human Environment in the South Pacific was convened in Rarotonga, from 8 to 11 March 1982. It adopted: the South Pacific Declaration on Natural Resources and Environment. the Action Plan for Managing the Natural Resources and the Environment in the South Pacific Region; and agreed on the administrative and financial arrangements needed to support the implementation of the Action Plan and on the workplan for the next phase of SPREP[3/].

The legal framework of the Action Plan was developed through several meetings of legal and technical experts from the South Pacific Region. It was adopted by the Plenipotentiary meeting of the High Level Conference on the Protection of the Natural Resources and Environment of the South Pacific Region convened by the Secretary-General of SPC in Noumea, New Caledonia, from 17 to 25 November 1986.

The legal framework adopted by the Conference consists of the following instruments[4/]:

Convention for the Protection of the Natural Resources and Environment of the South Pacific Region;

Protocol Concerning Co-operation in Combating Pollution Emergencies in the South Pacific Region;

Protocol for the Prevention of Pollution of the South Pacific Region by Dumping.

The convention is a comprehensive umbrella agreement for the protection, management and development of the marine and coastal environment of the South Pacific Region. It lists the sources of pollution which require control: pollution from ships, dumping, land-based sources, seabed exploration and exploitation, atmospheric discharges, storage of toxic and hazardous wastes, testing of nuclear devices, mining and coastal erosion. It also identifies environmental management issues requiring regional co-operation: specially protected areas, pollution in cases of emergency, environmental impact assessment, scientific and technical co-operation, technical assistance, and liability and compensation for damage resulting from pollution.

Considerable support to the implementation of the Action Plan is received from a number of South Pacific research and training institutions. Periodic consultative meetings of these institutions are convened to discuss the environmental problems of the region which may be mitigated or solved through the Action Plan and to identify activities which may contribute toward the goal of SPREP. The present report was commissioned by UNEP as such a contribution. The report has been prepared by Mr. David Lindsay Mowbray of the University of Papua New Guinea and the sponsors of the study would like to express their gratitude to the author of the report and to his institution.

3/ SPC/SPEC/ESCAP/UNEP: Action Plan for managing the natural resources and environment in the South Pacific Region. UNEP Regional Seas Reports and Studies No. 29, UNEP, 1983.

4/ Convention for the protection of the natural resources and environment of the South Pacific Region and related protocols, UNEP, 1987.

AUTHOR'S PREFACE

This is the second printing of the first edition of Pesticide Use in the South Pacific. The first printing was issued by the South Pacific Regional Environmental Programme (SPREP) entitled "Pesticide Use in the South Pacific", preliminary printing by the University of Papua New Guinea (UPNG), October 1986. Prior to this a "preliminary draft edition" was printed by UNPG in January 1984. This draft edition was for limited circulation only and was forwarded to governments and other specified personnel for their comments only.

Subsequent to writing this first edition, more information has been provided by officers of the South Pacific Commission (SPC), governments, companies and non-government organisations in the South Pacific and overseas. Assistance has also been provided by officers of the Australian, New Zealand and United States governments on the section on "banned and restricted pesticides". Their comments, suggestions and data, together with corrections and updates to earlier information, and bibliographic listings of recent publications will be incorporated into the second edition.

The following will also be incorporated into the second edition:

* Summary of responses to the Codex Questionnaire (see appendix F).
* Summary of responses to FAO Questionnaire to governments of the South Pacific on the international code of conduct on the distribution and use of pesticides.
* Summary on detailed study done in Papua New Guinea on monitoring and reporting the implementation of the FAO international code of conduct on the distribution and use of pesticides.
* Use of pictograms in labelling.
* A list of pesticides registered or in use in 1986-88, and a list of pesticides banned or restricted for use in 'non-SPC' countries with reasons given for such banning or restrictions.
* A preliminary pesticide data base for South Pacific countries.
* A re-evaluation of the needs of the South Pacific.

The following sections of the review will also be written in French:

* Title
* Contents
* Chapter 14. Summary and Recommendations
* Original questionnaire (Appendix A).

David Mowbray
10th June 1988

CONTENTS **page number**

PART A. PESTICIDES REVIEW

by David L. Mowbray

CONTENTS 1

CHAPTER 1. BACKGROUND AND AIMS OF REVIEW

1.1 INTRODUCTION 12
1.2 DEFINITION OF PESTICIDES 14
1.3 PROJECT METHODOLOGY 14

CHAPTER 2. SITUATION IN SOUTH PACIFIC COUNTRIES

2.1 RESPONSES TO QUESTIONNAIRE 18
2.2 FOCAL POINTS 18
2.3 SUMMARY OF RESPONSES TO QUESTIONNAIRE 18

CHAPTER 3. PESTICIDES USED IN SOUTH PACIFIC COUNTRIES

3.1 LIST OF PESTICIDES AVAILABLE FOR USE 82
3.2 DISCUSSION OF LIST 105
3.3 TRENDS IN NUMBERS OF PESTICIDES AVAILABLE 108
3.4 MOST COMMONLY AVAILABLE PESTICIDES 111
3.5 NUMBER OF FORMULATIONS 112
3.6 SUMMARY 114

CHAPTER 4. QUANTITIES OF PESTICIDES USED IN SOUTH PACIFIC

4.1 INTRODUCTION 115
4.2 COOK ISLANDS 115
4.3 FIJI 116
4.4 GUAM 120
4.5 NEW CALEDONIA 120
4.6 NIUE 121
4.7 PAPUA NEW GUINEA 130
4.8 SOLOMON ISLANDS 130
4.9 TONGA 131
4.10 VANUATU 131
4.11 WESTERN SAMOA 131
4.12 SUMMARY OF QUANTITIES OF PESTICIDES IN SOUTH PACIFIC 132
4.13 COMPARISON WITH SOUTH-EAST ASIA AND THE REST OF THE WORLD. 135

CHAPTER 5. PESTICIDE IMPORTERS AND DISTRIBUTORS

5.1 PESTICIDE IMPORTERS AND DISTRIBUTORS WITHIN COUNTRIES AND TERRITORIES. 141
5.2 MAJOR EXPORTING COUNTRIES 144
5.3 MAJOR AUSTRALIAN AND NEW ZEALAND COMPANIES EXPORTING INTO SOUTH PACIFIC. 147
5.4 SUMMARY 160

CHAPTER 6. PESTICIDES USED IN QUARANTINE

6.1 INTRODUCTION 161
6.2 FOCAL POINTS 162
6.3 QUARANTINE LEGISLATION 164
6.4 SUMMARY OF RESPONSES TO QUESTIONNAIRE 166
6.5 PESTICIDES USED IN QUARANTINE 169

CHAPTER 7. PESTICIDES USED IN FORESTRY

7.1 INTRODUCTION 171
7.2 SITUATION IN PAPUA NEW GUINEA 171
7.3 SUMMARY 174

CHAPTER 8. BANNED AND RESTRICTED PESTICIDES

8.1 INTRODUCTION 175
8.2 SITUATION IN THE SOUTH PACIFIC 176
8.3 INTERNATIONAL REGISTER FOR POTENTIALLY TOXIC CHEMICALS, FAO 'CODE OF CONDUCT' AND 'PRIOR INFORMED CONSENT' 183
8.4 SUMMARY 186

CHAPTER 9. RECOMMENDATIONS FOR PESTICIDE USE.

9.1 PUBLICATIONS ON RECOMMENDATIONS 187
9.2 ADVICE ON RECOMMENDATIONS 190
9.3 DECISION-MAKING ON PESTICIDE USE. 190
9.4 PUBLICATIONS ON SAFE-USE OF PESTICIDES. 191
9.5 TRAINING AND EDUCATIONAL PROGRAMMES. 193
9.6 SUMMARY 195

CHAPTER 10. PROBLEMS TO HUMANS AND WILDLIFE

10.1 HUMAN POISONING 196
10.2 POISONING OF DOMESTIC ANIMALS, FISH AND WILDLIFE 201
10.3 PUBLICATIONS ON POISONING TO HUMANS AND WILDLIFE. 205
10.4 SUMMARY 207

CHAPTER 11. PESTICIDE RESIDUES AND TOXICITY STUDIES.

11.1	LABORATORY FACILITIES AND PERSONNEL.	208
11.2	RESIDUE STUDIES DONE TO DATE.	213
11.3	RESIDUE STUDIES REQUIRED.	216
11.4	TOXICITY STUDIES	219
11.5	PROPOSED STUDIES I. SPREP COASTAL WATER QUALITY STUDIES	221
11.6	PROPOSED STUDIES II. SPREP OCCUPATIONAL AND ENVIRONMENTAL HAZARDS FROM THE USE OF PESTICIDES	224
11.7	SUMMARY	229

CHAPTER 12. PESTICIDE LEGISLATION AND REGISTRATION.

12.1	INTRODUCTION	230
12.2	LEGISLATION IN SOUTH PACIFIC COUNTRIES	230
12.3	REGISTRATION OF PESTICIDES	234
12.4	SUMMARY.	236

CHAPTER 13. CONTROLS ON PESTICIDES

13.1	IMPORTATION, SALE AND DISTRIBUTION.	237
13.2	LABELLING	238
13.3	STORAGE	241
13.4	TRANSPORTATION	242
13.5	DISPOSAL OF PESTICIDES	242
13.6	PROTECTIVE CLOTHING	243
13.7	HEALTH CHECKS	244
13.8	SOME PROBLEMS FACED IN ENFORCING LEGISLATION	245
13.9	SUMMARY	248

CHAPTER 14. INTERNATIONAL PUBLICATIONS ON PESTICIDE LEGISLATION AND REGISTRATION REQUIREMENTS

14.1	INTRODUCTION	250
14.2	LISTING OF PUBLICATIONS	251

CHAPTER 15. SUMMARY AND RECOMMENDATIONS 270

REFERENCES 272

PART B. BIBLIOGRAPHY OF PESTICIDE USE IN SOUTH PACIFIC UPTO 1985.

compiled by David L. Mowbray and Bligh Mowbray

1.	INTRODUCTION	1
2.	AMERICAN SAMOA	4
3.	COMMONWEALTH OF THE NORTHERN MARIANNA ISLANDS	4
4.	COOK ISLANDS	5
5.	FIJI	7
6.	FRENCH POLYNESIA	15
7.	GUAM	20
8.	KIRIBATI	24
9.	NAURU	26
10.	NEW CALEDONIA	26
11.	NIUE	29
12.	PAPUA NEW GUINEA	30
13.	PITCAIRN ISLAND	54
14.	SOLOMON ISLANDS	54
15.	TOKELAU	59
16.	TONGA	60
17.	TRUST TERRITORIES OF THE PACIFIC ISLANDS (TTPI)	64
18.	TUVALU	65
19.	VANUATU	67
20.	WALLIS ET FUTUNA	67
21.	WESTERN SAMOA	68
22.	SOUTH PACIFIC REGION.	72
23.	AUSTRALIA	87
24.	NEW ZEALAND	89
25.	NON - SOUTH PACIFIC.	90
	APPENDIX	91

PART C. PROPOSAL TO ESTABLISH A PESTICIDE INFORMATION, ADVISORY AND MONITORING NETWORK FOR THE SOUTH PACIFIC REGION.

proposed by David L. Mowbray

1.	INTRODUCTION	1
2.	ESTABLISHMENT OF REGIONAL PESTICIDE INFORMATION CENTRE	2
3.	ESTABLISHMENT OF REGIONAL PESTICIDE ADVISORY COMMITTEE AND A REGIONAL PESTICIDE ADVISORY SCHEME.	3
4.	CO-OPERATION BETWEEN PESTICIDE LABORATORIES.	4
5.	FUNDING FOR 'PESTICIDE PROJECT'.	7

APPENDICES

A.	PESTICIDE QUESTIONNAIRE, forwarded July 1983.	10
B.	QUARANTINE QUESTIONNAIRE, forwarded December 1985.	18
C.	BANNED, RESTRICTED AND HAZARDOUS PESTICIDES.	20
D.	PESTICIDE CONTAINER USE QUESTIONNAIRE (IN PAPUA NEW GUINEA).	31
E.	QUESTIONNAIRE ON UPDATED REGISTRATION REQUIREMENTS FOR RENPAF MEETING, forwarded September 1986.	39
F.	QUESTIONNAIRE FOR COUNTRIES OF SOUTH WEST PACIFIC REGION FOR CODEX COMMITTEE ON PESTICIDE RESIDUES, forwarded by Australian Dept of Primary Industry, October 1986.	48

ACKNOWLEDGEMENTS 50

NOTES ON DAVID MOWBRAY 51

LIST OF TABLES

table number	title	page number
1.	List of persons who responded to questionnaire	19
2.	Summary of responses to pesticide questionnaire	28
3.	List of pesticides available for use in the South Pacific	84
4.	Number of Pesticides (by ai) reported as available in the South Pacific	108
5.	List of most commonly available pesticides in South Pacific.	111
6.	Number of Recorded Pesticides and Formulations in Fiji, Papua New Guinea, Solomon Islands, Australia and New Zealand.	113
7.	Import of formulated pesticides by value into Cook Islands,1981.	115
8.	Import of formulated pesticides into Fiji, 1979-1981.	116
9.	Import of Agrochemicals in Fiji, 1982-1983.	116
10.	Estimate of total quantity of main pesticides used, by crop, in Fiji, 1983.	118
11.	Estimate of total value of main pesticides used, by crop, in Fiji, 1983.	119
12.	Annual sale of pesticides in Guam, 1981.	120
13.	Import of formulated pesticides into Niue, 1981.	121
14.	Import of pesticides by weight and value into Papua New Guinea, 1978 and 1982.	122

15.	Herbicide imports (by ai) into Papua New Guinea, 1978 and 1982.	123
16.	Insecticide imports (by ai) into Papua New Guinea, 1978 and 1982.	124
17.	Fungicide imports (by ai) into Papua New Guinea, 1978 and 1982.	125
18.	Summary of amounts and value of imports into Papua New Guinea of formulated pesticides by type, 1982 - 1985.	126
19.	Estimate of total quantity of main pesticides used, by crop, in Papua New Guinea in 1983.	127
20.	Estimate of total value of main pesticides used, by crop, in Papua New Guinea in 1983.	128
21.	Summary of estimates of quantities and value of pesticides used in agriculture in Papua New Guinea in 1983.	129
22.	Import of formulated pesticides by value into Solomon Islands, 1978 - 1981.	130
23.	Imports of pesticides into Tonga, 1982 - 1983.	131
24.	Imports of formulated pesticides into Western Samoa in 1981.	132
25.	Comparison of total quantities of pesticides used in South Pacific countries and territories.	135
26.	Comparison of total use of pesticides by country in South East Asia and the Pacific, 1981 - 1982.	137
27.	Comparison of quantities and value of agricultural pesticides in selected Asian countries, in Australia and Papua New Guinea.	138

28.	List of the Major Importers into the South Pacific Region, by country.	143
29.	Pesticides imported by three major importers in Papua New Guinea, 1985.	145
30.	Countries which have exported pesticides to Papua New Guinea since 1969.	146
31.	Pesticides distributed by Amalgamated Chemicals (ACL) of Australia.	148
32.	Pesticides distributed by BASF of New Zealand.	150
33.	Pesticides distributed by Dupont New Zealand.	152
34.	Pesticides exported by ICI New Zealand.	155
35.	Pesticides exported by Samuel Taylor of Australia.	159
36.	List of persons responding to Quarantine questionnaire.	162
37.	List of quarantine related legislation in thirteen South Pacific countries and territories.	164
38.	Summary of responses to Quarantine questionnaire.	166
39.	List of pesticides reported to be used in Quarantine in countries which responded to Questionnaire.	170
40.	Number of pesticides (ai) available in South Pacific which are banned or restricted elsewhere or regarded by WHO as extremely or highly hazardous.	177
41.	Listing by country of the number of pesticides available which are not registered in Australia and/or New Zealand.	178

42.	List of some banned or restricted pesticides in USA or EEC, presently used in the South Pacific.	181
43.	List of pesticides commonly available in South Pacific, not recommended for general use by Firman.	182
44.	Pesticides which have caused poisoning of humans in the South Pacific.	197
45	Accidental and Total Poisonings by Pesticides in Selected Countries throughout the World.	200
46.	Reports on Poisoning of domestic animals, fish and wildlife in the South Pacific.	202
47.	List of small scale residue studies, by country.	214
48.	Types of residue studies required, by country.	218
49.	Animals and pesticides used in toxicity studies in Fiji, Guam and Papua New Guinea.	220
50.	List of pesticide related legislation in South Pacific countries	233
51.	Summary of pesticide legislation situation in South Pacific.	230
52.	Information on Pesticides required by law for registration in Fiji, Papua New Guinea, Solomon Islands and Tonga.	235
53.	Information on Labels required by law in American Samoa, Cook Islands, Fiji, Guam, New Caledonia, Papua New Guinea, Solomon Islands and Tonga.	239

APPENDIX TABLES

table number	title	page number
54.	Compounds banned, withdrawn, not approved in United States of America.	20
55.	Compounds severely restricted in United States of America.	21
56.	Restricted Use Compounds in the United States of America.	22
57.	Compounds banned, withdrawn, not approved by European Economic Community (EEC).	22
58.	Compounds severely restricted in EEC	22
59.	Compounds banned, withdrawn, not approved, in other countries but not in USA nor EEC.	23
60.	Compounds severely restricted in other countries but not in USA nor EEC.	24
61.	List of pesticides classified by WHO as in Class 1A, "Extremely hazardous"	24
62.	List of pesticides classified by WHO as in Class 1B, "Highly hazardous"	25
63.	Compounds available in South Pacific but not registered for use in Australia nor New Zealand.	26

FIGURES

figure number	title	page number
1.	Map of South Pacific	11
2.	Map of South Pacific showing number of pesticides available per country	109
3.	Map of South Pacific showing quantities of pesticides used in selected countries	133
4.	Drawings showing proportion of major types of pesticides used in selected South Pacific countries, by value quantity; and for South East Asia.	134
5.	Diagram showing proportion of pesticides used in South Pacific compared to rest of the world.	140

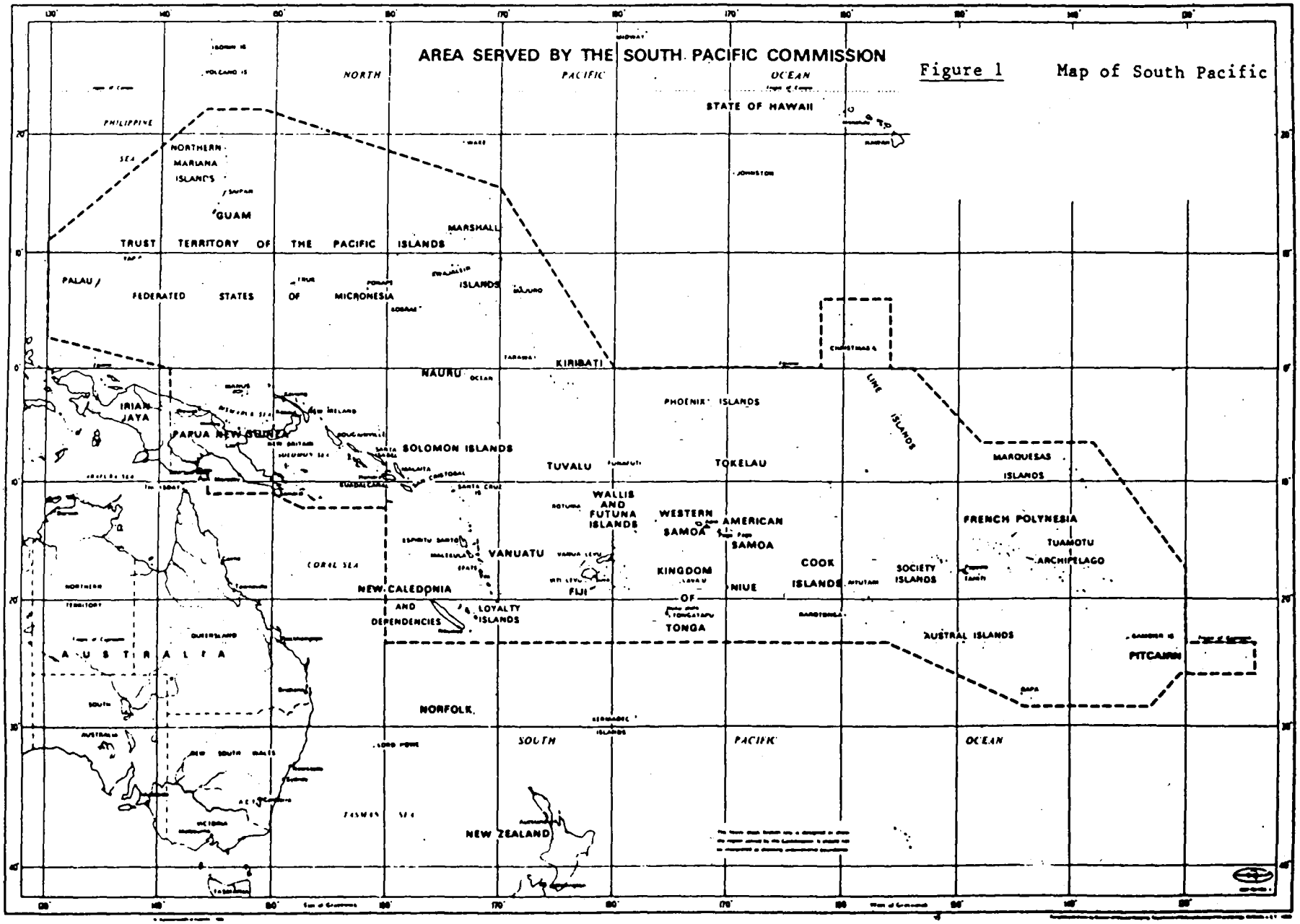


Figure 1 Map of South Pacific

(Cover photo: Michel H.T.T. Programme Radiométrie - ORSTOM)

PART A

PESTICIDES REVIEW

CHAPTER 1 BACKGROUND AND AIMS OF REVIEW

1.1 INTRODUCTION

In 1985, FAO ratified an 'International Code on the Distribution and Use of Pesticides' (FAO, 1985) (section 8.3) Whilst admirable in its intentions, it makes certain assumptions including that 'importing countries have effective legislation and the infrastructure necessary to regulate importation, sale and distribution'. The many small island states and territories of the South Pacific (see Figure 1) provide good examples of places where neither effective legislation nor infrastructure for enforcement exist. As a consequence many hazardous pesticides are amongst the multitude of those available and used throughout the region, often by people unaware of the hazards. It is impossible to determine precisely the quantities used since reliable data do not exist. Many of those pesticides used are classed by WHO as extremely and highly hazardous. Many are banned or are severely restricted or are classed 'restricted use' pesticides elsewhere in the world. Possibly some of the products (probably only a few) are being 'dumped' in the South Pacific countries as they can no longer be sold in many other countries.(No information exists on dumping in the South Pacific). It is generally known that some formulations of pesticides of dubious quality are being imported from countries with little or questionable quality control. However the fact that many of those pesticides which are known to be hazardous or environmentally persistent are freely available in the region, is sufficent requirement for us to take heed.

At the first consultative meeting of the Research and Training Institutions in the South Pacific Region held at the University of the South Pacific in Suva, Fiji, from 18-20th April, 1983 the South Pacific Regional Environment Program (SPREP) Research and Monitoring Network was established (SPREP, 1983 - Biblio No 590). This meeting proposed (under Recommendation 3) a **Biocides Project** as follows:

> It was recommended that the UPNG Science Faculty, in co-operation with other institutions of the region, prepare for December 1983, a report which:
>
> (a) reviews the existing information on biocides use and abuse within the region and on the levels of residues within environmental samples;
>
> (b) identifies the existing legislation on importation storage, use and disposal, and its enforcement within the region; and

(c) presents a detailed proposal for monitoring of biocides in environmental samples within the region.

UPNG Science Faculty subsequently appointed Dr. David Mowbray to be the principal investigator. After discussion with colleagues it was decided that a more extensive appraisal of the problems associated with pesticide use in the South Pacific was warranted. The title of the project was changed to "Pesticide Project". The aims of the project were therefore expanded to be as follows:

(a) To review existing information on pesticides' use and abuse within the region and on the level of residues within environmental samples;

(b) To identify laboratories in the region with facilities for doing analyses of particular pesticide residues, to list equipment available and to list appropriate methods;

(c) To identify personel in the region with expertise and experience for monitoring pesticide residues;

(d) To identify the existing legislation on importation, sale, storage, use and disposal and its enforcement within the region, and registration requirements;

(e) To present a detailed proposal for monitoring of pesticides in humans, foodstuffs and environmental samples within the region.

Consequently a draft report entitled "SPREP: Pesticide Project. A Review of Pesticide Use in the South Pacific, with a Proposal for Establishing a Pesticide Monitoring and Evaluation Network" was prepared for the Second Consultative Meeting of Research and Training Institutions in the South Pacific Region, UPNG, from 23-27 January, 1984 (Mowbray,1984a - Biblio No 625).

This 1984 draft report has been ammended, corrected and extended on the basis of responses obtained in correspondence with government and company personel in the South Pacific countries, and in Australia and New Zealand; and from information obtained from recent publications and conferences. Included in the revised and updated report is information from chemical companies, information on pesticides used in quarantine, and quantitative data on pesticide use in some South Pacific countries.

This final report attempts to summarise all this information coherently, and makes (repeats) recommendations for action.

The author of this report accepts as self evident the positive benefits which accrue from the safe and efficient use of pesticides in the South Pacific. **The objective of this report is to help ensure that safe and efficient use in the region!**

1.2 DEFINITION OF PESTICIDES

Pesticides as covered in the project include acaricides, biological pesticides (bacteria, viruses), defoliants, dessicants, fumigants, fungicides, herbicides, insecticides, molluscicides, nematicides, rodenticides and synergists. Pesticides included are those used in plant protection, in animal health (products for external use only), in human health programmes and for urban pest control.

Substances not included in the survey are attractants, avicides, bactericides, antiseptics, growth promoters, growth regulants, repellants, sterilants, vermin destroyers not included above, and animal health products for internal use such as anthelmintics, coccidiostats and vaccines which are normally regarded as pharmaceuticals or veterinary products (though a few of these are listed in Table 3).

1.3 PROJECT METHODOLOGY

To gather as much information as possible for the draft report, the following approaches were taken:

1. A questionaire was compiled (See Appendix A), and was sent in July 1983 to each of the following countries of the South Pacific Commission, and to Australia and New Zealand.

   American Samoa, Commonwealth of Northern Mariana Islands, Cook Islands, Federated States of Micronesia, Fiji, French Polynesia, Guam, Kiribati, Marshall Islands, Nauru, New Caledonia, Niue, Palau, Papua New Guinea, Pitcairn Island, Solomon Islands, Tokelau, Tonga, Tuvalu, Vanuatu, Wallis et Futuna, Western Samoa.

   An alphabetical listing of 503 pesticides and related compounds was enclosed. The respondants were asked to answer the questions and to tick and/or add to the list those pesticides used or recommended or registered for for use in their country. Up to 8 copies of the questionnaire and pesticide list were sent to each country, at least one to each of the Agricultural Department, Health Department or its equivalent if extant. Copies were also sent to other persons concerned with the use of pesticides in each country.

2. For Papua New Guinea, I corresponded, visited and talked with persons in the Department of Primary

Industry, Department of Health, Office (now Department) of Environment and Conservation, Department of Forests, World Health Organization, representatives of various provincial governments, city councils and representatives of the companies which are the principal pesticide distributors and users in PNG. Many small wholesale and retail sellers in the Port Moresby region were also visited.

3. During October and November, 1983, I visited the following countries:

Guam	October	20	-	23
Phillipines	October	24	-	30
Western Samoa	November	20	-	21
Fiji	November	22	-	28
Tonga	November	29	-	30
New Caledonia	November	30	-	December 1
Vanuatu	December	1	-	4
Solomon Islands	December	5	-	6

I again visited New Caledonia from February 13 - 17, 1984.

In each country I visited persons in agricultural, health and/or environment departments, and also wholesale and retail sellers of pesticides.

In Guam, I visited the University of Guam (UOG). In Fiji, I visited both the University of the South Pacific (USP) and the Plant Protection Section of the South Pacific Commission.

I visited the Phillipines to attend a conference on 'Regional Consultation on Harmonization of Pesticide Registration Requirements' for South East Asia and the Pacific, at Baguio City, November, 1983.(Mowbray, 1983 - Biblio No 624)). The conference was jointly sponsored by the United Nations Industrial Development Organisation (UNIDO), Food and Agriculture of the United Nations (FAO) and the Fertilizer and Pesticide Authority of the Phillipine Government.

4. Two library data searches were done through the National Library of Australia, one on 'Pesticides in the South Pacific'. Other library searches were done by the Library of the USP, and at the Library of the University of Papua New Guinea (UPNG).

5. I have collected many publications on pesticide use in third-world countries, particularly in South East Asia and the Pacific. These publications have provided a valuable source of information.

6. Copies of the 1984 draft report were sent either on the 2nd February or the 4th March, 1984 to all persons listed on Page 7 of the 1984 Report (Mowbray, 1984a - Biblio No 625) , and to personel in countries and territories which had not responded. These people were asked to check and where necessary correct the information. Those contacted in countries which had not provided information were asked to do so.

7. During 1985, a questionnaire on pesticides used in quarantine was compiled with the assistance of Dr Alphonse Benoit of the Department of Agriculture (UPNG), (now part of the University of Technology, Lae). This questionnaire together with a list of pesticides known to be used in quarantine, derived partly from Stout and Roth, 1983 - Pub.No H1) (see Appendix B) were sent to each of the countries and territories of the South Pacific Commission on the 2nd December, 1985. The responses to this questionnaire have been incorporated into the updated report.

8. During 1984 - 1986 further information was obtained through comments and feedback on papers and articles presented at conferences or submitted for publication.

I presented a number of papers on pesticide use and/or legislation in the South Pacific to conferences: two papers summarising the intiial report were presented to the Fourth Regional Technical Meeting of Plant Protection of the South Pacific Commission in Noumea, February 13 - 17, 1984 (Mowbray, 1984b; Mowbray 1984c - Biblio Nos 600, 626) . I also attended the Regional Forum on Pesticide Toxicology in the Philippines, April 22 - 26, 1985 (Mowbray 1985a - Biblio No 601)). Both conferences provided valuable feedback.

I prepared two semi-popular articles summarising the situation for The Siren (Mowbray,1985b - Biblio No 627) and for Ambio (Mowbray,1986a - Biblio No 628). These have also elicited a valuable response.

The draft of the paper, subsequently published in Ambio (Mowbray, 1986a) was forwarded on 14 August, 1985 to chemical companies known to supply pesticides throughout the region. The companies were asked to list the chemicals they supply to South Pacific countries, and to comment on the Ambio article.

Two papers have been written on the situation in Papua New Guinea; one on poisoning (Mowbray,1986b - Biblio No 370/606); the second on pesticide use (Mowbray and Sutherland,in press - Biblio No 393). The referees reviewing these articles have given valuable comments

and feedback.

9. A great deal more quantitative information was obtained, particularly for PNG, through continuing correspondance with government departments and research institutions.

I assisted the Tropical Development and Research Institute (TDRI) with a survey on 'pesticide container use' in Papua New Guinea, to assess the extent to which, and the ways in which pesticide containers are re-used after the original pesticide has been spent.

Much quantitative data has been compiled, with great assistance from the local chemical companies and government officers, on the amounts of pesticides used in PNG. Ms Lois Kesu redid a survey on pesticide formulations available in retail and wholesale outlets in Lae and Port Moresby (the two major cities in PNG). Ms Kesu was recently appointed Chemicals Officer in the PNG Department of Environment and Conservation, and will be responsible for co-ordinating registration of pesticides in PNG.

CHAPTER 2. SITUATION IN SOUTH PACIFIC COUNTRIES

2.1 RESPONSES TO QUESTIONNAIRE

Questionnaires and List of Pesticides (see Appendix A) were initially sent out on July 12, 1983. By December 14, 1983, 17 countries had responded to the questionnaire. American Samoa, Cook Islands, Federated States of Micronesia, Marshall Islands, Nauru, Palau, and Wallis and Futuna had not then responded. Nine had listed pesticides used but had not completed the questionnaire. Since the response from Northern Marianas was from Trust Territory of the Pacific Islands Environmental Protection Board (TTEPB), it was presumed to report the situation in the Federal States of Micronesia (FSM), Marshall Islands and Palau as well. Accordingly the response from Northern Marianas was treated in the draft report as being from TTPI. Information on Cook Islands was provided by the Plant Protection Officer of SPC.

The draft report (Mowbray, 1984 - Biblio No 625) was distributed between February and March, 1984. By June 1984, most countries had responded so that fairly complete information was available for all countries, except Nauru and Wallis et Futuna. Despite numerous letters, no response has ever been received from either Nauru or Wallis et Futuna. Since June, 1984, further correspondence has been received from many countries providing updated information. Furthermore, the response from the Northern Marianas has been separated from that of the Federated States of Micronesia (FSM), Marshall Islands and Palau, which have been treated collectively as the TTPI.

2.2 FOCAL POINTS

Table 1 gives the names of the respondants from each country (or their successor). These persons should be regarded as key focal points in the future for any correspondence on pesticide matters in these South Pacific Countries. This list is correct, to my knowledge, as of October,1986 (with known corrections as of July 1987).

2.3 SUMMARY OF RESPONSES TO QUESTIONNAIRE

Table 2 gives an abridged and updated summary of the responses from each country. These responses are referred to continually in the following report.

Table 1 : List of Persons who responded to questionnaire. and/or provided important information. (In some cases the predecessor of the named person also provided information).

American Samoa	Mr. Fa'amanu I. Falaniko Pesticide Officer Environmental Protection Agency, Office of the Governor, Government of American Samoa, PAGA PAGO, AMERICAN SAMOA 96799 Dr Tofiga Liaiga, Public Health Officer, Dept of Health Services, Public Health Division, Government of American Samoa, PAGO PAGO, AMERICAN SAMOA 96799
CNMI (Commonwealth of the Northern Mariana Islands)	Mr William B. Loop, Chief, Division of Environmental Quality Dept. of Public Health and Environmental Services, CNMI Government, SAIPAN, MARIANA ISLANDS 96950. C.N.M.I. Mr Ignacio (Ike) Cabrera Co-ordinator, Pesticide Program Division of Environmental Quality Dept. of Public Health and Environmental Services, PO Box 1304 CNMI Government, SAIPAN, MARIANA ISLANDS 96950. C.N.M.I.
Cook Islands	Mr. W.J. Hosking, Secretary Ministry of Agriculture and Fisheries, Cook Islands Government, P.O Box 96, RAROTONGA, COOK ISLANDS.

Mr. Poona Samuel,
Quarantine Officer,
Ministry of Agriculture and Fisheries,
Cook Islands Government,
P.O Box 96,
RAROTONGA, COOK ISLANDS.

Ms Sue Dabney,
Public Health Department,
Ministry of Health,
P.O. Box 109,
RAROTONGA, COOK ISLANDS.

Fiji

Mr. S.R. Singh,
Principal Research Officer and
Pesticide Registrar,
Koronivia Research Station,
Division of Plant Protection,
P.O. Box 77,
NAUSORI, FIJI.

Mr. K. Kumar,
Senior Research Officer,
Koronivia Research Station,
Division of Plant Protection,
P.O. Box 77,
NAUSORI, FIJI.

Mr Moti L. Autar
Entomologist
Koronivia Research Station,
Division of Plant Protection,
P.O. Box 77,
NAUSORI, FIJI.

French Polynesia

M. Jean-Louis Reboul,
Centre de Cooperation Internationale en
Recherche Agronomique pour le
Developpement (CIRAD)
(formerly Gerdat - Irat)
Mission de Recherche Agronomique,
B.P. 494,
PAPEETE, TAHITI,
POLYNESIE FRANCAISE.

M. Jacques Larcher
Le Directeur du CIRAD-Polynesie
Agence de Polynesie
B.P. 494,
PAPEETE, TAHITI,
POLYNESIE FRANCAISE.

Dr. P. Delebecque
Chief, Service d'Hygiene et
de Salubrite Publique,
B.P. 611,
PAPEETE, TAHITI,
POLYNESIE FRANCAISE

GUAM

James B. Branch,
Deputy Administrator,
Guam Environmental Protection Agency,
P.O. Box 2999,
AGANA, GUAM 96910

Mr. Virgilio Obias
Pesticide Control Program
Guam Environmental Protection Agency
P.O. Box 2999,
AGANA, GUAM 96910

Kiribati

Mr Manate Tenang
Chief Agricultural Officer
(formerly Dr. Edwin Dharmaraju,
CFTC Senior Entomologist),
Division of Agriculture,
Ministry of Natural Resources
Development,
P.O. Box 267, Bikenibeu,
TANAEA, TARAWA.
REPUBLIC OF KIRIBATI.

Nauru

No response.

Suggested contacts are:

Mr S.S. Macker,
Project Engineer,
Dept of Island Development and Industry,
REPUBLIC OF NAURU

and

Mr Don Lauder,
Nauru Phosphate Commission
REPUBLIC OF NAURU

New Caledonia	M. J. Kusser, Le Secretaire du Comite pour la Protection de l'Environnement, Service des Forets et du Patrimoine Naturel, B.P. 285. NOUMEA, NOUVELLE - CALEDONIE
	M. Remy Amice, Service Veterinaire et du Controle de la Qualite des Produits Agro- alimentaires, Direction du Developpement de l'Economie Rurale B.P 11, NOUMEA, NOUVELLE - CALEDONIE
Niue	Mr. Bradley Punu, Acting Director, Department of Agriculture & Fisheries, P.O. Box 3, ALOFI, NIUE.
	Mr. P. Erick, Principal Health Inspector, Health Department, P.O Box 33, ALOFI, NIUE.
Papua New Guinea (PNG)	Ms. Lois Kesu, Chemicals Officer, Department of Environment and Conservation, P.O Box 6601, BOROKO, N.C.D., PNG.
	Mr. Fred Dori, Chief Entomologist, Department of Agriculture and Livestock, P.O. Box 2417, KONEDOBU, N.C.D., PNG.
	Dr. David Mowbray, Biology Department, University of Papua New Guinea, P.O. Box 320, University P.O. N.C.D., PNG.

Pitcairn Island	Mr. G.D. Harraway, Office of the Governor of Pitcairn Island, C/- British Consulate General, Private Mail Bag, AUCKLAND. NEW ZEALAND.
Solomon Islands	Mr. John Abington, Chief Research Officer and Pesticide Registrar, (formerly Mr Bob Macfarlane) Ministry of Agriculture and Lands P.O. Box G13, HONIARA, SOLOMON ISLANDS.
Tokelau	Mr F. Toloa A/ Director of Agriculture & Fisheries, (formerly Mr Semu Uili), Director of Agriculture & Fisheries, Office for Tokelau Affairs, P.O. Box 865, APIA, WESTERN SAMOA.
Tonga	Dr. Dirk H. Stechmann / Mr Konrad Englberger, (formerly Mr Neils von Keyserlingk) Tongan-German (GTZ) Integrated Plant and Protection Project, P.O. Box 881, NUKU'ALOFA, TONGA.
	Mr 'Ofa Fakalata Tongan-German Plant Protection Project, P.O. Box 14, MAFF, NUKU'ALOFA, TONGA.
	Dr T. Puloka, Senior Medical Officer, Public Health, or: Mr. Latu Sateki Telefoni, Health Inspector, Environmental Health Section, Ministry of Health, NUKU'ALOFA, TONGA.

Trust Territory of the Pacific Islands
(TTPI)
includes:
.Federated States of Micronesia:
.Marshall Islands:
.Palau (Belau):

Mr Gregory Baker
TTEPB Executive Officer
(formerly Mr Masao Ueda,
Chairman,)
Environmental Protection Board,
Office of the High Commissioner,
Trust Territory of the Pacific Islands,
SAIPAN, MARIANA ISLANDS 96950,
C.N.M.I.

(see below)

Tuvalu

Mr Fred Pullen
Chief Agricultural Officer
Ministry of Commerce and Natural
Resources,
P.O. Box 38
FUNAFUTI ATOLL,
TUVALU.

Dr K.P. Laupepa,
Senior Medical Officer,
Ministry of Social Services
Vaiaku
FUNAFUTI ATOLL,
TUVALU.

Vanuatu

Mr. Bob Weller,
Senior Plant Quarantine Officer,
Department of Agriculture, Livestock
and Forestry,
P.O. Box 129,
PORT VILA,
VANUATU.

Wallis and Futuna

no response.

Suggested contact is:
Le Responsable du Service de l'Economie
Rurale,
B.P. 19,
MATA UTU,
WALLIS ET FUTUNA.

Western Samoa

Mr. Ioane Aloali'i,
Acting Senior Crop Protection Officer
(formerly Mr Semisi T. Semisi,
Chief Crops Officer)
Department of Agriculture & Forestry,
P.O. Box 206,
APIA.
WESTERN SAMOA.
or:
Dr Hans Braune
Project Manager
Samoan-German (GTZ) Crop Protection
Project,
P.O. Box 597,
APIA,
WESTERN SAMOA.

Australia

Mr Greg N. Hooper
(formerly Mr Jack T. Snelson)
Pesticide Coordinator,
Pesticide Section,
Department of Primary Industry,
Queen Victoria Terrace,
CANBERRA, ACT, 2600.
AUSTRALIA.

Dr Alan Black
Medical Advisor in Toxicology
Commonwealth Department of Health
PO Box 100 Woden
CANBERRA, ACT, 2606.
AUSTRALIA.

New South Wales	The Registrar of Pesticides Pesticide Registration Section Department of Agriculture P O Box K220 HAYMARKET NSW 2000
Victoria	Chief Chemist Division of Agricultural Chemistry Department of Agriculture GPO Box 4041 MELBOURNE VIC 3001
Queensland	Director of Agricultural Standards and Standards Officer Department of Primary Industries GPO Box 46 BRISBANE QLD 4001
South Australia	Registrar, Agricultural Chemicals, Department of Agriculture GPO Box 1671 ADELAIDE SA 5001
Western Australia	Secretary Pesticides Advisory Committee Department of Health & Medical Services GPO Box C134 PERTH WA 6001
Tasmania	Registrar of Pesticides Division of Public Health Department of Health Services Public Buildings 34 Davey Street HOBART TAS 7000
New Zealand	Mr. Brian Watts, Registrar of Pesticide (also Mr David Lunn) Ministry of Agriculture Pesticides Board, Private Bag, WELLINGTON, NEW ZEALAND.

Regional International Agencies

South Pacific Commission Plant Protection Office	Mr Bob Macfarlane Plant Protection Officer, (formerly Mr Bob Ikin) South Pacific Commission, Pacific Media Centre P.O. Box 2119, SUVA, FIJI.
UNDP/FAO-SPC Project for Strengthening Plant Protection and Root Crop Development in the South Pacific	Dr Bernard Zelazny Team Leader/ Plant Protection Officer, (formerly Mr Ivor Firman) Plant Protection Project, U.N.D.P. Private Mail Bag, SUVA, FIJI.

The Trust Territory Environmental Protection Board terminated all operations on the 31st January 1987.

Focal points or contact persons for each of the Governments of the Marshall Islands , Federated States of Micronesia and Palau are from now on as follows:

MARSHALL ISLANDS

Rachel Dagovitz
General Manager
Marshall Islands Environmental Protection Authority, Hospital
MAJURO,
MARSHALL ISLANDS 96960

FEDERATED STATES OF MICRONESIA

Donna Scheuring,
Executive Officer
FSM Environmental Protection Board
FSM Health Services
KOLONIA,
POHNPEI 96941

PALAU

Lucio Abraham,
Executive Officer
Palau Environmental Quality Protection Board, Hospital
KOROR,
PALAU 96940

TABLE 2:: Summary of responses to pesticide questionaire, forwarded on 12 July, 1983. (Copy of questionaire is included as Appendix A).

Countries included in the table are [in order]:

American Samoa, Commonwealth of the Northern Mariana Islands, Cook Islands, Fiji, French Polynesia, Guam, Kiribati, Nauru, New Caledonia, Niue, Papua New Guinea, Pitcairn Island, Solomon Islands, Tokelau, Tonga, TTPI, Tuvalu, Vanuatu, Wallis and Futuna, Western Samoa, Australia and New Zealand.

Note: Federated States of Micronesia, Marshall Islands, and Palau are grouped together under the title Trust Territory of the Pacific Islands (TTPI).

Responses have been modified in the light of other information available, and correspondence received from focal points since February, 1984 upto October 1986.

		American Samoa	Cook Islands	Fiji	French Polynesia
1.	Registration of PesticidesF				
1.1	Do you have a Registrar of Pesticides, or Pesticide Advisory Committee and do you keep a register of all pesticides allowed to be used in your country?	Follows registration approved by US EPA. All pesticides must be EPA registered products. The Pesticides Officer formerly with the Dept of Agriculture now administers the "Pesticide Program" which regulates the importation, sale, distribution and use of pesticides. The Director of Agriculture upon the advice of the Pesticide Officer recommends the appropriate types and quantities of pesticides to be imported. However Pesticide Program is now under American Samoa Environmental Protection Agency.	No registrar nor any recognised body responsible for the regulation of pesticides. However all pesticides must be approved for use by the Ministry of Agriculture and Fisheries. (At present NZ Pesticide Board assisting to formulate legislation and registration).	Yes - have a Registrar - (Principal Research Officer, Department of Agriculture), an advisory committee and an official register.	There is no official Central "Register" or "Registrar", of Pesticides in French Polynesia. However, there is a Pesticide Commission, presided over by the Government Councillor ("Minister") for Rural Economy (Agriculture). The role Of the Commission is defined by enabling legislation (Delib. No. 74-86, 3 July,. 1974, Article 4). There is also an official list by cate- of all pesticides allowed for importation/sales/use in the Territory. As products are approved, they are listed in the Official Govt Journal of the Territory. It should be noted that in drawing up the first basic list, the WHO revised (May 1971) Directives were used as guidelines.

		American Samoa	Cook Islands	Fiji	French Polynesia
1.2	When pesticides are considered for registration (or simply for use) does the importer/ manufacturer have to provide information, including such as ISO common name, chemical name, physical/chemical properties of pesticide and/or pesticide formulation, analytical methods for determining residues of active ingredient, toxicological data, and evidence of registration elsewhere - for example in Australia, New Zealand, USA, UK, or Fiji?	As for EPA registration.	Has adopted New Zealand's general policies on pesticide regulations. It is normal practice for the manufacturers to supply pesticides properly labelled, however, information on analytical methods for determining residues of active ingredient, toxicology data and evidence of registration elsewhere are normally supplied by the manufacturers (on request) when the pesticide is introduced. Importers requiring further information on the pesticides they sell usually refer buyers to the Ministry of Agriculture. It is an adopted practice by the manufacturers to notify the Ministry of Agriculture about the chemical they intend to market in the Cook Islands and they normally supply the Ministry with samples of the pesticide for screening by the Ministry's Research Division.	Requires all of the information given in question 1.2 - much of which must be included on label. Other relevant information is also required.	Local legislation does not specify in detail the information which must be submitted in accompaniment to a demand for approval of a pesticide product. However, it has been the practice of the regulatory agencies (Agriculture for agricultural pesticides, Health for others) charged with processing the demands for approval by the Pesticides Commission, to request similar information to that listed in question 1.2 .

		Guam	Kiribati	Nauru	New Caledonia
1.	Registration of Pesticides				
1.1.	Do you have a Registrar of Pesticides, or Pesticide Advisory Committee, and do you keep a register of all pesticides allowed to be used in your country?	Manufacturers of pesticides must register any pesticide or other substances intended for sale to control pests in the Territory of Guam with Federal EPA (US EPA). The Guam EPA does not initially register pesticide products	Do not have a Registrar of Pesticides, Pesticide Advisory Committee nor Register of Pesticides. However all information about pesticides imported into the country like -name of the pesticide, country from which imported, quantity, its use, and other details- are available in the files maintained by the Chief Agricultural Officer, Ministry of Natural Resources Development.	No response	There is no Registrar of Pesticides nor Commission of Pesticides . Rely on French registration to recommend active ingredients and application rates. The Public Health and Hygiene Service regularly publishes the list of new substances in tables of Toxic and Dangerous Substances, but this simply follows the list produced in France for new homologues.
1.2	When pesticides are considered for registration (or simply for use) does the importer, manufacturer have to provide information, including such as ISO common name, chemical name; physical/chemical properties of pesticide and/or pesticide formulation, analytical methods for determining residues of active ingredient, toxicological data, and evidence of registration elsewhere - for example in Australia, New Zealand, USA, UK, or Fiji?	Pesticide manufacturers are required to provide scientific evidence that their products are effective for the purposes intended and will not injure humans, livestock, crops or wildlife when used as directed	At present when pesticides are considered for use information is obtained either from New Zealand or Australia.	No response	Pesticides imported into the Territory were regulated under Deliberation No. 183 of 26/9/1969. This regulation prescribes obligations of importers and sellers (according to the class of pesticide) and sets out the labelling requirements. This regulation was not enforced on pesticides of foreign (non-French) origin. In February 1986 Arrete No. 86-040 was passed regulating the sale and use of agricultural pesticides; it includes mandatory labelling in French, the banning and restriction of use of some pesticides and sets conditions on use of others.

		Niue	Papua New Guinea	Pitcairn Island	Solomon Island
1.	Registration of Pesticides				
1.1.	Do you have a Registrar of Pesticides, or Pesticide Advisory Committee, and do you keep a register of all pesticides allowed to be used in your country?	No- Niue does not have a Registrar of Pesticides, but all pesticides used must be registered in New Zealand.The Dept. of Agriculture decides on the type of pesticides to buy from New Zealand.	To date no registrar, advisory committee nor register. However, regulations are about to be gazetted to create each. A list of all pesticides available in PNG has been made by Dr Mowbray of UPNG together with the Chemicals Officer of the Dept of Environment who will maintain the register & co-ordinate the activities of the Advisory Committee (termed the Pesticide Working Party).	All imported pesticides are in the control of the Agricultural Officer who is also the Head Forester. No register is kept of pesticides allowed to be used in Pitcairn. In practice, however the range of pesticides available for use in Pitcairn is similar to those used in New Zealand from whence all of Pitcairn's pesticides are imported.	Yes - have a Registrar of Pesticides (Chief Research Officer, Ministry of Agriculture and Lands) a Pesticide Advisory Committee and an official Register which includes restrictions and conditions of sale.
1.2	When pesticides are considered for registration (or simply for use) does the importer/ manufacturer have to provide information, such as ISO common name, chemical name, physical/ chemical properties of pesticide and/or pesticide formulation, analytical methods for determining residues of active ingredient, toxicological data, and evidence of registration elsewhere - for example in Australia, New Zealand, USA, UK, or Fiji?	Whatever pesticide is registered in New Zealand also applied on Niue.	Varies - sometimes when pesticides are considered for use information is obtained from Australia or from chemical companies. With new regulations procedures have been drawn up where pesticide formulations not registered in such countries will have to provide such detailed information.	Not available	Yes - regulations provide for requirements for information set out in question 1.2 and more, and includes proof that the formulation has current registration for use in Australia, New Zealand, Hawaii, UK, Japan or Fiji

		Tokelau	Tonga	TTPI	Tuvalu
1.	Registration of Pesticides				
1.1	Do you have a Registrar of Pesticides, or Pesticide Advisory Committee, and do you keep a register of all pesticides allowed to be used in your country?	Do not have either a Pesticide Registrar or a Pesticide Advisory Committee, and there is no proposal to create such	Officially yes - have a Registrar (Director of Agriculture) and a register, and an advisory committee- but above does not function. Unofficial register kept by Chief Plant Protection Officer who in consultation with others, recommends what should or should not be used	The TT EPB is responsible for controlling the use of pesticides in the TTPI, and adopts the registration of pesticides approved by the US EPA under the FIFRA	Do not have a Registrar of Pesticides nor a Pesticide Advisory Committee. However do keep a register of pesticides allowed into the country
1.2	When pesticides are considered for registration (or simply for use) does the importer/ manufacturer have to provide information, including such as ISO common name, chemical name; physical/chemical properties of pesticide and/or pesticide formulation, analytical methods for determining residues of active ingredient, toxicological data, and evidence of registration elsewhere - for example in Australia, New Zealand.		Registration is not enforced. Information as in question 1.2 is requested when considering use of pesticides	Registration of pesticides is done by the US EPA and is done under their rules and regulations (which require detailed information on all properties listed in question 1.2). The TT EPB may register pesticides for special local uses and/or experimental studies	No

		Vanuatu	Wallis & Futuna	Western Samoa	CNMI
1.	Registration of Pesticides				
1.1	Do you have a Registrar of Pesticides, or Pesticides Advisory Committee, and do you keep a register of all pesticides allowed to be used in your country?	At present there is no Registrar nor Advisory Committee of Pesticides nor register. The Health Department has drafted legislation on chemical imports which is mainly for drugs and medicines but also includes some agrochemicals (Have requested FAO assistance to formulate legislation and registration).	No response	No, no registrar, no advisory committee, no register.	The Dept. of Environmental Quality (DEQ) uses information provided by the USEPA for pesticide classification and registration. This information includes pesticides that are banned, have restricted uses, and other constraints. Only those pesticides that have an US EPA registration number are allowed to be used in the CNMI. DEQ also conducts an inventory of pesticides being used by applicators and sold by retailers.
1.2	When pesticides are considered for registration (or simply for use) does the importer, manufacturer have to provide information, including such as ISO common name, chemical name; physical/ chemical properties of pesticide and/or pesticide formulation, analytical methods for determining residues of active ingredient, toxicological data, and evidence of registration elsewhere - for example in Australia, New Zealand, USA, UK, or Fiji?	No information required at present			Registration of pesticides must meet the requirements of the USEPA FIFRA (P.L. 95-396) and DEQ regulations

		Australia	New Zealand
1.	Registration of Pesticides		
1.1	Do you have a Registrar of Pesticides, or Pesticide Advisory Committee, and do you keep a register of all pesticides allowed to be used in your country?	No pesticide may be offered for sale until it has been registered by the relevant authority in that State. No new pesticide may be registered or offered for sale until it has been cleared by the Technical Committee on Agricultural Chemicals. Each State has its own Registrar, advisory committee and register - though Registrar may be known by another title. Department responsible varies: NSW - Agriculture Victoria - Agriculture Queensland - Primary Industry South A. - Agriculture Western A. - Health Tasmania - Health	There is a N.Z. Registrar of Pesticides, and a Pesticide Board, set up under the Pesticides Act, 1979, which controls the use of pesticides A register of pesticides is kept. All pesticides used are required to be registered.
1.2	When pesticides are considered for registration (or simply for use) does the importer, manufacturer have to provide infor- to provide information, including such as ISO common name, chemical name; physical/chemical properties of pesticide and/or pesticide formulation, analytical methods for determining residues of active ingredient, toxicological data, an evidence of registration elsewhere - for example in Australia, New Zealand, USA, UK, or Fiji?	Extensive information has to be provided by the manufacturer/formulator/importer. Details of the information required can be obtained from the regulations under each State Act (See Text). The requirements for clearance by the Technical Committee on Agricultureal Chemicals are set out in Document PB310 "Requirements for Clearance of Agricultural Chemicals" (See Text)	The publication "Procedures for Registration and Experimental Use Permits" (See Text) details the information required before an application to register a pesticide is considered

		American Samoa	Cook Islands	Fiji	French Polynesia
2.	List of Pesticides Used and Distributors				
2.1	Attached is an alphabetical list of common names of many pesticides. Could you please tick all those pesticides used or recommended for use or registered for use in your country.....	See Table 3	See Table 3	See Table 3	See Table 3
	Total Number of Pesticides (active ingredient) Used or Recommended or Registered for Use.....	43	94	155	418
2.2	Could you provide a list of companies that import and distribute pesticides in your country, or do Government Departments import directly?	See Table 28. The major importer is the Government Department of Material Management, with the Department of Health and three private companies importing small amounts, including a pest control firm.	See Text. The Government Chemical Store used to supply the pesticides used in high volume but now mostly supplied thru private companies. Ministry of Health, the Ministry of Agriculture, the CI Government Liquor Store, the Totokoitu Research Station and the DSIR also import/distribute pesticides.	See Table 28. Health Dept may import.	See Table 28 Government Services either import directly or pass their orders via the approved importers
	Total Number of Main Importers and Distributors	5	4 or 10 (according to source)	> 12 (includes one company which formulates)	> 30

		American Samoa	Cook Islands	Fiji	French Polynesia
3.	Recommendations for Pesticides Use				
3.1	Could you forward any booklet, brochure, pamphlet produced in your country which lists recommendations for use of pesticides?	See Text (But no locally produced materials)	See Text	See Text	See Text
	Types of publications		Brochures, booklets, report.	Cyclostyled notes and published books	Technical bulletins

		Guam	Kiribati	Nauru	New Caledonia
2.	List of Pesticides Used and Distributors				
2.1	Attached is an alphabetical list of common names of many pesticides. Could you please tick all those pesticides used or recommended for use or recommended for use or registered for use in your country.....	See Table 3	See Table 3		See Table 3
	Total Number of Pesticides (active ingredient) Used or Recommended or Registered for Use.....	107	11	2 +	206
2.2	Could you provide a list of names and addresses of companies that import and distribute pesticides in your country; or do Government Departments import directly?	See Table 28 The Vector Contorl program within the Department of Public Health often purchases their pesticide supplies from local sources	Importation and distribution of agricultural pesticides done solely by the Division of Agriculture, Ministry of Natural Resources Development. Pesticides for household use in the form of aerosols are imported by private dealers.		See Table 28 The two most important importers are the Agriculture and Health Departments.
	Total Number of Main Importers and distributors	10 - 33 (according to source)	3		11
3.	Recommendations for Pesticide Use				
3.1	Could you forward any booklet. brochure, pamphlet produced in your country which lists recommendations for use of pesticides?	See Text	Nil		Non-existent
	Types of publications	Pamphlets, small books, circulars			

		Niue	Papua New Guinea	Pitcairn Island	Solomon Island
2.	List of Pesticides Used distributors				
2.1	Attached is an alphabetical list of common names of many pesticides. Could you please tick all those pesticides used or recommended for use or registered for use in your country.....	See Table 3	See Table 3	See Table 3	See Table 3
	Total Number of Pesticides (active ingregient) Used or Recommended or Registered for Use.....		275	6	125
2.2	Could you provide a list of names and addresses of companies that import and distribute pesticides in your country, or do Government Departments import directly?	See Table 28 All pesticides purchased through Government Store.	See Text - Table 28 Health Dept. imports directly. One company processes pyrethrin which is grown locally. Plantations often import their own chemicals.	One Government Department, Forestry, imports directly	No chemical companies now operate. Large companies import their own. However one garden shop operates and Health Dept. imports directly
	Total Number of Main Importers and Distributors	2	15 (3 major)	1	1
3.	Recommendations for Pesticide Use				
3.1	Could you forward any booklet, brochure, pamphlet produced in your country which lists recommendations for use of pesticides?	Yes, but none available.	See Text	No booklets produced	See Text
	Types of publications		Many pamphlets brochures, technical bulletins and books exist		One book produced on weeds, and advisory leaflets produced

		Tokelau	Tonga	TTPI	Tuvalu
2.	List of Pesticides Used and distributors				
2.1	Attached is an alphabetical list of common names of many pesticides. Could you please tick all those pesticides used or recommended for use or registered for use in your country.....	See Table 3	See Table 3	See Table 3	See Table 3
	Total Number of Pesticides (active ingredient) Used or Recommended or Registered for Use.....	5	92	375	7
2.2	Could you provide a list of names and addresses of companies that import and distribute pesticides in your country, or do Government Departments import directly?	Imported by Department of Agriculture directly from N.Z., Great Britain or Western Samoa	See Table 28 - both Ministries of Agriculture and Health also import	Many small wholesalers import household insecticides and rodenticides. Agricultural pesticides are imported by local Departments of Agriculture	Imported by Crown Agent
	Total Number of Main Importers and Distributors	1	7	?	1
3.	Recommendations for Pesticide Use				
3.1	Could you forward any booklet, brochure, pamphlet produced in your country which lists recommendations for use of pesticides?	Nil	See Text	See text but no recent locally produced booklets on the use of pesticides	None
	Types of publications		Technical Bulletins and advisory leaflets.		

		Vanuatu	Wallis & Futuna	Western Samoa	CNMI
2.	List of Pesticides Used and Distributors				
2.1	Attached is an alphabetical list of common names of many pesticides. Could you please tick all those pesticides used or recommended for use or registered for use in your country.....	See Table 3		See Table 3	See Table 3, which lists those pesticides most commonly used.
	Total Number of Pesticides (active ingredient) Used or Recommended or Registered for Use.....	113	20 +	84	81
2.2	Could you provide a list of names and addresses of companies that import and distribute pesticides in your country, or do Government Departments import directly?	See Table 28 Government departments do also import directly		See Table 28 Main importer is (Gov.) Agriculture Store	
	Total Number of Main Importers and Distributors	2		3	
3.	Recommendations for Pesticide Use				
3.1	Could you forward any booklet, brochure, pamphlet produced in your country which lists recommendations for use of pesticides?	Advice given individually according to pest/ disease See Text		See Text, few outdated publications	No books produced, but use books prepared by USEPA and training materials prepared by UOG Agricultural Co-operative Extension.
	Types of publications				

		Australia	New Zealand
2.	List of Pesticides Used and Distributors		
2.1	Attached is an alphabetical list of common names of many pesticides. Could you please tick all those pesticides used or recommended for use or registered for use in your country.....	See Table 3	See Table 3
	Total Number of Pesticides (active ingredient) Used or Recommended or Registered for Use.....	514	315
2.2	Could you provide a list of names and addresses of companies that import and distribute pesticides in your country, or do Government Departments import directly?	See PESTLIST by Snellgrove (1983, 1985) and QAC-PESTKEM (1985): see page 105	See N.Z. Agricultural Chemicals Board (1982) and N.Z. Pesticide Board (1985,1986): see page 106
	Total Number of Main Importers and Distributors	depends upon source: Pestlist by Snellgrove 1985 - 217 suppliers, QAC-Pestkem gives 96 distributors.	129 proprietors
3.	Recommendations for Pesticide Use		
3.1	Could you forward any booklet, brochure, pamphlet produced in your country which list recommendations for use of pesticides?	See Text	See Text
	Types of publications	Numerous publications	Numerous publications

		American Samoa	Cook Islands	Fiji	French Polynesia
3.2	Do any of your departments advise following the recommendations of UN agencies or those of other countries, e.g. USA, NZ, Australia or France?	Re Agriculture: Use USDA, University of Hawaii, UN and SPC in conjunction with manufacturer's recommendations. Also conduct own research trials. Re Health: Follows recommendations of WHO, USA and manufacturers.	Apart from the manufacturer's recommendations the Ministry of Agriculture considers recommendations by "The NZ Chemicals Board", SPC Handbook on Pesticides, FAO and DPI Queensland Handbook on Disease, Vol 1, NZ Fruit Grower's Federation.	Go to Review of Plant Protection; and Review of Applied Entomology, Series B. plus other available articles	Re Agriculture Recommend following information provided by French, USA, NZ or Australian firms, after having tried them in the local conditions. Never make recommendations before experimentation Re Health Recommend using WHO guidelines in conjunction with manufacturers' recommendations. Particular pesticide users usually follow manufacturers' recommendations or those provided by the sellers
3.3	Could you state who makes recommendations for large scale use of pesticides - agricultural or health extension officers, entomologists, plant pathologist, pest control operator, chemical company representative?	Pesticide use on small scale only.	The Ministry of Agriculture's Advisory and Research Staff with the co-operation of NZ DSIR Plant Diseases Division. For household pests and diseases and mosquitoes, the Health Department recommends. Also chemical companies advise. Do own trials.	For agriculture - Entomologists and Plant Pathologist; for health - WHO and Department of Health	For agriculture - officers of agricultural departments or Chamber of Agriculture or the Society for the Development of Agriculture and Fisheries

		American Samoa	Cook Islands	Fiji	French Polynesia
3.4	Could you forward a listing of any publications on safe use of pesticides published in your country?	Handout published both in English and Samoan languages. Also offer pesticide safety training courses for pesticide applicators, and public education programs through TV, radio, news bulletins.	Publications under 3.1 include sections on safe use.	See Text Cyclostyled notes provided by extension officers, and courses held with farmers in both Fijian and Hindustani	See Text Circulars widely distributed amongst sellers and professional users. Other general publications also published

		Guam	Kiribati	Nauru	New Caledonia
3.2	Do any of your Departments advise following the recommendations of UN agencies or those of other countries, e.g. USA, NZ, Australia or France?	Primary users must adhere to instructions printed on the product labels Dept of Health follows recommendations of WHO, USA and manufacturing companies.	Recommendations made by New Zealand and Australia are usually adopted		Public Health and Hygiene, Agriculture and Veterinary departments all follow advice from these countries.
3.3	Could you state who makes recommendations for large scale use of pesticides - agricultural or health extension officers, entomologists, plant pathologist, pest control operator, chemical company representative?	Extension entomologists, agricultural and health extension officers	Crop Protection/ Quarantine Section, Division of Agriculture, Ministry of Natural Resources Development.		For Agriculture - officers of Dept. of Agriculture, Entomologists and Plant Pathologists from ORSTOM For Health - the Chief Medical Officer or users themselves.
3.4	Could you forward a listing of any publications on safe use of pesticides published in your country?	See Text. Small brochures. However courses held with distributors and users and includes emphasis on safety	None		No reliable publications - but labels of containers must be written in an explicit way to prevent accidents

		Niue	Papua New Guinea	Pitcairn Island	Solomon Islands
3.2	Do any of your departments advise following the recommendations of UN agencies or those of other countries, e.g. USA, NZ, Australia or France?	Re Agriculture: Follow recommendations of New Zealand, South Pacific Commission and USP. Re Public Health: Follow WHO instructions and directions by manufacturer on labels.	Often consider recommendations including those made in Australia, and for public health by UN However experimental trials are sometimes carried out to check and modify recommendations	Recommendations of New Zealand are followed	Agricultural Division bases recommendations on literature and experimental results. Malarial Control Division uses WHO guidelines
3.3	Could you state who makes recommendations for large scale use of pesticides - agricultural or health extension officers, entomologists, plant pathologist, pest control operator, chemical company representative?	Research Division staff, Extension staff in Agriculture and staff of Health Department.	Any of persons listed in question 3.3 dependent upon problem	Agricultural Officer, or DSIR, Auckland	Officers of Agricultural Division, Chemical Company representatives and Ministry of Health or entomologist employed by private company
3.4	Could you forward a listing of any publications on safe use of pesticides published in your country?	Nil available.	See Text Booklets and pamphlets provided by Dept. of Agriculture	None	None

		Tokelau	Tonga	TTPI	Tuvalu
3.2	Do any of your departments advise following the recommendations fo UN agencies or those of other countries, e.g. USA, NZ, Australia or France?	Nil	Yes - in Agriculture consider recommendations made by SPC, & in NZ, Australia, Germany, France, UK, and those made in Thomson's books; In Health follow recommendations made by WHO and those made in Fiji.	All pesticide users in TIPI follow the recommendations of the US EPA	Yes - look at Technical Bulletin
3.3	Could you state who makes recommendations for large scale use of pesticides - agricultural or health extension officers, entomologists, plant pathologist, pest control operator, chemical company representative?	Dept. of Agriculture on the basis of advice received from NZ Ministry of Agriculture and USP	Entomologists and Plant Pathologists and extension officers from Research and Advisory divisions of Dept. of Agriculture, and by Health extension officers.	By TT EPB with assistance of agricultural extension officers, entomologists and/or plant pathologists as the conditions require	WHO entomologist and Chemical Company Representative
3.4	Could you forward a listing of any publications on safe use of pesticides published in your country?	None	Recommendations in local language included in new "Pesticide Bulletin, No.2," and courses held with users regularly each year with emphasis on safety.	None locally published, but some users do Guam courses	None

		Vanuatu	Wallis & Futuna	Western Samoa	CNMI
3.2	Do any of your departments advise following the recommendations of UN agencies or those of other countries, e.g. USA, NZ, Australia or France?	For agriculture - make recommendations from SPC Handbook to select the chemicals which should be used but also consider hazard rating of the product against the expertise of the proposed operator. The Health Department uses WHO guidelines		Nil	Guidelines are used from US Government and from individual states in USA.
3.3	Could you state who makes recommendations for large scale use of pesticides - agricultural or health extension officers, entomologists, plant pathologist, pest control operator, chemical company representative?	Plant Quarantine Section of Dept. of Agriculture gives advice but it is small scale. There are no entomologists or plant pathologists in the Dept. There is one pest control firm who make own recommendations		By officers of Dept. of Agriculture (particularly Chief Crops Officer), USP Alafua, and by the Samoan-German Crop Protection Project	Large and small-scale farming (main users of pesticides) receive application assistance from the Department of Natural Resources, Division of Plant Industry. Person in charge is an entomologist. The government has an agricultural co-operative program to assist farmers with crop cultivation including use and selection of pesticides.
3.4	Could you forward a listing of any publications on safe use of pesticides published in your country?	None		One publication in Samoan	None _ but do provide educational material for those persons seeking pesticide applicator certification.

		Australia	New Zealand
3.2	Do any of your departments advise following the recommendations of UN agencies or those of other countries, e.g. USA, NZ, Australia or France?		Do not advise following the recommendations of other countries
3.3.	Could you state who makes recommendations for large scale use of pesticides - agricultural or health extension officers, entomologists, plant pathologist, pest control operator, chemical company representative?	Each State has agricultural officers who provide advice. CSIRO, private consultants and chemical companies also make recommendations. Similarly, health workers also make recommendations where appropriate	The NZ Ministry of Agriculture has advisory officers all over the country. The DSIR, private farm management consultants and chemical companies also make recommendations
3.4.	Could you forward a listing of any publications on safe use of pesticides published in your country?	See Text Many publications are available but a useful reference is 'Manual of Safe Practice in the Handling and Use of Pesticides'. See listings in Publications - section 14.2.	A large number of publications are available - Ministry of Agriculture produces Ag Links, local brochures, articles appear in newspapers, companies provide information, and safety precautions are included on all pesticide labels.

	American Samoa	Cook Islands	Fiji	French Polynesia
4. Controls on Pesticides				
4.1 Importation, Sale and Distribution of Pesticides				
*Are the importation, sale and distribution of pesticides controlled in any manner?	Controlled by law. See 4.8. All pesticides classified for general or restricted use.	No control, as no law.	Controlled by law. See 4.8. Policed by inspectors.	Controlled by law. See 4.8
*Are pesticides allowed to be sold in containers other than those in which they were imported?	No _ must only be sold in original containers.	Yes _ pesticides are sometimes sold in containers other than those in which they were imported in.	Need special permission to sell if repacked	Only allowed under certain circumstances but with permission of Pesticide Commission. However it is forbidden to use containers normally used for packaging food or drinks
4.2 Labelling				
*What sorts of information are required on labels of pesticide containers?	As specified by law - See Text.	See Text.	As specified by Act - See Text	As specified by Act - See Text
*Are the labels in a language understood by all users?	No - labelling is in English, but intend in the future to translate into Samoan, Korean, Chinese.	Label must be in English, and information on directions for use, storage, precautionary statements, signal words, application rates must be written in Cook Island Maori.	Must be in English, Fijian and Hindustani	Must be in French and Tahitian - however not always complied with as import from USA, NZ and Australia

	Guam	Kiribati	Nauru	New Caledonia
4. Controls on Pesticides				
4.1 Importation, Sale and Distribution of Pesticides				
*Are the importation, sale and distribution of pesticides controlled in any manner?	Regulated by local and federal pesticide acts and subsequent regulations. See 4.8	Agricultural pesticides handled only by the staff of the Division of Agriculture.		See Text Regulated by law (See 4.6). which upto 1986 was not enforced. Now new regulations.
*Are pesticides allowed to be sold in containers other than those in which they are imported?		Does not arise in view of the above.		
4.2 Labelling				
*What sorts of information are required on labels of pesticide containers?	As specified by Act, See Text	Information like active ingredient, dilution rates, waiting periods, precautions to be taken and treatment to be taken in case of accidental poisoning.		Upto 1986 as specified by Act. Labelling effectively limited to the use of the words 'Poison' or 'Dangerous'. French products conform to regulations in force for Metropolitan France. New regulations much more stringent - see text.
*Are the labels in a language understood by all users?	Must be in English	Must be in English.		Upto 1986 no - foreign products (from NZ, Australia) did not need to be translated into French. New regulations make French mandatory.

	Niue	Papua New Guinea	Pitcairn Island	Solomon Island
4. Controls on Pesticides				
4.1 Importation, Sale and				
*Are the importation, sale and distribution of pesticides controlled in any manner?	Controlled by officers of Agriculture Department and Health Department.	Sale only controlled by law, but control about to be introduced. See text.	No controls, but Agricultural officer, through Forestry Department, imports and sells pesticides	Controlled by law. See 4.8
*Are pesticides allowed to be sold in containers other than those in which they are imported?		Yes - as long as appropriately labelled and in suitable containers, but will be illegal in future unless got special permit.	No regulation of the containers in which pesticides are sold but in practice they are distributed in their original containers as received from New Zealand	Need special permission to sell if repacked
4.2 Labelling				
*What sorts of information are required on labels of pesticide containers?		As specified by Act. At present labelling effectively limited to use of word 'Poison'. But new regulations specify UN recommendations. See text.	No requirements	As specified by Act See Text
*Are the labels in a language understood by all users?	Yes - English labels. and common pesticides also in Niuean.	No, mainly in English, though few major chemicals have labels in Tok Pisin	English labels understood by all inhabitants	Only English required, though main language is Solomon Pidgin

	Tokelau	Tonga	TTPI	Tuvalu
4. Controls on Pesticides				
4.1 Importation, Sale and Distribution of Pesticides				
*Are the importation, sale and distribution of pesticides controlled in any manner?	Pesticides are not for sale. Poisoning operations are carried out by the department concerned with assistance from village labour	Officially yes - controlled by law. See 4.8	Controlled by TT EPB in accordance with TTPI Pesticides Regulations	None - the Agriculture and Medical Departments are the only organisations using pesticides
*Are pesticides allowed to be sold in containers other than those in which they are imported?		No - unless labelling fulfils requirements	Pesticides for sale must be in their original containers	
4.2 Labelling				
*What sorts of information are requred on labels of pesticide containers?	None	As specified by Act - See Text	Labelling requirements must comply with the requirements	
*Are the labels in a language understood by all users?		Must be in English and Tongan	Must be in English	(Yes)

		Vanuatu	Wallis & Futuna	Western Samoa	CNMI
4.	Controls on Pesticides				
4.1	Importation, Sale and Distribution of Pesticides				
	*Are the importation, sale and distribution of pesticides controlled in an, manner?	No controls		No controls, but Government Agricultural Store Corporation is the main importer of pesticides.	Controlled under pesticide regulations.
	*Are pesticides allowed to be sold in containers other than those in which they are imported?	Pesticides now only sold in original containers, but in past decanting		Yes - pesticides are sometimes sold after having been refilled into secondary containers, e.g. beer bottles.	No.
4.2	Labelling				
	*What sorts of information are required on labels of pesticide containers?	None		Information lists chemical name, Samoan name, hazard, what crop it is for, rate of application.	Must comply with USEPA regulations.
	*Are the label in a language understood by all users?	Most labels in English but main language is Bislama, with English and French. Many Ni-Vanuatu growers would not understand present labels		Relabelling is in Samoan	Only in English.

		Australia	New Zealand
4.	Controls on Pesticides		
4.1	Importation, Sale and Distribution of Pesticides		
	*Are the importation, sale and distribution of pesticides controlled in any manner?	Importation of pesticides is not controlled though sale and distribution is very strictly controlled under State laws	Control by law. See 4.8. Moreover for chemicals subject to licensing, an import licence is not given to substances not registered by the Pesticide Board
	*Are pesticides allowed to be sold in containers other than those in which they are imported?	No, unless labelling fulfils requirements and is in an acceptable container	No, unless labelling fulfils requirements, and is in acceptable container
4.2	Labelling		
	*What sorts of information are required on labels of pesticides containers?	Labelling is as specified in different State laws, but has been largely harmonised by the Technical Committee on Agricultural Chemicals which has published guidelines. See Text	As specified by Pesticide Act.
	*Are the labels in a language understood by all users?	Must be in English	Must be in English.

	American Samoa	Cook Island	Fiji	French Polynesia
4.3 Storage				
Are pesticides allowed to be stored in containers other than the original labelled container in which they were imported? If so do you specify the type of storage vessel, e.g. glass, polythene, metal drum...?	No _ must be kept in original container.	Yes _ No restrictions on storage vessels. However storage space must be in well-ventilated room with concrete floor locked entry with sign reading: "Danger- Pesticide Storage Area".	See 4.1	No - see 4.1 Type of containers not specified under Act
Are there restrictions on where pesticides may be stored?	Recommended to be stored in well-ventilated, dry, cool building with concrete floor. Fire resistant building materials are preferred. Storage should be in temperatures specified on labels.	No.	Not specified in Act, but through education restrict storage near foodstuffs	Specified in Regulations
4.4 Transportation				
Are there restrictions on the way pesticides are transported by road, ship or air?	Restrictions on transportation with food, or in dangerous manner. Federal Aviation Authorities forbid transportation on aircraft	No restrictions within Cook Islands but regulations of transport from outside, especially from New Zealand.	Not specified in Act	Not specified in Act, though must meet international regulations; however forbidden to transport pesticides with foods
4.5 Disposal of Pesticides				
Do you know how old/ expired/unwanted pesticides are disposed of?	By diluting or dispersing on unused agricultural land or shipping back to US mainland for burial at EPA-approved landfill. Pesticide containers are destroyed and buried	No regulations, but usually by burying and burning under strict supervision	By burning or burying under strict supervision	Legislation mentions restrictions and precautions regarding the disposal of pesticides and used containers

	Guam	Kiribati	Nauru	New Caledonia
4.3 Storage				
Are pesticides allowed to be stored in containers other than the original labelled container in which they were imported? If so do you specify the type of storage vessel. e.g.glass polythene, metal drum....?	All pesticide products are required to be stored in their original containers Labels must not be removed and replaced when unreadable	Must be stored in original labelled containers		Restrictions on storage as specified by law, but are commonly not enforced, e.g. Dieldrin is sold retail in empty beer bottles. New laws should prevent this.
Are there restrictions on where pesticides may be stored?	Must not be stored near food, animal feed and must be checked frequently for leaks and breaks	Must be stored in a separate room with concrete floor		
4.4 Transportation				
Are there restrictions on the way pesticides are transported by road, ship or air?	Shipment of pesticides is regulated by the Federal Department of Transport	According to airline and shipping regulations		No special conditions

	Guam	Kiribati	Nauru	New Caledonia
4.5 Disposal of Pesticides				
Do you know how old/expired/ unwanted pesticides are disposed of?	Pesticide applicators normally triple rinse every empty pesticide container and dispose of pesticide residues on their own property in accordance with instruction on the product label. All rinsed containers are crushed and buried at the sanitary landfill. Pesticide applicators generating large quantities of pesticde waste are required to dispose of these wastes at approved hazardous waste treatment or disposal facilities.	No disposal required to date		No regulations but disposal generally not required

		Niue	Papua New Guinea	Pitcairn Island	Solomon Island
4.3	Storage				
	Are pesticides allowed to be stored in containers other than the original lebelled container in which they were imported? If so do you specify the type of storage vessel, e.g. glass, polythene, metal drum...?	No - re-use is prohibited.	Not regulated by law, but will be illegal in the near future, unless got special permit.	No restrictions	Prohibited by law
	Are there restrictions on where pesticides may be stored?		Must be stored away from foodstuffs	No restrictions	No restriction
4.4	Transportation				
	Are there restrictions on the way pesticides are transported by road, ship or air?	Not allowed to be transported with food	No regulations apart from international regulations, but will not be allowed to be carried with foodstuffs under proposed regulation.	No restrictions on road transport (no sea or air transport)	No regulations apart from international regulations
4.5	Disposal of Pesticides				
	Do you know how old/expired/ unwanted pesticides are disposed of?	Done with Health authorities; buried in landfill according to specific procedures.	No regulations; generally by burying or burning or by spraying as diluted formulation on wasteland.	No	

	Tokelau	Tonga	TTPI	Tuvalu
4.3 Storage				
Are pesticides allowed to be stored in contains other than the original labelled container in which they were imported? If so do you specify the type of storage vessel, e.g. glass, polythene, metal	No regulations	No restictions - but try to bring in only small containers	Pesticides must be stored in their original containers, and in accordance with the US EPA approved label directions	No
Are there restrictions on where pesticides may be stored?		Not by law		
4.4 Transportation				
Are there restrictions on the way pesticides are transported by road, ship or air?	No - but transported in separate containers	No restrictions by law	Must comply with US and International Regulations	None
4.5 Disposal of Pesticides				
Do you know how old/ expired/unwanted pesticides are disposed of?	Zinc Phosphide disposed of by burning	Store - would like to know how to dispose of, alternatively diluted and dispersed		(Yes) but not specified

	Vanuatu	Wallis & Futuna	Western Samoa	CNMI
4.3 Storage				
Are pesticides allowed to be stored in containers other than the original labelled container in which they were imported? If so do you specify the type of storage vessel, e.g. glass, polythene, metal drum...?	No regulations to specify containers to be used		Yes - if the original container is damaged the chemical is repacked	Yes - controlled under CNMI regulations
Are there restrictions on where pesticides may be stored?	No regulations to specify storage conditions. No special fire protection or fighting equipment		Should be in cool dry room	As above
4.4. Transportation				
Are there restrictions on the way pesticides are transported by road, ship or air?	No restrictions		No regulations	Yes - must conform to CNMI regulations, FIFRA and other US Federal regulations
4.5 Disposal of Pesticides				
Do you know how old/expired/ unwanted pesticides are disposed of?	Follow standard recommendations concerning burning and burying or by diluting and dispersing	Requested information on disposal of unwanted pesticides (but no response to letter or questionnaire)	USAID funded project about to construct a Pesticide Disposal Site	Disposed of in accordance with instructions on the label. Otherwise they are diluted and applied to agricultural lands, the cans crushed and disposed of at the landfill

		Australia	New Zealand
4.3	Storage		
	Are pesticides allowed to be stored in containers other than the original labelled container in which they were imported? If so do you specify the type of storage vessel, e.g. glass, polythene, metal drum...?	Storage of pesticides is largely controlled by the Poisons Acts but also covered in the various Pesticide legislation	No. Requirements specified by the Pesticide Act and Toxic Substances Act, and their Regulations
	Are there restrictions on where pesticides may be stored?		Certain classes may not be stored next to food stuffs
4.4.	Transportation		
	Are there restrictions on the way pesticides are transported by road, ship or air?	Dangerous Goods Codes set standards for the transport and handling of pesticides	Restrictions as specified under the Toxic Substances Act
4.5.	Disposal of Pesticides		
	Do you know how old/ expired/unwanted pesticides are disposed of?	Guidelines on the disposal of pesticides have been published by the Pesticide Section, and reprinted and distributed by AVCA	Since the Pesticides Act 1979 has come into force, all products are required to have information on their means of disposal on the label. Health Department will supervise disposal at controlled tips

		American Samoa	Cook Islands	Fiji	French Polynesia
4.6	Protective Clothing				
	Do you know of people who use protective clothing when using pesticides?	The law requires users of restricted use pesticides to wear protective clothing. This includes unlined rubber or neoprene boots, gloves, clothing, hats, goggles and respirators. However such clothing is not always worn because of its unavailability. Protective clothing is also worn by Dept. of Health personnel in vector control	Yes - wearing gum boots,gloves overalls and masks,though some do not because of heat	Advised to use gloves, overalls, boots, goggles, aspirators of good quality where necessary. Law requires safety precautions to be included on label	Legislation provides for conditions and precautions for use; this includes detailed listing of protective clothing. However clothing is not always worn because of the heat
4.7	Health Checks				
	Do you know of any regular users of pesticides who submit to regular medical examination?	None	No - but Health Dept. can take blood samples for analysis in New Zealand	Nothing	6 month or annual regular medical checkup including blood tests for people working with pesticides
4.8	Pesticide Legislation				
	Could you please forward a list of present of proposed legislation controlling importation, sale, storage, use and disposal of pesticides in your country?	See Text	No legislation but adopts NZ policy on pesticide regulations. Presently NZ Pesticide Board is assisting to frame regulations.	See Text	See Text

		Guam	Kiribati	Nauru	New Caledonia
4.6	Protective Clothing				
	Do you know of people who use protective clothing when using pesticides?	Whenever using restricted use pesticides, applicators should use approved protective clothing (coverall, hat, gloves, respirator)	Nothing		**Use of protective clothing is strongly recommended but seldom followed due to heat. Labels on pesticides must also indicate precautions needed**
4.7	Health Checks				
	Do you know of any regular users of pesticides who submit to regular medical examination?	No program to date	Nothing		**Cholinesterase tests done regularly, 6 monthly, and some government workers submit to medical examination**
4.8	Pesticide Legislation				
	Could you please forward a list of present or proposed legislation controlling importation, sale, storage, use and disposal of pesticides in your country?	See Text	Nil		**See Text**

		Niue	Papua New Guinea	Pitcairn Island	Solomon Island
4.6	Protective Clothing				
	Do you know of people who use protective clothing when using pesticides?	Yes - workers employed by Agriculture wear protective clothes	Advised to use where necessary gloves, overalls, boots, goggles and respirators but many don't because of heat	No	**Yes - workers in one large company wear protective gear when aerial spraying**
4.7	Health Checks				
	Do you know of any regular users of pesticides who submit to regular medical examination?	Only have health checks if suspected chemical poisoning, though it is intended to do this	Recently commenced program to do blood checks (to include blood residues and cholinesterase test)	Not applicable - no regular users of pesticides	**Regular cholinesterase tests done on workers from one large company**
4.8	Pesticide Legislation				
	Could you please forward a list of present or proposed legislation controlling importation, sale, storage, use and disposal of pesticides in your country?	None - but Pesticide Legislation follow regulations in New Zealand	See Text	No legislation	**See Text**

		Tokelau	Tonga	TTPI	Tuvalu
4.6	Protective Clothing				
	Do you know of people who use protective clothing when using pesticides?	Nil	Recommended to use protective clothing. Masks widely used for particular pesticides. However often people dont wear protective clothing.	Must be worn when applying pesticides in accordance with US EPA approved label directions	Yes
4.7	Health Checks				
	Do you know of any regular users of pesticides who submit to regular medical examination?	No regular medical checkups	No regular check-ups, though some have physical examination.	No	No
4.8	Pesticide Legislation				
	Could you please forward a list of present or proposed legislation controlling importation, sale, storage, use and disposal of pesticides in your country?	No legislation	See Text	See Text	No legislation

		Vanuatu	Wallis & Futuna	Western Samoa	CNMI
4.6	Protective Clothing				
	Do you know of people who use protective clothing when using pesticides?	Plant Quarantine staff wear protective clothes including respirators as does staff of the one pest control operator		Majority don't wear protective clothes though some wear boots and gloves	Recommended, but not always followed
4.7	Health Checks				
	Do you know of any regular users of pesticides who submit to regular medical examination?	None		None About to establish a Poisons Centre	No - most regular users are alien workers and do not take advantage of medical facilities where available.
4.8	Pesticide Legislation				
	Could you please forward a list of present or proposed legislation controlling importation, sale, storage, use and disposal of pesticides in your country?	N.Z. Pesticide Board /FAO about to assist to frame pesticide legislation.		See Text Strongly recommend pesticide legislation on a regional approach. Suggest this would be more practical. economical and easy to monitor	See Text Other Federal laws and regulations touch on use of pesticides

		Australia	New Zealand
4.6	Protective Clothing		
	Do you know of people who use protective clothing when using pesticide?	Protective clothing is defined under the Hazardous Pesticide Regulations of N.S.W. and other legislation	Protective clothing is widely use - especially by horticulturalists who need to use more toxic pesticides than most other users
4.7	Health Checks		
	Do you know of any regular users of pesticides who submit to regular medical examination?	Regular users of pesticides may submit blood or urine samples for testing in N.S.W. and possibly other States but such examinations are rarely mandatory and the service is not widely used	Regular health check-ups are available to those who care to avail themselves of them, especially orchardists, aerial operators and contractors who regularly handle toxic chemicals
4.8	Pesticide Legislation		
	Could you please forward a list of present or proposed legislation controlling importation, sale, storage, use and disposal of pesticides in your country?	See Text	See Text

		American Samoa	Cook Islands	Fiji	French Polynesia
5.	Problems to Humans and Wildlife				
5.1	Could you give any details of known poisonings of people by pesticides in your country over the last 10 years?	No data available	Two fatal cases of accidental poisoning suspected from intake of paraquat which mistaken to be beer. Also of person who developed allergies to methomyl and tridemorph.	Know cases, e.g due to paraquat both deliberate and accidental. Detailed records not kept See Text.	Known cases of fatal paraquat poisonings (suicide). Also documented cases of acute non-fatal accidental poisonings due to organophosphates or xyloprotectors, e.g. PCP, predominantly amongst non-professional rural users.
5.2	Could you give any details of known poisonings of domestic animals or fish or wildlife in your country over the last 10 years?	No data available, though a mass killing of fish occurred at Nu'uuli due to calcium hypochlorite	Many reported cases of fish dying in rivers but not substantiated as due to pesticides	Only reported cases are of dogs deliberately poisoned by metaldehyde	No precise statistics, but cases of fish kills downstream of agricultural activities suspected of being due to pesticides - but not confirmed. One case of fish poisoning reported due to deltametrin spraying in the river in Tahiti.

		American Samoa	Cook Islands	Fiji	French Polynesia
5.3	Do you know of any publications on problems/ potential problems caused by pesticides in your country?	No	No	Two papers presented on paraquat poisoning. Many cases of paraquat poisoning. See text.	Numerous cases in local press - and one technical publication. Other publication on pesticide use survey and residues completed but references not given. See Text.

		Guam	Kiribati	Nauru	New Caledonia
5.	Problems to Humans and Wildlife				
5.1	Could you give any details of known poisonings of people by pesticides in your country over the last 10 years?	One farmer poisoned by diazinon	Nil		Several cases of varying severity due to use of Phosdrin (mevinphos)
5.2	Could you give any details of known poisonings of domestic animals of fish or wildlife in your country over the last 10 years?	None to date	Nil		None reported, except for a number of cases of dogs poisoned deliberately with pieces of meat containing an organophosphate
5.3	Do you know of any publications on problems/ potential problems caused by pesticides in your country?	Some - See Text	See Text		No publications

		Niue	Papua New Guinea	Pitcairn Island	Solomon Island
5.	Problems to Humans and Wildlife				
5.1	Could you give any details of known poisonings of people by pesticides in your country over the last 10 years?	Few cases of people poisoned by paraquat. Two cases of suicide	See Text. At least 40 cases have been recorded of people dying accidentally or deliberately from paraquat over the last 15 years; other cases of varying severity have been recorded due to acephate,arsenic, coumaphos,DDT,dieldrin dichlorvos,dimethoate, methyl parathion, mevinphos,monocrotophos,parathion, propoxur,rotenone, trichlorthon.	No poisonings	One recent case of lethal diazanon poisoning.
5.2	Could you give any details of known poisonings of domestic animals or fish or wildlife in your country over the last 10 years?	None - but in past poisoning of domestic pets and poultry by dieldrin which is no longer used	Many reported cases of cats dying after DDT spraying, dogs have been poisoned by coumaphos; fish kills after lindane and DDT was dumped into creeks; and cattle poisoned by dimethoate and diazinon. See Text	No reported poisonings	None known
5.3	Do you know of any publications on problems/ potential problems caused by pesticides in your country?	None	See Text - many	No publications	None known

		Tokelau	Tonga	TTPI	Tuvalu
5.	Problems to Humans and Wildlife				
5.1	Could you give any details of known poisonings of people by pesticides in your country over the last 10 years?	No	One suicide & one accidental death (mixing with hands) from unknown pesticide. Number of known cases of workers mildly affected by carbofuran, and of workers getting skin rashes from mancozeb.		None
5.2	Could you give any details of known poisonings of domestic animals or fish or wildlife in your country over the last 10 years?	DDT & lindane caused fish & coral kills. See Text	One case of foal dying after drinking mixture of benomyl and banana misting oil.	Endrin and sodium arsenite caused kills. See Text	None
5.3	Do you know of any publications on problems/potential problems caused by pesticides in your country?	No	No	No publications	None

		Vanuatu	Wallis & Futuna	Western Samoa	CNMI
5.	Problems to Humans and Wildlife				
5.1	Could you give any details of known poisonings of people by pesticides in your country over the last 10 years?	, one mild poisoning by dieldrin		From 1973 to 1984, 205 known cases of suicide by paraquat, and from 1970 to 1972, 5 cases of suicide by arsenic trioxide. Recently one accidental death due to paraquat and non-fatal poisonings due to mancozeb (and tridemorph). Dogs are commonly poisoned by licking used paraquat containers. See Text.	None
5.2	Could you give any details of known poisonings of domestic animals or fish of wildlife in your country over the last 10 years?	No knowledge of any		Few cases of cattle and pigs poisoned but not documented	One instance of cattle poisoning. See Text
5.3	Do you know of any publications on problems/ potential problems caused by pesticides in your country?	None		See Text	None, but use those of US Federal and State Governments

		Australia	New Zealand
5.	Problems to Humans and Wildlife		
5.1	Could you give any details of known poisonings of people by pesticides in your country over last 10 years?	See Text, but incidences of injury from pesticides is astonishingly low	See Text In 1980, 165/4276 poisoning notifications or 3.9% were due to pesticides and 5/19 fatal poisonings were due to pesticides
5.2	Could you give any details of known poisonings of domestic animals or fish or wildlife in your country over the 10 years?	See Text, few reported	Few reported
5.3	Do you know of any publications on problems/ potential problems caused by pesticides in your country?	Numerous papers and articles published. See Text	Numerous papers and articles published, particularly over recent years on 2,4,5-T

		American Samoa	Cook Islands	Fiji	French Polynesia
6.	Laboratory Facilities and Personnel				
6.1	Do you know of any laboratory/ personnel in your country capable of analysing any pesticide residues on a small scale/large scale?	Recently completed construction of a well equipped laboratory. Intend to do pesticide residue work in near future.	None	Two laboratories. one is Chemistry Laboratory Koronivia Research Station, and other at USP would be capable given extra equipment and personel. USP is commencing monitoring programme. Only capable of doing so on a small scale	One government laboratory is capable of doing residues on large or small scale, In past was cheaper to get analyses done in France or Hawaii. Now many analyses can be done at LESE - see text.
6.2	Do you know of any work being done in your country on analysing residues of pesticides in foodstuffs, fish, wildlife and other environmental samples, and human blood/tissues? If so please give name and address of persons or institutions involved. Are organisations/institutions from outside your country involved?	Residue analyses have been done by the University of Hawaii and University of California	Ministry of Health can send samples for analysis to DSIR, Wellington NZ	None done to date	Some small surveys have been done on residues in vegetables, fruit, soil and water but no systematic or routine monitoring is carried out, except environmental monitoring on water, sediment and marine life. No studies on humans done.

		Guam	Kiribati	Nauru	New Caledonia
6.	Laboratory Facilities and Personnel				
6.1	Do you know of any laboratory/ personnel in your country capable of analysing any pesticide residues on a small scale/large scale?	Guam EPA laboratory is capable of analysing certain residues (OC's, lindane, dieldrin, toxaphene, malathion) on a small scale.	Nil		None but given sufficient equipment, two government labs may be able to do on a small scale
6.2	Do you know of any work being done in your country on analysing residues of pesticides in foodstuffs, fish, wildlife and other environmental samples, and human blood/tissues? If so please give name and address of persons or institutions involved.	Guam EPA laboratory may perform residue analysis of pesticides in foodstuffs, fish, wildlife, etc on a limited scale depending upon availability of chemical standards.	Nil		None to date
	Are organisations/ institutions from outside your country involved?	Yes, residues in water done, experimental studies on residues of diazinon and malathion in crops, and wildlife survey by Patuxent.			

		Niue	Papua New Guinea	Pitcairn Island	Solomon Islands
6.	Laboratory Facilities and Personnel				
6.1	Do you know of any laboratory/ personnel in your country capable of analysing any pesticide residues on a small scale/large scale?	None	UPNG Chemistry and Biology Depts. have a Pesticide Lab. - capable of doing work on a small scale. The DPI Chemistry Lab has in the past done limited residue work and the National Analytical Lab at UOT could do analyses given extra equipment. See Text.	No - but if need arose testing for pesticide residues would be carried out in New Zealand	No
6.2	Do you know of any work being done in your country on analysing residues of pesticides in foodstuffs, fish wildlife and other environmental samples, and human blood/tissues? If so please give name and address of persons or institutions involved. Are organisations/institutions from outside your country involved?	None	Yes. at UPNG See Text	No	Samples have been sent to Tropical Products Institute in England for analysis of lindane residues in root crops, with inconclusive results

		Tokelau	Tonga	TTPI	Tuvalu
6.	Laboratory Facilities and Personnel				
6.1	Do you know of any laboratory/ personnel in your country capable of analysing any pesticide residues on a small scale/large scale?	No	No, but Tonga has access to GTZ laboratories in W. Germany and Phillipines	No	No
6.2	Do you know of any work being done in your country on analysing residues of pesticides in foodstuffs, fish, wildlife and other environmental samples, and human blood/tissues? If so please give name and address of persons or institutions involved. Are organisations/institutions from outside your country involved?	No	Few samples of water analysed for OC residues See Text	No	No

		Vanuatu	Wallis & Futuna	Western Samoa	CMNI
6.	Laboratory Facilities and				
6.1	Do you know of any laboratory/ personnel in your country capable of analysing any pesticide residues on a small scale/large scale?	No		No	Yes - but no facilities, though get assistance from Guam EPA.
6.2	Do you know of any work being done in your country on analysing residues of pesticides in foodstuffs, fish, wildlife and other environmental samples, and human blood/tissues? If so please give name and address of persons or institutions involved. Are organisations/institutions from outside your country involved?	No		Few samples analysed for OC residues See Text	None but do analyses for drinking water supplies with Guam EPA

		Australia	New Zealand
6.	Laboratory Facilities and Personnel		
6.1	Do you know of any laboratory/ personnel in your country capable of analysing any pesticide residues on a small scale/large scale?	Facilities exist in each State and some private companies also possess facilities. Most possess ability to do monitoring on a large scale. See Text	5 laboratories noted - 2 government and 3 private. Most possess ability to do monitoring on a large scale. See Text
6.2	Do you know of anywork being done in your country on analysing residues of pesticides in foodstuffs, fish, wildlife and other environmental samples, and human blood/tissues? If so please give name and address of persons or institutions involved. Are organisations/institutions from outside your country involved?	Extensive monitoring done throughout Australia. Some examples are given in text	Extensive monitoring of residues is undertaken by the Government and analyses of residues of pesticides in foodstuffs etc. is done by proprietors of pesticides when applying for registration, and by MAF and DSIR researchers. Some analysis of results is done outside NZ but most is internal. A market basket survey has also been done. See Text.

CHAPTER 3 PESTICIDES USED IN THE SOUTH PACIFIC REGION

3.1 LIST OF PESTICIDES AVAILABLE FOR USE

Table 3 lists those pesticides (by common name) reported to be registered for use, used or recommended for use in the region during the approximate period of 1977 to mid-1986. The list was compiled from the following sources:

1. From answers to the original questionnaire (Question 2.1), and to questionnaire on quarantine (Section 6.4).

2. From correspondence with and lists provided by chemical companies, government officers and users.

3. By visiting sellers and distributors (Fiji, PNG, New Caledonia, Solomons, Tonga, Vanuatu, and Western Samoa).

4. By reviewing available publications including journal articles, books, booklets, brochures and leaflets.

Generally pesticide names were given as trade names. All pesticides had then to be identified and given their ISO common name. This was done by reference to:

1. Australia, Commonwealth Department of Health 1983. Pesticides. Synonyms and Chemical names. Sixth edition, Australian Government Publishing Service, Canberra. (latest edition is Seventh edition, 1985).

2. Meister, R.T. 1985. Farm Chemicals Handbook 1985. Meister Publishing Co., Willoughby, Ohio.

3. Worthing, C.R. and Walker, S.B. 1983. The Pesticide Manual. A World Compendium. Seventh edition, British Crop Protection Council, Suffolk, U.K.

4. Association de Co-ordination Technique Agricole 1983. 1984 Index Phytosanitaire, France, Afrique mediterrraneene et tropicale. ACTA, Paris.

5. International Organisation for Standardization (ISO) 1981. Pesticides and other Agrochemicals - Common Names, 1750. First edition, 1981-12-15 (plus Addendum 1 (1983-08-15), Addendum 2(1983-12-15) and and Ammendment 1(1982-12-15).

Geneva.

6. Agricultural Requisites Scheme for Asia and the Pacific 1984. ARSAP Agro-Pesticide Index. ESCAP, Agriculture Division, Bangkok, Thailand.

Table 3:

List of pesticides reported or observed to be used or recommended for use or registered for use in the following countries or territories:

American Samoa (AS), Commonwealth of the Northern Mariana Islands (CN), Cook Islands (CI), Fiji (FI), French Polynesia (FP), Guam (GU), Kiribati (KI), Nauru (NA), New Caledonia (NC), Niue (NU), Papua New Guinea (PN), Pitcairn Island (PI), Solomon Islands (SI), Tokelau (TK), Tonga (TG), TTPI (TT), Tuvalu (TU), Vanuatu (VA), Wallis et Futuna (WF), Western Samoa (WS), Australia (AU), and New Zealand (NZ).

Note 1: Federated States of Micronesia, Marshall Islands and Palau are grouped together under the title of the Trust Territory of the Pacific Islands.

Note 2: Some chemical companies have indicated the pesticides they supplied to South Pacific countries, but have not specified which countries, hence the unspecified category 'UU'.

Note 3: Australian, New Zealand and Unspecified categories are not included when counting the number of countries recorded as using the pesticide.

This list includes all pesticides known to have been available for use in each country from 1977 to 1986. It is NOT a list of those pesticides currently registered or available now.

The superscript symbols refer to the status of the pesticide:

i.e Xr means 'restricted';
Xb means 'is now banned';
Xn means 'not now registered'.
b means 'is now banned, and no record of past availability'

COMMON NAME	AS	CN	CI	FI	FP	GU	KI	NA	NC	NU	PN	PI	SI	TK	TG	TT	TU	VA	WF	WS	UU	AU	NZ	TOTAL NO
AC217, 230		X																						1
ACEPHATE		X	X	X	X	X			X		X		X		X	X		X		X	X	X	X	12
ACETIC ACID																						X		0
ACIFLUORFEN				Xn																		X		1
ACROLEIN		X				Xr										X						X		3
ACRYLONITRILE		X														X								2
AGROBACTERIUM RADIOBACTER																							X	0
ALACHLOR					X	X					X		X		X	X				X		X	X	7
ALCOHOL ETHOXYLATES																						X		0
ALDICARB		X			X	Xr			Xr		X				X	X		X				X	X	8
ALDICARB SULPHONE						X										X								2
ALDICARB SULPHOXIDE						X																		1
ALDRIN		X		Xn	X	Xr			Xb		X		Xr			X						X	X	8
ALLETHRIN				X	X	X			X		X		X			X					X	X	X	7
ALLIDOCHLOR					X																	X		1
ALLOXYDIM					X																	X	X	1
ALPHACHLORALOSE				Xn	X				X		X											X	X	4
ALUM																						X		0
ALUMINIUM PHOSPHIDE	X		X	X					Xr		X		Xr			X		X		X		X	X	9
AMA											X													1
AMETRYN				X	X	X					X											X		4
2-AMINOBENZIMID AZOLE						X																		1
AMINOCARB																X						X	Xn	1
4-AMINO PYRIDINE											X					X						X		2
AMITRAZ					X				X		X					X						X	X	4
AMITROLE			X	X	X				X		X		X			X		X			X	X	X	8
AMMONIUM BORATE																						X		0
AMMONIUM SULPHAMATE																							X	0
AMMONIUM THIO-CYANATE											X					X						X	X	2
AMOBAM																						X		0
AMORPHOUS SILICA																						X		0
AMS					X						X		X			X						X	X	4
ANCYMIDOL					X											X						X		2
ANILAZINE					X											X						X		2
ANTHRAQUINONE					X											X						X		2
ANTU																X								1
ARIMIPHOS METHYL				Xn																				1
ARSENIC PENTOXIDE				X							X		Xr					X				X		4
ARSENIC SULPHIDE																						X		0
ARSENIC TRIOXIDE (ARSENIOUS OXIDE)					X						X											X	X	2
	AS	CN	CI	FI	FP	GU	KI	NA	NC	NU	PN	PI	SI	TK	TG	TT	TU	VA	WF	WS	UU	AU	NZ	TOTAL NO

COMMON NAME	AS	CN	CI	FI	FP	GU	KI	NA	NC	NU	PN	PI	SI	TK	TG	TT	TU	VA	WF	WS	UU	AU	NZ	TOTAL NO
ASPON (NPD)																X								1
ASULAM				X	X						X					X						X	X	4
ATRATON																						X		0
ATRAZINE				X	X	X			X	X	X				X	X		X		X		X	X	10
AURAMINE																					X	X		1
AZAMETHIPOS									X													X		1
AZINPHOS ETHYL					X				X							X						X	Xn	3
AZINPHOS METHYL	X	X	X		X				X							X						X	X	6
AZIPROTRYNE					X																	X	X	1
AZOBENZENE																X								1
AZOCYCLOTIN									X													X	X	1
BACILLUS THURINGIENSIS	X	X	X		X	X			X		X		X		X	X		X		X		X	X	12
BARBAN					X											X						X	X	2
BARIUM CARBONATE					X																			1
BENAZOLINE					X																		X	1
BENDIOCARB	X	X		X	X	X			X		X		Xr			X	X			X		X		11
BENEFIN					X											X								2
BENFLURALIN					X																	X		1
BENODANIL					X						X												X	2
BENOMYL	X	X	X	X	X	X			X	X	X		X		X	X		X	X	X	X	X	X	15
BENSULIDE				X	X				X							X						X		4
BENTAZON				Xn	X				X				X		X	X						X	X	6
BENZADOX																X								1
BENZALKONIUM CHLORIDE																						X		0
BENZOXIMATE					X				X														X	2
BENZOYLPROP ETHYL					X											X							X	2
BENZTHIAZURON					X																			1
BENZYL BENZOATE											X		X		X	X		X				X		5
6-BENZYLADENINE																						X		0
BERELEX											X					X								2
BHC (Mixed Isomers)									b		X		X									X		2
BHC, g-ISOMER (LINDANE, gHCH)			X	Xr	X	Xr			X		X		Xr		X	X		X	X	X		X	X	12
BIFENOX					X											X								2
BINAPACRYL					X						X											X	X	2
BITERTANOL		X													X				X			X	X	3
BIOALLETHRIN			X	X	X				X		X		X		X	X		X		X		X	X	9
BIORESMETHRIN			X	X	X	X			X		X		X		X	X		X		X		X	X	11
BIPHENYL																X						X		1
BIS-BUTYLENE TETRA-HYDROFURFURAL																						X		0
BITUMEN																						X		0
BLAZER																X						X		1
BORAX			X		X	X				X	X		Xr			X		X				X	X	8
	AS	CN	CI	FI	PP	GU	KI	NA	NC	NU	PN	PI	SI	TK	TG	TT	TU	VA	WF	WS	UU	AU	NZ	TOTAL NO

COMMON NAME	AS	CN	CI	FI	FP	GU	KI	NA	NC	NU	PN	PI	SI	TK	TG	TT	TU	VA	WF	WS	UU	AU	NZ	TOTAL NO
BORDEAUX			X			X			X	X	X	X						X		X	X	X		8
BORIC ACID					X	X				X	X		Xr			X				X		X	X	6
BPMC				X	X								Xr			X						X		4
BRODIFACOUM		X	X	X	X		X		X	X	X		X		X	X		X		X		X	X	13
BROMACIL	X		X	X	X	X			X		X		X					X		X		X	X	10
BROMADIOLONE									X		X		X			X						X	X	4
4-BROMO-2,5-DICHLOPHENOL																						X		0
BROMOPHENOXIM					X																		X	1
BROMOPHOS					X				X		X					X						X	X	4
BROMOPHOS ETHYL					X											X						X		2
BROMOPROPYLATE					X											X						X	X	2
BROMOXYNIL					X						X					X						X	X	3
BROMOXYNIL OCTANOATE					X																			1
BROMPYRAXONE					X																			1
BRONOPOL					X																			1
BUFENCARB					X											X								2
BUNEMA																X								1
BUPIRIMATE					X						X					X						X	X	3
BUPROFEZIN													X											1
BUTACARB					X																	X		1
BUTACHLOR					X						X					X						X	X	3
BUTHIDAZOLE																X							X	1
BUTOPYRONOXYL					X																			1
BUTOXYCARBOXIM																						X		0
BUTRALIN									X							X						X		2
BUTURON					X																			1
BUTYLATE					X				X							X							X	3
CACODYLIC ACID					X	X			X		X					X		X				X		6
CADMIUM ACETATE																						X		0
CADMIUM NITRATE																						X		0
CALCIFEROL																							X	0
CALCIUM ARSENATE											X					X								2
CALCIUM CHLORIDE																						X		0
CALCIUM CYANAMIDE					X																			1
CALCIUM CYANIDE		Xr														X						X	X	2
CALCIUM HYDROXIDE																							X	0
CALCIUM HYPOCHLORITE											X											X		1
CALCIUM PHOSPHIDE									Xr															1
CALCIUM POLY-SULPHIDE									X		X					X						X		3
CALOMEL																						X		0
CALVINPHOS											X													1
CAMPHECHLOR (TOXAPHENE)					X	Xr					X					X						X		4
CAPTAFOL			X	X	X				X		X		X		X	X				X	X	Xn	X	9
	AS	CN	CI	FI	FP	GU	KI	NA	NC	NU	PN	PI	SI	TK	TG	TT	TU	VA	WF	WS	UU	AU	NZ	TOTAL NO

COMMON NAME	AS	CN	CI	FI	FP	GU	KI	NA	NC	NU	PN	PI	SI	TK	TG	TT	TU	VA	WP	WS	UU	AU	NZ	TOTAL NO
CAPTAN	X	X	X	X	X	X			X	X	X	X	X		X	X	X			X	X	X	X	15
CARBARYL	X	X	X	X	X	X			X	X	X	X	X		X	X	X			X	X	Xn	X	14
CARBENDAZIM			X	X	X				X		X		X		X	X		X	X			X	X	10
CARBETAMIDE		X	X		X											X						X	X	4
CARBOFURAN		Xr	X	X	X				X		X		X		X	X						X	X	9
CARBON SULPHIDE									Xr															1
CARBOPHENOTHION					X											X						X	X	2
CARBOSULFAN				Xn							X													2
CARBOXIN					X											X						X	X	2
CARTAP					X																			1
CDAA																X						X		1
CDEC																X								1
CHINOSOL					X																			1
CHLORALOSE																							X	0
CHLORAMBEN				X	X				X						X	X							X	5
CHLORAMINE																						X		0
CHLORAMPHENICOL													X											1
CHLORANIFORMETHAN					X																			1
CHORANIL					X											X						X		2
CHLORBENSIDE																						X		0
CHLORBOMURAN																						X		0
CHLORBROMURON					X																			1
CHLORBUFAM				Xn	X				X		X					X							X	5
CHLORCAM																						X		0
CHLORDANE		X		Xr	X	Xr			Xb		X		X		X	X		X		X		X		11
CHLORDECONE									b									X				X		1
CHLORDIMEFORM					X						X					X						X		3
CHLORETHEPHON			X																				X	1
CHLORETHIDIAZOLE																						X		0
CHLORFENAC					X																	X		1
CHLORFENETHOL					X																		X	1
CHLORFENPROP METHYL					X																			1
CHLORFENSON					X				X													X		2
CHLORFENSULPHIDE					X																		X	1
CHLORFENVINPHOS		Xr			X				X		X					X		X				X	X	6
CHLORFLURENOL			X		X						X													3
CHLORFURENOL METHYL																						X		0
CHLORHEXIDINE GLUCON											X													1
CHLORHYDRIN ETHYLENE																						X		0
CHLORIDAZON				Xn	X				X							X						X	X	4
CHLORINATED C-3 HYDROCARBONS																						X		0
CHLORMEPHOS						X										X								2
CHLORMEQUAT					X				X													X	X	3
	AS	CN	CI	FI	FP	GU	KI	NA	NC	NU	PN	PI	SI	TK	TG	TT	TU	VA	WP	WS	UU	AU	NZ	TOTAL NO

COMMON NAME	AS	CN	CI	FI	FP	GU	KI	NA	NC	NU	PN	PI	SI	TK	TG	TT	TU	VA	WF	WS	UU	AU	NZ	TOTAL NO
CHLORNITROFEN																							X	0
CHLOROBENZILATE				X	X											X								3
CHLOROMETHANE SULFONAMIDE																							X	0
CHLOROMETHIURON																						X		0
CHLORONEB					X											X						X		2
CHLOROPHACINONE		X			X				X							X						X		4
CHLOROPHENE																						X		0
CHLOROPICRIN	X			X	X				Xr		X				X							X	X	6
3-CHLORO-1,2-PROPANEDIOL																							X	0
CHLOROPROPYLATE					X																	X		1
3-CHLORO-P-TOLUIDINE HYDRO-CHLORIDE																							X	0
CHLOROTHALONIL		X	X		X				X		X				X	X		X			X	X	X	9
CHLOROTOLURON					X																			1
CHLOROXURON					X						X											X	X	2
CHLORPHONIUM					X				X														X	1
CHLORPROPHAM					X				X							X						X	X	3
CHLORPYRIFOS		X			X	X			X		X		X			X		X				X	X	8
CHLORPYRIFOS METHYL					X	X					X		X			X						X		5
CHLORQUINOX					X																			1
CHLORSULFURON																						X	X	0
CHLORTHAL				Xn	X				X						X							X		4
CHLORTHAL DIMETHYL (DCPA)					X	X										X						X	X	3
CHLORTHIAMID (CHLOROTHIAMID)					X				X						X							X	X	3
CHLORTHIOPHOS											X					X						X		2
CITRIC ACID																						X		0
CLOFENTEZINE																							X	0
CLOFOP-ISOBUTYL					X																			1
CLONITRALID																X								1
CLOPYRALID																						X		0
COCONUT OIL SOAP																						X		0
COMPOUND 1080 (SODIUM FLUORO-ACETATE)				Xn							X					X						X	X	3
COPPER NAPTHANATE											X											X		1
COPPER HYDROXIDE			X		X				X		X					X		X	X		X	X	X	7
COPPER OXYCHLORIDE			X	X	X				X	X	X		X		X	X		X		X	X	X	X	11
COPPER SULPHATE	X	X	X		X	X			X	X	X		X		X	X		X		X	X	X	X	13
COUMACHLOR					X																			1
COUMAFURYL					X	X					X					X								4
	AS	CN	CI	FI	FP	GU	KI	NA	NC	NU	PN	PI	SI	TK	TG	TT	TU	VA	WF	WS	UU	AU	NZ	TOTAL NO

COMMON NAME	AS	CN	CI	FI	FP	GU	KI	NA	NC	NU	PN	PI	SI	TK	TG	TT	TU	VA	WF	WS	UU	AU	NZ	TOTAL NO
COUMAPHOS					X	X			X		X		X			X		X				X		7
COUMATETRALYL				X	X	X			X		X				X	X			X	X		X	X	9
4-CPA						X			X		X					X						X	X	4
CPMC																X								1
CREDAZINE					X																			1
CREOSOTE											X		X									X		2
CRESOL																						X		0
CRESYLIC ACID																						X		0
CROTOXYPHOS											X		X			X						X		3
CRUFOMATE					X						X					X						X		3
CRYOLITE					X						X					X						X		3
CRYOMAZINE																						X		0
CUPROUS OXIDE		X	X	X	X				X	X	X				X	X				X		X	X	10
CYANATRYN																						X		0
CYANAZINE					X				X							X						X	X	3
CYANAFENPHOS					X											X						X		2
CYANOPHOS					X																			1
CYCLOATE					X											X						X	X	2
CYCLOHEXIMIDE																X								1
CYCLOHEXANONE PEROXIDE																								
CYCLURON					X																			1
CYHALOTHRIN											X		X									X		2
CYHEXATIN					X				X													X	X	2
CYMIAZOLE																						X		0
CYMOXANIL																							X	0
CYPERMETHRIN									X		X		X			X		X				X	X	5
CYPERQUAT				X																				1
CYPRAZINE																X						X		1
CYTHIOATE						X					X					X		X						4
2,4-D, ACID		X		X	X	Xr			X		X		X		X	X		X		X	X	X	X	12
2,4-D, BE				X						X	X							X				X	X	
2.4-D, BOEE			amine								amine												X	
2,4-D, DEA SALT		X		Na					Na		Na											X		
2,4-D, DMA SALT				X							X		X									X	amine	
2,4-D, 2-ETHY. ESTER				ester	X						ester											X	acetyl	
2,4-D, IBE																						X	e.ester	
2,4-D, IPE																							Na	
2,4-D, PGBEE																						X		
2,4-DB, ACID					X				X		X					X		X				X	X	5
2,4-DB, BE																						X		
DAMINOZIDE					X											X						X	X	2
DAZOMET	X		X		X				X		X		X		X	X				X		X	X	9
DD			X	X	X				X		X				X	X						X	X	7
DDT					X				Xb	Xb	X		Xr		Xb			X				X	X	7
1-DECANOL																						X		0
DEET				X	X				X		X					X					X	X		5
	AS	CN	CI	FI	FP	GU	KI	NA	NC	NU	PN	PI	SI	TK	TG	TT	TU	VA	WF	WS	UU	AU	NZ	TOTAL NO

COMMON NAME	AS	CN	CI	FI	FP	GU	KI	NA	NC	NU	PN	PI	SI	TK	TG	TT	TU	VA	WP	WS	UU	AU	NZ	TOTAL NO
DEF																						X		0
DELTAMETHRIN				X	X				X		X		X						X		X	X	X	6
DEMETON-O	X	Xr									X					X						X		4
DEMETON-S-METHYL				Xn					X		X					X		X		X		X	X	6
DESMEDIPHAM					X											X							X	2
DESMETRYN					X																	X	X	1
DIALIFOS					X											X							X	2
DIALLATE					X											X						X		2
DIAPHENE																X								1
DIAZINON	X	X	X	Xn	X	X			X	X	X		X		X	X	X	X		X	X	X	X	15
DIBROMOCHLORO-PROPANE (DBCP)				X	X											X						X		3
DIBUTYL PHTHALATE					X											X						X		2
DIBUTYL SUCCINATE					X																			1
DICAMBA				Xn	X				X		X				X	X		X		X	X	X	X	8
DICHLOBENIL																X						X	X	1
DICHLOFENTHION					X				X		X					X						X		4
DICHLOFLUANID					X				X														X	2
DICHLONE					X						X					X						X	X	3
DICHLORAN					X						X							X				X	X	3
DICHLOROBENZENE																X						X		1
DICHLOROBENZENE-P					X											X						X		2
DICHLOROETHYL ETHER					X																			1
DICHLOROPHEN					X						X											X	X	2
DICHLOROPROPENE					X											X						X	X	2
3,6-DICHLOROPICO-LINIC ACID																						X	X	0
2,4-DICHLORO 3,5-XYLENOL																						X		0
DICHLORPROP					X				X		X		X			X						X	X	5
DICHLORVOS	X	X	X	X	X	X			X		X		X		X	X		X		X	X	X	X	13
DICLOBUTRAZOL											X													1
DICLOFOP-METHYL					X																	X	X	1
DICLORAN					X																	X	X	1
DICOFOL	X	X	X	X	X	X			X	X	X		X		X	X		X	X	X		X	X	15
DICROTOPHOS				Xn							X					X						X	X	3
DIELDRIN		X		Xn	X	Xr			Xb	Xb	X		Xr	X	Xr	X	X	X		X		X	X	14
DIENOCHLOR					X																			1
DIETHION									X															
DIFENACOUM				X	X				X		X					X								5
DIFENOXURON					X											X								2
DIFENZOQUAT					X											X						X	X	2
DIFLUBENZURON					X											X						X		2
DIKEGULAC					X																	X		1
DIMAZIDE																						X		0
	AS	CN	CI	FI	FP	GU	KI	NA	NC	NU	PN	PI	SI	TK	TG	TT	TU	VA	WP	WS	UU	AU	NZ	TOTAL NO

COMMON NAME	AS	CN	CI	FI	FP	GU	KI	NA	NC	NU	PN	PI	SI	TK	TG	TT	TU	VA	WF	WS	UU	AU	NZ	TOTAL NO
DIMEFOX																			X					1
DIMETILAN											X											X		1
DIMETHAMETRYN					X								X											2
DIMETHIRIMOL	X		X	X	X				X	X	X				X	X		X		X		X	X	11
DIMETHOATE	X	X	X	Xn	X	X			X		X		X		X	X		X		X		X	X	13
DIMETHYL PHTHALATE (DMP)					X								X			X						X		3
DIMEXANO					X																			1
DINITRAMINE					X											X						X	X	2
DINOBUTAN					X																			1
DINOCAP		X	X	X	X	X			X		X		X		X	X		X			X	X	X	11
DINOSEB			X			Xr			X							X						X	X	4
DINOSEB ACETATE																X						X		1
DIOXACARB					X											X						X		2
DIOXATHION		Xr			X	X										X						X		4
DIPHACINONE	X	X		X	X	Xr			X		X					X						X	X	8
DIPHENAMID					X				X							X						X	X	3
DIPHENYL					X																	X		1
DIPROPETRYN					X											X								2
DIQUAT DIBROMIDE			X	X	X					X	X										X	X	X	5
DISODIUM TETRA-BORATE PENTAHYDRATE																						X		0
DISULFOTON		Xr	X	X	X						X					X						X	X	6
DITALIMFOS					X											X								2
DITHIANON					X											X						X	X	2
DIURON		X	X	X	X	X			X	X	X		X		X	X		X		X	X	X	X	13
DNOC																X						X	X	1
DODEMORPH					X																		X	1
DODINE					X																	X	X	1
2,2-DPA (DALAPON)	X	X	X	X	X	X			X	X	X		X			X		X		X		X	X	13
DRAZOXOLON					X											X							X	2
DSMA						X			X							X		X				X		4
EDB			X	X	X				X		X		X		X	X		X				X	X	9
EDC					X																			1
EDIPHENPHOS																X								1
EMITRAM											X													1
ENDOSULFAN		X	X	Xn	X	X			X		X					X		X		X		X	X	10
ENDOTHALL, ACID					X	X					X					X					X	X		4
ENDRIN		Xr				Xr			Xb	Xb	X					X						X		5
EPN																X								1
EPTC					X				X		X					X						X	X	4
ERBON					X																			1
ETHALFLURALIN					X																			1
ETHEPHON			X						X		X					X		X		X		X	X	6
ETHIDIMURON											X											X	X	1
ETHIOFENCARB					X																			1
ETHIOLATE																X								1
	AS	CN	CI	FI	FP	GU	KI	NA	NC	NU	PN	PI	SI	TK	TG	TT	TU	VA	WF	WS	UU	AU	NZ	TOTAL NO

COMMON NAME	AS	CN	CI	FI	FP	GU	KI	NA	NC	NU	PN	PI	SI	TK	TG	TT	TU	VA	WP	WS	UU	AU	NZ	TOTAL NO
ETHION					X	Xr			X		X		X			X		X				X	X	7
ETHIPHOS											X													1
ETHIRIMOL					X											X							X	2
ETHOATE METHYL					X																	X		1
ETHOFUMESATE					X											X						X	X	2
ETHOTHEXADIOL					X																			1
ETHOPROPHOS				X	X				X		X		X		X	X				X		X	X	8
ETHOXYQUIN																						X		0
ETHYLAN																						X		0
ETHYLENE DICHLORIDE				Xn																		X		1
ETHYLENE OXIDE									Xr															1
ETHYL FORMATE																						X		0
ETHYLHEXANEDIOL					X						X		X			X					X			4
ETHYL TALLOWATE																						X		0
ETHRIDIAZOLE				X	X											X		X		X			X	5
ETHIMFOS					X											X							X	2
EXD					X											X								2
FAMPHUR											X					X						X		2
FATTY ACID ESTERS																						X		0
FATTY ALCOHOLS											X												X	1
FENAC											X					X								2
FENAMINOSULF					X											X						X	Xn	2
FENAMIPHOS		Xr	X		X				X		X				X	X		X				X	X	8
FENARIMOL					X																	X	X	1
FENAZAFLOR																						X		0
FENBUTATIN-OXIDE					X				X							X						X	X	3
FENCHLORPHOS				X	X	X			X		X					X						X		6
FENFURAM					X																	X		1
FENIDIM					X																			1
FENITROTHION				X	X				X		X		X			X		X	X	X		X	X	9
FENOPROP		X			X	Xr										X						X		4
FENPROPIMORPH																							X	0
FENSON					X														X			X		1
FENSULFOTHION		X	X			X					X					X						X	X	5
FENTHION ETHYL																						X		0
FENTHION		X		Xn	X	Xr			X		X		X			X		X				X		9
FENTIN											X											X		1
FENTIN ACETATE				X	X						X				X	X						X	X	5
FENTIN HYDROXIDE					X						X					X						X		3
FENURON					X																	X		1
FENURON-TCA					X																			1
FENVALERATE			X	X		X			X		X		X		X	X		X		X		X	X	10
FERBAM				Xn	X											X						X	X	3
FERROUS SULPHATE																						X		0
FLAMPROP ISOPROPYL					X																		X	1
	AS	CN	CI	FI	FP	GU	KI	NA	NC	NU	PN	PI	SI	TK	TG	TT	TU	VA	WP	WS	UU	AU	NZ	TOTAL NO

COMMON NAME	AS	CN	CI	FI	FP	GU	KI	NA	NC	NU	PN	PI	SI	TK	TG	TT	TU	VA	WF	WS	UU	AU	NZ	TOTAL NO
FLAMPROP METHYL																						X	X	0
FLUAZIFOP																						X		0
FLUAZIFOP-BUTYL			X	X	X				X		X		X		X					X		X	X	8
FLUCHLORALIN																X						X		1
FLUMETHRIN									X															1
FLUOMETURON																X						X		1
FLUOROACETAMIDE	Xr															X								2
FLUORODIFEN					X																			1
FLUOTRIMAZOLE					X																			1
FLUPROPION (FLUPROPRATE)											X													1
FLURECOL-N-BUTYL-ESTER																X								1
FLURENOL					X																			1
FOLPET.					X	X			X							X						X	X	4
FONOPHOS		X			X				X							X								4
FORMALDEHYDE									X	X	X		X			X		X		X		X		7
FORMETANATE																						X		0
FORMETANATE HYDRO-CHLORIDE																X							X	1
FORMOTHION			X	X	X						X		X			X						X	X	6
FOSAMINE AMMONIUM									X							X						X	X	2
FOSETYL -AL				X					X		X											X	X	3
FUBERIDAZOLE					X																		X	1
FURALAXYL																						X		0
GARLIC EXTRACT																						X		0
GIBBERELLIC ACID											X					X				X		X	X	3
GLYODIN																						X		0
GLYPHOSATE	X	X	X	X	X	X			X	X	X		X		X	X		X	X	X	X	X	X	15
GLYPHOSINE					X								X									X		2
GLYPHOSONATE AMMONIUM											X													1
GUAZATINE					X											X						X		2
HALACRINATE					X																			1
HELIOTHIS NPV																						X		0
HEPTACHLOR		X			X	Xr			Xb		X					X		X				X		7
HEPTENOPHOS																X								1
HEXACHLORO-ACETONE					X																			1
HEXACHLORO-BENZENE											X					X								2
HEXACHLOROPHENE						X										X						X		2
HEXAFLURATE					X																	X		1
HEXAN-1-OL																						X		0
HEXAZINONE				X	X				X		X					X		X				X	X	6
HEXYTHIAZOX																						X		0
HYDROCARBON OIL				X							X													2
HYDROCYANIC ACID		Xr							Xr							X								3
	AS	CN	CI	FI	FP	GU	KI	NA	NC	NU	PN	PI	SI	TK	TG	TT	TU	VA	WF	WS	UU	AU	NZ	TOTAL NO

COMMON NAME	AS	CN	CI	FI	FP	GU	KI	NA	NC	NU	PN	PI	SI	TK	TG	TT	TU	VA	WF	WS	UU	AU	NZ	TOTAL NO
HYDROGEN CYANIDE					X																			1
8-HYDROXYQUINO-LINE																						X	X	0
HYMEXAZOL					X																			1
IBA					X																	X	X	1
IBP					X											X								2
IMAZALIL																						X	X	0
IODOFENPHOS					X						X					X				X		X		4
B-INDOLYLBUTYRIC ACID																							X	0
g-INDOLYLBUTYRIC ACID																							X	0
IOXYNIL				X	X											X						X	X	3
IOXYNIL OCTANOATE				X	X																			2
IPRODIONE				Xn					X		X											X	X	3
ISAZOPHOS													X							X			X	0
ISOCARBANID					X																			1
ISOCARBOPHOS					X																	X		1
ISOFENPHOS																X								1
ISONORURON					X																			1
ISOPROCARB				Xn	X																			2
ISOPROPALIN					X											X								2
ISOPROTURON					X											X								2
KARBUTILATE					X											X						X	X	2
KASUGAMYCIN				X	X						X				X					X			X	5
KINETIN EQUIVALENT																						X		0
LEAD ARSENATE											X					X						X		2
LENACIL					X						X											X	X	2
LEPTOPHOS											X					X						X		2
LESMETHRIN				X																				1
LETHANE 384																X								1
LEVAMISOLE HYDROCHLORIDE											X		X									X		2
LIME SULPHUR			X						X		X							X				X	X	4
LINURON			X	X	X				X		X		X		X	X		X				X	X	9
MAGNESIUM FLUOSILIC.																						X		0
MAGNESIUM PHOSPHIDE																						X		0
MALATHION (MALDISON)	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X		X	X	X	X	19
MANCOZEB	X	X	X	X	X	X			X		X		X		X	X		X	X	X	X	X	X	14
MANEB		X	X	X	X	X			X	X	X		X		X	X		X	X	X	X	X	X	14
	AS	CN	CI	FI	FP	GU	KI	NA	NC	NU	PN	PI	SI	TK	TG	TT	TU	VA	WF	WS	UU	AU	NZ	TOTAL NO

COMMON NAME	AS	CN	CI	FI	FP	GU	KI	NA	NC	NU	PN	PI	SI	TK	TG	TT	TU	VA	WF	WS	UU	AU	NZ	TOTAL NO
MCPA, ACID				X	X	X			X		X					X		X			X	X	X	8
MCPA, IOE				K/Na							Na		Na					di.e.a.				X		
MCPB, ACID					X						X					X							X	3
MEBENIL					X																			1
MECARBAM																X						X		1
MECOPROP					X				X	X	X					X		X				X	X	6
MEFLUIDIDE					X											X						X	X	2
MENAZON					X								X							X		X		3
MEPHOSFOLAN																X								1
MEPIQUAT CHLORIDE																						X		0
MERCURY CHLORIDE					X				b				X									X		2
MERCURY OXIDE					X				b		X												X	2
MERPHOS																X						X		1
METALAXYL			X	Xn					X		X		X			X				X		X	X	7
METALDEHYDE	X	X	X	X	X	X			X		X		X		X	X		X		X	X	X	X	13
METAM																							X	0
METAMITRON					X				X														X	2
METHABENZTHIAZURON				Xn	X				X						X							X	X	4
METHACRIFOS																						X		0
METHAM					X	X										X		X				X	X	4
METHAMIDOPHOS				Xn	X				X						X	X						X	X	5
METHANEARSONIC ACID				X							X					X						X		3
METHANOL																						X		0
METHAZOLE				Xn	X											X						X	X	3
METHIDATHION				X	X				X		X					X						X	X	5
METHIOCARB			X	X	X				X		X				X	X		X		X		X	X	9
METHOMYL	X	Xr	X	X	X	Xr			X		X		X		X	X		X		X		X	X	13
METHOPRENE																X								1
METHOPROTRYN					X																			1
METHOXYCHLOR		X			X	X					X					X						X		5
METHOXYETHYL MERCURIC CHLORIDE (MEMC)											X							X						2
METHOXYETHL-MERCURY					X																			1
METHYLBROMIDE	X	Xr	X	X	X	Xr	X		Xr	X	X		X		X	X		X		X		X	X	15
METHYL 5-HYDROXY-2 BENZIMIDAZOLE-CARBAMATE						X												X						2
METHYL ISOTHIO-CYANATE																						X	X	0
	AS	CN	CI	FI	FP	GU	KI	NA	NC	NU	PN	PI	SI	TK	TG	TT	TU	VA	WF	WS	UU	AU	NZ	TOTAL NO

COMMON NAME	AS	CN	CI	FI	FP	GU	KI	NA	NC	NU	PN	PI	SI	TK	TG	TT	TU	VA	WF	WS	UU	AU	NZ	TOTAL NO
METHYL THIOPHANATE					X				X															2
METHYLMERCURIC CHLORIDE																X								1
METHYLMERCURIC DICYANAMIDE																		X						1
METIRAM			X		X				X		X		X			X		X		X		X	X	7
METOBROMURON					X				X		X					X								4
METOLACHLOR					X				X		X					X						X	X	4
METOXURON					X											X						X		2
METRIBUZIN				Xn	X				X		X				X	X						X	X	6
MEVINPHOS		X			X	Xr			Xr		X					X						X	X	6
MEZINEB									X													X		1
MEXACARBATE						X										X								2
MH				X	X	X										X						X	X	4
MIREX		X	X	Xn	X				Xb		X					X		X		X		X		9
MINERAL OIL	X		X	X	X	X			X		X		X		X	X		X		X		X	X	12
MINERAL TURPENTINE																						X		0
MOLINATE					X								X			X						X		3
MONALIDE					X											X								2
MONOCLOROXYLENOL																						X		0
MONOCROTOPHOS		Xr		Xn		X			X		X		Xr		X	X		X				X		9
MONOLINURON					X				X							X								3
MONURON					X	X					X					X						X	X	4
MONURON-TCA					X											X						X		2
MPMC					X											X						X		2
MSMA				X	X	X			X		X		Xr		X	X		X		X		X		10
MTC											X													1
MUSCAMONE																						X		0
NAA			X	X						X	X					X		X				X	X	6
NABAM					X											X						X		2
NALED	X	X	X	X	X	X			X		X		X		X	X		X		X		X	X	13
NAPHTHALENE			X	X							X		X					X				X		5
NAPHTHALENE ACETAMIDE			X		X				X							X							X	4
1-NAPHTHOL																X								1
2-NAPTHOXYACETIC ACID																							X	0
1-NAPTHYLACETIC ACID																							X	0
NAPROPAMIDE					X											X						X	X	2
NEPTALAM, SODIUM					X					X														2
NEBURON					X																	X		1
NICLOSAMIDE		Xr			X				X		X					X						X		5
NICOTINE					X				X		X													3
NITRALIN					X											X						X	X	2
	AS	CN	CI	FI	FP	GU	KI	NA	NC	NU	PN	PI	SI	TK	TG	TT	TU	VA	WF	WS	UU	AU	NZ	TOTAL NO

COMMON NAME	AS	CN	CI	FI	FP	GU	KI	NA	NC	NU	PN	PI	SI	TK	TG	TT	TU	VA	WF	WS	UU	AU	NZ	TOTAL NO
NITRAPYRIN					X											X						X		2
NITRIC ACID																						X		0
NITROFEN					X				X							X						X	X	3
NITROTHAL-ISOPROPYL					X																	X	X	1
TRANS-NONACHLOR																X								1
NORBORMIDE					X																	X		1
NORFLURAZON					X											X						X		2
OCTAN-1-OL																						X		0
N-OCTYL BICYCLO-HEPTENE DICARBOXIMIDE				X							X		X								X	X		3
ODB																						X		0
OIL-CITRONELLA																						X		0
OIL-EUCALYPTUS																						X		0
OIL-REFINED MINERAL																						X		0
OMETHOATE					X				X		X		Xr			X		X				X	X	6
OPP											X											X		1
ORYZALIN					X											X						X	X	2
OXADIAZON				X	X																	X	X	2
OXAMYL		X	X	X					Xr		X				X	X		X		X		X	X	9
OXYCARBOXIM					X				X		X											X	X	3
OXYDEMETON METHYL			X	Xn	X				X							X								5
OXYFLUORFEN				Xn							X											X	X	2
OXYTHIOQUINOX			X		X	X										X						X	X	4
PARAQUAT DI CHLORIDE	X	Xr	X	X	X	Xr			X	X	X		X		X	X	X	X		X	X	X	X	15
PARAQUAT DIMETHYL SULPHATE																						X		0
PARATHION ETHYL		Xr			X				Xr		X				X	X		X	X			X	X	8
PARATHION METHYL		Xr			X				Xr		X		X		X	X						X	X	7
PARINOL																X								1
PARIS GREEN (COPPER ACETOARSENITE)		X				X																		2
PCP			X	Xn	X	Xr					X					X						X	X	6
PDB																						X		0
PEBULATE					X						X					X						X	X	3
PELARGONIC ACID																						X		0
PENCONAZOLE																							X	0
PENDIMETHALIN					X										X	X						X	X	3
PENFENATE											X											X		1
PENOXALIN																						X		0
PENTANOCHLOR					X																	X		1
PERFLUIDONE					X	X							X									X		3

COMMON NAME AS CN CI FI FP GU KI NA NC NU PN PI SI TK TG TT TU VA WF WS UU AU NZ TOTAL NO

COMMON NAME	AS	CN	CI	FI	FP	GU	KI	NA	NC	NU	PN	PI	SI	TK	TG	TT	TU	VA	WF	WS	UU	AU	NZ	TOTAL NO
PERMETHRIN	X		X	X	X	X		X	X	X	X		X		X	X				X	X	X	X	13
PETROLEUM OIL	X	X	X	X	X	X	X				X				X	X		X		X	X	X	X	12
PHENISOPHAN																						X		0
PHENMEDIPHAM					X											X						X	X	2
PHENOBENZURON					X																			1
PHENOTHIAZINE																X.								1
PHENOTHRIN				X	X		X		X		X		X	X	X			X			X	X	X	9
PHENTHOATE					X																		X	1
PHENYLMERCURIC ACETATE (PMA)													Xr			X						X		2
N-PHENYLMETHYL PURIN AMINE																							X	0
O-PHENYLPHENOL					X											X						X		2
PHOPATE																						X		0
PHORATE		Xr				X										X						X	X	3
PHOSACETIM		Xr														X								2
PHOSALONE					X											X						X		2
PHOSFOLAN																X						X		1
PHOSMET					X						X					X						X	X	3
PHOSPHAMIDON		Xr				X										X						X		3
PHOSPHORIC ACID											X											X		1
PHOSPHORUS																						X	X	0
PHOXIM					X				X													X		2
PICLORAM		Xr			X	Xr			X		X		X			X		X		X		X	X	9
PINDONE					X																			1
PIPERALIN						X										X								2
PIPERONYL BUTOXIDE	X			X	X	X	X		X		X		X		X	X					X	X	X	10
PIPEROPHOS					X						X		X											3
PIRIMICARB			X		X						X				X	X						X	X	5
PIRIMIPHOS ETHYL					X				X		X					X						X	X	4
PIRIMIPHOS METHYL	X		X	X	X				X	X	X		X		X	X		X		X		X	X	12
PLIFENATE									X									X						2
PMC																						X		0
POLYHEXAMETHYLENE BIGUANIDE HYDROCHLORIDE																						X		0
POLYSULPHIDE SULPHUR																						X		0
POTASSIUM AZIDE											X					X								2
POTASSIUM CYANATE					X																			1
	AS	CN	CI	FI	FP	GU	KI	NA	NC	NU	PN	PI	SI	TK	TG	TT	TU	VA	WF	WS	UU	AU	NZ	TOTAL NO

COMMON NAME	AS	CN	CI	FI	FP	GU	KI	NA	NC	NU	PN	PI	SI	TK	TG	TT	TU	VA	WF	WS	UU	AU	NZ	TOTAL NO
POTASSIUM DI-CHROMATE											X													1
POTASSIUM DIETHYL DITHIO-PHOSPHATE											X													1
POTASSIUM DIETHYL THIO-PHOSPHATE											X													1
POTASSIUM DIMETHYL DITHIO-PHOSPHATE											X													1
POTASSIUM DIMETHYL THIO-PHOSPHATE											X													1
POTÁSSIUM NITRATE																						X		0
PROCHLORAS																						X		0
PROCYAZINE											X					X								2
PROCYMIDONE									X									X				X	X	2
PROFENOPHOS					X						X					X						X		3
PROFLURALIN					X											X								2
PROMACYL											X		X									X		2
PROMECARB					X	X			X							X						X		4
PROMETON					X	X										X								3
PROMETRYN				Xn	X						X					X						X	X	4
PROPACHLOR				Xn	X						X					X						X	X	4
PROPAMOCARB											X											X	X	1
PROPANIL			X	X	X								X			X						X	X	5
PROPARGITE	X				X											X					X	X	X	3
PROPAZINE					X											X						X	X	2
PROPETAMPHOS		X														X								2
PROPHAM					X											X		X				X	X	3
PROPICONAZOLE			X								X				X					X		X	X	4
PROPINEB					X				X													X	X	2
PROPOXUR	X	X	X	X	X	X			X		X		X		X	X		X	X	X		X	X	14
PROPYL ISOME					X																		X	1
DI-N-PROPYL ISOCINCHOMERATE				X							X		X								X	X		3
PROPYZAMIDE			X		X				X							X					X	X	X	4
PROTECT									X							X								2
PROTHIOCARB					X																			1
PROTHIOFOS																						X	X	0
PYRACARBOLID					X											X						X		2
PYRAZON																						X		0
PYRAZOPHOS									X							X		X			X	X	X	3
PYRETHRINS	X		X	X	X	X	X		X		X		X		X	X		X		X	X	X	X	13
PYRIDINITRIL					X																			1
	AS	CN	CI	FI	FP	GU	KI	NA	NC	NU	PN	PI	SI	TK	TG	TT	TU	VA	WF	WS	UU	AU	NZ	TOTAL NO

COMMON NAME	AS	CN	CI	FI	FP	GU	KI	NA	NC	NU	PN	PI	SI	TK	TG	TT	TU	VA	WF	WS	UU	AU	NZ	TOTAL NO
N-3-PYRIDYLMETHYL N-P NITROPHENYL UREA																							X	0
QUARTERNARY AMMONIUM TIN COMPLEX																						X		0
QUINACETO-SULPHATE					X																			1
QUINALPHOS				Xn	X											X								3
QUINONAMID					X																			1
QUINTOZENE (PCNB)		X			X	X			X		X		Xr			X						X	X	7
RED SQUILL																							X	0
RESMETHRIN					X	X					X					X		X				X		4
RONNEL						X					X													2
ROTENONE			X	Xn	X	X			X	X	X		X		X	X		X		X		X	X	12
RYANIA					X																			1
SABADILLA					X																			1
SALICYANILIDE					X						X													2
SALITHION																X								1
SECBUMETON					X																	X		1
SEC-BUTYLAMINE																						X		0
SESAMEX					X																			1
SETHOXYDIM				X							X											X	X	2
SIDURON					X											X						X		2
SIMETRYN					X																			1
SIMAZINE					X	X			X		X		X		X	X		X			X	X	X	8
SODIUM ARSENATE																						X		0
SODIUM ARSENITE					X				Xb		X													3
SODIUM AZIDE																X								1
SODIUM BISULPHATE																						X		0
SODIUM BORATE																						X		0
SODIUM CARBONATE																						X		0
SODIUM CHLORATE			X	X	X				X		X					X		X				X	X	7
SODIUM CYANIDE		Xr									X					X							X	2
SODIUM DICHLOROISO-CYANURATE											X											X		1
SODIUM DICHROMATE											X		Xr		X	X								4
SODIUM FLUORIDE		Xr		X	X						X		Xr									X		5
SODIUM FLUOSILICATE																						X		0
SODIUM HYDROXIDE																						X		0
SODIUM HYPOCHLORITE																		X						1
SODIUM METABORATE					X																			1
SODIUM MOLYBDATE																						X		0
SODIUM NITRATE																							X	0
SODIUM PENTACHLORO-PHENATE									X		X											X		2
SODIUM O-PHENYL-PHENATE						X			X							X						X		3
SODIUM SILICO-FLUORIDE																						X		0
SODIUM TETRABORATE				Xn									X									X		2
	AS	CN	CI	FI	FP	GU	KI	NA	NC	NU	PN	PI	SI	TK	TG	TT	TU	VA	WF	WS	UU	AU	NZ	TOTAL NO

COMMON NAME	AS	CN	CI	FI	FP	GU	KI	NA	NC	NU	PN	PI	SI	TK	TG	TT	TU	VA	WF	WS	UU	AU	NZ	TOTAL NO
SODIUM THIOCYANATE									X		X												X	2
SODIUM TRIPOLY-PHOSPHATE																						X		0
STREPTOMYCIN SULPHATE						X			X		X					X				X		X	X	5
STROBANE																X						X		1
STRYCHNINE		Xr							Xr		X					X						X		4
SULFALLATE					X																	X	X	1
SULFAMIC ACID																						X		0
SULFONIC ACID																						X		0
SULFOTEPP		Xr														X								2
SULFOXIDE					X																			1
SULPHAMETHAZINE											X													1
SULPHAQUINOXALINE																						X		0
SULPHUR			X	X	X	X			X	X	X		X		X	X					X	X	X	10
SULPROFOS																X						X		1
SWEEP					X																			1
2,4,5-T, ACID	X		X	X	X				X	X	X	X	Xr		X			amine		X		X	amine	12
2.4.5-T, BE				X							Na		X					X				X	X	
2.4.5-T, BOEE											X							X				X		
2,4,5-T, IOE											X							X				X	e.ester	
2.4,5-T, PGBEE											X							X				X		
2,4,5-T, TEA SALT											X							X				X		
TAR ACIDS																						X	X	0
4-(2,4.5-TB)											X					X		X						3
2,3,6- TBA					X																	X	X	1
TCA				X	X				X									X				X	X	4
TCMTB											X		X									X		2
TDE (DDD)																						X	X	0
TEBUTHIURON					X																			1
TECNAZENE					X																	X	X	1
TEMEPHOS	X		X	Xn	X		X		X	X	X		X		X	X	X	X		X		X		14
TEPP		Xr							Xr							X						X		3
TERBACIL					X											X						X	X	2
TERBUFOS									Xr							X						X	X	2
TERBUMETON					X																		X	1
TERBUTYLAZINE					X						X					X						X	X	3
TERBUTRYN					X				X		X					X						X	X	4
TETRACHLORVINPHOS				Xn	X				X		X		X			X						X		6
TETRADIFON					X											X						X	X	2
2,2.3,3, TETRA-FLUOROPROPRIONIC ACID											X													1
TETRAPION											X											X	X	1
TETRAMETHRIN			X	X	X		X		X	X	X		X		X			X		X		X	X	11
TETRASUL					X											X								2
	AS	CN	CI	FI	FP	GU	KI	NA	NC	NU	PN	PI	SI	TK	TG	TT	TU	VA	WF	WS	UU	AU	NZ	TOTAL NO

COMMON NAME	AS	CN	CI	FI	FP	GU	KI	NA	NC	NU	PN	PI	SI	TK	TG	TT	TU	VA	WF	WS	UU	AU	NZ	TOTAL NO
THALLIUM SULPHATE				Xn					Xr		X											X		3
THIABENDAZOLE			X		X				X		X					X						X	X	5
THIAZFLURON					X																			1
THIDIAZURON																						X		0
THIOBENCARB				X	X								X			X						X		4
2-THIOCYANOMETHYL-BENZOTHIAZOLE																						X		0
THIOCYCLAM					X																			1
THIODICARB																						X		0
THIOFANOX																X						X		1
THIOMETON				Xn												X						X	X	2
THIONAZIN																						X		0
THIOPHANATE				X	X						X					X			X			X	X	5
THIOPHANATE METHYL				Xn	X				X		X					X		X				X	X	6
THIOSULPHATE SULPHUR																						X		0
THIRAM			X	X	X	X			X	X	X		X			X		X		X		X	X	11
TIOCARBAZIL																						X		0
TOLYFLUANID					X											X								2
TRIBUTIL																						X		0
TRIADIMEFON					X				X		X											X	X	3
TRIADIMENOL																							X	0
TRI-ALLATE					X											X						X	X	2
TRIAZOPHOS				Xn					X							X						X	X	3
TRIBUTYL TINOXIDE											X											X		1
TRICHLORFON	X			X	X				X		X		X		X	X		X	X	X		X	X	11
TRICHLOROCYANURIC ACID																						X		0
TRICHLOROETHYLENE																						X		0
TRICHLORONATE									X							X							X	2
TRICHLORONITRO-METHANE				X																				1
2,4,5-TRICHLORO-PHENOL											X													1
TRICLOPYR									X		X		X			X						X	X	4
TRICYCLAZOLE					X																			1
TRIDEMORPH	X		X	X	X				X		X		X		X	X				X		X	X	10
TRIETAZINE					X											X							X	2
TRIFENMORPH					X																			1
TRIFLURALIN	X		X	Xn	X	X			X		X		Xr		X	X					X	X	X	10
TRIFORINE		X	X	X	X				X		X					X		X		X	X	X	X	9
UREA																						X	X	0
VALIDAMYCINE ACID					X																			1
	AS	CN	CI	FI	FP	GU	KI	NA	NC	NU	PN	PI	SI	TK	TG	TT	TU	VA	WF	WS	UU	AU	NZ	TOTAL NO

COMMON NAME	AS	CN	CI	FI	FP	GU	KI	NA	NC	NU	PN	PI	SI	TK	TG	TT	TU	VA	WF	WS	UU	AU	NZ	TOTAL NO
VAMIDOTHION				Xn	X																	X	X	2
VERNOLATE					X						X				X	X				X		X	X	4
VINCLOZOLINE					X				X									X		X		X	X	4
WARFARIN		X	X	X	X	Xr	X		X	X	X	X	X	X	X	X		X		X		X	X	16
WHITE OIL	X		X	X	X				X	X	X		X		X			X	X	X		X	X	12
XMC					X																			1
ZINEB	X	X	X	X	X	X			X	X	X				X	X		X	X	X		X	X	14
ZINC NAPTHENATE																						X		0
ZINC OXIDE											X											X		1
ZINC PHOSPHIDE		X			X		X		Xr	X	X			X		X								8
ZINC SULPHATE			X																					1
ZIRAM				X	X				X		X					X		X				X		6
TOTAL NO OF PESTICIDES RECORDED AS USED	43	81	94	155	418	107	11	2+	207	42	275	6	126	5	92	375	8	114	20	84	45	514	315	762 618
COUNTRY	AS	CN	CI	FI	FP	GU	KI	NA	NC	NU	PN	PI	SI	TK	TG	TT	TU	VA	WF	WS	UU	AU	NZ	TOTAL NO

Note:

1. Fenuron and monuron are no longer manufactured anywhere in the world (Dupont New Zealand, pers. comm.)
2. The following pesticides have not been commercially available in large amounts, if at all (Hoechst Australia, pers.comm.):

   binapacryl, clofop-isobutyl, deltamethrin, diclofop-methyl. endosulfan, fentin acetate, glufinosate ammonia, linuron, pyrazophos, triazophos.

3.2 DISCUSSION

From Table 3 it can be seen that a minimum of 618 different pesticides are available in the region, and 762 are available if Australia and New Zealand are included. Australia and New Zealand are included firstly for comparison and secondly it is useful to know what pesticides are registered for use in Australia and New Zealand.

Firman (1981 - Biblio No 615) in the SPC 'Pesticide Handbook' listed only 162 pesticides as being available in the region. All the chemicals he listed are included in the updated list in Table 3, with the exception of ESP (reported by Firman to be available in Vanuatu).

However, Table 3 is not completely accurate and probably includes some errors. Some pesticides listed as available may not now be available for various reasons (withdrawn, banned, restricted, unavailable or no longer produced). Some may have been used for experimental purposes only, and as such were not commercially available. Others that may be used, might not be included in Table 3. This is so for the following reasons:

1. Some respondants did not include any pesticide not on the original list of 503 (eg: Guam, New Caledonia, TTPI, Australia).

2. Some respondants only included or provided information on those used in agriculture and possibly excluded those used in Public Health or for household use. Most countries probably did not include pesticides used in forestry or timber treatment, or in quarantine. Some countries included pesticides being used in experimental trials only, others did not.

3. Many responses were found to have omissions. From my review of the literature, or from my limited observations in stores in a few of the countries, I found that many more pesticides were available than were stated in the responses to the questionnaire listing. For example, in both Vanuatu and the Solomons I found many pesticides not on the lists provided available in stores. In the case of Australia and New Zealand, I added pesticides to the lists provided after referring to the following publications:

   For Australia:

   Snellgrove, J. 1983/84 . Pestlist. Microfiche A. Supgazette Registered Pesticides, 1979-82 by Suppliers, Active Constituents; Function.

Department of Agriculture, Victoria.

Snellgrove, J. 1985. PestList. Microfiche A. Supgazette - Registered Products, 1985-88 by Suppliers, Active Constituents; Function. Department of Agriculture, Victoria.

Queensland Agricultural College 1985. QAC-PESKEM. Microfiche. Preparations by Active Constituent. Queensland Agricultural College, Gatton, Queensland.

For New Zealand:

The Agricultural Chemicals Board 1982. Registered Agricultural Chemicals. Wellington, New Zealand.

Pesticide Board. 1985. Unpublished Computer Printout (D. Lunn), November, 1985.

4. In some countries no accurate records are kept on imports and so pesticides may be imported without the knowledge of the appropriate authorities. This is certainly the case in PNG, and I suspect in most other countries, possibly excepting those with both pesticide registration and effective law enforcement (eg: Guam).

5. In countries without registration, or without legislation which is enforced, some formulations are imported which do not specify the active constituent (eg: in PNG three aerosols available in Port Moresby include Woolf® (Hoover, Singapore), and Mortein Superconcentrated® (Reckitt and Colman, N.Z. - also available in the Solomons), and Scorpio® (Northern Distributors, N.Z.). Woolf® is known to contain dichlorvos, Scorpio® was found to contain dichlorvos and propoxur, and Mortein Superconcentrated® is thought to contain pyrethrins or synthetic pyrethroids. Some countries retain compounds originally imported by their previous colonial rulers (eg: in Vanuatu, one Government store contained a substance called 'oleoparaphene', recently identified as parathion).

6. No further information has been received from most governments since mid-1984, in which time many changes may have occurred in use patterns. However information for New Caledonia, Papua New Guinea and Solomon Islands has been updated till October 1986.

Table 3 is not a list of currently registered, or even currently used or available pesticides. **It is a list of pesticides known to have been available over the last 5 - 9 years. Not all those listed are now used.** For example, in Fiji some have been withdrawn from registration. These

include acifluorfen, aldrin, alphachoralose, arimiphos methyl, bentazon, carbosulfan, chlorbufam, chloridazon, chlorthal, compound 1080, demeton-S-methyl, diazinon, dicamba, dicrotophos, dieldrin, dimethoate, endosulfan, ethylene dichloride, fenthion, ferbam, iprodione, isoprocarb, metalaxyl, methabenzthiazuron, methamidophos, methazole, metribuzin, mirex, monocrotophos, oxydemeton methyl, oxyfluorfen, PCP, prometryn, propachlor, quinalphos, rotenone, sodium tetraborate, temephos, tetrachlorvinphos, thallium sulphate, thiometon, thiophanate methyl, triazophos, trifluralin, and vamidothion. gBHC (lindane) and chlordane are restricted for specific uses (pers. comm., Kumar, 1985). Many of the pesticides listed are not recommended for use, or are of no commercial value and so are no longer available, eg: in PNG, the Solomons and Tonga. In French Polynesia and TTPI the list of pesticides actually used would probably only be a fraction of that given in the Table. The lists for these countries are of permitted pesticides, in that they are registered in their metroplitan country, France or USA respectively. Unfortunately no lists are available for what is actually used.

3.3 Trends in Numbers of Pesticides Available

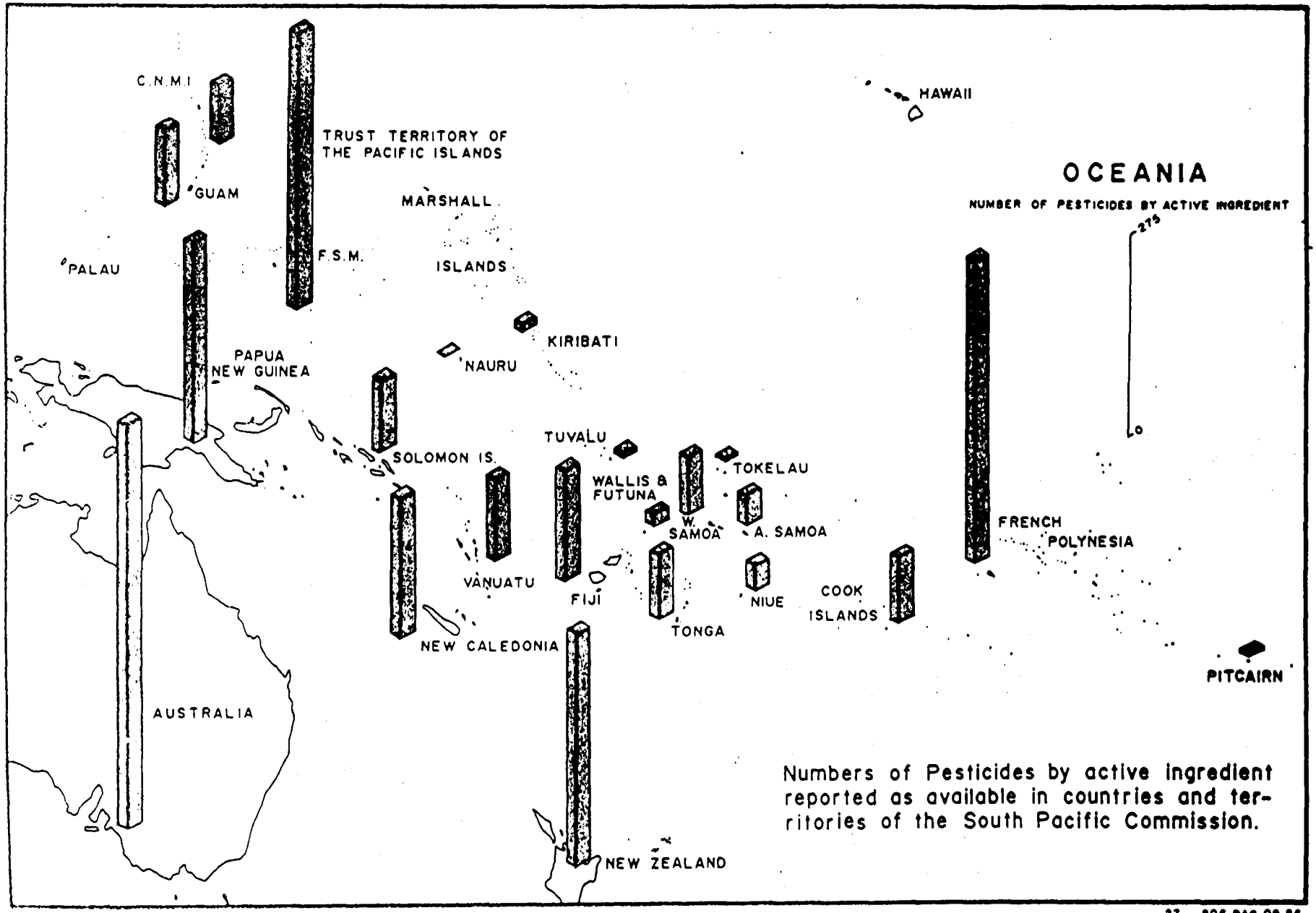
The number of different pesticides reported as available in each of the countries of the region are given below in Table 4 , and in Figure 2. Table 4 also includes Firman's estimates (personal communication) which were the number of pesticides reported as being used in the region between 1975 and 1980.

Table 4 Number of Pesticides (a.i.) Reported as Available in Area of South Pacific Commission

Country	No of Pesticides (a.i.)	
	1975 - 1980	1977 - 1986
American Samoa	16	43
CNMI		81
Cook Islands	30	94
Fiji	52	155
French Polynesia	114	418
Guam	33	107
Kiribati		11
Nauru		2+
New Caledonia	50	207
Niue	18	42
Papau New Guinea	65	275
Pitcairn Island		6
Solomon Island	43	126
Tokelau	4	5
Tonga	40	92
TTPI	39	375
Tuvalu		8
Vanuatu	39	114
Wallis & Futuna		20
Western Samoa	26	84
Unspecified		45
Australia		514
New Zealand		315
Total for S.P.C. countries	162	618
Total including Aust. & N.Z.		762
Total available in S.P.C. countries not registered in Aust. & N.Z.		182

a. includes CNMI
b. incomplete

Figure 2 Map of South Pacific showing number of pesticides available, per country.



Most countries show a substantial increase in the number of pesticides reported as being available. However, the number indicated may not always represent the number used for the reasons given above; but also, as in French Polynesia and TTPI the list of pesticides actually used would probably only be a fraction of that given in the table. The list for these countries is of pesticides allowed to be used, that is for use in Metroplitan France and the USA.

Many pesticides not used in Australia and New Zealand are available for use. This is further discussed in Chapter 8.

A considerable number of the pesticides may have been available at some stages in the past, but are most definitely now not used. Unfortunately no lists are available for what is actually now used. Such a list needs to be compiled.

3.4 MOST COMMONLY AVAILABLE PESTICIDES

Table 5 lists the 59 pesticides most widely available in the region, reported as available in 10 or more countries. Those listed with an * are pesticides not included in Firman's "Pesticide Handbook".

Table 5 list of most commonly available pesticides in South Pacific Countries.

Number of Countries in which pesticide is reported as been available	Pesticide
19	malathion (maldison)
16	warfarin
15	benomyl, captan, diazinon, dicofol, glyphosate, methyl bromide
14	carbaryl, dicrotophos*, dieldrin, mancozeb, maneb, paraquat, propoxur*, temephos*, zineb
13	brodifacoum*, copper sulphate, dichlorvos, dimethoate, diuron, 2,2-DPA, metaldehyde, methomyl, naled, permethrin, pyrethrins
12	acephate, Bacillus thuringiensis, gBHC(lindane) brodifacoum*, 2,4-D, mineral oil, petroleum oil, pirimiphos methyl, rotenone, 2,4,5-T, white oil*
11	bendiocarb*, bioresmethrin*, chlordane, copper oxychloride, dimethirimol, dinocap, tetramethrin*, thiram, trichlorfon.
10	atrazine, bromacil, carbendazin, cuprous oxide, endosulfan, fenvalerate*, MSMA, piperonyl butoxide*, sulphur, thiram tridemorph, trifluralin.

The availability of these pesticides does not indicate the quantity used. Very little, accurate information is available (or even exists) on quantities used in most countries. In chapter 4 an attempt is made to quantify pesticide use in the South Pacific.

3.5 NUMBERS OF FORMULATIONS

Although 762 different pesticides (active consituents) are reported as being available in the region, including Australia and New Zealand; 620 excluding Australia and New Zealand, there are many more formulations. The only data I have been able to compile on formulations are for Fiji, PNG, Solomon Islands, Australia, and New Zealand. These are given in Table 6. Data from Fiji and Solomon Islands were provided by the Registrar of Pesticides in each country. Data from PNG was obtained from chemical companies and by visiting stores that sell and distribute pesticides in PNG, and was done with the assistance of Ms Lois Kesu who is the Chemicals Officer, Department of Environment and Conservation. A computer listing of all formulations presently commercially available from retail and wholesale distributors (including major importers, minor importers, tradestores and supermarkets) is presently being compiled for PNG. A listing of some commonly available formulations in Fiji is given in Karan (1982a - Biblio No 27; also published in Staring (1984 - Biblio No 636). Australian data was obtained from Snellgrove (1983,1984,1985) using Victorian Department of Agriculture PESTLIST and Queensland Agriculural College (1985) QAC-PESTKEM. New Zealand data were obtained from N.Z. Agricultural Chemical Board (1982, 1983, 1985).(For these references see pages 105 and 106).

Table 6 Number of Recorded Pesticides and Formulations in Fiji, Papua New Guinea, Solomon Islands, Australia and New Zealand.

Country	No. of recorded pesticides (a.i.)	No of recorded formulations	Source
Fiji	134	496	Mowbray (1984a)
	155		Table 3
PNG	275	824+	Kesu and Mowbray
			Table 3
Solomons Islands	98	133	Macfarlane (1984,pers com.)
	89	174	Abington (1986,pers com.)
	126		Table 3
Australia	370	1874	Snellgrove (PESTLIST,1983)
	385	2186	Snellgrove (PESTLIST,1984)
	399	2402	Snellgrove (PESTLIST,1985) QAC-PESTKEM (1985)
	514		Table 3
New Zealand	287	1213	N.Z. Agricultural Chemicals Board (1982)a
	367	962	N.Z. Agricultural Chemicals Board (1983)
	261	771	N.Z. Agricultural Chemicals Board (1985)
	315		Table 3

a. Agricultural chemicals only

Since new formulations appear regularly, and many old formulations are withdrawn or discontinued, all figures in Table 6 can only be considered as the approximate number of formulations available. In countries with registration, the numbers of formulations should be known, but in fact, numbers are difficult to determine. In Fiji, I (Mowbray, 1984a - Biblio No 625) recorded 134 pesticides as being available in 496 formulations. Subsequently further pesticides have been reported to be used. In May 1984, Kumar (pers.com.) stated that 45 of the active ingredients I noted (in Table 3) were not registered, and should not be generally available (however, some are!). I was notified by chemical companies that other pesticides listed in Table 3 were also not now registered. All such chemicals, are listed as Xn in Table 3.

As can be seen from the Australian and New Zealand data, the number of active ingredients and formulations change year to year, but the numbers are very high.

One could predict that the numbers of formulations available in

the South Pacific would also exceed 1000.

A full computerised listing of all formulations, and amounts imported and actually used in the South Pacific is needed. This would give a more accurate picture of pesticide use than this report is able to provide. This would be possible if pesticide registration procedures were implemented and enforced in the region, and all information on imports and use were forwarded to a central data bank, eg at the SPC Plant Protection Office in Fiji.

3.6 SUMMARY

618 different pesticides (active ingredients) are listed as being available in the region in the last nine years; 762 if one includes Australia and New Zealand. Many of these are probably not used or only used in very small amounts. The 59 most commonly available ones (present in most countries) are given in Table 4 ; the two most common being malathion (an insecticide) and warfarin (a rodenticide). The numbers of pesticides reported as being available have increased possibly upto four-fold over the last ten years.

The number of formulations available in the region are most likely well in excess of 1000 (even when excluding Australia and New Zealand). A full computerised listing of all formulations currently being used in the region is needed.

CHAPTER 4

QUANTITIES OF PESTICIDES USED IN SOUTH PACIFIC COUNTRIES

4.1 INTRODUCTION

The availability of pesticides does not indicate the quantity used. Very little, if any, accurate information is available (or even exists) on quantities used in many countries in the South Pacific. However detailed data is now available for the following eight countries:

Cook Islands, Fiji, Guam, Nuie, Papua New Guinea, Solomon Islands, Tonga and Western Samoa

Little information is also available for New Caledonia and Vanuatu.

Data is taken from Staring (1984), Landell Mills (1983) or information I have collected over the last three years. The following is a summary of that information, country by country.

4.2 COOK ISLANDS

Staring (1984 Biblio No 636) provides the following data for 1981, which give a rough estimate of imports by value:

Table 7 Import of formulated pesticides by value into Cook Islands for 1981, in thousand $US

Pesticide Group	Value
Insecticides	15
Herbicides	10
Fungicides	15
Total	40

The major chemicals used are:

insecticides - malathion, permethrin, fenvalerate, diazinon, acephate, methomyl.
herbicides - paraquat, glyphosate, diuron, bromacil
fungicides - copper oxychloride, chlorothalonil, mancozeb, benomyl

4.3 FIJI

Staring (1984) provides quantative data on pesticide use in Fiji.

Table 8 Import of formulated pesticides into Fiji, 1979-1981 (where $US 1 = approve. $F 0.85)

Pesticide Group	Formulation quantity (in metric tons or kilolitres)			Value (in thousand $US)		
	1979	1980	1981	1979	1980	1981
Insecticides	293	322	283 (56)	872	856	1089 (46)
Herbicides	250	196	198 (39)	996	1050	1197 (50)
Fungicides	6	12	24 (5)	22	60	93 (4)
Total	549	530	505	1890	1966	2379

Proportions of insecticides and herbicides imports vary around 50%, depending upon whether by quantity or value. The amount imported during the period remained about the same. In 1982, the most used insecticide was malathion, whilst 2,4-D and asulam were the largest selling herbicides. Staring (1984) provided a detailed list of agricultural chemicals available in Fiji.

Landell Mills (1984 Biblio No 30) evaluated the market for agrochemicals in Fiji. Data they obtained from the Bureau of Statistics for imports of agrochemicals 1982 and 1983 are given in Table 9.

Table 9 Importation of agricultural chemicals into Fiji, 1982 -1983.

Chemical	Value (in thousand F$	
	1982	1983 (9 months only)
Insecticide	683	785
Fungicides	42	45
Herbicides	1307	643
Other	69	-
Total	2101	1473

These data are similar to those estimated by Staring (1984).

Tables 10 and 11 give in detail the total quantity and value of the main pesticides used on the main crops in Fiji. Values for herbicides estimated by Landel Mills are similar to those estimated by Staring (1984), but value of insecticides is far less, indicating that the household insecticides and those used in vector control are probably most important. Amounts (assuming active ingredients) are higher than what are estimated from Staring's data.

Table 10 Estimated total quantity of main pesticides and by crop in Fiji, 1983 (by Landell Mills, 1984) (in 000'kg or t, or kl, presumably active ingredient)

Chemical	Sugar cane	Coconut	Rice	Root Crops	Forestry	Other	Total
Insecticides and Nematicides							
acephate			0.7				0.7
carbaryl			1.4				1.4
diazinon			2.3				2.3
malathion			2.6				2.6
naled			0.2				0.2
permethrin			0.5				0.5
Total	*	nil	7.6	*	*		7.6
Fungicides							
benomyl							na
captafol							na
mancozeb	2.2						2.2
triforine	1.0						1.0
Total	3.2	nil	*	*	*		3.2
Herbicides							
dalapon					5		5
2,4-D/2,4,5-T	79.5						79.5
2,4-D	1.2						1.2
2,4-D/ioxynil	4						4
2,4-D/asulam/ ioxynil	95						95
hexazinon/diuron	11.3						11.3
MCPA			10			*	10
paraquat	5				100	*	105
proponil			15				15
thiobencarb			10				10
Total	196	*	35	*	105		336
Grand Total all pesticides	199	*	42.6	*	105		347

* insignificant quantities, values unknown.
na data not available

Table 11 Estimated total value of main pesticides used by crop in Fiji, 1983 (by Landell Mills, 1984) in '000 F $, where US$1 = F $ 0.95).

Chemical	Sugar cane	Coconut	Rice	Root Crops	Forestry	Other	Total
Insecticides and Nematocides							
acephate			14.4				
carbaryl			8,8				
diazinon			16				
malathion			10.4				
naled			1.6				
permethrin			8.0				
Total	*	nil	59.2	*	*	*	59.2
Fungicides							
benomyl						8.8	8.8
captafol	9.8						8.8
mancozeb	9.8						9.8
triforine	6.7						6.7
Total	26.3	nil	*	*	*	*	34.1
Herbicides							
dalapon (2,2 DPA)						10.7	10.7
2,4-D/2,4,5-T	374						347
2,4-D	3.2						3.2
2,4-D/ioxynil	19.5						19.5
2,4-D/asulam/ ioxynil	462						462
hexazinon/diuron	75.6						75.6
MCPA			16.4			*	16.4
paraquat	13.3			*	267	20	300
proponil			33				33
thiobencarb			36				36
Total	921		85.4		278	34.7	1303
Grand Total	947	nil	145	*	278	-	1397

* insignificant quantities, values unknown.

4.4 GUAM

Data does exist for Guam on pesticide usage by farmers, and for commercial and industrial use (Guam Environmental Protection Agency, GEPA) (1975 - Biblio No 145; 79 - Biblio No 140; 83 - Biblio No 139), and Bjork (1983, 84 - Biblio nos 120,121). Bjork (1983, 1984) conducted farmer surveys through 1981-83, and analysed Guam EPA data.

Data given in Table 12 is derived by me from unpublished data provided to Bjork by Guam EPA.

Table 12 Annual sale of (presumably formulated) pesticides in Guam in 1981.

Pesticide Group	Formulation Quantity (thousand kg or kilolitres)
Insecticides	4.9
Herbicides	2.1
Fungicides	0.6
Others	0.1
Total	7.8

In 1981 the most used pesticides formulations were in order (in 1000 kg or kilolitres): malathion (1.3), diuron (1.2), diazinon (1.1), carbaryl (1.0), naled (0.7), 2,2-DPA (dalapon; 0.6) mancozeb (0.3). In 1983, Brewer Chemical Company sold 2.4 kilolitres of chlordane, 1.9 kg of DowponR (2,2-DPA) and 1.3 kg of diuron. Bjork (1984) found that the most used pesticides by farmers in 1983 were still (in 1000 kg or kilolitres): diazinon (1.3), carbaryl (1.0), and malathion (0.7).

Other pesticides commonly used in Guam include, acephate, aldrin, allethrin, 2-amino benizimid azole, Bacillus thuriengiensis, chlorphyrifos, diphacinone, fenthion, metaldhyde, propoxur, pyrethrins.

4.5 NEW CALEDONIA

No precise data exists on the amounts of pesticides used in New Caledonia. However the most used pesticides are reported by Amice (pers. comm.) to be:

azinphos, benomyl, gBHC, captafol, copper, 2,4-D, deltamethrin, diazinon, dieldrin, endosulfan, glyphosate, linuron, malathion, mancozeb, maneb, metaldehyde, metribuzin, methamidophos, methomyl, paraquat, parathion, 2,4,5-T, thiophanate-methyl, warfarin.

4.6 NIUE

Staring (1984) provides the following data for 1981, which are rough estimates of imports.

Table 13 Import of formulated pesticides into Niue in 1981.

Pesticide Group	Formulations quantity (in metric tons or kilolitres)	Value (in '000 $US)
Insecticides	1.5	12.0
Herbicides	1.5	22.5
Fungicides	0.5	4.0
Total	3.5	38.5

The major chemicals used include paraquat, mancozeb and copper oxychloride.

4.7 PAPUA NEW GUINEA

Detailed information on pesticide use in given in Mowbray and Sutherland (1986 - Biblio No 393). Information was obtained both from industry and the National Statistics Office. Data are somewhat conflicting but give a reasonable idea of the quantities imported, and their value. Further information was obtained from Landell Mills (1984 - Biblio No 391).

Table 14 summarises the amounts of pesticides imported into PNG by formulation and active ingredients and their value, for 1978 and 1982, as estimated by Mowbray and Sutherland (1986). This data were obtained from statistics provided to Sutherland and me by the major importers of pesticides, both companies and the Health department.

Table 14 Import of Pesticides by weight and value into PNG, in 1978 and 1982

Pesticide Group	Formulation Quantity in metric tons		Active Ingredients in metric tons	
	1978	1982	1978	1982
Insecticides	132	143	76	74
Herbicides	267	467	114	188
Fungicides	9	21	5	9
Other	12	6	1	0.01
Total	420	637	195	271

The major pesticides used in PNG are given in Tables 15 -17 which list them in their groups, and in decreasing order of quantity of active ingredient used, and changes in use patterns over this period. Paraquat was by far the most used pesticide in 1982, with DDT the second most. Both probably still are, though the amount of DDT being used in vector control is decreasing dramatically.

Individual companies in PNG maintain data on pesticide imports but this data is not generally available and although supplied to me, and to PNG Government, it is company confidential information. Accordingly Tables give only amounts by range.

In 1986 when coffee rust badly effected coffee trees, particularly in Highlands' provinces, the PNG Government imported 6000 litres of Bayleton® (triadimefon) and 300 kg of Plantvax® (oxycarboxin). Also used were copper oxychloride and Vigil® (diclobutrazol). The quantities of fungicides have increased greatly since 1982. As can be seen from data provided by the National Statistics Office (Table 18), the quantities of all pesticides imported, not only fungicides, have increased greatly. In 1985 3.6 million PNG Kina's worth of over 1.3 million kg or litres of formulated pesticide was being imported.

Table 15 Herbicide sales/imports for 1978 and 1982 (in order of quantity of a.i. for 1982) and percentage change in sales.

Amount of Active Ingredient '000kg	Common Name 1978	1982	% change in sales
>50	-	paraquat	+ 140 (+ 20)[a]
>30	paraquat dalapon	-	
>20	-	dalapon	- 30
		atrazine	+ 2400
>10	2,4-D	diuron	+ 260
		ametryne	new
		terbutryn	new
> 5	diuron MSMA 2,4,5-T	2,4-D MSMA	- 30 - 40
> 3	glyphosate	2,4,5-T	- 50
		simazine	new
< 3	MCPA	MCPA	new
	atrazine	amitrole	new
	bromacil	glyphosate	- 80
	tetrapion	bromacil	+ 180
	sodium chlorate	MCPB	new
	picloram	alachlor	new
		sethoxydim	new
		sodium chlorate	+ 400
		diquat	new

[a] The amount of paraquat for 1982 may be an overestimate since the figure provided by one company was excessively high. No correction has been made for this in other tables. Paraquat sales in 1983 increased 90 % over 1978 sales.

Table 16 Insecticide sales/imports for 1978 and 1982 (in order of quantity of a.i. for 1982) and percentage change in sales. (includes that imported by Pharmaceutical Services).

Amount of Active Ingredient '000kg	Common Name 1978	1982	% change in sales
>50	DDT (PS)		
>40		DDT (PS)	- 11
> 5	white oil	DDT	+ 230
> 4	-	diazinon	+ 3220
		white oil	- 50
> 3	acephate	-	
> 2	dichlorvos	malathion	+ 88
> 1	DDT	acephate	- 50
	g HCH (lindane)	carbaryl	new
	malathion	methomyl	+ 30
	dieldrin		
>0.5	methomyl	g HCH (lindane)	- 60
	monocrotophos	dieldrin	- 60
		pirimiphos methyl	+ 300
		chlordane	+ 40
		monocrotophos	- 40
< 0.5	chlordane	permethrin [a]	new
	endrin	trichlorfon	+ 60
	trichlorfon	methyl bromide	0
	dimethoate	dimethoate	- 30
	methyl bromide	dichlorvos	- 100
	amitraz	aluminium phosphide	new
	pirimiphos methyl	formothion	new
	coumaphos	temephos	new
	diazinon		
	endosulfan		
	tetrachlorvinphos		
	crotoxphos		

[a] 50% permethrin exported to Solomon Islands.

Table 17 Fungicide sales/imports for 1978 and 1982 (in order of quantity of a.i. for 1982) and percentage change in sales.

Amount of active Ingredient '000kg	Common Name 1978	1982	% change in sales
> 4	-	copper oxychloride/ oxide	+ 100
> 2	copper oxychloride/oxide	-	
> 1	-	mancozeb	+ 60
>0.5	captafol	captafol	- 20
	mancozeb	carbendizim	+ 250
>0.25	-	metalaxyl	new
<0.25	binapacryl	thiophanate methyl	new
	zineb	benomyl	+ 220
	benomyl	binapacryl	+ 120
	captan	chlorothalonil	new
	carbendizim	captan	+ 180
		fentin hydroxide	new
		thiram	new
		zineb	+ 20

Table 18 Summary of Amounts and Value of Imports into PNG of Formulated Pesticides by type, from 1982 - 1985[a]

Type of pesticide		Quantity (Q) (in kg or litres)[b]				Value (V) (in PNG Kina)[b]			
		1982	1983	1984	1985	1982	1983	1984	1985
Insecticide	Q/V	397213	456652	460643	537909	1156673	1135969	1357285	1342199
	%	50	45	36	41	56	46	38	37
Fungicide	Q/V	48674	91855	141166	167165	70953	123473	453892	814897
	%	6	9	11	13	3	5	13	23
Herbicide	Q/V	307484	401778	581012	485038	778102	1100099	1551387	1226411
	%	39	40	46	37	37	45	43	34
Others[c]	Q/V	34365	56408	89119	110250	77140	109643	205483	237868
	%	4	6	7	8	4	4	6	7
Total	Q	787736	1006693	1271940	1300362	2082868	2469184	3568047	3621375

a National Statistics Office

b Preliminary data only; have not been check edited

c includes rodenticides, nematicides, molluscides and other pesticides; the last could include unspecified pesticides.

Landell Mills (1984 - Biblio No 391) did a market survey of agrochemical use in South East Asia and the Pacific. Part of this survey included an evaluation of the market in PNG.

Tables 19 - 20 give in detail the total quantity and value of the main pesticides used on the main crops in PNG.

Table 19 Estimated total quantity of main pesticides used by crop in PNG 1983 (by Landell Mills, 1984) ('000 kg or t, or kl, presumably active ingredient)

Chemical	Coffee	Cocoa	Copra	Oil Palm	Tea	Rubber	Sugarcane	Cardaman	Total
Insecticides and Nematicides									
dieldrin	5								
dichlorvos		*							
fenthion		*							
malathion	8								
Total	13	*	*	*	*	*	*	nil	13
Fungicides									
copper oxychloride	10								
cuprous oxide									
metalaxyl		*							
Total	10	*	nil	nil	*	*	*	nil	10
Herbicides									
ametryn	20	5					15		40
atrazine		*					20		20
diuron	10								10
fluarifop-butyl		*							*
glyphosate		*		6					6
paraquat	80	40[a]	*		7.5	**			128
simazine	18	*							18
Total	128	45	*	6	7.5	**	35	*	222
Grant Total all pesticides	151	45	*	6	7.5	**	35	*	245

* insignificant quantities, values unknown

** very small amounts used, values and amounts unknown.

a. thought to be an underestimate.

Table 20 Estimated total value of main pesticides by crop in PNG, 1983 (by Landell Mills, 1984) (in thousand kina, where in 1983 1 US$ = 0.85 kina)

Chemicals	Coffee	Cocoa	Copra	Oil Palm	Tea	Rubber	Sugar Cane	Cardaman	Total
Insecticides and Nematicides									
dieldrin	25								25
dichlorvos		*							*
fenthion		*							*
malathion	15								15
Total	40	*	*	*	*	*	*	nil	40
Fungicides									
copper oxychloride	20	5							25
cuprous oxide		*							*
metalaxyl		*							*
Total	20	5	nil	nil	*	*	*	nil	25
Herbicides									
ametryn	80	20					60		160
atrazine							40		40
diuron	30								30
fluarifop-methyl		*							*
glyphosate		*		100					100
paraquat	240	120	*		23	**			383
simazine	54	*						*	54
Total	404	140	*	100	23	**	100	*	767
Grand Total all pesticides	464	145	*	100	23	**	100	*	832

* insignificant, values unknown

** very small amounts used, values and amounts unknown.

Overall the Landell Mill's estimates of pesticides use are summarised in Table 20. Herbicides comprise 90% of quantity and value of pesticides used in agriculture. 50% of the herbicide used is paraquat. Most pesticides are used on coffee. The estimates for 1983 on quantity of active ingredient used are not too different from those given in Table 14, which also includes 52 metric tons of DDT which is mainly used in PNG for vector control. However since these estimates are for agricultural chemicals only, they grossly under-estimate the value of total pesticide imports, which, as given in Table 18, was estimated to be about 2.5 million kina in 1983 (and 3.6 million in 1985). This also includes 0.8 million kina for household insecticide and repellent formulation, on top

of the total 1.1 million kina's worth of total herbicides.

Table 21 Estimated value of pesticide market for PNG in 1983, by Landell Mills (1984).

Chemicals	Quantity ('000kg or t or kl)	Retail Value (thousand kina) 1 US$ = 0.85 kina
Insecticides	13	40
Fungicides	10	25
Herbicides	222	767
Rodenticides	n.a.	5
Total	245	837

4.8 SOLOMONS ISLANDS

Staring (1984) also gives data on value of imports of formulated pesticides in the Solomon Islands, as shown in Table 22 together with figures tabulated by me.

Table 22 Import of formulated pesticides by value into Solomon Islands, 1978- 1981, in thousand $US (where $US 1 = $SI 1)

Pesticides	1978	1979	1980	1981	1981 (Mowbray)
Insecticides	na	na	na	419 (58)	283
Herbicides	na	na	na	292 (40)	205
Fungicides	na	na	na	8	5
Other	na	na	na	5	4
Total	411	489	643	724	507

More insecticides were used than herbicides, and the amount (by value) was increasing. The major products include parathion, malathion, acephate, DDT, paraquat, MSMA, 2,4-D and glyphosate. The majority of pesticides imported were mainly used in three large commercial projects growing rice, oil palm and coconuts and cocoa. Much of it was used on rice. However Cyclone Namu in mid 1986 decimated the crops and use of many of these pesticides will presumably be far less in the foreseeable future.

4.9 TONGA

From data provided to me by Von Keyserlingk (Tonga, Ministry of Agriculture, Fisheries and Forests, 1983), I calculated the following estimates of quantities and value of imports into Tonga for 1982-1983.

Table 23 Imports of pesticides into Tonga, 1982-1983.

Pesticides Group	Formulation (in metric tons or litres)	Active ingredient (in metric kilo-tons)	Value (in thousand $US)
Insecticides	10.5	2.5	32
Herbicides	3	0.9	24
Fungicides	6	3.8	26
Others	0.6	0.02	1
Total	20	7.2	83

Approximately one third of insecticides and fungicides were provided as hurricane relief, and are not included in the value. An estimate of the actual quantities of major pesticides is as follows (given in thousand kilograms: mancozeb (2.7), malathion (1.1), paraquat (0.8), carbofuran (0.5), carbaryl (0.5), benomyl (0.4).

G.S.Elliot of BASF (pers.com.) believes that the fungicide figure of 6000kg is too low; this amount would be used on bananas alone. Similarly he believes that much higher quantities of carbofuran and benomyl (used on bananas) were used. Benomyl has since been replaced by tridemorph. He believes that the quantities for 1982-1983 were low due to the damage to crops caused by the hurricanes in these years, and that the amounts now used are much greater.

4.10 VANUATU

No detailed data exists on quantities of pesticides used. The major products are reported by Staring (1984) to be

> captan, 2,4-D, diazinon, DDT, dimethoate, endosulfan, linuron, malathion, maneb, metaldehyde, naled, paraquat, and 2,4,5-T.

4.11 WESTERN SAMOA

From Fryauff (1982 - Biblio No 518), I estimated the following amounts of pesticides imported into Western Samoa for 1981.

Table 24 Import of formulated pesticides into Western Samoa in 1981

Pesticide Group	Formulation Quantity (metric tons or kilolitres)	Value (in thousand $US)
insecticides	4	16
herbicides	47	197
fungicides	142	87
other	13	13
Total	207	313

Major pesticides imported into Western Samoa are banana misting oil (petroleum oil; 93% of all fungicides), paraquat (>97% of all herbicides), and in smaller quantities carbendazim, mancozeb, maneb, tridemorph, benomyl, diazinon, ethoprophos, gBHC (lindane) permethrin and trichlorfon. G.S. Elliot of BASF (pers. com.) believes that the amount of fungicide should be closer to 40,000 kg; the above well over-estimates the amounts used.

4.11 SUMMARY OF QUANTITIES OF PESTICIDES USED IN SOUTH PACIFIC

Table 25 and Figure 3 summarise the total quantities of pesticides used in selected South Pacific countries and territories. The breakdown of types of pesticides used in these countries, by value are shown in Figure 4.

Figure 3 Map of South Pacific showing quantities of pesticides used in selected countries

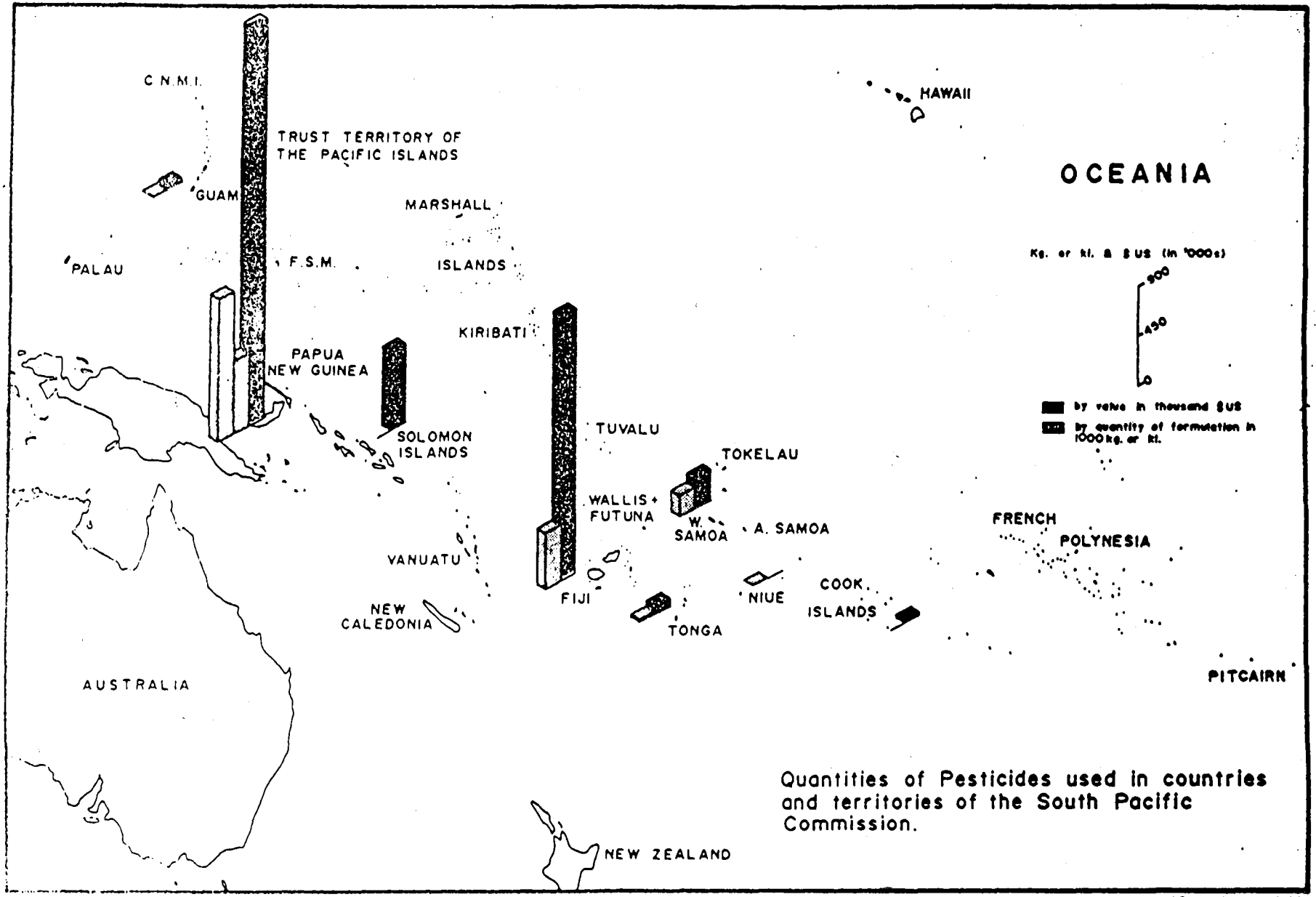


Figure 4 Drawings showing proportions of major types of pesticides used in selected South Pacific countries, by value ; and for South East Asia.

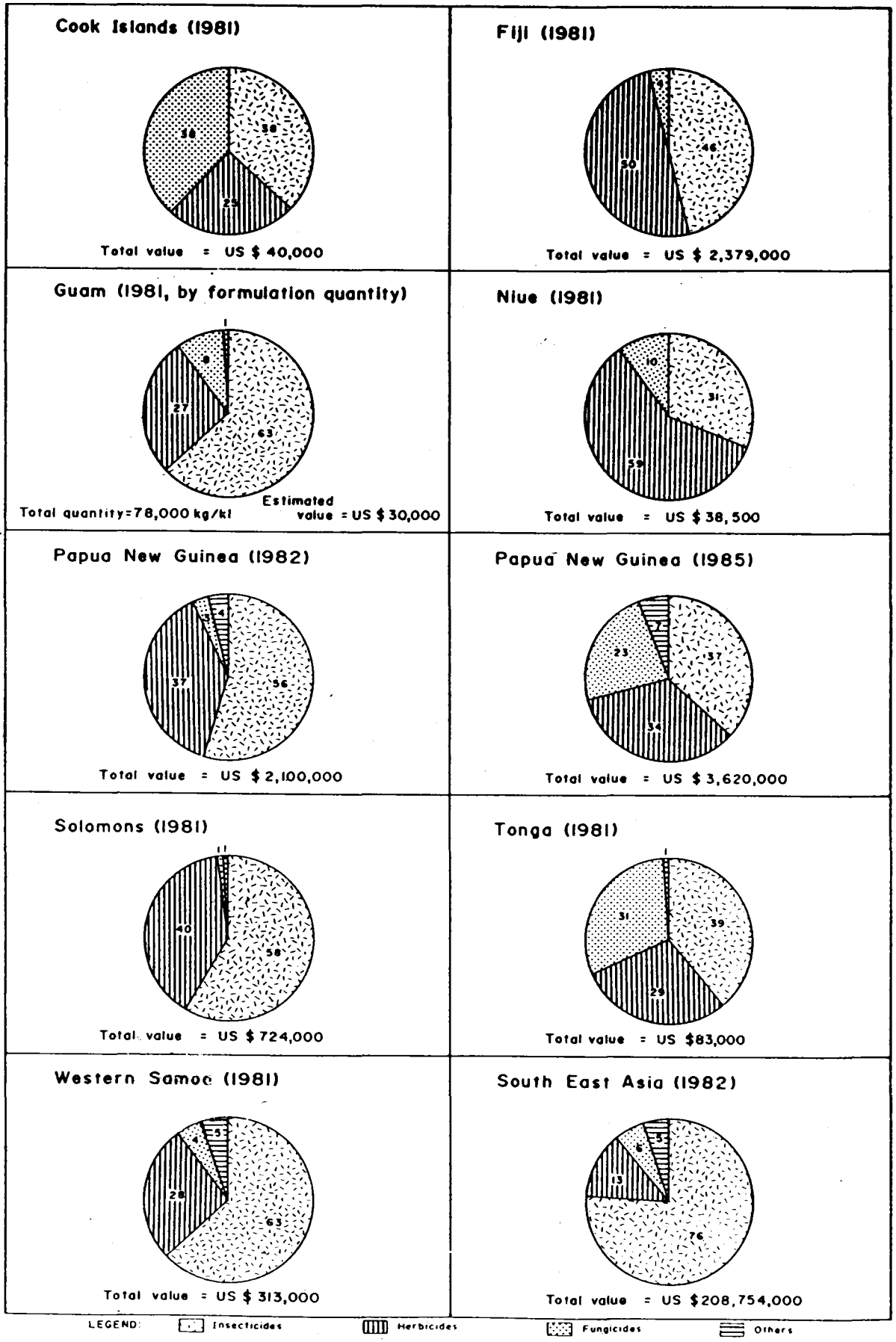


Table 25 Comparison of total quantities of pesticides used in South Pacific Countries.

Country	Period	Quantity by Formulation 1000 kg or kilolitres	Quantity by Active Ingredient 1000 kg or kilolitres	Quantity by Value thousand $US
1. Cook Island	1981	-	-	40
2. Fiji	1981	505	-	2379
3. Guam	1981	8	-	39
4. Niue	1981	4	-	
5. PNG(NSO)	1982	788	-	2083
(companies)	1982	637	271	-
	1985	1300		3621
6. Solomon Islands	1981		-	-
7. Tonga	1982-83	20	7.2	83
8. Western Samoa		207	-	313

Papua New Guinea and Fiji are the two major users of those countries where data on quantities used are available. In the South Pacific overall herbicides are used in greater quantities than all other pesticides. The situation (re formulation quantity) can be summarised as follows:

Herbicides most used:

Fiji(agriculture) , Niue, PNG(agriculture), Western Samoa

Insecticides most used:

Cook Islands (with fungicides), Fiji (total), Guam, PNG(total), Solomon Islands, Tonga.

4.12 COMPARISON WITH SOUTH EAST ASIA AND THE REST OF THE WORLD.

By comparison to South East Asian countries, the amounts of pesticides used in the Pacific is small.

Both RENPAF (1985) and Staring (1984) have published data for South East Asia. RENPAF (Regional Network for Production Marketing and Control of Pesticides in Asia and the Far East) is a regional agency funded jointly by member countries and UNIDO. Its members included Afghaniston, Bangladesh, India, Indonesia, Korea, Pakistan, Philippines, Sri Lanka and Thailand.

RENPAF commenced collecting data on pesticides use in its member countries in 1983, and published it in 1985 (RENPAF, 1985). ESCAP (Economic Commision for Asia and the Pacific), through its Agricultural Requisites Scheme for Asia and the Pacific (ARSAP) spent six years amassing data on pesticide use in South East Asian Countries. Staring (1984) summarised then findings in a 223 page book. Countries included some of those covered by RENPAF, but also China, Malaysia, Nepal and the following South Pacific countries: Cook Islands, Fiji, Niue, Papua New Guinea, Solomon Islands, Vanuatu and Western Samoa.

In Tables 26 and 27 comparisons are made of quantities of pesticides used in South East Asian countries, with those for the Papua New Guinea and other South Pacific countries.

Table 26 Comparison of Total Use of Pesticides by Country in South East Asia and the Pacific, 1981-1982 (1981 data is taken from Staring (1984), and 1982 data from RENPAF(1985).

Country	Formulation (in metric tons or kilolitres)		Active ingredient (in metric tons or kilolitres)		Retail Value (in thousand $US)		Percentage	
	1981	1982	1981	1982	1981	1982	locally formulated	imported
1. Afghanistan	275	235	250	210	150		0	100
2. Bangladesh	4000	1969	650	697	7000		35	65
3. China	500000	-	140000		900000		99	1
4. India	130000	513896	52364	40543	480000		95	5
5. Indonesia	22750	49668	6828	9433	35000		80	20
6. Malaysia	25000	-	8000		70000		45	55
7. Nepal	550	-	69		800		45	55
8. Pakistan	5400	7375	1348	232	31000		60	40
9. Philippines	31000	29231	4500	5178	70000		90	10
10. Republic of Korea	126284	104473	15993	16748	237156		99	1
11. Sri Lanka	2773	2453	1014	200	7987		64	36
12. Thailand	348000	28857	10500	1951	130000		52	48
Total	882,832	738,157[a]	241,516[a]	75,192[a]	1,969,093[a]	719,113[a]		
13. Papua New Guinea	550	637[b] 788	200	271	1800	2083	<1[c]	99
14. South Pacific (Cook Islands, Guam, Fiji, Niue, Solomon Islands, Vanuatu and Western Samoa)	900	-	250	-	3700	-	<1[c]	99
Total	1450	-	450	-	5500	-		

a not include China, Malaysia, Nepal

b depending upon source

c Fiji and PNG do small amount of formulation.

Table 27 Gives a further comparison, which compares the amounts of agricultural pesticides in selected Asian countries, with that in Australia, and PNG.

Country	Quantity of Active Ingredient in metric tons	Value in thousand $US
China	133075	n.a.
India	27248	n.a.
Indonesia	6584	57894
Japan	81458	1536586
Pakistan	1101	20418
Philippines	3509	26093
Republic of Korea	15234	197173
Thailand	9786	107420
Australia	9778	163456
PNG	271	2500

By comparison to South East Asian countries, the amounts of pesticides used in PNG and the rest of the Pacific, both overall and in agriculture is very small; but it is of increasing importance to the region.

In most South East Asian countries, insecticides are extensively used, whilst herbicides and fungicides are only used in much smaller proportions (see Figure 4); an exception is Malaysia where herbicides are extensively used. An unknown source quotes Wachter and Staring who reported that in 1978 paraquat and glyphosate had a share of 25% and 10% of the total pesticide market in Malaysia; in 1981 the following four herbicides constituted a major part of the market: paraquat (30%), glyphosate (8%), dalapon (10%), and 2,4 - D amine (8%).

These compare with Paciic countries where often herbicides are the most important (see 4.12), and in particular paraquat.

The following pesticides are reported by UNIDO (1983) and Staring (1984) to be the most commonly used agricultural pesticides in 12 countries of South East Asia:

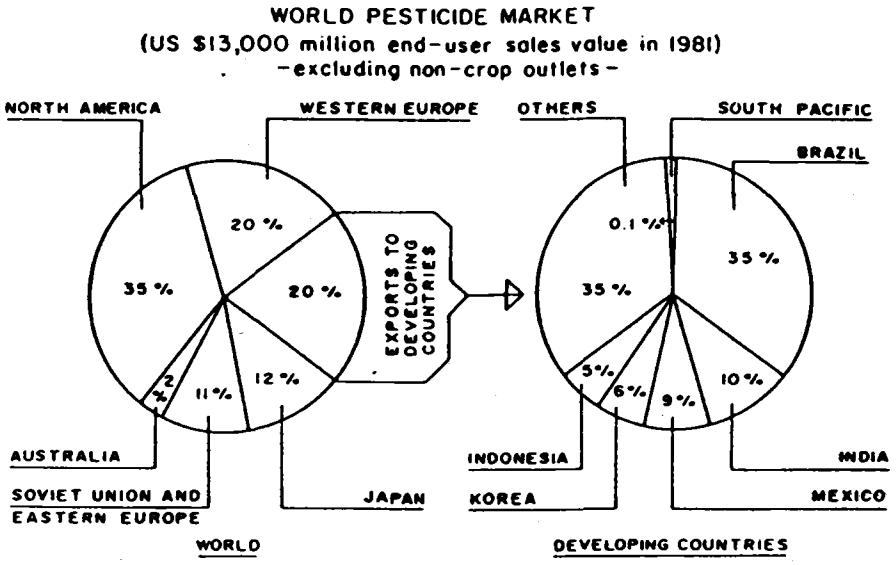
benomyl	(F)	glyphosate	(H)
butachlor	(H)	HCH (BHC)	(I)
captan	(F)	IBP	(F)
carbaryl	(I)	isoprothiolane	(F/I)
carbofuran	(I)	malathion	(I)
carboxin	(F)	mancozeb	(F)
cartap	(I)	methamidophos	(I)
chlorpyrifos	(I)	methomyl	(I)
copper oxychloride	(F)	methyl bromide	(FUM)
cypermethrin	(I)	methyl parathion	(I)
2,4 - D	(H)	monocrotophos	(I)
2,2 DPA (dalapon)	(H)	paraquat	(H)
DDT	(I)	phenthoate	(I)
diazinon	(I)	thiobencarb	(H)
dimethoate	(I)	tridemorph	(F)
disulfoton	(I)	zinc phosphide	(R)
endosulphan	(I)	zineb	(F)
endrin	(I)		
fenitrothion	(I)		
fenthion	(I)		

where F = fungicide, H = herbicide, I = insecticide
FUM = fumigant R = rodenticide

Formulation of pesticides is done in many South East Asian countries, see Table 26. China, India, Philippines and the Republic of Korea all locally formulated more than 90% of their pesticides. In the Pacific less than a fraction of a percent is formulated, and only in Fiji and PNG. The amounts of formulation (in million $US) that occurs in China (900) and India (480) is large by world standards and place them with the ten largest producers, who are (with values in 1983 in $US millions): Bayer (1500), Ciba-Geigy (1320), Monsanto (1167), Shell (720), ICI (695), Rhone-Poulenc (630), Hoechst (620), DuPont (580), BASF (568) and Dow (565) (from Weir, 1986 - Pub.No U13). Korea (237) would also rate amongst the top 20 agrochemical producers.

Figure 5 shows an estimate of the overall proportion of pesticides used in the South Pacific on a world scale. (constructed from a drawing taken from Spurrier,1985). Note that I suspect that the market values are for pesticides produced mainly by the large multinational agrochemical producers and do not include that produced in China. Hence the percent value for the South Pacific would be far smaller than 0.1%.

Figure 5 Drawing showing proportion of pesticides used in the South Pacific compared to the rest of the world.



MODIFIED FROM DATA PUBLISHED BY WOOD MACKENZIE AND CO

CHAPTER 5 PESTICIDE IMPORTERS AND DISTRIBUTORS

5.1 PESTICIDE IMPORTERS AND DISTRIBUTORS WITHIN COUNTRIES AND TERRITORIES

The number and types of importers and distributors vary from country to country. They include large and small chemical companies (some multinational), small wholesalers and retailers and government departments. Some data on the situation are given in Table 2. Refer Question 2.2. Further information was obtained from Staring (1984 - Biblio No 636)),and Landell Mills (1985 - Biblio Nos 30, 391).

A summary of the situation follows:

In some countries there are a number of large companies, some multinational, and a multitude of small wholesalers and retailers who import and distribute pesticides. These countries include:

Fiji
French Polynesia
New Caledonia
Papua New Guinea

In one country there are a large number of small wholesalers and retailers who import and distribute pesticides; the US Military also import their own, ie:

Guam

In other countries, one or a few small wholesalers or retailers import pesticides of all kinds. Governments may also import some. These countries include:

Tonga
Tuvalu
Vanuatu

In yet other countries, most pesticides are imported by a government department (generally the agricultural department) , although there may be a few small wholesalers or retailers also importing pesticides. These include:

American Samoa
Cook Island (Government Stores)
Kiribati (agricultural pesticides by Government, household pesticides and aerosols by private shop owners)
Niue
TTPI (Agriculture Department)
Western Samoa (Government Store)

In one country, there are a few small wholesalers or retailers but most pesticides are imported directly by the major agricultural and timber companies. This is

Solomon Islands

In some countries only the Government imports pesticides. These are:

Pitcairn Island
Tokelau

Few pesticides are produced in the South Pacific region. Formulation is only reported in Fiji and PNG. In Fiji, one company prepared formulations in the past and another company (Ag Chem) is about to commence formulating there. In PNG, one large company (ICI) and three smaller companies (Belltek Laboratories, Koppers, Morobe Pharmacy) do small amounts of formulation, having imported technical material. One company (Kagamuga Natural Products) is producing a concentrated extract from locally grown pyrethrin. This unrefined or waxy concentrate is then exported for formulation.

Some of the major companies involved in the region are listed in Table 28.

Table 28 List of major importers into the South Pacific region. by country or territory. (* is major importer)

Country/Territory	Companies importing pesticides
American Samoa	Plus Exterminating.
CNMI	Farmers' Market, Joeten.
Cook Islands	Triad Enterprises Ltd, Cook Island Trading Co. Ltd, Turners and Growers Ltd.
Fiji	Ag Chem., Dupont, Fiji Chemicals, Flick, ICI, May and Baker, Morris Hedstrom, Punja & Sons, Rentokil, Shell, South Pacific Chemicals
French Polynesia	Agritech, Societe de Development de l'Agriculture et de la Peche (SDAP), Tahiti Produits, Sheltex.
Guam	CIVILIAN: Ace Hardware, Benson Hardware, Brewer Chemical Corporation*, Farmers Co-operative Market*, Gibson's, Island Chemical Co., Home Improvement Centre, Joeten, Mac's Services, MVP Enterprises, Oceanic Hardware, Pacific Wholesalers, Payless Market, Pestex Co., Sanico, Smith Co, SPI, Texol Inc., Unitech MILITARY: AAFB Regional Base Exchange, Naval Base Exchange.
New Caledonia	Co-operative Centrale Agricole, ICC, La Caledonienne, Maison de l'Horticulture, Renault, SICA-NC, SIFRA, Vetophyt
Niue a	Fruit Growers Ltd (NZ), ICI, Shell, Yates, Ivon Watkins-Dow.
Papua New Guinea	Farmset*, Flick, Harcros*, ICI*, Koppers KK Kingston, Reckitt and Colman.
Solomon Islands	Greenacres
Tonga	Commodities Board, Farmers Federation, Fua'o e Fonua, Morris Hedstrom, Shell.
Vanuatu	Vanuatu Agricultural Supplies
Western Samoa	Burns Philp, Government Agricultural Store, Morris Hedstrom.

a. These companies presumably export from New Zealand.

In most countries small wholesalers and retailers directly import household insecticides (eg aerosols) and/or pesticide pharmaceuticals (eg anti-lice washes). Health Departments may import pesticides for public health programs, and the Agriculture Departments of a number of the nations import pesticides directly.

Most information is available from PNG. Most pesticides (by quantity) are imported by three major companies Farmset, ICI and Harcros. Those pesticides they imported into PNG in 1985 are listed in Table 29. Further information on retailers and other distributors who sell pesticides is presently being entered onto a computer list by the author and Lois Kesu, the pesticide co-ordinator. In 1986 an 'Agricultural and Veterinary Chemicals Association' was established in PNG, with the aims of both to represent the industry re registration matters and to ensure responsible practices amongst its members.

Karan (1982b - Biblio No 28) summarised the organisation of retail distribution of pesticides in Fiji. Staring (1984 - - Biblio No 636) lists some of the main pesticide suppliers within both Fiji and some South Pacific countries; all major suppliers are listed in Table 28.

No information is available for Nauru or Wallis et Futuna.

5.2 MAJOR EXPORTING COUNTRIES

Most pesticides used in the South Pacific region are imported from Australia and/or New Zealand. For example, on average, 50% of the imports into PNG in 1982-1986 were from Australia. Many of the Australian and New Zealand multinational chemical companies distribute their products throughout the South Pacific region. These are given (with details) in section 5.3.

Many of those imported into French Polynesia and New Caledonia are imported from France. Major French companies which export into these territories include Procida and Rhone-Poulenc Agrochimie.

However, the sources of imported pesticides are not restricted to these 'metropolitan' countries. The list of countries from which pesticides are exported into Papua New Guinea, for example, is long and varied, see Table 30.

Table 29 Pesticides, by active ingredient, imported into Papua New Guinea by the three major suppliers in 1985.

Pesticide	Supplier/Importer Farmset	Harcros	ICI	Pesticide	Farmset	Harcros	ICI
acephate	x		x	mancozeb		x	x
alachlor	x			MCPA	x	x	x
aluminium phosphide			x	metalaxyl		x	
ametryn	x	x		metaldehyde		x	
amitrole	x			methidathion		x	
arsenic trioxide		x		methomyl		x	x
atrazine	x	x	x	methyl bromide		x	x
benomyl		x		metolachlor		x	
g BHC (lindane)	x	x	x	mercury oxide		x	
bioresmethrin		x		mineral oil	x		
borax	x			mercury oxide		x	
brodifacoum		x	x	MSMA		x	
bromoxynil		x		paraquat		(x)	x
captafol	x		x	permethrin			x
captan		x		phosmet		x	
carbaryl		x	x	phyomone			x?
carbendazim		x		picloram		x	
carbofuran		x		piperonyl butoxide		x	
chlordane		x	x	pirimiphos methyl		x	
chloropicrin		x		promacyl			x
chlorothalonil		x		prometryn		x	x
chloroxuron		x		pyrethrods			x
copper hydroxide		x		sethoxydim		x	x
copper oxychloride	x	x		simazine		x	x
creosote		x		sodium arsenite		x	
cyhalothrin			x	sodium borate		x	
2,4-D	x	x	x	sulphamezathene			x
dazomet		x		2,4,5-T		x	x
DDT		x	x	temephos			x
diazinon	x	x		terbuthylazine		x	
dichlorophen		x		terbutryn	x		
dichlorvos		x		tetramethrin		x	
dieldrin	x	x	x	triclopyr		x	
dicamba		x		trichlorfon		x	
diuron	x	x	x	tridemorph		x	
diquat			x	warfarin	x		
2,2 DPA	x	x	x	white oil			x
endosulphan			x	zineb		x	
ethokem			x ?				
fatty alcohol		x					
fenitrothion		x					
fluazifop butyl		x	x				
formaldehyde			x				
glyphosate	x	x	x				
hydrocarbon oil	x						
iodofenphos		x					
malathion	x		x				

Table 30 Countries which have exported pesticides to Papua New Guinea.

Australia	Isreal
Austria	Italy
Belgium	Korea (Republic of/ South)
Canada	Malaysia
China	Netherlands
Czechoslavakia	New Zealand
Denmark	Norway
Fiji	Philippines
France	Singapore
Germany (East)	Switzerland
Germany (Federal/ West)	Taiwan
HongKong	Thailand
Japan	United Kingdom
India	United Soviet Socialist Republics (USSR)
Indonesia	
Iraq	United States of America (USA)

A compilation of import statistics listing the amounts of major groups of pesticides imported into PNG from each country from 1982 - 1986 is given in Mowbray (in press - Biblio No 393).

5.3 MAJOR AUSTRALIAN AND NEW ZEALAND COMPANIES EXPORTING INTO THE SOUTH PACIFIC.

In order to determine the main suppliers of pesticides in the South Pacific a letter was sent in December 1985 (and again in August 1986) to some of the companies listed as proprietors of registered pesticides in the New Zealand Pesticide Register, or on the PESTKEM or PESTLIST microfiches, published in Australia.

In this letter the objectives of the SPREP Pesticide Project were included (p) (1.1) together with a copy of the Ambio review (Mowbray, 1986). Companies were requested to include their comments on the Ambio paper. Many did, and their comments have been, where appropriate, incorporated into the text. Their main criticism was concerning the section in the Ambio paper on banned or restricted pesticides. Extremely useful comments were received from Bayer (New Zealand), BASF (New Zealand), Dupont (New Zealand) and Hoechst (Australia).

Also included in the letter was a draft of Table 3. Companies were requested to make additions/corrections to this list, and to supply information on pesticides exported to the countries, by active ingredient, formulated product, amounts and value.

Nearly all companies were unable to be specific as to the quantities and values of pesticides distributed to specific countries since they considered this information confidential.

Further information on companies operating in South Pacific was got from Staring (1984, Biblio No 636), and by visiting Renault Chemicals (Noumea).

In this section an alphabetical list of the main companies is provided, together with information on the chemicals they supply to South Pacific countries, where provided.

5.3.1 AMALGAMATED CHEMICALS LIMITED

AUSTRALIA address:

Amalgamated Chemicals Limited (ACL)
Queensland Branch
PO Box 355
Hamilton Centrol 4007
Queensland

ACL products distributed to each company are listed in the table below by active ingredient and country. ACL has discontinued supplying captafol, captan and 2,4,5-T to the region. ACL sales to the region would total around one quarter of a million Australian dollars per annum.

Table 31 **Pesticides distributed by Amalgamated Chemicals (ACL) of Australia.**

Pesticide	Country FI	GU	NC	PN	SI	VA	WS
amitrole	X		X	X	X	X	
arsenic pentoxide	X			X	X	X	
atrazine	X	X	X	X		X	
azinphos ethyl			X				
BHC (g isomer = lindane)	X		X	X	X	X	
carbaryl	X		X	X	X	X	
chlordane	X		X	X	X	X	
chlorpyrifos					X		
copper oxychloride	X		X	X	X	X	
copper sulphate				X		X	
cyhexatin			X				
2,4-D, acid			X	X	X	X	
DDT			X	X	X	X	
diazinon	X		X	X		X	
dicamba	X		X	X		X	
dicofol	X			X			
dieldrin	X		X	X		X	
dimethoate	X		X	X		X	
diuron	X		X	X		X	
2,2-DPA	X		X	X		X	
DSMA			X				
endosulfan	X		X	X		X	
ethion				X		X	
ethoprophos	X		X	X	X		X
fenitrothion	X		X	X	X	X	
heptachlor			X	X		X	
lime sulphur			X	X		X	
malathion	X		X	X	X	X	
mancozeb	X		X	X		X	
MCPA, acid	X			X		X	
metaldehyde	X			X		X	
methamidophos			X				
MSMA	X		X	X		X	
naled	X						
parathion ethyl			X	X		X	
parathion methyl				X	X		
prophyzamide			X				
simazine			X	X			
sodium arsenite				X			
sulphur	X		X	X			
TCA	X		X			X	
thiram			X	X		X	
trifluralin	X		X	X			
white oil	X		X	X		X	
country	FI	GU	NC	PN	SI	VA	WS

5.3.2 **BAYER**

AUSTRALIA address:

Bayer Australia Ltd
46-67 Wilson St
PO Box 159
Botany NSW 2019

Bayer (Australia) forwarded request to Bayer in Leverkusen in Germany. Bayer products are been distributed either from Australia or New Zealand, but no reply was given by Bayer (Australia).

NEW ZEALAND address:

Bayer New Zealand Ltd
Marine Parade
PO Box 38-405 Petone

Majority of Bayer products in the Pacific are distributed by BASF, NZ, though propoxur and coumatetralyl are distributed by other organizations. (See BASF New Zealand, 5.3.3)

5.33 **BASF**

NEW ZEALAND address:

BASF New Zealand Ltd
83-87 Carr Rd, Mt Roskill
PO Box 407 Auckland

BASF (New Zealand) is a major supplier of pesticides to the region. A summary of pesticides provided to South Pacific countries is given below:

Table 32 Pesticides distributed by BASF of New Zealand.

Pesticide	Country AS	CI	FI	FP	NC	NU	PN	SI	TG	VA	WS	NZ	Comments
alachlor				X			X	X	X		X		for Monsanto
benodanil			X				X						samples only
bentazon			X	X	X			X				X	
bitertanol		X							X		X		for Bayer
BPMC			X										
carbendazim		X	X	X	X		X		X		X	X	
carbosulfan			X										samples only
chloramben			X	X	X				X			X	
chlorbufam			X	X	X							X	
chlorflurenol		X		X			X						
chloridazon			X	X	X							X	
chlormequat				X	X							X	
copper oxychloride	X		X	X	X	X	X	X	X	X	X	X	
coumatetralyl									X		X		for Bayer
dazomet	X	X	X	X	X		X	X	X		X	X	
dimethoate	X	X	X	X	X		X		X	X	X	X	
2,2 DPA			X	X	X		X				X	X	
endosulfan			X								X	X	
ethephon											X	X	
glyphosate	X	X	X	X	X	X		X	X	X	X		for Monsanto
kasugamycin			X				X		X		X	X	samples only
linuron			X	X	X			X	X			X	
mancozeb	X	X	X	X	X		X		X	X	X	X	
maneb		X		X	X				X		X	X	
MCPA, IOE				X									
methamidophos				X	X				X			X	for Chevron
methiocarb		X	X	X	X		X		X	X	X		for Bayer
metiram					X						X	X	
mineral oil	X	X	X	X	X		X	X	X		X	X	for Ampol
naled	X	X	X	X	X		X		X		X	X	for Chevron
petroleum oil	X	X	X	X			X		X		X	X	for Ampol
sethoxydim			X										for Ivor Watkins Dow
tridemorph	X	X	X	X	X		X	X	X		X	X	
vinclozoline				X	X						X	X	
white oil	X	X	X	X	X	X	X	X	X		X	X	
country	AS	CI	FI	FP	NC	NU	PN	SI	TG	VA	WS	NZ	

Common BASF Products include:

insecticides:	Dibrom, Malix, Monitor
herbicides:	Basagran, Basfapon, Lasso, Linuron, Multiprop, Roundup,
fungicides:	Baycor, Bavistan, Calixin, Cobox, BASF Mancozeb, Mesurol, Polyram, Polyram Maneb, Ronilan.
miscellaneous:	Basamid, Cycocel, Racumin.

Those sold in the largest quantities include Roundup (glyphosate), Calixin (tridemorph), Basagran (bentazone and propanil), and Baycor (bitertanol).

5.3.4 CHEMPACK

AUSTRALIA address:

Chempack Industries
PO Box 469
Archerfield Queensland 4108

No reply received.

5.3.5 CIBAGEIGY

AUSTRALIA address:

Ciba-Geigy Australia Limited
140-150 Bungaree Road, Pendle Hill
PO Box 4 Wentworthville NSW 2145

Ciba-Geigy Australia distributes to New Caledonia, PNG, Solomons and Vanuatu. Pesticides supplied (mainly) to PNG include:

(a) fungicides used in cocoa - metalaxyl (Ridomil)
(b) herbicides used in coffee and cocoa - residual triazines - ametryn, atrazine, simazine formulated as Gesapax, Gesatop and Gesaprim.
(c) insecticides - diazinon (Gesapon), dichlorvos (Nuvan), methidathion (Supracide)(vegetables), monocrotophos (Nuvacron)(palm oil).

NEW ZEALAND address:

Ciba-Geigy New Zealand Limited
47-53 Patiki Road, Avondale
Private Bag, Avondale, Auckland 7

Ciba Geigy New Zealand supplies the following pesticides on a commercial basis:

atrazine	(Gesaprim)	Fiji
diazinon	(Diazinon)	Fiji
dichlorvos	(Nuvan)	Fiji
isazophos	(Miral)	Western Samoa
metalazxyl	(Ridomil)	Cook Islands, Fiji
methidathion	(Supracide)	Fiji
prometryn	(Gesagard)	Norfolk Island
propiconazole	(Tilt)	Cook Island, Tonga, Western Samoa

5.3.6 CYANAMID

AUSTRALIA address:

Cyanamid Australia Pty Limited
5 Gibbon Rd., Baulkham Hills
NSW 2153

Cyanamid does not market pesticides in the region, but they do sell temephos and maldison to distributors which market the region.

5.3.7 DUPONT

NEW ZEALAND address:

Dupont (New Zealand) Limited
7 Ronwood Avenue
Manukau City
PO Box 76-256
Auckland

Dupont distributes the following pesticides to the following South Pacific countries:

Table 33 Pesticides distributed by Dupont New Zealand.

Pesticide	Trade Name	AS	CI	FI	FP	NC	NU	PN	SI	TG	VA	WS
benomyl	Benlate	X	X	X	X	X	X	X	X	X	X	X
bromacil	Hyvar		X	X	X	X		X			X	
	Krovar											
diuron	Karmex		X	X	X	X		X	X	X	X	X
	Velpar											
	Krovar											
hexazinone	Velpar			X	X						X	
linuron	Linuron		X	X	X	X				X		
mancozeb	Manzate 200		X							X		
methomyl	Lannate		X	X	X	X		X		X	X	X
metribuzin	Lexone					X						
oxamyl	Vydate											X

AUSTRALIA address:

Dupont (Australia) Limited
168 Walker St North Sydney 2060 NSW
or
20-26 Balaclava St
Wooloongabba 4102 Queensland

Never replied.

5.3.8 ELANCO

AUSTRALIA address:

Elanco Products Company
Wharf Road
West Ryde NSW 2114

Elanco products are exported, not by Elanco but by other distributors in Australia and New Zealand. Main products include benfluralin, oryzalin and trifluralin.

5.3.9 FARMERS FERTILISER LIMITED

NEW ZEALAND address:

Farmers Fertiliser Limited
81 Carlton Gore Road
New Market
Private Bag, Auckland

Farmers Fertiliser exported mainly to Fiji and Papua New Guinea, and lesser quantities to Cook Island, New Caledonia, Solomon Islands, Tónga, Vanuatu and Western Samoa. Pesticides exported were by a.i.:

insecticides:	acephate, carbaryl, deltamethrin, diazinon, dichlorvos, endosulfan, maldison, propargite.
herbicides:	amitrole, atrazine, 2,4-D butylester, diuron, MCPA, paraquat, trifluralin.
fungicides:	captafol, captan, copper oxychloride, copper sulphate, dinocap, mancozeb, pyrazophos, triforine

For the period May 1984 to May 1985 the volumes of active ingredient exported to the eight countries named were as follows:

Triazine herbicides	-1600kg	
Phenoxy herbicides	-1500kg	
Paraquat	-2000kg	All of these
Other herbicides	- 900kg	in ready to use
Copper Sulphate & Copper Oxychloride	-2000kg	formulations
Other fungicides	-3000kg	
Carbamate insecticides	-1800kg	
Organophosphate insecticides	-3800kg	
Other insecticides	- 100kg	

5.3.10 HOECHST

AUSTRALIA address:

Hoechst Australia limited
606 St. Kilda Road
PO Box 4300 Melbourne
Victoria 3001

Hoechst products are listed below but most are distributed by other companies. Products are:

- binapacryl - probably used for trial purposes;
- clofop-isobutyl - possibly only used experimentally, now withdrawn from the market;
- deltamethrin - only limited quantities sold, probably less than 500 litres or 12kg of a.i.;
- diclofop-methyl - possibly only used experimentally
- endosulfan - only sold to Fiji and PNG, but less than 500 litres or 200kg a.i. per year;
- fentin acetate - limited quantities used only for tests on cocoa;
- glufosinate ammonium - experimental product of which only 10 litres used;
- linuron - very limited quantities available;
- pyrazophos - limited quantities only;
- triazophos - only limited quantities sold to Fiji ex New Zealand for experimental purposed, not registered.

NEW ZEALAND address:

Hoeschst New Zealand Ltd
Box 67 Auckland

Hoeschst (NZ) products are distributed to the region by BASF.

5.3.11 ICI

AUSTRALIA address:

ICI Australia Operations
PO Box 4311
Melbourne Victoria 3001
Australia

No reply to letter.

NEW ZEALAND address:

ICI New Zealand Ltd (Rural Division)
ICI House
Box 1592
Wellington.

and

ICI Tasman Ltd. or
Private Bag PO Box 900
Upper Hutt Auckland

Table 34 Pesticides exported by ICI New Zealand.

Pesticide	Country CI	FI	FP	NC	NU	PN	SI	TG	VA	WS
acephate	X	X	X	X		X	X	X	X	X
atrazine		X								X
BHC, g-isomer (lindane)		X								
brodifacoum	X	X	X	X	X	X	X	X	X	X
carbofuran		X	X	X				X		
copper oxychloride		X								
2,4-D, DEA Na Salt	X									
2,4-D, 2 ethy ester	X	X								
diazinon		X						X		X
dicamba		X	X	X				X		X
dicofol					X					
dimethirimol					X					
diuron	X	X	X	X				X	X	X
2.2-DPA (dalapon)	X	X								X
fluazifop-butyl	X	X	X	X				X		X
MCPA, acid		X								
naled	X	X	X					X	X	X
paraquat dichloride	X	X	X	X	X			X	X	X
permethrin	X	X	X		X			X		X
pirimiphos methyl					X					
trichlorfon		X	X	X				X	X	X
triforine		X	X							
	CI	FI	FP	NC	NU	PN	SI	TG	VA	WS

ICI is a major exporter to South Pacific countries. ICI New Zealand and ICI Fiji market products mainly in Cook Islands, Fiji, Niue, Tonga and Western Samoa. A list of pesticides distributed to South Pacific countries is given above. Products marketed to Niue wre not included in the reply. ICI also exports their products to French Polynesia and New Caledonia, and to a lesser extent to Solomon Islands and Papua New Guinea. ICI is a major company in PNG:

PNG address:

ICI Papua New Guinea Pty Ltd
PO Box 1105
Lae Morobe Province

ICI (PNG) is one of the three major importers of pesticides into PNG. A list of pesticides by active ingredient, imported into PNG is listed under 'PNG Importers' in Table 29. The pesticide imported into PNG by ICI in far the greatest quantities is paraquat as Gramoxone®. See section 5.1.

5.3.12 IVON WATKINS DOW

NEW ZEALAND address:

Ivon Watkins Dow Limited
Private Bag
New Plymouth

Ivon Watkins - Dow (NZ) does not actively promote their products in the region.

AUSTRALIA address:

Dow Chemical (Australia) Limited
100 Miller St
North Sydney, NSW 2060
or
301 Coronation Drive
Milton, Queensland 4064
or
12 Sallow St
Pallarenda
Townsville, Queensland 4810.

Dow (Australia) never replied to letter, but from personal communication, it intends to market some products in PNG in the near future.

5.3.13 MAY AND BAKER

NEW ZEALAND address:

May and Baker New Zealand Ltd
PO Box 35060 Naenae
Peterkin Street
Wingate Lower Hutt

May and Baker New Zealand are responsible for the distribution and marketing of Rhone Poulenc Group chemicals in Cook Islands, Fiji, Niue, Tonga, Western Samoa and New Zealand. However May and Baker only actively market their products in Fiji and New Zealand. Products marketed in Fiji are:

Group products

herbicides: asulam, 2,4-D plus ioxynil octanoate (Actil), ioxynil octanoate (Totril), diuron, oxadiazon (Ronstar Flo)

plant hormones: indolyl butyricacid (Seradix), naphthalene acetic acid (Planofix)

fungicide: fosetyl (Aliette)

Distribute only

insecticides:	carbaryl, deltamethrin (Decis (R)), malathion,
herbicide:	paraquat
fungicide:	mancozeb

May and Baker (NZ) products are sold in PNG through Farmset.

AUSTRALIA address:

May and Baker Australia Ltd
19-23 Paramount Road
West Footscray
Victoria 3012

May and Baker(Aust.) forwarded letter to parent company Rhone - Poluenc, who have never replied.

May and Baker (Australia) products are distributed to PNG through Island Traders (Burns Philp). These products include:

insecticides:	ethion, ethoprophos (Mocap), phosalone and vamidothion (Kilval)
herbicides:	asulam (Asulox), bromoxynil/ bromoxynil octanoate (Buctril), carbetamide (Carbetamex), ioxynil/ioxynil octanoate (Totril),
fungicides:	fosetyl (Aliette), iprodione (Rovral)

5.3.14 MONSANTO

AUSTRALIA address:

Monsanto Australia Limited
East Tower Princes Gate
151 Flinders Street
PO Box 4077
Melbourne Victoria 3001

Monsanto Australia supplies to PNG approximately 70 kL RoundupR CT (450 g/L glyphosate). PNG is the only region outside Australia serviced by Monsanto Australia.

NEW ZEALAND address:

Monsanto New Zealand Limited
Cnr Frankmoor Ave and Trafalgar Road
Private Bag, Johnsonville,
Wellington.

Monsanto (NZ) supplied products to all the region except for PNG (through Monsanto Australia), and Guam and the old Trust Territories (TTPI, CNMI). BASF (NZ) distributes about 10kl of Roundup(R) (glyphosate) and 5kl of Lasso(R) (alachlor), both Monsanto products. Other Monsanto products such as butachlor and propachlor are very little used, the former has only been used in Australia and New Zealand experimentally.

5.3.15 NUFARM CHEMICALS

AUSTRALIA address:

Nufarm Chemicals Pty Ltd
103-105 Pipe Road
PO Box 103
Laverton Victoria 3028

Nufarm never replied.

5.3.16 SHELL

AUSTRALIA address:

Shell Chemical (Australia) Pty Ltd
Shell Corner 155 William Street
PO Box 1713P, Melbourne 3001

Shell Chemical (Australia) sales are less than A$150,000 per annum for total area. Sales are as follows:

insecticides	90%
herbicides	0%
fungicides/miscellaneous	7.5%
ectoparasiticides	2.5%

In PNG/Solomons Shell deals through Harcros Trading, Lae, though in PNG a small amount is imported by Shell itself, mainly for the Defence Force.

NEW ZEALAND address: Shell Chemicals (New Zealand) Ltd
Box 2091 Wellington

No reply received.

5.3.17 RECKITT AND COLMAN/SAMUEL TAYLOR

NEW ZEALAND address:

Reckitt and Colman (New Zealand) Ltd
550 Rosebank Road, Avondale
Auckland 7

Reckitt and Colman (NZ) exports in small quantities Aeroblast Fly Killer (permethrin, tetramethrin) to Cook Islands, Fiji, Nauru, Niue, Norfolk Islands, Solomon Islands, Tonga and Western Samoa.

AUSTRALIA address:

Samuel Taylor
33 Hope Street, Ermington
PO Box 250 Ermington, 2115, NSW

Samuel Taylor is the consumer household products division within Reckitt and Colman (Australia). A summary of exports by Samuel Taylor to South Pacific region is given below, where major brand names are

Mortein, Pea-Beu and Aerogard.

Pesticide exports to the Pacific region are:

Table 35 Pesticides exported by Samuel Taylor of Australia.

PRODUCT	FIJI	PAPUA NEW GUINEA	SOUTH PACIFIC (GENERAL)
Mortein Export Aerosol	X	X	X
Bite Free Insect Repellent	X	X	X
Aerogard Insect Repellent	X	X	X
Green Elf Products home garden)		X	X
Veto Animal Insecticide	X	X	X
Mortein House & Garden	X	X	X
Pea-Beu Products	X	X	X
Mortein Mozzie Zapper		X	X

Active ingredients used throughout the Pacific region which are in Reckitt and Colman products are:

allethrin, biollethrin, bioresmethrin, carbaryl, chlorothalonil(*) diethyltoluamide (deet), di-n-propyl isocinchomeronate, ethyl hexane diol, glyphosate(*), n-octyl bicycloheptene dicarboximide, permethrin, phenothrin, piperonyl butoxide, pyrethrins, tetramethrin (* - not distributed to Fiji)

Reckitt and Colman have an office in PNG:

PNG address:

Reckitt and Colman (PNG) Pty Ltd
PO Box 1004 Lae Morobe Province

5.3.18 UNION CARBIDE

AUSTRALIA

Union Carbide Australia Limited
157-167 Liverpool Street
GPO Box 5322 Sydney NSW 2001

Union Carbide Australia products from Australia are distributed by Ciba-Geigy, ICI, Amalgamated Chemicals and Nufarm.

NEW ZEALAND address:

Union Carbide New Zealand Limited
7-9 Fanshawe Street
PO Box 1040 Auckland

Union Carbide New Zealand forwarded the letter onto their Agricultural Products Company in the USA, who never replied.

5.3.19 ARTHUR YATES

AUSTRALIA

Arthur Yates and Company Pty Ltd
Export Division
244-254 Horsley Road Milperra
PO Box 72
Revesby NSW 2212

Yates products are designed for Australian home gardens and are in small packs. Products are regulated by Australian standards, and all products sent to PNG and other Pacific Island nations are labelled accordingly, in English. Sales are relatively small. Active ingredients exported include:

> benomyl, bordeaux, captan, carbaryl, copper hydroxide, 2,4-D acid, diazinon, dicamba, diquat dibromide, malathion, mancozeb, maneb, MCPA acid, metaldehyde, paraquat dichloride, permethrin, petroleum oil, piperonyl butoxide, propyzamide, pyrethrins, simazine, sulphur.

NEW ZEALAND address:

Arthur Yates and Company Ltd
Box 1109
Auckland.

Received no reply.

5.4. SUMMARY

The methods of distribution varies within each country, largely depending upon the size of the market. Large multinational companies (eg, ICI) are only present in Fiji and Papua New Guinea, the two largest countries. The main distributors to the area (based on the questionnaire responses) appear to be Amalgamated Chemicals (Australia), BASF (New Zealand), Dupont (New Zealand), Farmers Fertilisers (New Zealand), and ICI (New Zealand/Tasman). Most pesticides would be imported from Australia and New Zealand, though many pesticides in PNG also come from a wide range of countries, eg United Kingdom. The actual quantities of imports were discussed in Chapter 4.

CHAPTER 6 PESTICIDES USED IN QUARANTINE

6.1 INTRODUCTION

One of the criticisms of the draft report (Mowbray, 1984 - Biblio No 625) was that the use of pesticides in quarantine was not covered. Since the drafting of that report, Benoit (1985 - Biblio No 335) has stressed the importance of good plant quarantine strategies for PNG and other Pacific countries, although he recognised constraints in their implementation. Paaticides are important "tools" in quarantine. In early 1985, J.D. Baird [J.R.Morschel], an FAO Consultant, and former Director of Plant Quarantine in Australia prepared and submitted a report on plant quarantine legislation for Cook Islands, Fiji, Kiribati, Niue, Tonga, Tuvalu, and Western Samoa (Baird nd, Biblio No 508). Also in mid 1986 separate New Zealand and Australian consultants conducted reviews of aspects of PNG's quarantine services. So it is timely to briefly review pesticide use in quarantine.

A questionnaire on quarantine practices was prepared with the assistance of Dr Alphonse Benoit (Agriculture Department, University of Technology) and with reference to Stout and Roth (1983 - Pub No H1). With the asistance of Dr Bob Ikin (formerly SPC Plant Protection Officer), the pesticides most probably used in quarantine were listed. Copies of the questionnaire and list were sent out on 2nd December, 1985, to senior officers involved in plant and agricultural quarantine in all South Pacific countries and territories.

By March, 1986, eleven countries had responded. They were:

> Cook Islands, Guam, Kiribati, New Caledonia, Papua New Guinea, Pitcairn Island, Solomon Islands, Tonga, TTPI and Palau separately, and Vanuatu.

No responses were received from American Samoa, Commonwealth of the Northern Marianas (CNMI), Fiji, French Polynesia, Nauru, Wallis and Futuna, Western Samoa, Federated States of Micronesia, Marshall Islands, Niue, or Tuvalu. Tokelau has no quarantine service.

Some information on the situations in Fiji, Guam and Western Samoa were obtained from their country reports presented to the Fourth Regional Technical Meeting on Plant Protection in Noumea in 1984. Information for Niue was obtained from "Plant Protection News' issued by the SPC Plant Protection Officer.

A training workshop in quarantine methods, including use of pesticides was held in Suva from 9 - 13 April 1986 as part of the UNDP/FAO-SPC Project for Strengthening Plant Protection and Root

Crops Development in the South Pacific, RAS/83/001. One of the objectives of this project has been to assist countries to develop an effective quarantine capability, which includes the use of fumigants and other pesticides.

Publications citing use of pesticides in quarantine are listed in the Bibliography (Part B) under section 1E for each country, and for the South Pacific Region generally.

6.2 FOCAL POINTS

Table 36 gives the names of persons who reponded to the questionnaire, and henceforth can be considered key contact personnel or focal points for future reference.

Table 36 List of Persons Responding to Quarantine Questionnaire

Cook Islands	Mr N. P. Samuel, Chief Quarantine Officer, Ministry of Agriculture, P.O. Box 96, RAROTONGA, COOK ISLANDS.
Guam	Mr Tom Blas, Department of Agriculture, Plant Industry, P.O. Box 2950, AGANA, GUAM, 96910.
Kiribati	Mr Manate Tenang, Agricultural Officer, (Pest Control and Quarantine), Ministry of Natural Resource Development, Agriculture Division, Tanaea, P.O. Box 267, BIKENIBEU, TARAWA, KIRIBATI.
New Caledonia	M. Remy Amice, Plant Protection - Fields and Crops, Direction du Developpement De L'Economie Rurale, Service Veterinaire et du Controle de la Qualite des Produits Agro-Alimentaires, B.P. 11, NOUMEA, NOUVELLE CALEDONIE. M. J. Fonce, Plant Quarantine Inspector - Harbour and Airport, Direction du Developpement de l'Economie Rurale, B.P. 43, NOUMEA, NOUVELLE CALEDONIE.

Papua New Guinea	Mr David Kanawi, Chief Quarantine Officer, Department of Primary Industry, P.O. Box 417, KONEDOBU, N.C.D., PAPUA NEW GUINEA.
Pitcairn Island	Mr G. D. Harraway, Pitcairn Island Administration, British Consulate-General, Private Bag, AUCKLAND, NEW ZEALAND.
Solomon Islands	Mr Cameron Rini Eta, S.F.O. (Q), Ministry of Agriculture and Lands, Agriculture Quarantine Service, P.O. Box G13, HONIARA, SOLOMON ISLANDS.
Tonga	Director of Agriculture, Head of Research, Ministry of Agriculture, Fisheries and Forests, P.O. Box 14, NUKU'ALOFA, KINGDOM OF TONGA. Mr Konrad Englberger, Tongan-German (GTZ) Plant and Harvest Protection Project, P.O. Box 881, NUKU'ALOFA, KINGDOM OF TONGA.
Vanuatu	Mr Robert Weller, Senior Plant Protection Officer Ministry of Agriculture, Forestry and Fisheries P.O. Box 129, PORT VILA, REPUBLIC OF VANUATU.
TTPI	Mr Gregory Baker, Trust Territory Environmental Protection Board, Office of the High Commissioner, Trust Territory of the pacific Islands, SAIPAN, CM 96950, MARIANA ISLANDS.
Palau	Mr Herman Francisco, Chief Agriculturalist, Division of Agriculture, P.O. Box 460, KOROR, REPUBLIC OF PALAU 96940.

6.3 QUARANTINE LEGISLATION

Table 37 summarised the legislative situation in those countries and territories which responded to the questionnaire, plus Nuie and Western Samoa.

Table 37 List of Quarantine Related Legislation in Thirteen South Pacific Countries or Territories.

Cook Islands	.Plants Act 1973, Plant Introduction and Quarantine Regulations, 1976. .Animals Act 1975, Animal Importation Regulations, 1982. .Animal Disease Prevention Regulations, 1982.
Guam	.Government Code of Guam Sections: 12026, 12102, 12103, 12104, 12105, 12106.
Kiribati	.Plant Ordinance 1976. .Prohibition of Importation of Plants Order 1977. .Importation of Animals Regulations 1965.
New Caledonia	.Resolution No 219 of 4 June, 1965 of the Territorial Assembly laying down plant quarantine procedures for incoming and outgoing commodities (brought into force by .Regulation No 1161 of 22 June, 1965). .Regulation No 67/149 of 23 March, 1967 listing of plants whose entry into the Territory of New Caledonia was formerly prohibited. .Resolution No 67 of 26 January, 1968 laying down the conditions of import into New Caledonia for animals and animal products. .(Many other smaller regulations follow these.)
Niue	.Plant Quarantine Act, 1982 (?) .Agricultural Quarantine Act, 1985 (?)
Papua New Guinea	.Quarantine Act. Chapter 234. .Animal Disease and Control Act. .Plant Disease and Control Act. .Quarantine Ordinance 1953.
Pitcairn island	.Local Government Regulations, Part III. Plant and Animal Quarantine, 1976.
Solomon Islands	.Agriculture Quarantine Act, 1982. .Agriculture and Livestock Ordinance (Cap. 80) .Disease and Animals Ordinance (Cap.85).
Tonga	.Plant Quarantine Act 1981 (not yet enforced).
Vanuatu	.Joint Regulation No 26 of 1964, to provide for plant quarantine. .Joint Regulation No 16 of 1977, to provide conditions for importation

	of animals and animal products into Vanuatu, and to control movement in the country.
TTPI	.Title 25 Trust Territory Code. Animals and Plants. Chapter 1. Quarantine Regulations.
Palau	.Title 25 Trust Territory Code. Animas and Plants. Chapter 1. Quarantine Regulations.
Western Samoa	.Plant Quarantine Act .Plant Quarantine Regulations

6.4 SUMMARY OF RESPONSES TO QUESTIONNAIRE

A summary of the responses to the questionnaires plus other pertinent information is given in Table 38.

Table 38S Summary of Responses to Quarantine Questionnaire forwarded on 2 December, 1985,

	Cook Islands	Guam	Kiribati
1. Do you, by law, have mandatory treatment of foodstuffs, planting materials, cultures and other commodities?	Yes, under the legislation, the Secretary may specify treatments for any commodity that may be infested by pests or host to specific pests.	Yes, if deemed to be necnecessary or feasible. Importation of agricultural products is regulated by both Federal and local Government. Permits must be issued before imports are entered. Some commodities require special treatment at the place of origin. If these requirements are not followed, it would be destroyed or rejected at the expense of the importer.	Handicraft is sprayed either with Mortein or Secto insecticides and a phytosanitory certificate is issued.
2. Please give details on your facilities for formulation and other forms of treatment with pesticides, including dips, dusting, spraying, baits...	Rarotonga: Fumigation station with chambers of 28 & 2.8 m3 capacity. Chemical dips used. Fumigants used are methyl bromide and EDB Aitutaki: 2.8 m3 chamber but not operational.	Do not have facilities for fumigation. Regulated articles or commodities found infested or diseased are destroyed by burning in an incinerator. Small lots of non-regulated plants are treated in dips with malathion, diazinon or captan.	Boniriki International Airport: contains 1 methyl bromide fumigation unit, 1 fogging machine, 4 knapsack sprayers, one boiling pot used for dipping, insecticides (Secto, Mortein and d'phenothrin - for handicraft spraying and aircraft disinfection).
3. What problems do you have in using chemicals in plant quarantine and other quarantine procedures you use?	The failure of staff to adhere to safety precautions and to use safety equipment that is supplied	None.	None.

	New Caledonia	Papua New Guinea	Pitcairn Island
1. Do you, by law, have mandatory treatment of foodstuffs, planting materials, cultures and other commodities?	Several mandatory treatments for agricultural commodities: .EDB for fruits from some countries; .methyl bromide for yams, coffee and forage; .fungicides & insecticides for plants, cuttings, grafts and layers; .fungicide treatment against boil smut for corn seed and against blast for rice; .heat treatment for compost.	Yes, If treatment conditions are not met or imports found to be infested on arrival, the consignments of materials are treated. Exports are also treated.	No.
2. Please give details on your facilities for formulation and other forms of treatment with pesticides, including dips, dusting, spraying, baits...	Noumea Harbour: 2 fumigation chambers of 10m3 capacity & 1 of 1m3 capacity. All used for methyl bromide. 1 fumigation chamber of 18m3 capacity for EDB. Proposed to build one 'tunnel chamber' of 40-50 m3 capacity for methyl bromide. Toutouta Airport: 1 fumigation chamber of 5m3 capacity for methyl bromide; 1 fumigation chamber of 20 m3 capacity for use with EDB or methyl bromide. Other forms of treatment include dipping and spraying. Holds of ships are fumigated with lindane or ActellicR	Currently have 1 small fumigation chamber of 1m3 for methyl bromide. Large quantities done by private firm under supervision. Use d'phenothrin to spray all international aircraft. Both fungicides and insecticides used as spray, dips, dust on imported and exported plants. Formalin is used to treat secondhand hides/animal products.	Nil
3. What problems do you have in using chemicals in plant quarantine and other quarantine procedures you use?	No problems under present conditions of use.	Problems include: .safety measures and control of using pesticides hence only trained staff handle fumigants and pesticides; .training of quarantine especially to use methyl bromide; .have limited facilities to carry out thorough treatments. * present procedures and facilities are being reviewed with assistance of Australian and NZ quarantine officers.	Not applicable.

	Solomon Islands	Tonga	Vanuatu
1. Do you, by law, have mandatory treatment of foodstuffs, planting materials, cultures and other commodities?	Yes, treatments depend on country of origin, type of commodity, state of commodity on arrival. Prior treatment of commodities before shipment is practiced. Mandatory treatment is done on arrival when not meet the required conditions.	Legislation not yet enforced.	Articles can be disinfected, but not mandatory. Conditions on import permit specify either mandatory treatment or treatment if necessary. Methyl bromide is usual treatment at varyschedules depending on the commodity. Susceptible plants are dipped in 0.1% malathion, 0.1% carbaryl, and 1.0% white oil for 30 seconds.
2. Please give details on your facilities for formulation and other forms of treatment with pesticides, including dips, dusting, spraying, baits...	Following treatment facilities are available: .Agriculture Quarantine Service has 1x8m3 fumigation chamber; .Facilities for dipping, spraying, baiting are all available at the Agriculture Research Station, Dodo Creek & Quarantine Station; .Autoclave for devitalising.	Airport Nuku'Alofa 28.3m3 Fumigation chamber used for EDB and methyl bromide, and one 1.3m3 fumigation drum (defective) Sea Port Nuku'Alofa: New quarantine facilities are being built to include 1 56.6m3 fumigation chamber and one 1m3 chamber, store and inspection areas. Research Farm Vaini: one green house for post entry quarantine. Vava'u MAFF Station: 1m3 fumigation chamber.	Fumigation: 3x1m3 fumigation chambers 1x5m3 fumigation chamber, 6x12mx12m plastic fumigation sheets; 4xGas masks with Halide detectors. Treatments: 2 x Riken detectors; 4 x Junior knapsacks; 2 x London Fog Machines; 2 x Mistblowers. Dips: 2 x 7l plastic rubbish bins 4 x 8l plastic buckets plus gloves, overalls, respirators, etc.
3. What problems do you have in using chemicals in plant quarantine and other quarantine procedures you use?	.Lack well trained officer to carry out operations; Only 2 officers with Fumigation Certificate (NZ) within the Agriculture Quarantine Service; .Lack of knowledge of chemicals used; .Inadequate facilities for application; .Lack of safety equipment; .Very little publicity on chemicals being used in the region.	Sometimes have phytotoxicity problems on root crops and fruits being treated with methyl bromide for export.	Obtaining regular supplies of methyl bromide. Equipment breakdowns and lack of replacement parts.

	TTPI (Federates States of Micronesia and Marshall Islands)	Palau	Western Samoa
1. Do you, by law, have mandatory treatment of foodstuffs, planting materials, cultures and other commodities?	No	No	
2. Please give details on your facilities for formulation and other forms of treatment with pesticides, including dips, dusting, spraying, baits...	None	None	at seaport, Apia - one new fumigation chamber and steam cleaning unit, one 200 cubic feet vacuum fumigation chamber and portable steam cleaning equipment. at airport - one incinerator. post-entry quarantine - one potting unit with soil steriliser, one acrylic house, one greenhouse, one incinerator.
3. What problems do you have in using chemicals in plant quarantine and other quarantine procedures you use?	Not applicable	No problems.	

For Fiji, Kumar (1984 - Biblio No 29) lists quarantine facilities to include one incinerator, and two fumigation chambers, but he included no details

For Commonwealth of the Northern Marianna Islands, Muniappan (pers. com.) states that an USDA officer from Guam assists in plant quarantine matters.

6.5 LIST OF PESTICIDES USED IN QUARANTINE

Those pesticides said to be used in quarantine are listed in Table 39.
The most widely used pesticides are malathion, methyl bromide and phenothrin.
44 different chemicals are used, 30 of these in Vanuatu.

Table 39 List of pesticides reported to be used in Quarantine in countries which responded to Questionnaire.

Countries were: Cook Islands (CI), Guam (GU), Kiribati (KI), New Caledonia (NC), Papua New Guinea (PN), Pitcairn Island (PI), Solomon Islands (SI), Tonga (TG), Vanuatu (VA) and TTPI (TT) with Palau (PL) separate.

COMMON NAME	CI	GU	KI	NC	PN	PI	SI	TG	VA	TT	PL	TOTAL NO.
ACEPHATE									X			1
ALDICARB									X			1
ALUMINIUM PHOSPHIDE					X				X			2
BENOMYL	X			X				X	X			4
BHC, g ISOMER (LINDANE)				X					X			2
BRODIFACOUM									X			1
BROMADIOLONE			X									1
CAPTAN		X			X		X		X			4
CARBARYL				X					X		X	3
CHLORDANE									X			1
COPPER OXYCHLORIDE					X							1
COPPER SULPHATE				X			X		X			3
DIAZINON	X	X						X	X			4
DICHLORVOS	X								X			2
DIELDRIN					X				X			2
DIETHIN				X								1
DIMETHOATE							X		X			2
EDB	X			X				X				3
FENITROTHION				X					X			2
FORMALDEHYDE					X		X		X			3
HYDROGEN CYANIDE					X							1
MALATHION (MALDISON)	X	X			X		X	X	X		X	7
MANEB				X								1
METALDEHYDE							X	X				2
METHYL BROMIDE	X		X	X	X		X	X	X			7
METHYL MERCURY DICYANAMIDE									X			1
MONOCROTOPHOS									X			1
NALED									X			1
NAPHTHALENE	X								X			2
OILS	X							X	X			3
OMETHOATE				X								1
PERMETHRIN							X					1
PHENOTHRIN	X		X	X	X		X		X			6
PIPERONYL BUTOXIDE			X									1
PIRIMIPHOS METHYL				X								1
PYRETHRINS			X									1
RESMETHRIN									X			1
SODIUM HYPOCHLORITE									X			1
SULPHUR				X								1
TETRAMETHRIN			X									1
THIRAM				X					X			2
TRICHLORFON									X			1
WARFARIN			X						X			2
ZINEB				X					X			2
TOTAL NO. OF PESTICIDES RECORDED AS USED	9	3	7	15	9	0	9	7	30	0	2	44
COUNTRY	CI	GU	KI	NC	PN	PI	SI	TG	VA	TT	PL	TOTAL

CHAPTER 7 PESTICIDES USED IN FORESTRY

7.1 INTRODUCTION

Unfortunately many countries when they responded to the original questionnaire (of July 1983) did not include in their answers mention of chemicals used in forestry and timber preservation.

Consequently, an attempt was made to determine what chemicals are used in the timber industry here in PNG. One can presume that they are similar to those used elsewhere in the Pacific where a forestry industry exists, as eg in the Solomon Islands.

7.2 SITUATION IN PAPUA NEW GUINEA

7.21 Chemicals used in Forestry and Timber Preservation

Personnel involved in both forestry and timber preservation were contacted, and a review was made of the small amount of literature available. A summary of chemicals used is as follows:

1. Antisap stains (used as fungicides) used in wood preservation include the following (some with trade names listed):

   captafol (Difolotan, Haipen, Timbafol), formalin, sodium pentachlorophenate (Pentabrite, Santobrite, Sapco), tributyltin oxide, and two substances of unknown active ingredients not now used Tanamine® (supplied by Koppers) and Preserin Ace® (a chlorinated phenol). Busan (TCMTB) and permethrin are used individually as antisap stains.

2. Wood preservatives (used both as fungicides and insecticides) include:

   - aldrin, captafol, creosote (including PEC or pigment emulsifiable creosote) , PCP, PCNB, mixture of IF100 & thiabendazole, and the following trade names Naprocide® (N54) Celbrite® (a quarternary ammonium compound); plus XJ Protedione®, and CN emulsion oil (containing copper naphthenate).
   - Both Formula 7® and Celsol are BFCA dip-diffusion treatment chemicals containing borax, boric acid, potassium/sodium dichromate, arsenic pentoxide and sodium fluoride.
   - CCA type chemicals are used in the vacuum pressure impregnation process and include both Celcure and Tanalith; chemicals in the formulations include copper sulphate, sodium dichromate and arsenic acid/arsenic pentoxide.

. Busan and Penacide (both formulated by Belltek) and Farmay (produced by Welcome) contain different proportions of TCMTB and MTC (methylene bis thiocyanate).

The major supplier of wood preservatives within PNG and to the Solomon Islands (in much smaller quantities) is Koppers, who also do nearly all their own formulation.

3. Insecticides used for treatment of logs and lumber (as prophylactic chemicals) include:

g BHC (lindane, as Gammexane and Gammaphex) and the synthetic pyrethroids deltamethrin (Cislin) and permethrin (Perigen). Acephate (Orthene) has been used in trials.

4. Insecticides used in urban termite control include:

aldrin, dieldrin, heptachlor, chlordane; arsenic trioxide has been used in past, and chlorpyrifos may be used in the future.

5. Pesticides used in nurseries and plantations very according to need and cost, but include:

insecticides:	g BHC (lindane), chlordane, dichlorvos, dicrotophos, endosulfan, fenthion, malathion and propoxur
fungicides:	benomyl, Brassicol Calerus, metalaxyl, thiram.

In PNG, there are no official recommendations for use of insecticides and fungicides in forestry. Spot treatment is carried out at the time of an out-break. The cost of insecticides and fungicides are prohibitive. A little herbicide is used.

Proctor (pers. com.) estimates that around 1984 the market for timber treatment chemicals in PNG and the Solomons was worth close to 1.25 million kina, but the market value has decreased over the last two years to about 800,000 - 900,000 kina with more and more timber being left untreated. These chemicals were not included in the estimates of the market value of pesticides used in PNG in Chapter 4 (section 4.7) . If they were the value for 1985 would be around 4.5 million kina, with 20% local formulation.

References on pesticides used in forestry and timber preservation are included in the bibliograpghy under PNG; these include

numbers 203. 204, 220. 286, 287, 291 - 293, 314, 326, 343. 349, 390.

7.22 Problems associated with use of chemicals

Aitken (1976 - Biblio No 349) cites an instance of poisoning by arsenic by persons who used arsenic treated timber-offcuts for cooking. Konabe (1984 - Biblio No 291) mentions a case of poisoning by sodium PCP.

Macfarlane and other government officers (pers.com.) worried greatly about the safety of workers in treatment plants in the Solomons where plant hygiene was poor and inadequate attention was placed on human safety.

Pilotti (1985 - Biblio No 343) sent a questionnaire to wood preservation plants throughout PNG and found that out of the 22 sawmills who responded:

1. 12 provide full protective clothes for their employees (gloves, boots, aprons). Six also provide respirators for mixing. Three provide gloves only ; five provide gloves and boots; two provide no protective clothing.

2. 18 have washing facilities on site.

3. 4 carry out regular medical checks.

4. 18 burn waste timber and three have burial pits. Sometimes sawdust and ash is used as landfill or used on roads.

5. 3 do not burn nor bury containers. Some containers (drums) are returned to the supplier or used for storing sludge on site. Generally plastic chemical bags are burnt.One sawmill dumps them into a nearby river.

6. 9 remove spillages by hosing whilst four use sawdust to contain the spill. 8 claim to have no spillages of chemicals.

7. Drainage around the treatment areas is only directed back to the sump in four sawmills. 12 allow drainage into surrounding ground and six also allow drainage into natural watercourses. Four use public drains.

8. 13 provide housing on site; 6 of these burn treated offcuts and sawdust on site - and occupants use rainwater which is possibly contaminated by arsenic and chromium from ash from the burnt timber.

9. 4 allow employees to use waste timber for firewood. This could be a potential hazard if the wood had been treated.

Overall Pilotti concludes that

- plant hygiene is generally poor
- most plant operators are unaware of, or choose to ignore environmental hazards of wood preservatives
- inspections by forestry personnel should should place greater emphasis on safety aspects of operations
- guidelines for safety and a code of practice should be immmediately introduced .

Recently the Forest Products Research Council produced a draft ' Code of Practice ' (FPRC, 1984 - Biblio No 286). This publication sets out guidelines for safe and efficient use of chemicals in timber treatment and wood preservation Hilton (1985 - Biblio No 390) also published a manual of safe usé of foestry chemicals.

One further problem has arisen in PNG. In both Kavieng and Manus largestocks piles of CCA chemicals have been stored out in the weather by the Forestry Department. At Kavieng 25 44 gallon drums (possibly worth close to K25,000) have been standing in these rusted drums for upto 5 years despite advice from the supplier to use/dispose of them; another government treatment plant operates closeby. Similarly in Manus 10 -15 drums lie out in the weather, with a treatment plant also nearby. This is a classic example of what should not be allowed to happen!

7.3 SUMMARY

Very little information exists on the use of pesticides in forestry and timber treatment in the region. Most chemicals which are used are used in timber treatment. These chemicals are generally quite toxic. Problems have arisen in their use and will continue to arise unless better hygiene standards are enforced and workers are educated both on their potential human and environmental hazards.

A thorough study on the use of pesticides in forestry and timber treatment in countries of the South Pacific should be immmediately conducted with the aim to improve the safety and efficacy of their use.

CHAPTER 8 BANNED AND RESTRICTED PESTICIDES

8.1 INTRODUCTION

Much concern has been expressed in recent years that many pesticides which are restricted for use by certified operators or severely restricted or banned in their country of origin, are exported to and/or freely available in third world countries. (Weir and Shapiro, 1981 - Pub No U12 ; Bull, 1982 - Pub No U3 ; Pesticide Action Network, 1983 ; Weir 1986 - Pub No U13). The inference of such criticisms is that if a chemical is banned or restricted in its country of origin, it should not be used in the third world nations. However, the situation is not so clear cut. Many different reasons exist for banning or restriction. When they are concerned with human or environmental hazards special heed must be taken. Certainly if a product is rejected in its country of origin as being of poor quality, beyond expiry date or too hazardous then the importing nation should prohibit its importation. The importing nation must take the inititative to control the entry and use of pesticides within its boundaries.

A pesticide may well be restricted in a given country - not because of its toxic properties but for some good and sufficient agricultural reason. Some pesticides may not be registered in some countries because their are no potential markets for the pesticide. Some chemicals which are banned or restricted in their country of origin, may have a particular necessary application in a particular importing nation; e.g. DDT in vector control programmes in Papua New Guinea and the Solomon Islands . The importing nation must weigh the costs and benefits of such chemicals.

Similarly, any chemicals which are registered in their country of origin but which are considered unsuitable or too hazardous for use in local conditions, must be prohibited for import. Again the initiative and onus to control the entry and use of pesticides rests with the importing nation. To provide safe products and adequate information about those products is the responsibility of the exporter.

The draft FAO code of conduct incorporated the principal of 'prior informed consent'. (FAO 1984 - Publ. no 01) However FAO (1986 - Publ. no 02) has now amended this and has accepted the IRPTC/UNEP provisional notification scheme. The UNEP scheme merely requires countries which ban or severely restrict pesticides to notify, directly or indirectly, the designated national authority in other countries. The FAO code of conduct and 'prior informed consent are discussed in section 8.3.

8.2 SITUATION IN THE SOUTH PACIFIC

The problem in the South Pacific for both proposals is that there may not necessarily be 'a designated national authority'. Where there is, this authority (registrar) is grossly overburdened with many divergent responsibilities.

Whereas some 'dumping of pesticides' undoubtedly does exist in the South Pacific, the actual extent is not known. Most of the major suppliers of pesticides will claim to adopt a responsible attitude to the sale and distribution of pesticides. Many belong to their trade associations which accept the 'FAO Code of Conduct'.

Table 40 lists the numbers of pesticides banned or restricted elsewhere in the world which are available in the South Pacific. It also lists the numbers of pesticides available which are placed in the 'extremely hazardous' and 'highly hazardous' classes of the WHO recommended classification by hazard. (WHO, 1986 - Pub No J4) It should be noted that in the South Pacific only those territories under US legislation plus the Solomon Islands and more recently New Caledonia (and hopefully Papua New Guinea) presently place pesticides in a 'restricted use category'. Also the hazard category is based on the formulation, so compounds with a low percentage of active ingredient may 'drop' hazard categories.

Table 40 Number of pesticides (a.i.) available in the South Pacific which are banned or restricted elsewhere or are regarded by WHO as extremely or highly hazardous (includes Australia and New Zealand)

Category	Number
Compounds 'banned, withdrawn, not approved' in USA	20
Compounds 'severely restricted' in USA	22
Compounds which are for 'restricted use' in USA or territories	58
Compounds 'banned withdrawn, not approved' in other countries but not USA	66
Total number of compounds 'banned, withdrawn, not approved' somewhere in the world	86
Compounds in WHO class 1A: extremely hazardous	35
Compounds in WHO class 1B: highly hazardous	59
Total number of pesticides available for use in the South Pacific excluding Australia & NZ	618
Total number of pesticides available for use in the South Pacific including Australia & NZ	762

This table needs to be read in conjunction with the text, and should not be quoted out of context!

Table 41 lists the numbers of pesticides available in each of the countries and territories of the South Pacific. but for various reasons are not registered in Australia and New Zealand. This data has been derived fron Table 3.

Table 41 Listing by country of the number of pesticides available in countries and territories of the South Pacific,but are not registered in Australia and/nor New Zealand.

Country	Number of Pesticides
American Samoa	2
CNMI	9
Cook Islands	3
Fiji	9
French Polynesia	97
Guam	12
Kiribati	1
Nauru	?
New Caledonia	11
Niue	2
Papua New Guinea	37
Pitcairn Island	0
Solomon Islands	2
Tokelau	1
Tonga	1
TTPI	69
Tuvalu	0
Vanuatu	7
Wallis et Futuna	1 (+?)
Total	177

Most of the pesticides not registered in Australia nor New Zealand are available in either countries which are under the US FIFRA or under French laws (and registration). Most of these pesticides are probably not used in the South Pacific countries but are 'available' since they are registered on the US mainland or in metropolitan France. The only other country presently with a large number of 'unregistered' pesticides is PNG, and most of these chemicals are used (if now used at all) in insignificant quantities. At present the reasons they are not registered in Australia or New Zealand is presently being ascertained. The Australia Department of Health (Toxicology Section) and New Zealand Pesticide Board are assisting. Possibly the main reason for many of them is that they are not neeeded or have been withdrawn from the market in Australia or New Zealand.

Table 42 lists pesticides known to be banned or restricted in USA and EEC. In some instances only particular formulations are banned or restricted. This list needs updating. It needs to also include those pesticides banned or restricted in Australia and New Zealand. the two countries which are the major sources of pesticides for the South Pacific region. A complete list of all chemicals which are listed in Table 3 which are banned, severly restricted or restricted. or are regarded by WHO as being 'extremely hazardous' or 'highly hazardous' is given in Appendix C Tables 54 to 62.

In fact many of the products listed as banned or severely restricted in the USA or EEC are registered in Australia and/or New Zealand, countries which both have effective registration evaluation systems. It is worth noting that sometimes authorities in both countries differ on aspects of pesticide safety so compounds may be banned or severly restricted in one country but not the other. In Australia the ultimate decisions rest with state authorities, who also may make different decisions concerning restrictions/banning. Non-government organisations, be they companies or action groups (eg Greenpeace, Friends of the Earth, Pesticide Action Group) contain scientists who also differ in their interpretation of available toxicological data, and whether substances should be banned, restricted etc..

Some of these severely restricted or restricted pesticides are used in South Pacific countries solely by government agencies under fairly strictly controlled conditions, eg EDB, methyl bromide, chloropicrin for fumigation work.

In 1984 the International Organization of Consumer Unions listed 44 'problem pesticides' which they consider harmful and forwhich more information should be made available (IOCU, 1984 1st ed.- Publ. no P4). 43 of these pesticides (not including schradan) are available in the region, with the following all appearing in table 5. which is a list of the pesticides most widely available in the region:

captan, carbaryl, chlordane, 2,4-D, diazinon, dichlorvos, dieldrin. endosulfan, lindane, malathion metaldehyde, paraquat and 2,4,5-T

On June 5 1985 IOCU launched a global campaign to ban the use of the following 12 pesticides (groups) whereever their safe use cannot be insured (IOCU. 1985). They are:

DDT, EDB, aldrin/dieldrin/endrin, chlordimeform, parathion. 2,4,5-T, paraquat, DBCP, chlordane/heptachlor, lindane/HCH, toxaphene, PCP.

Alternatives to these hazardous pesticides have been proposed by Gips (1986).

It must be noted that all banned or severely resticted or hazardous pesticides are registered (and banned) somewhere in the world. Even malathion is banned in India! These pesticides are banned or restricted for many different reasons. However according to UN Secretariat (1984 - Pub No P2) and other publications given in chapter 14 section P, the main reason given for most is that they are considered hazardous to human health.

Table 42 Some banned or restricted pesticides in U.S.A. or EEC, presently used in South Pacific.

---

acrolein
acrylontrile
aldicarb
aldrin
aluminium phosphide
amitraz
arsenic compounds
acetates methyl
BHC (other than lindane)
calcium cyanide
camphechlor (toxaphene)
carbofuran
chloranil
chlordane
chlordecone
chlorfenvinphos
chlorobenzilate
chloropicrin
compound 1080
coumafuryl
2,4-D
DDT
demeton
diallate
dicrotophos
dieldrin
diflubenzuron
dinoseb
dioxathion
diphacinone
disulfoton
EDB
endrin
erbon
ethion
ethoprop
fenoprop
fensulfothion
fenthion
fluoroacetamide
fonophos
heptachlor
hydrocyanic acid
isocyanurates
mercury (all)
metham sodium
methamiphos
methomyl
methyl bromide
mevinphos
mirex
monocrotophos
monuron
nitrofen
paris green
paraquat
parathion ethyl
parathion methyl
PCP
phenyl mercury acetate
phorate
phosacetim
phosphamidon
picloram
pirimicarb
sodium arsenite
sodium cyanide
sodium fluoride
strobane
strychnine
sulfotepp
2,4,5-T
TEPP
terbufos
terbutrylazine
thallium sulphate
warfarin

In the South Pacific countries there exists either no pesticide legislation and/or regulations, or legislation are not enforced. There is very little certification of applicators and many of the users are uneducated and untrained in the use of toxic chemicals. For these reasons, it would be wise for the countries ofthe South Pacific to restrict the use of the chemicals they import and for the relevant bodies in each to recommend the safer pesticides, ie. those in Class II or below in the WHO Recommended Classification of Pesticides by Hazard. (WHO, 1986 - Pub No J4).

Firman (1981 - Biblio No 615) outlines plant protection measures including the use of some pesticides. However, among the most commonly available pesticides in the South Pacific (see Tables 3 and 5) are some which Firman does not recommend for general use for safety and other reasons. See Table 43. Many other pesticides available (as listed in Table 3) including some known to be used would not be recommended due to their hazard rating.

Table 43 List of Pesticides commonly available in South Pacific not recommended for general use by Firman (1981)

carbofuran	fenamiphos
DDT	fenthion
dichlorvos	methomyl
dieldrin	methyl bromide
endosulfan	monocrotophos
ethoprophos	

The South Pacific countries need specific information available for reference when each country considers registration and/or recommendations for use or import permits. An up dated compilation is needed of those pesticides which are banned or severely restricted for use in U.S., E.E.C., Australia and New Zealand, and the reason for banning or restriction. Lists should also be made of 'restricted' or 'general use' pesticides recommended in the region. Such data should be kept by the SPC Plant Protection Office. This is further discussed in Part C of this report.

8.3 INTERNATIONAL REGISTER FOR POTENTIALLY TOXIC CHEMICALS, FAO CODE OF CONDUCT AND 'PRIOR INFORMED CONSENT'.

In 1977 the Governing Council of UNEP adopted a decision whereby it urged governments to take steps to ensure that potentially harmful chemicals, in whatever form or commodity, which are unacceptable for domestic purposes in the exporting country, are not permitted to be exported without the knowledge and consent of appropriate authorities in the importing country. In 1978, the Governing Council appealed to countries exporting potentially harmful chemicals to prevent the export of items which are restricted, or not registered for use, in the countries of origin until all appropriate information has been provided to the designated authorities in the recipient countries, so that these authorities can make fully informed decisions (IRPTC, 1985). In 1984, the Governing Council of UNEP adopted a Provisional Notification Scheme for Banned and Severely Restricted Chemicals. UNEP's International Register for Potentially Tocic Chemicals (IRPTC) provides the facilities for the implementation of this scheme which covers both notification of national control action and information exchange regarding the export of banned and severely restricted chemicals, especially where the chemicals pose human or environmental hazards. (IRPTC, 1984).

By Resolution 37/137 the United Nations General Assembly in December 1982 agreed overwhelmingly to the principle of 'prior-informed consent' with 146 countries voting in favour,with one country, the US, voting against, with no abstentions. In part they agreed that

> products banned from domestic use or sale because of their potential harm can only be exported upon request from the importing country, or when the sale or use of such products is officially permitted in the importing country.

In 1986 FAO (FAO, 1986 - Pub. No 02) published a 'code of conduct on the distribution and use of pesticides'. This code of conduct had been adopted by the 87th Session of the FAO Council in Rome in June 1985. FAO did so to try to ensure responsible action by manufacturers, exporters and importers. Numbers of governments and non-government organizations had expressed concern at the propriety of supplying pesticides to countries which do not have the infrastructures to register pesticides and to ensure safe and efficient use. In particular the export to such countries of pesticides which have been banned or severly restricted has been the subject of much debate.

Many government and non-government persons have been critical of FAO for changing parts of the original draft which incorporated the principle of ' prior informed consent' (Article 9 - Information Exchange'). In the draft (FAO, 1984 - Pub. No 01) , Article 9 read in part

> Governments of pesticide exporting countries which take action to ban or severely restrict the use or handling of a pesticide in order to protect health or the environment domestically should take appropriate measures to ensure that:
>
> any trader involved in export of such a pesticide informs the responsible authority in the importing country of the bans and restrictions imposed;...
>
> no export takes place without prior notification to the importing government .... and without the explicit consent of the importing country.

The principle of 'prior informed consent' would operate in the following way: information on the domestic regulatory status of a banned or severely restricted pesticide would be made available to the importing country; that country government would then decide whether or not it wished to import the pesticide and communicate that decision to the exporting country govrernment; the exporting country government would then permit the export only when the positive consent of the importing country government has been received (IOCU, 1985 per. com.)

The requirement for 'prior informed consent ' has deen deleted from the recently agreed 'code of conduct' . The requirement is now that the government of a pesticide-exporting country which takes action to ban or severely restrict the use or handling of a pesticide domestically for human health or environmental reasons should notify. directly or indirectly, the designated national authorities in other countries of the action it has taken. Provision of such information should take place prior to the time of first export following the control action, and should recur if significant changes are made in the control action. IRPTC should assist in the implementation of this scheme.

The main problem concerning both above schemes is that in the South Pacific many countries have no effective legislation, no designated authority, nor the infrastructure to regulate the importation, sale and distribution of pesticides. (See Chapters 12 and 13). However where these do exist it is my contension (and that of many third world governments) that only 'prior informed consent' can ensure that the decisions are firmly in the hands of the importing countries. Moreover it would better ensure the necessary information exchange.

In fact in the Netherlands the export of banned and severely restricted chemicals is now regulated by legislation (in the Chemical Substances Act). On the first of June 1986 a voluntary export-notification regulation came into force; it contains a prior-informed consent procedure. Moreover the Netherlands chemical industry, producers as well as traders, have declared that they will

export substances in the Dutch list of banned and severely restricted chemicals, only if the exporter has made certain that the use of that chemical is not forbidden in the country of import and if the designated authority has no objects to the import from the point of view of protecting man and the environment (v.d. Meer, pers.com.). Nauru and Vanuatu had notified the Netherlands Government of their designated authority. I provided them with the list of focal points given in Table 1.

The United States (through EPA) has for 15 years operated a notification system for pesticide exports and regulatory decisions. According to section 17(b) of FIFRA, EPA must notify all governments, world-wide, of major regulatory actions concerning US pesticide registrations, such as cancellations or suspensions of uses.Upon request, EPA will provide additional information. Also under section 17(a) of FIFRA EPA issues international notifications concerning the US's pesticide exports. Under this provision, added to FIFRA in 1978, EPA must notify the government of another country the first time each year that a pesticide not registered in the US is exported to a purchaser in that country. EPA requires that the foreign purchaser of an unregistered pesticide sign a statement acknowledging an understanding that a pesticide is not registered for use in the US, and cannot be sold or used anywhere in the US. A copy of this statement must then be transmitted to the government of the importing country (Schatzow, 1985). In Papua New Guinea receipt of such notifications from US EPA has been irregular. Seldom has the appropriate authorities been notified. Hopefully with newly implemented legislation and a designated authority such information exchange will improve. This lack of notification is widespread in the Pacific. Authorities have indicated that they would welcome any information they could receive from the US EPA.

Over the last few years IRPTC has provided much information on bannings, restrictions etc. In other ways they also assist. In 1984 they provided PNG with urgent information on sodium cyanide after a massive spill of this chemical at the mouth of the large Fly River. The chemical was being transported to the Ok Tedi copper mine (Mowbray, 1985). Through its query-response service IRPTC provided the PNG Government with valuable information on both potential human and environmental hazards posed by the cyanide spill.. Unfortunately very few South Pacific countries have national correspondance; those that do include Papua New Guinea (Department of Environment and Conservation), Tonga (Ministry of Agriculture, Fisheries and Forestry) and Western Samoa (Department of Health). SPREP also (through the author) receives regular correspondance, bulletins etc from IRPTC. More South Pacific countries need to 'join' IRPTC.

8.4 SUMMARY

In the South Pacific many pesticides are available which are banned or severely restricted elsewhere in the world (Table 40). This includes 41 which are banned or severely restricted in the USA, and 58 which are for restricted use. 94 are classified (by technical ingredient) by WHO as extremely or highly hazardous. 177 out of 620 available in the South Pacific are not registered for use in Australia or New Zealand. Reasons for this is being investigated. However most of these pesticides are probably not (now) used in the region, though 37 of them are known to have been used in the last 9 years in PNG.

At present information is being sought on the extent of use of these chemicals. and why they have been banned or restricted. Generally, where banning, restrictions etc. are based on toxicological environmental or social reasons special consideration must be given. Because of the lack of appropriate legislation, lack of designated authorities and the infrastructure to control importation, sale and use a regional advisory scheme/authority needs to be established. This is further discussed in Part C.

The FAO 'Code of Conduct'(in particular Article 9 on Information Exchange) and the IRPTC 'Provisional Notification Scheme for Banned and Severely Restricted Chemicals' whilst admirable in intention perhaps do not go far enough. It is contended that what is needed is a system of 'prior informed consent' as originally proposed in the draft FAO Code. This would ensure better information exchange and give the importing country better control on importation. IRPTC should provide the critical backup to guarantee the information exchange. Countries in the South Pacific are strongly recommended to appoint national correspondants so they can fully utilise IRPTC's facilities.

CHAPTER 9 RECOMMENDATIONS FOR PESTICIDE USE

9.1 PUBLICATIONS ON RECOMMENDATIONS FOR PESTICIDE USE

Refer to Question 3.1 in Table 2

Many countries produce small booklets, brochures. pamphlets. roneoed notes, technical bulletins and advisory leaflets. Unfortunately many of these publications are unavailable or not easily accessible outside the country in which they are produced. Small numbers of such publications however are held in the following libraries: USP, UOG, UPNG, and SPC, and in the Plant Protection Office of SPC in Fiji. These are listed in the bibliography.

The SPC and a number of countries have produced substantive publications which contain recommendations for pest control and safe use of pesticides. These are briefly cited below. They are cited in full in the bibliography under the country of origin and the appropriate subject. Some have brief annotations.

Cook Islands

BOTTRELL, Dale 1982 Bibliography no. 20.

LEITMANN, J. 1983 Bibliography no. 11.

MANARANGI, A and LEITMANN, J. 1982 Bibliography no. 13.

Fiji

GRAHAM, K.M. 1971 Bibliography no. 76.

SINGH, S.R. 1973 Bibliography no. 37/78.

SWAIN, G. 1971 Bibliography no. 79.

French Polynesia

REBOUL, Jean, TAEAETUA, A. and YAU, R. 1973.
Bibliography no. 116.

REBOUL, J.L., TAEAETUA, A. and YAU DIT AKUI, R. 1978.
Bibliography no. 117.

REBOUL, J.L., TAEAETUA, A. and YAU DIT AKUI, R. 1978.
Bibliography no. 118.

Guam

BJORK, C. 1977. Bibliography no. 148.

BJORK, C. 1977. Bibliography no. 149.

BJORK, C. and BEVACQUA. R. 1980. Bibliography no. 150

MUNIAPPAN, R., CRUZ, F. and CRUZ, J.A. Bibliography no. 153.

MUNIAPPAN, R. [et al] Bibliography no. 152.

Papua New Guinea

HENTY, E.E. and PRITCHARD, C.H. 1982. Bibliography no.323.

THISTLETON, B.M. (ed) 1983. Bibliography no.401.

Many leaflets are produced in Harvest as part of the following series:

Entomology Bulletins
Plant Pathology Notes
Horticulture Notes

See Bibliography under PNG

Solomon Islands

MACFARLANE, R. [?] Bibliography no. 447.

Tonga

CROCKER, P. 1979. Bibliography no. 467.

CROCKER, P. and FALALATA, O. 1981 Bibliography no. 466.

FRYAUFF, D.J. 1981. Bibliography no. 469.

FRYAUFF, D.J. and ENGLBERGER, K. Bibliography no. 470.

TTPI

TRUJILLO, E.E. 1971. Bibliography no. 479.

Western Samoa

DALE, P.S. and HERRING, J.L. 1956. Bibliography no. 498.

South Pacific Commission

ANON. Bibliography no 579

FIRMAN, I.D. 1976. Bibliography no. 614.

FIRMAN, I.D. 1981 Bibliography no. 615.

JACKSON, G.V.H. 1980. Bibliography no. 621.

LAMBERT, M. 1973. Bibliography no. 623.

ROWE, F.P. 1975. Bibliography no. 631.

SOUTH PACIFIC COMMISSION. 1976 to 1985. Plant Protection Advisory Leaflets 1 to 14. Bibliography no. 633

STOUT, O.O. 1984 Bibliography no. 577.

Australia

Each State Department of Agriculture also publishes leaflets on pest and disease problems and these incorporate recommendations. Some State Departments publish spray charts and others publish manuals such as weed control manuals.

AUSTRALIA. DEPARTMENT OF PRIMARY INDUSTRY. 1979 Bibliography no. 644.

SNELLGROVE, J. 1982 Bibliography no. 641.

SNELLGROVE, J. 1982 Bibliography no. 642.

SNELLGROVE, J. 1982 Bibliography no. 643.

SNELLGROVE, J. 1983,85 PESTLIST refer page ..

QUEENSLAND AGRICULTURAL COLLEGE 1985 PESTKEM refer page ...

New Zealand

NEW ZEALAND. AGRICULTURAL CHEMICALS BOARD. Bibliography no. 648.

NEW ZEALAND PESTICIDE BOARD 1986 unpublished computer print out.

9.2 ADVICE ON RECOMMENDATION FOR PESTICIDE USE

Refer to Question 3.2 in Table 2

For advice on recommendations, countries reported that they do the following:

1.	Review scientific literature	Fiji, New Caledonia, Solomons, Tonga
2.	Seek advice of chemical companies in Australia, N.Z., France or U.S.A. or other overseas	Cook Islands, French Polynesia, New Caledonia, PNG
3.	Seek advice of government agencies in Australia N.Z. or U.S.A.	American Samoa, Cook Islands, Kiribati, New Caledonia, Pitcairn Island, PNG
4.	Follow instructions on labels on product.	American Samoa, Guam, New Caledonia
5.	Follow WHO recommendations in public health programmes	French Polynesia, Guam New Caledonia, PNG, Solomons, Tonga, Vanuatu, Western Samoa
6.	Seek advice from SPC (includes using Handbook)	American Samoa, Cook Islands, New Caledonia Tonga, Vanuatu
7.	Review advice from elsewhere, but do own experimental trials.	American Samoa, Cook Islands, Fiji, French Polynesia, Guam, New Caledonia, PNG, Solomons, Tonga, Western Samoa.

In fact most countries probably do all 1-6. Those listed under 7 do experimental trials on selected crops, and consequently check and modify recommendations.

9.3 DECISION - MAKING ON PESTICIDE USE

Refer to Question 3.3 in Table 2

The efficacy of pesticides depends not only on the type of chemical or active ingredient but also on the type of formulation, the concentration the spraying method and the time of application. Most importantly, the pest species must be correctly

identified before the most appropriate and effective chemical can be chosen. One should also consider whether cultural or biological methods of control would be more appropriate.

Hence the choice of whether a pesticide is required, what pesticide to use, and when and how to use it, should be taken by an experienced person, particularly for use on a large scale. This person is usually an agricultural or health extension officer, entomologist, plant pathologist. pest control operator, chemical company representive or farmer. Whether they make the correct choice or not is sometimes debatable, and often only 'time will tell'. The effects on non-target insects and wildlife. and such problems as resistance, pest resurgence and secondary pest outbreak are factors that are often not considered. If the wrong pesticide or formulation is used. if the pesticide is used incorrectly or at the wrong time, more problems may occur than benefits accrue.

To make the correct decision requires a trained person who has a detailed knowledge of the pest ecology and of alternative and complementory methods. Unfortunately throughout the South Pacific there are very few trained plant pathologists, entomologists or public health workers with experience and expertise with pesticides. Most of the persons working in these fields in the South Pacific are non-nationals. Countries with professional entomologists and/or plant pathologists include Fiji, French Polynesia, Guam Kiribati, New Caledonia. Papua New Guinea, Solomon Islands, Tonga, TTPI, and Western Samoa. The Universities in Guam (UOG), PNG (UPNG and UOT) and Western Samoa (USP at Alafua and in Suva) all employ plant pathologists and entomologists and are training poeple in these areas. Entomologists with some expertise in pesticide use, are employed in vector control in PNG and the Solomon .Islands. Research organisations employing such persons include CSIRO (Australia) in PNG, DSIR (New Zealand) in Cook Islands, CIRAD (Centre de Cooperation Internationale en Recherche Agronomique pour le Developpement (formerly Gerat-Irat) and ORSTOM (Office de la Recherche Scientifique et Technicique Outre-Mer) in French Polynesia and ORSTOM in New Caledonia. IRHO (Institut de Recherches pour les Huiles et Oleagineaux) employs an entomologist in Vanuatu German Agency for Technical Co-operation (GTZ) is involved in both Tonga and Western Samoa. Both FAO and SPC employ entomologists and plant pathologists within the region. UNDP and FAO run jointly with SPC a project aimed at strengthening plant protection and root crop development in the South Pacific. This project has sponsored a postgraduate entomology student at UPNG. WHO employs vector control personel with expertise in pesticide use in PNG and Fiji. Chemical companies provide advice but most of their employees throughout the South Pacific are sales personel.

9.4 PUBLICATIONS ON SAFE USE OF PESTICIDES

Refer to Question 3.4 in Table 2.

In many countries small published brochures or leaflets are provided by agricultural or health departments on the safe handling of pesticides. They are usually in English or French, sometimes in a local language.

Most countries insist that basic safety precautions are included on the label.

Few substantive publications on the safe use of pesticides have been produced in in the South Pacific. In PNG a number of significant publications have been published specifically on this subject. The Fiji Department of Agriculture and Fisheries in conjunction with ARSAP produced a manual that includes a section on the safe use of pesticides:

FIJI. DEPARTMENT OF AGRICULTURE AND FISHERIES . 1983. Bibliography no. 75.

SUTHERLAND, J.A. 1983a. Bibliography no. 399.

SUTHERLAND, J.A. 1983b. Bibliography no. 400.

THISTLETON, B.M. and GREVE, J.E. van S. Bibliography no. 402.

WOHLFAHRT, D.J. 1981. Bibliography no. 403.

There are a number of substantive publications available and in use in the South Pacific that were not written specifically for South Pacific conditions nor published in the South Pacific. Again these are briefly cited here for identification. They are fully cited under BIBLIOGRAPHY or in the REFERENCES. Other pertinent UN documents are included in Chapter 14.

AUSTRALIA. DEPARTMENT OF PRIMARY INDUSTRY. Bibliography no. 645.

DAVIES, J.E., FREED, V.H., and WHITTEMORE, F.W. 1982. Bibliography no. 649.

DRESBACH, R.H. [latest edition) See References

MORGAN, D.P. 1982. Bibliography no. 650.

SELF, L.S. 1981. Bibliography no. 651.

UNITED STATES OF AMERICA. DEPARTMENT OF AGRICULTURE and UNITED STATES OF AMERICA. ENVIRONMENTAL PROTECTION AGENCY. nd Bibliography no. 583.

While these manuals, books and advisory leaflets are available, there may still be a significant gap between the knowledge and advice available and the knowledge and understanding of the user, especially in the South Pacific region where so many of those

using pesticides are untrained and unsophisticated in regard to using toxic chemicals and where these materials may not be readily available. Ideally publications similar to that by Sutherland (1983b - Biblio no 400) should be more widely distributed and translated into local languages. Sutherland's publication is being translated into Tok Pisin.

It is also essential that safety and first-aid information be more widely disseminated and information on the treatment be placed in all major hospitals and health centres in the region. Poison Centres should be established in all larger countries eg Fiji and Papua New Guinea. Such centres could play a vital role in dessiminating such information. It would be useful if either of the following safety charts could be distributed to all main hospitals in the SP region:

1. Chart on 'Emergency Medical Treatment for Acute Pesticide Poisoning', produced by the U.S. Navy, available from Disease Vector Ecology and Control Centre, US Naval Air Base, Jacksonville, Florida 32212 United States of America.

2. Wall Chart for Emergency Medical Treatment for Acute Pesticide Poisoning . Bulletin 766B produced by Supelco; obtainable from Supelco, Inc., Supelco Park, Bellefonte, Pennsylvania 16823 United States of America.

9.5 TRAINING AND EDUCATIONAL PROGRAMMES

In Guam and Tonga regular courses are held with extension workers and other pesticide users when safe handling is emphasised. Staff of the University of Guam conduct courses both in Guam and elsewhere in CNMI and in TTPI. Health Department Officers in the Cook Islands and Tonga and the Chemicals Officer in the PNG Department of Environment and Conservation are preparing small booklets or courses in safe use of pesticides. In Cook Islands, Fiji and PNG courses with emphasis on safe use of pesticide are conducted. In PNG such courses are part of the curricula of the agricultural colleges. The Education Officer of the South Pacific Regional Environment Program in 1985 produced a poster on PESTICIDES (SPREP,1985) emphasising safety.

In American Samoa and Guam restricted use pesticides can only be used by certified users. In New Caledonia and the Solomon Islands (and soon in Papua New Guinea) restrictions have been placed on some of the more toxic pesticides, thus limiting their distribution. Those persons who used these chemicals must either have a 'certification certificate' or have demonstrated to the authorities a high degree of competence.

Four major training courses which have dealt with aspects of pesticide use and which have been run on a regional basis have been held over the last 5 years. They have been in chronological order:

1982 31 May to 11 June	FIJI MINISTRY OF AGRICULTURE AND FISHERIES/ PPS/ESCAP/ARSAP Workshop on Pesticides and Fertilisers Suva, Fiji See Staring (1982) Biblio no 635.
1982 October	TONGA MAFF/ GTZ/USAID/CICP Subregional training course in methods of controlling diseases, insects and other pests of plants in the South Pacific, Tonga . See TONGA MAFF (1984) Biblio no 548.
1984 9 to 13 April	UNDP/FAO-SPC Subregional Workshop on Plant Quarantine Guidelines Suva, Fiji See SPC (1984) Biblio no 578.
1986 23 June to 4 July	SPREP/IOC/EAS Workshop on Organochlorines in Marine Animals, UPNG, Port Moresby See Mowbray and Baria(1986) Biblio no 588; Mowbray (in prep - Biblio no 653; Uthe (1986) Biblio no 654; and Uthe et al (1986) Biblio no 655.

At the Fourth Regional Technical Meeting on Plant Protection in Noumea in 1984 it was agreed to support recommendations, similar to that in Section C, which included recommendations re the licensing and certification, and training of pesticide users.

The South Pacific Commission recognizes the general paucity of suitably trained manpower on safe use and handling of pesticides in the region and has recognized that regional training courses for training of trainers and extension workers in this field should be organized.

Outside the region two institutions regular run courses which could be of immense value in training national manpower within the region. They are:

Queensland Agricultural College, Department of Plant Protection at Lawes (Gatton) Queensland.

run short courses in 'Pesticide Application Technology'

Tropical Development and Research Institute, London, United Kingdom.

run short courses on 'Pesticide Residue Analysis' , and various aspects of 'Pest Control Management'.

One severe problem faced in the region is that often a person is suitably trained, and then they change jobs; often they are promoted (due to extra qualifications), or they get better paid elsewhere, or they lose interest and leave.

What also is needed is an extensive educational programme run on a regional basis, but presented at a national level throughout the South Pacific. Such a programme would stress all aspects of safe use of pesticides at a 'grass-roots' level. Such a programme is discussed in greater detail in PART C.

9.6 SUMMARY

A few countries have produced their own publications both on recommendations and on safe use. Some countries run their own training and 'awareness' programs. Many countries either lack manpower with expertise to make competent recommendations on pesticide use or the few experts they do have are grossly overburdened with responsibilities. University and college-level training is available in the region and overseas. A few short training programmes have been conducted in the region, and others are also available overseas. A real problem is the lack of national manpower available for further training, and the guarantee that once trained they will stick in that job. Governments within the region require assistance to run 'grass-roots' awareness programmes on the safe and efficient use of pesticides.

CHAPTER 10. PROBLEMS TO HUMANS AND WILDLIFE

10.1 HUMAN POISONING

Refer to Question 5.1 in Table 2.

Very little information is available in the region on cases of human poisonings. What data is available is scant and not well documented. The situation has been summarised in Mowbray (1986 - Biblio no 606).

In response to the questionnaire (Table 2), the respondants did not always differentiate between poisoning due to occupational use and unauthorised or contraindicated use when answering Question 5.1. For example, paraquat has caused a high number of deaths, but death following accidental or deliberate ingestion should be distinguished from death due to occupational use. Some persons have argued that although the deaths due to accident or intent are regretable, they bear no relation to the occupational use of the chemical.

Table 44 lists those pesticides known to have caused poisonings and death in certain cases in countries in the region. It should be noted that many of these deaths, particularly those caused by paraquat, have been deliberate and not accidental.

****

The following was published in December 1985:

Taylor, R., Tama, K. and Goldstein, G. 1985 Paraquat poisoning in Pacific Island countries, 1975-1985. Report. SPC Technical Paper No 189.

****

Table 44 Pesticides which have caused poisoning of humans in the South Pacific.

Those marked with * have caused death though many of these deaths were deliberate and not accidental.

COUNTRY	PESTICIDES
Cook Islands	methomyl, paraquat*, tridemorph
Fiji	diazinon, paraquat*, 2,4-D / 2,4,5 -T mixture
French Polynesia	paraquat*, PCP, organophosphates
Guam	diazinon
New Caledonia	methaldehyde*, mevinphos, dieldrin
Niue	paraquat*
PNG	acephate, arsenic, coumaphos, DDT, dichlorvos, dieldrin, dimethoate, methomyl, methyl bromide, methyl parathion, mevinphos, monocrotophos, paraquat*, parathion, propoxur, rotenone*, sodium PCP, trichlorfon, unspecified timber treatment chemical (possibly CCA)
Solomon Islands	diazinon*, unspecified organophosphate or carbamate
Tonga	carbofuran, mancozeb,
TTPI (FSM)	endrin, sodium arsenite
Vanuatu	dieldrin, parathion*
Western Samoa	arsenic trioxide*, mancozeb, paraquat* , tridemorph.

mancozeb and tridemorph cause skin irritation.

The only data available are from Fiji, Papua New Guinea and Western Samoa. Mowbray (1986) summarises the situation on pesticide poisoning in the South Pacific. In brief the main problem chemical is paraquat, mostly through intentional misuse and because of its wide availability. Western Samoa, Fiji and Papua New Guinea have had high incidences of paraquat poisoning with significant numbers of deaths. Most of these deaths have been intentional. Many have been accidental because people drank paraquat which was stored in unlabelled drinking containers.

Levine (1986) stated that 10 persons were accidentally poisoned in Western Samoa in 1972. In Western Samoa between 1973 and 1984, 205 persons have suicided using paraquat. (N.B. the numbers vary according to source). Between 1970 and 1972, 5 persons suicided with arsenic trioxide.

In Fiji between 1976 and 1981. 59 persons were admitted to one major hospital with paraquat poisoning, 27 of whom died. In 1980, 44 persons were admitted to hospitals in Fiji with paraquat poisoning; 21 died. In Macuata province on Vanua Leva Island, Fiji, from 1979 to 1982, 17 persons suicided with pesticides. Most used paraquat, though some used a spray containing 2,4-D and 2,4,5-T. One hospital in Fiji reported 16 persons dying from paraquat poisoning in 1982, and 10 more in May 1983. In April, 1984 a farmer is reported to have died after spilling undiluted paraquat on his skin.

In PNG, between 1969 and 1984, 45 persons are known to have died from paraquat poisoning. In 1985 one further confirmed case of suicide was reported to the author from Mount Hage Hospital (Beavis, pers.com.) In both 1985 and 1986 there have been reported a number of further though unconfirmed cases. In publications listed in 10.3, Wohlfahrt lists 47 known poisonings due to paraquat from 1969 to 1981, 35 of these fatal. These cases were mostly from highlands provinces, mainly from Western Highlands Province; others came from Southern Highlands, Enga and Eastern Highlands. One case was reported from Oro and one from West New Britain. In 1983 he informed me that he had heard of a further 32 incidences of paraquat poisonings in the highlands provinces. However, these reports were not confirmed.

The addition of emetics, stenchants and dyes in paraquat and an educational awareness programme have greatly reduced the incidences of paraquat poisoning in PNG. Similarly incidences in Western Samoa have also decreased.

In PNG, rotenone from derris and related plants is traditionally used in some areas when persons are threatening or attempting suicide.

While the data on acute poisoning in the South Pacific is scant, no confirmed reports have been made on possible chronic effects to pesticide users in the South Pacific. It would be difficult to distinguish such effects. In Guam in the last five years three persons between the ages of 32 and 54 who were engaged in

pesticide application have died, one from cancer and two from cardiac arrest. However there is no sufficient evidence to link their deaths to pesticide poisoning.

Incidence of poisoning in Fiji, PNG and Western Samoa is probably high compared to those in Australia and New Zealand considering the larger populations and their much greater use of agrochemicals. In Australia, according to Davies (1981), from 1971 to 1980 there were 450 cases of poisonings due to agricultural chemicals reported annually. 350 of these occurred amongst children aged 0 to 4 years old. During the whole 10 years period, only 15 persons died, 8 of whom were suicides. In N.Z., the Department of Health (1981) reports from 1978 to 1980, 25 cases of poisonings due to agricultural chemicals reported annually. The number of fatal poisonings is very low. In 1980 5 persons died from pesticides: one by an organophosphate, one from bipyridyls (paraquat) and three from cyanide.

Levine (1986) reviewed the world-wide situation concerning mortality and morbidity due to unintentional pesticide poisoning. He cites four estimates of global (unintentional) poisonings and deaths per year:

Estimate	No of unintentional poisoning	Deaths
A	1,111,000	20,000
B	1,528,000	28,000
C	1,056,000	20,000
D	834,000	3,000

Bull (1982 - Publ. no U3) estimated 750,000 poisonings with 13,800 deaths per year (presumably including suicides).

All estimates make assumptions and use incomplete information. Whichever is the more correct is not important. Unintentional poisoning has been and still remains a major worldwide problem.

From data supplied by Levine (1986) and Mowbray (1986 - Biblio no 606) I have made comparisons of average mortality for either accidental or total pesticide poisonings over the periods indicated. See Table 45.

Table 45 Accidental and Total Poisonings by Pesticides in Selected Countries.
(deaths per 1,000,000 persons per year)

Country	Period	Accidental	TOTAL
Australia	1971-1980	0.05	0.10
	1979-1983	0.18	
New Zealand	1980	0.32	1.6
USA	1979	0.13	
Canada	1979-1983	0.04	
Japan	1979-1983	1.83	
Brazil	1979-1981	0.42	
PNG	1969-1984		1.1*
Fiji	1976-1983		16.4*
Western Samoa	1970-1984		89.2*

* most cases were intentional (suicide cases)

Incidences of poisoning deaths were very high in Fiji and Western Samoa, though mainly through intentional poisoning by suicide. Incidences of poisoning is much less in PNG. Incidence of poisoning in all countries is much higher than in Australia, though that in PNG is similar to that in New Zealand. However much more pesticide is used in both Australia and New Zealand. Accidental poisoning is low in most countries.

If the number of poisonings in PNG is representative of the South Pacific overall, I would estimate about six deaths at minimum per year, with an unknown number of mild or severe (but not fatal) poisonings.

Clearly there is a need for a Poisons Information Centre in the Pacific to (1) maintain a record of poisoning incidences, and (2) to provide immediate advice on treatment as required.

When poisonings do occur, in PNG eg , doctors invariably refer to the latest edition of Dreisbach:

DREISBACH, R.H. 1983. Handbook of Poisoning (11th edition). Lange Medical Publications, Los Altos, California, 632p

Other useful publications on poisonings include the two charts referred to in section 9.4, and

DIVISION OF OCCUPATIONAL HEALTH , NSW 1983. Poisoning by Pesticides. Department of Industrial Relations, Sydney.

PLEISTENA R. 1984 see Publ. no M17.

ICI has also published and widely distributed a publication on treatment of paraquat poisoning:

ICI Australia 1980 The Treatment of paraquat poisoning. A guide for doctors. Melbourne. ICI Australia.

10.2 POISONING OF DOMESTIC ANIMALS, FISH AND WILDLIFE

Refer to Question 5.2 in Table 2.

Very little documented evidence exists on poisonings other than that of humans in the South Pacific region. Only isolated incidences of poisonings have been reported and many of these lack confirmation.

Table 46 Reports on Poisonings of domestic animals, fish and wildlife in South Pacific.

Country	Report
CNMI	poisoning of cattle by organoarsenate herbicide
Cook Islands	animals killed by oil dumped in streams
Fiji	dogs deliberately poisoned by metaldehyde.
French Polynesia	fish in rivers killed by deltamethrin and other agricultural chemicals
New Caledonia	dogs poisoned by organophosphate baits; chickens by metaldehyde
PNG	DDT and lindane killed fish in small creeks and streams; cats and non target insects in village houses died after DDT spraying (roofs collapsed); cattle killed by dimethoate and diazinon; rotenone (derris) used traditionally to kill fish; DDT and unspecified timber treatment chemical (possibly CCA) used to catch fish.
Solomon Islands	fish killed by using temephos illegally
Tokelau	fish and coral killed by lindane; fish kill by DDT
Tonga	foal poisoned after drinking from drum containing benomyl and banana misting oil
TTPI	fish killed by endrin (Truk); large scale kill of fish, wildlife and domestic animals by endrin and sodium arsenite leakage into lagoon (Yap)
Western Samoa	dogs poisoned by licking used paraquat containers.

The largest reported kills both involved cattle. One occurred in PNG in February 1984. 53 cattle were sprayed wath diazinon. 44 Brahman and Brahman-cross cattle died within 10-30 minutes. Subsequent analysis showed that the diazinon used had totally decomposed into breakdown products, one 14000 times more toxic than diazinon. The other occurred in CNMI. 75 cattle died from drinking water in old and discarded drums which had originally contained an organoarsenate herbicide. The drums were unmarked and it was presumed that they were old military drums left to sit on unused land. When it rained, water collected in the drums.

No autopsy was conducted on the dead foal in Tonga. Both pesticides have very low LD50's Hencé no definite cause of death can be ascertained.

Marschall (1976 - Biblio no 451) reported cases of fish and coral poisoning in Tokelau:

- accidental spillage of lindane into lagoon caused coral death
- DDT 'accidentally' thrown into lagoon caused large fish kill.

Falanruw (1980 - Biblio no 481) reported cases of poisoning in the Federated States of Micronesia (TTPI):

- fish kill associated with endrin contamination in lagoon on Truk.
- endrin and sodium arsenite leakage into freshwater stream and lagoon caused death of everything in stream and fish and plankton kill in lagoon. and death of seabirds, rats and sickness of chickens in Federated States of Micronesia (Yap).

An unsighted article by Lambert (1977 - Biblio no 517) refers to the effects of DDT and endrin on coral reefs in Western Samoa.

An unidentified SPREP Memo notes that a hurricane carried an agricultural store house into a lagoon killing reef and fish. This incident needs verification.

Appendix 17 of SPC et al (1984, Biblio no 593b) list some of the above examples, plus mention a further spill in Yap Harbour by an unnamed pesticide.

Bourke (1973) reports on effects on anti-malarial DDT spraying on non-target insects causing house roofs to rot. There is in fact much unpublished data on this in 'Malarial Control' files in PNG. Similar effects are reported from the Solomon Islands (Macfarlane,1984 pers.com.)

From 1983 to 1985 a series of articles and letters appeared in Nature and other scientific publications (Biblio nos 137, 138, 141, 142, 143). Some suggested that pesticides could have been responsible for the decline in bird species in Guam, but this is now thought not to be the case.

Similarly only isolated incidences of acute poisoning have been reported in Australia and New Zealand. Whilst I was studying effects in pesticides on wildlife around cotton fields in NSW from 1972 to 1977 (Mowbray, 1978) , I observed and heard of cases of fish and bird kills both in cotton areas, and in other agricultural areas in Australia. However, it is often difficult to prove conclusively the cause.

Cases of chronic poisoning due to pesticides have been reported both in New Zealand and and Australia. These include effects on both fish and birds. In New Zealand this includes the death of rainbow trout fry in lakes due to high DDT residues in their yolk sacs (Hopkins, 1969; Dack and Scott, 1971). In Australia, eggshell thinning in some birds of prey due to DDT throughout Australia was reported by Pepperell (1975) and Olsen and Olsen (1979). Similarly I showed eggshell thinning was occurring in kookaburras and nankeen kestrels living around cotton fields in NSW (Mowbray, 1978). Summaries of studies on the environmental impact of pesticides in Australia have been collected and recently published by Bowen and Templeton (1984). No such studies have been done throughout the South Pacific, so no data is available.

10.3 PUBLICATIONS ON POISONING TO HUMANS AND WILDLIFE

Refer Question 5.3 in Table 2.

Only the respondants from French Polynesia, Guam, Kiribati and myself could name known publications, although persons in Fiji and Western Samoa knew that some publications did exist. Most publications on the problems caused by pesticides are on human poisonings or public health concerns. Few articles cover the effects to wildlife or the environment in the South Pacific. This is a reflection of the minimal data available. Articles on residues are mentioned in Chapter 11.

Extensive information on poisonings to humans and wildlife in Australia is available through:

Commonwealth Department of Health
P.O. Box 100,
Woden, ACT 2616.

The following list includes references not mentioned in sections 10.1 and 10.2. It is certainly not complete. It does not include newspaper articles, although it includes one article from Islands Business. More work needs to be done to compile a complete listing. Refer to Bibliography for full citation, where publications are listed under their countries.

Further publications known on this subject from the South Pacific include:

Fiji

1. DAVIES, R.E. 1980 Bibliography no. 63.
2. DAVIES, R.E. 1980 Bibliography no. 64.
3. GOUNDAR, R.P.S. 1984 Bibliography no. 67.
4. HAYNES, R.H. 1984a Bibliography no. 68.
5. HAYNES, R.H. 1984b Bibliography no. 69.
6. KEITH-REID, R. 1983a Bibliography no. 70
7. KEITH-REID, R. 1983b Bibliography no. 71.
8. LARKHAN, A. 1983. Bibliography no. 72.
9. RAM, P. and ROA, U. 1983 Bibliography no. 73.

French Polynesia

1. Delebecque, P. (1975) Bibliography no. 100.

Kiribati

1. Dharmaraju, E. 1982. Bibliography no. 162

Papua New Guinea

1. Aitken, I 1976 Bibliography no. 349.
2. Binns, C.W. 1976 Bibliography no. 352.
3. Bourke, T.V., et al 1971. Bibliography no. 355.
4. Konabe, C. 1984 Bibliography no. 291.
5. Vince, J.D. 1981 Bibliography no. 382.
6. Vince, J.D. et al 1981. Bibliography no. 383.
7. Wohlfahrt, D.J. 1981. Bibliography no. 384.
8. Wohlfahrt, D.J. 1982. Bibliography no. 385.

Western Samoa

1. Keith - Reid, R. 1983. Bibliography no. 525.
2. Galuvao, M. and Bourke, T.V. 1981. Bibliography no. 523.
3. Imo, A. and Grigor, R.R. 1974. Bibliography no. 524.

10.4 SUMMARY

Pesticides are not a major cause of poisoning in most South Pacific countries, although high instances of intentional poisoning have occurred in Fiji, PNG and Western Samoa. Paraquat is the main problem pesticide, due to its wide availablity and high oral toxicity.

Very little information is available on known effects on domestic animals and wildlife. The two largest known poisonings both killed many cattle; due to diazinon break-down-products(in PNG) and an organoarsenate herbicide (in CNMI).

Little literature is available; that which is, is listed in the bibliograpghy (Part B).

CHAPTER 11 PESTICIDE RESIDUES AND TOXICITY STUDIES

11.1 LABORATORY FACILITIES AND PERSONNEL

Refer Question 6.1 and 6.2 in Table 2.

To be able to do pesticide analyses laboratories need, apart from a gas chrmatograph and adequate glassware, at minimum a good supply of gases and chemicals, plenty of funds and skilled technical expertise.

There are at present seven laboratories in the region capable of doing residue analysis, though some may need extra accessory equipment. These laboratories are:

Fiji

1. Chemistry Laboratory, Dept. of Agriculture
   Koronivia Research Station

   Principal Research Officer is Dr. R.V. Duve.

   This laboratory would need a lot more equipment to do regular monitoring. It has not done any pesticide analysis to date. Ms Iliseva Ledua, a technical officer in this laboratory attended the Organochlorine Workshop at UPNG in June-July 1986.

2. Institute of Natural Resources,
   University of the South Pacific

   Principal Chemists are Dr. John Morrison and Dr. Jan Brodie, and senior technician is Ms Regina Prasad.

   This laboratory would need more equipment and staff. However it regards pesticide residues as priority though it is has not done any pesticide residue analysis to date. INR is the lead institution in the SPREP 'Coastal and Inland Water Quality Projects' See section 11.5. It is proposed that this laboratory be supported so that in conjunction with their own proposals they be given extra financial assistance to ensure that they also be able to do pesticide residues and formulations, as proposed in section 11.6.
   Ms Prasad and Ms Neelam Keshni attended the Organochlorine Workshop at UPNG.

French Polynesia

1. Laboratoire d' Etudes et de Surveillance de l'Environnement (L.E.S.E.) attached to Commissariat a l' Energie Atomique, Institut de Protection et de Surete Nucleaire in Mahina, Tahiti.

   Principal Chemist is Dr Beade.

   It is equipped with suitable materials such as two gas chromatographs and atomic absorption spectrophotometer for analysing pesticide residues on a large scale. To date it has done pesticide residue analysis on a medium scale, and monitoring is carried out. The priorities of this laboratory are presently unknown. It needs more staff. It does by far the most analyses of the laboratories presently operating in the region.
   M. Jean-Louis Denardi, a senior research officer attended the Organochlorine Workshop at UPNG. At present arrangements are being made for Mr Mulo Kapush of UPNG to work at LESE for 2-3 months in 1987, and to receive further training from M. Denardi.

Guam

1. Chemistry Laboratory, Monitoring Services Division, Guam EPA

   Chief chemist is Mr. Ken Morphew, senior chemist is Mila Padoi, and chemist is Carmen Hardina.

   This laboratory does routine pesticide monitoring in water samples. It would need more equipment and staff to embark on larger scale monitoring. However, it regards pesticide residues as a priority. It is suggested that this laboratory be supported as proposed in Section C. Ms Hardina attended the Organochlorine Workshop, but expects to be on study leave in Hawaii for the next 15 months.

2. College of Agriculture and Life Sciences, (CALS) University of Guam

   Staff is Dr. Jefren Demeterio

   This laboratory is restricted to doing limited pesticide residues as part of research work.

3. Water and Energy Research Institute (WERI), University of Guam

The Water Laboratory has the facilities for doing pesticide residue analyses.

Papua New Guinea

1. Biology and Chemistry Departments, University of Papua New Guinea

Staff are:

Dr. David Mowbray, Lecturer in Biology

Mr. Aspi Baria, Principal Instrument Technician in Chemistry.

Mr. Mulo Kapush, Research Officer SPREP Coastal Water Quality Program.

Mr. Peter Haei, Research Officer SPREP Coastal Water Quality Program.

These staff together with one research assistant have established a small pesticide laboratory and presently are doing pesticide residue monotoring. Present work includes determination of paraquat residues in water, soil and fish, and organochlorine and organophosphate residues in human blood and tissues, and organochlorine residues in marine bivalves. However more equipment and staff are required if it is to embark on large scale monitoring. Laboratory also does heavy metal analyses in marine animals. Present funding is by the University Research Committee, the Chemistry Department and UNEP and SPREP. See sections 11.5 and 11.6. It is suggested that this laboratory be further supported as proposed in Section C.
This laboratory organised the Organochlorine Workshop in June/July 1986.

At present a joint submission is been prepared by the Department of Environment and Conservation and the University of Papua New Guinea to upgrade the 'Pesticide Laboratory'. The proposal will be submitted to the Asian Development Bank, at their request. Unfortunately the submission has been delayed. The University lacks sufficient laboratory space, hence the submission will require the funding of a new building which would substantially add to the cost of the project.

It is estimated that the cost of upgrading facilities through 1987-1989 would be K280,000 and an extra K120,000 for a new building (where K1 = US$1).

2. **National Analysis Laboratory. and Department of Chemical Technology, PNG University of Technology.**

   Chief Chemist of NAL is Mr Damien D'Huiller and Head of Chemistry Dept is Prof Ken Gawne.

   This laboratory will require a lot more equipment to do pesticide analyses.

   This laboratory is involved in SPREP's. 'Coastal and Inland Water Quality Project'(SPREP, 1986 - Biblio no 592) has not done any pesticide residue determinations to date.

3. Department of Primary Industry Laboratory.

   This laboratory neither has the equipment, nor the intention to do pesticide analyses in the near future.

A full listing of equipment available for pesticide analytical work and of methods used in these laboratories has not been compiled, but this need to be done.

American Samoa has recently built a federally certified and standardized, fully and well equiped laboratory. It is inteded that pesticide residue analyses be conducted in the laboratory in the near future. However it is not known if this laboratory has a gas chromatograph or a HPLC, or if it has, whether it is federally certified for pesticide residue work.

Western Samoa intends to establish facilities to do thin layer chromatography for detection of residues.

Tonga and CNMI sent participants to the Organochlorine Workshop. They were Mr Semisi Pone from Tonga, and Mr Ignacio Cabrera from CNMI. It is intended that these persons work in co-operation with the laboratories at USP and Guam EPA respectively, and initiate sampling work in their own countries. The problem is that the countries lack the correct chemicals for preparation of the sample materials.

Several countries have indicated that they have had analyses done for them overseas in government laboratories in Australia, New Zealand, France, the Philippines, United Kingdom, Hawaii and mainland U.S.A. One French Polynesian respondant said it was cheaper to get analyses done in France than in French Polynesia.

GTZ (Deutsche Gesellschaft fur Technische Zusammenarbeit / German Agency for Technical Cooperation) has a laboratory in the Philippines which has done some analyses for Tonga and Western Samoa. GTZ was approached to see if it could assist by doing residue work for South Pacific countries. Unfortunately its response was in the negative.

All state governments and the national government in Australia have analytical laboratories capable of doing regular pesticide analyses. Some states have more than one, eg in NSW - both agriculture and health departments have analytical laboratories. Such laboratories include -

- Divison of Analytical Laboratories, Health Department, Lidcombe. N.S.W.
- Government Chemical Laboratories, Brisbane. Queensland.
- State Chemistry Laboratory, Agriculture Department, East Melbourne. Victoria.
- Australian Government Analytical Laboratories - different regional laboratories.

Many chemical companies, and CSIRO have their facilities.

The Division of Analytical Laboratories of the NSW Health Department have assisted both Papua New Guinea (to check contents of 'diazinon' formulation which killed a large number of cattle), and Vanuatu (to test the gastric contents of persons who died from parathion poisoning).

In New Zealand a number of laboratories undertake analyses of pesticide residues. Government analyses are done by two DSIR laboratories. Private laboratories within New Zealand which can do pesticide residue analyses include -

- P.J. Dawson Laboratories, Taradale.
- Cawthron Institute, Nelson.
- Water, Soil and Laboratory Services, Napier.
- T.J. Sprott, Auckland.

At the 14th session of the Asia and Pacific Plant Protection Commission , held in Jakarta in August 1985 (FAO, 1985 - Biblio no 618) facilities for residue analyses were discussed. While some countries felt that the importance of residue analysis was getting over-emphasised, other countries felt that this was a significant emerging problem which had not received adequate attention in respect of trained manpower and facilities for residue analysis and monitoring. The meeting supported a proposal to establish in Thailand a "Regional Pesticide Training Centre and Service Laboratory". This project should be asked to assist South Pacific countries as well. Its aims are the following:

- Training of laboratory staff in pesticide residue analysis, in pesticide quality control and in the safe and efficient use of pesticides, including maintenance and repair of laboratory equipment.

- Training in planning, conducting and evaluating controlled field trials under good agricultural practices for the generation of pesticide residue data under local climatic conditions in the Region in order to contribute to the estimation of Maximum Residue Limits (MRLs) for the acceptance of Codex MRL's.

- Evaluating and adopting laboratory methods under given local conditions, using local resources and harmonizing such methods for pesticide quality control and residue analysis in the Region.

- Acting as a service and reference laboratory for countries in the Region that are without their own national facilities.

- Acting as a reference centre for all questions of pesticide problems in the Region.

An uptodate register of persons resident in SP countries who are trained to recommend use of pesticides and/or have the expertise to evaluation registration requirements, to do chemical analyses and to assess effects of pesticides needs to be compiled (See Recommendations). It should be completed with the help of the South Pacific Plant Protection Office. The register should include plant pathologists, entomologists, quarantine officers, chemists, biologists, certified pest control operators and pesticide control officers.

11.2 RESIDUE STUDIES DONE TO DATE

Refer Questions 5.3 and 6.2 in Table 2.

Much published and unpublished data exists on pesticide residues in Australia and New Zealand. Regular monitoring is done by government laboratories on human blood or fat samples, foodstuffs, water and environmental samples; formulations are also checked. However, very little data is available on the South Pacific. Known studies carried out are listed in Table 47

Table 47 Countries and studies where small scale residue studies have been done in South Pacific Countries.

Country		Study	Laboratory Analysis
American Samoa	1.	Water residues - for paraquat.	?
Guam	1.	Water residues - for organochlorines	Guam EPA
	2.	Wildlife survey (small scale)	Patuxent Wildlife Centre, U.S.A.
	3.	Experimental studies on diazinon and malathion persistance in crops	CALS/UOG
	4.	Water residues - for for unknown pesticides	WERI/UOG
French Polynesia	1.	Residues in crops grown in coral soils	L.E.S.E.
	2.	Residues of water. sediment and animals in lagoons / atolls (including bivalves)	L.E.S.E.
	3.	Residues in vegetables fruit, soil and water	Labs. in Hawaii and France.
Papua New Guinea	1.	Wildlife survey (very small scale) in Purari for organochlorines	Australian Institute of Marine Sciences UPNG
	2.	Human blood residues- wide range of pesticides	UPNG
	3.	Paraquat residues in water, mud and fish.	UPNG
	4.	Residues in marine bivalves (mussels, oysters, clams)	UPNG
	5.	Limited checking of formulations	UPNG

Solomon Islands	1.	Lindane residues in root crops.	TPI, London.
Tonga	1.	Water residues for organochlorines	Ministry of Agriculture, Philippines.
	2.	Vegetable residues for unknown pesticide	Japan ?
CNMI	1.	Water residues for organochlorines	Guam EPA
Western Samoa	1.	Residues in water, foodstuffs, fish and human milk and fat	Ministry of Agriculture Philippines.

Most studies have found low residues in samples, or interpretation of data is inconclusive. Data from Western Samoa gives data where lindane, aldrin, heptachlor, and DDT residues in some food stuffs, and DDT in human fat is above acceptable international residue limits for pesticide residues.

Other studies on pesticide residues in humans have been done in PNG in breast milk, blood and fat. All residue levels found to date have been very low, and include aldrin, DDT, dieldrin, HCB, aHCH, and BHCH, heptachlor. heptachlor expoxide, lindane and oxychlordane. Routine cholinesterase tests are reportedly done in French Polynesia, New Caledonia, Solomon Islands, and sporadically in PNG. Only occassionally have persons been detected with low cholinesterase levels.

No studies have been done to determine the fate of pesticide used in any of the South Pacific countries. Little is known on how active pesticides remain in tropical small island environments.

Publications on residue studies done to date are given in the Bibliography. These include:

French Polynesia	Bibliography nos. 87 - 97.
Guam	Bibliography nos 139, 145.
Papua New Guinea	Bibliography nos 339, 342, 350 and 377

11.3 RESIDUE STUDIES REQUIRED

A well planned program for monitoring residues throughout the South Pacific needs to be implemented. Laboratories at EPA (Guam), USP(Fiji), UPNG, LESE (French Polynesia) and University of Hawaii have all expressed a willingness to participate in such a monitoring program.

Time needs to be spent on interpreting the existing data and writing it up for publication. A well planned program for monitoring residues throughout the Pacific needs to be implemented. Officials from Fiji, Guam, PNG. Solomon Islands, Tonga and Western Samoa all indicated a desire for implementing a monitoring program throughout the South Pacific. This will be further discussed in Section C.

Officials from most countries have all indicated a desire for implementing a monitoring program throughout the South Pacific, to include foodstuffs, human blood, environmental samples, formulations, as well as regular cholinesterase testing. The South Pacific Plant Protection Officer has requested assistance to analyse organochlorine (lindane) and other residues in crop samples in association with experimental trials. As he states, ' the cost elsewhere is

prohibitive'. See Table 48.

The Pesticide Commission in French Polynesia has instituted some baseline studies on pesticide residues in environmental samples and foodstuffs in French Polynesia. The laboratories at EPA in Guam, at USP and UPNG have all being invited to participate in the international 'Mussel Watch Program'. In June and July 1986 a training workshop was held at UPNG for nationals of the South Pacific on organochlorine residue analysis. At present there are very few nationals of the South Pacific trained to do this type of work; one in Guam, one in French Polynesia and five just commencing training at UPNG and USP. Trainees from. CNMI, Fiji. French Polynesia, Papua New Guinea and Tonga (as well as trainees from South East Asia) attended this two week workshop, which was jointly sponsored by SPREP,EAS/COSEA and IOC/WESTPAC. A copy of the Workshop Manual (Mowbray and Baria (ed) 1986 - Biblio no 588) is available at cost, from UPNG.

Table 48 Types of Residue analyses required

	Analysis	Country
1.	cholinesterase tests *	Fiji, Niue, PNG Solomon Islands, Tonga Vanuatu, Western Samoa
2.	residues in human blood	Fiji. Niue, PNG, Solomon Islands, Tonga, Vanuatu, Western Samoa
3.	residues in food stuffs (eg meat and vegetable crops)	Fiji, PNG, Solomon Islands, Tonga, Vanuatu.
4.	residues in soils (eg lindane)	Solomon Islands
5.	residues in environmental samples	Fiji, French Polynesia, PNG
6.	residues in well water and lagoon water	Tonga
7	residues in crops in association with experimental trials	PNG, Solomon Islands, Vanuatu. FAO-SPC Plant Protection Project
8.	checking formulations	Fiji, PNG

Unfortunately few countries have the required WHO recommended cholinesterase kits (refer Publ. no M 25). ICI (PNG) recently purchased one kit for UPNG, and under the SPREP Pesticide Project a further kit will be purchased by USP (see section 11.6).

Residues to be analysed for in the above include:

organochlorines	gBHC (lindane), DDT
organophosphates	diazinon, malathion, trichlorfor
carbamates	carbaryl carbofuran, methomyl
herbicides	paraquat

In late October 1986 a questionnaire was forwarded by the SPC Plant Protection Officer to all key personnel in South Pacific countries concerning pesticides and pesticide residues in food. Mr G.N.Hooper, the Pesticide Coordinator for the Department of Primary Industry in Australia is coordinating this exercise on behalf of the Joint FAO/WHO Codex Alimentarius Commission Codex Committee on Pesticide Residues (CCPR). At the 18th Session of CCPR held in The Hague in April 1986 the Committee requested that the needs and activities of the countries in the South West Pacific Region be ascertained, such that CCPR may be of assistance to the countries in the region. A copy of the questionnaire is given as Appendix E.

It is hoped that as a result of both this SPREP Report, and of the CODEX questionnaire. practical assistance might be provide to help establish adequate facilities for residue work throughout the region. To date the only 'outside' assistance has been provided by UNEP's Programme Activity Centre for Oceans and Coastal Areas which provides SPREP with the bulk of the funding for the Coastal Water Quality (section 11.5) and Pesticide Projects (section 11.6). Despite assurance of assistance from other UN agencies (UNIDO, UNEP, FAO, WHO and ILO) , as promised at a meeting held with SPREP in November 1984 no assistance has been forthcoming.

11.4 TOXICITY STUDIES

Toxicity studies accessing acute toxicity of pesticides on non-target organisms (or target species) have been done in Guam at UOG, and can be be done in the Monitoring Laboratory of the Guam EPA. and are done by the author at UPNG, and by Ms Neelam Keshni at INR at USP (pers. com.).

The laboratory at UPNG is also working with the PNG Malarial Control section by doing toxicity tests on mosquito larvae (Aedes, Anopheles and Culex), freshwater shrimps (Caridina), mosquitofish (Gambusia) and guppies (Poecilia) . Larvicides used are Abate (temephos) and Actellic (pirimiphos methyl). Presently data from tests done by officers of the Health Department on the determination of adulticides (eg DDT) on Anopheles species are being reanalysed,by the author, using a program adopted and modified from Mowbray (1978). Unfortunately much of the raw data for accurate determinations of the LD50 of DDT on mosquitoes, collected over many years in PNG, was either lost in a fire in 1981, or was destroyed or lost when the malarial control headquarters moved building in 1985.

Tests to determine both the acute and chronic toxicity of copper (and other heavy metals) and cyanide have been run using shrimps, mosquitofish, guppies and tilapia (Oreochromis) at UPNG as part of an environmental impact study of the effects of mine tailings on a PNG river sytem (Mowbray, 1986)

Such studies involving animals and pesticides are given in table 49.

Table 49 Animals and Pesticides used in Toxicity Studies in Fiji, Guam and PNG.

Laboratory	Test Organisims	Pesticide
UOG, Guam	tropical hermit crab	carbaryl, chlordane. diazinon, dicofol, malathion
UPNG	mosquitofish, guppy tilapia, freshwater shrimp	copper sulphate, sodium cyanide, paraquat, pirimiphos-methyl, temephos
	mosquito larvae and adults	pirimiphos-methyl, temephos, DDT, bromophos,lindane
	cockroaches	dieldrin, propoxur malathion, diazinon
USP	tilapia	BPMC, carbaryl, MIPC (isoprocarb)

The Guam work is written up by Wortman (1976 - Biblio no 144), and studies in PNG with copper sulphate by Balat (1982), Lam (1984) and Mowbray (1986). The other studies are presently being written up by Mowbray (on paraquat - Bibliography no 341; and on larvicides / adulticides Bibliography no 371). The studies done by Keshni are for a MSc. degree.

11.5 PROPOSED STUDIES I. SPREP COASTAL WATER QUALITY STUDIES.

The following residue monitoring programme, funded by SPREP and UNEP's Regional Seas Programme (now called Programme Activity Centre for Oceans and Coastal Areas) was approved at the Third Consultative Meeting of Research and Training Institutions in the South Pacific Region in Guam in June 1986 (SPREP, 1986 - Biblio no 592). Previous work done on this project was summarised by Kapush et al (1986, Biblio no 339).

COASTAL WATER MONITORING AT SELECTED SITES IN PAPUA NEW GUINEA.

(original proposal prepared by David Mowbray and Aspi Baria)

11.5.1 BACKGROUND

A marine pollution monitoring programme is instigated either to provide baseline water quality data, or the selected site is expected to suffer environmental changes due to commercial activities in the surrounding area, because of its geographical situation.

The use of certain bivalves as sentinel organisms to monitor chemical pollutants in coastal areas has been well documented (Mussel Watch programme). We propose to use this principle to monitor heavy metal and/or organochlorine residues in coastal water at four selected sites. The first study area is the Port Moresby harbour area; the SPREP supported study of this area has been initiated and is expected to continue. The second location is the Fly River delta which is possibly contaminated by tailings released from the giant Ok Tedi copper/gold mine since mid-1984. The third location will be the Empress Augusta Bay area near the Jaba River delta which has received tailings from the Bougainville Copper mine for the last 15 years. The fourth location is the Morobe Coast adjacent to Lae at the mouth of the Markham River, which receives run off, most probably containing organochlorines, from agricultural land and areas sprayed for vector control.

11.5.2 OBJECTIVES

a) Short term objectives:

- to continue generating baseline data on the heavy metal and organochlorine residues in bivalves in Port Moresby harbour and adjacent lagoons.
- to do an initial study of the Fly River delta and the Empress Augusta Bay areas.
- to make an initial study of the Morobe coast.

b) Long term objectives:

- to monitor on a continous basis residues in the Port Moresby harbour and the adjacent lagoons and to extend the monitoring programme to other selected coastal areas of Papua New Guinea affected by land based sources of chemical pollution, particularly from mining, vector control and agricultural spraying.
- to continue training nationals with the necessary skills, to preserve the continuity of the monitoring programme.
- to carry out a more comprehensive monitoring at the Fly River delta, Empress Augusta Bay area and Morobe coastline, if the initial studies warrant it.

11.5.3 WORKPLAN AND TIMETABLE

Months 1 - 6: Order. install and commission the Atomic Absorption Spectrometer. Selection of appropriate bivalve as indicator species and sampling sites. Re-evaluation of existing methods.

Months 7 - 12: Begin sampling programme. Confirm methodology and its reproducibility.

Months 13 - 24: Continue sampling programme every three months. Take part in interlaboratory calibration exercise to verify our results.

11.5.4 METHODOLOGY

UNEP's Reference Methods for Marine Pollution Studies will be used as far as possible for the determination of the levels of chemical pollutants. Where necessary, modifications will be made to suit local analytical conditions. A variety of biological indicator species will be examined for the presence of organochlorine residues and heavy metals.

11.5.5 OUTPUTS

a) An interim report summarising the levels of heavy metals and organochlorine residues in bivalves from the study areas (at the end of twelve months).

b) Comprehensive report including an assessment of the main sources of chemical pollutants in the study areas and recommendations to mitigate the effects caused by that pollution (at the end of twenty four months.)

11.5.6 INSTITUTIONAL ARRANGEMENTS

a) Principal Investigators:
Dr David Mowbray and Mr Aspi Baria, Science Faculty, University of Papua New Guinea, Port Moresby, Papua New Guinea.

b) Lead Institution:
Science Faculty, University of Papua New Guinea, Port Moresby, Papua New Guinea.

11.5.7 BUDGET (IN US$)

(a) SPREP contribution:

	1986	1987	1988
Training	-	8000	8000
Equipment	40000	6000	5000
Materials	-	4000	3000
Travel	-	2000	3000
Computing	-	-	500
Reporting	-	-	500
Sub-total	40000	20000	20000

(b) Estimated contribution from institutions in kind and services:

1986	1987	1988
9000	48000	52000

(c) Total cost

49000	68000	72000

11.6 PROPOSED STUDIES II SPREP OCCUPATIONAL AND ENVIRONMENTAL HAZARDS FROM THE USE OF PESTICIDES

The following study programme to be funded by SPREP and UNEP's Regional Seas Programme was approved at the Third Consultative Meeting of Research and Training Institutions in the South Pacific Region in Guam in June 1986 (SPREP 1986 - Biblio no 592). Previous attempts to obtain funding were unsuccessful.

11.6.1 BACKGROUND

A study initiated at the First Consultative Meeting of Research and Training Intitutions in the South Pacific (Suva, 18-20 April 1983) reviewed the use of pesticides in the SPREP region. The study revealed that very little control is exercised over the use of pesticides in the SPREP region. The study revealed that very little control is exercised over the use of pesticides and that their environmental and health effects are barely known. The study also indicated the urgent need to monitor the levels of pesticides in human tissues, agricultural products and environmental samples. (Refer SPREP (1983, Biblio no 590).

Consequent to this, a proposal to establish a monitoring program was submitted by Mowbray in his draft report (Mowbray, 1984 - Biblio no 625) to the Second Consultative Meeting of Research and Training Institutions at the University of PNG in January 1984 (SPREP, 1984 - Biblio no 591). Unfortunately although a 'pesticide monitoring program' was approved in principle, no funds were guaranteed, and infact ever obtained. However some of what was proposed to be done at UPNG was done using funds approved by UPNG's University Research Committee. Funds were also received for the Coastal Water Quality Project (section 11.5 and refer Kapush et al, 1986 - Biblio no 339) and for the Organochlorine Workshop (see section 9.5). Such funds enabled us to purchase two gas chromatographs, glassware and consumables, and to employ a research assistant. ICI (PNG) donated a portable mini-spectrophotometer for cholinesterase tests. These studies are presently being prepared for publication (Baria et al, in prep. - Biblio no 350).

11.6.2 OBJECTIVES

Monitoring of the pesticide situation in the region should be based on the extension of the existing activities in several institutions of the SPREP regions:

- University of Papua New Guinea (UPNG), Port Moresby, Papua New Guinea. In 1981 UPNG established a pesticides

project to study paraquat residues in environmental samples. In 1982 this was extended to include organochlorines, organophosphates and cholinesterase levels in huma blood. In 1983 equipment was purchased to allow analysis of other plant and animal tissues. The recently acquired gas chromatographs (Varian and Hewlett Packard) and the Organochlorine Workshop have improved the capability of UPNG to respond to the urgent need for more extensive monitoring. The workshop has also enhanced the capability of regional agencies to particpate in this program.

- University of the South Pacific (USP), Suva, Fiji. With the acquisition of an electron capture detector with SPREP support and two staff members trained at the Organochlorine workshop, the INR laboratory is now equipped to participate in the monitoring programme.

- Guam Environment Protection Agency (GEPA), Agana, Guam. At GEPA analyses of organochlorines in water are regularly carried out. The work could be expanded to monitor organochlorines in biota. One of the staff attended the Organochlorine Workshop.

- Laboratoire d'Etudes et de Surveillance de l'Environnement (LESE) , Mahina, Tahiti, French Polynesia. LESE is presently the most active laboratory engaged in the region in residue studies, and has been regularly involved in monitoring over the last few years. One of its staff attended the Organochlorine Workshop.

11.6.3 WORKPLAN AND TIMETABLE

Having acquired the equipment and participated in an intercalibration exercise, the plan for the co-ordinated regular regional monitoring programme will be finalised between participating institutions during early 1987 (once funding has come through) and the project will commence immediately.

The sampling and analytical techniques will be harmonized and intercalibrated, and the strategy of the regional monitoring programme will be agreed upon. Specific workplans of participating institutions are as follows (modified):

(a) UPNG:

- completion of current blood analyses,and continued evaluation of methods for analysing organochlorines in indicator species and in food crops, and for analysing selected organophosphates and herbicides (June 1987)

- continued participation in intercalibration exercises.

- further training of one staff at LESE [partial funding by French Government] (early 1987)

- commencement of regular monitoring programme (July 1987)

(b) USP:

- ordering of cosumables (January 1987)

- recruitment of support staff (January 1987)

- testing / learning techniques and commissioning equipment (June 1987)

- continued participation in intercalibration exercises.

- commencement of regular monitoring programme. (July 1987).

(c) Guam EPA:

- ordering of equipment and materials as required (January 1987)

- continued participation in intercalibration exercises.

- commencement of monitoring programme.

(d) LESE:

- ordering of materials as required (January 1987)

- continued participation in intercalibration exercises.

11.6.4 METHODOLOGY

The cholinesterase tests will be based on procedures recommended by WHO (WHO, 1984 - Publ. no M25). The methods recommended for the analysis of organochlorine and organophosphate residues and herbicides in blood, tissues and urine (FAO, USEPA, NSW Health Department) and modifications of methods learnt at Organochlorine Workshop will be evaluated and the most suitable method selected for the regular monitoring programme.

The methodology used in the project will be harmonized and intercalibrated among the participants in the project. The

following analyses will be carried out:

- UPNG: organochlorines, selected organophosphates and herbicides (e.g. paraguat) in blood: or urine, cholinesterase tests; organochlorines in biological indicators; [modified to include also residues in crops (associated with experimental trials), foods and checking formulations];

- USP: organochlorines in blood: cholinesterase tests: organochlorines in biological indicators;

- GEPA: organochlorines in drinking water, possibly foodstuffs and biological indicators;

- LESE: continuation of studies of pesticide residues in groundwaters, lagoon waters and biological indicators, and in vegetables; if thought appropriate also organochlorines in blood and cholinesterase tests.

11.6.5 OUTPUTS

(a) Interim report on the preparatory phase of the project, including the results of methodological calibrations and the proposed co-ordinated regional regular monitoring programme. (June 1987 and December 1987).

(b) Facilities at each institution participating in the project for checking the health of occupationally exposed persons and for quick analyses in cases of poisoning and contamination [and checking formulations as required] (December 1987).

(c) The production of an interim report on the progress of the project (December 1987).

(d) Comprehensive report on the results obtained through the project, including a detailed analysis of the use, as well as of the health and environmental effects of pesticides in the SPREP region. (December 1988).

11.6.6 INSTITUTIONAL ARRANGEMENTS

(a) Principal investigator: Dr. David Mowbray. University of Papua New Guinea, Port Moresby, Papua New Guinea.

(b) Lead institutions: Science Faculty, University of Papua New Guinea, Port Moresby, Papua New Guinea.

(c) Collaborating institutions:

- Institute of Natural Resources, University of the South Pacific, Suva, Fiji
- Guam Environment Protection Agency, Agana, Guam
- Laboratoire d'Etudes et de Surveillance de l'Environnement, Mahina. Tahiti, French Polynesia.

11.6.7 BUDGET

As approved in June 1986 , in US$:

(a) SPREP contribution:

	1986	1987	1988
Training	3 500	20 000	20 000
Equipment	2 500	0	0
Material	24 000	0	4 000
Travel	0	2 000	2 000
Reporting cost	0	0	1 000
Sub-total*	30 000	22 000	27 000

(b) Estimated contribution from institutions in kind and services:

1986	1987	1988
30 000	50 000	50 000

(c) Total Cost

1986	1987	1988
60 000	72 000	77 000

* The institutional breakdown of the funds for this project is:

1986

	UPNG	USP	GEPA	LESE	TOTAL
Training	1 500	2 000	0	0	3 500
Equipment	0	0	2 500	0	2 500
Materials	6 000	6 000	6 000	6 000	24 000
Travel	0	0	0	0	0
Reporting Costs	0	0	0	0	0
				Sub-total	30 000

1987

	UPNG	USP	GEPA	LESE	TOTAL
Training	12 000	8 000	0	0	20 000
Equipment	0	0	0	0	0
Materials	0	0	0	0	0
Travel	500	500	500	500	2 000
Reporting Costs	0	0	0	0	0

			Sub-total		22 000

1988

	UPNG	USP	GEPA	LESE	TOTAL
Training	12 000	8 000	0	0	20 000
Equipment	0	0	0	0	0
Materials	1 000	1 000	1 000	1 000	4 000
Travel	500	500	500	500	2 000
Reporting cost	250	250	250	250	1 000

			Sub - total		27 000

11.6 SUMMARY

Existing facilities and expertise in the region is limited for residue and toxicity studies. Moreover, the cost of running a residue laboratory is prohibitive for nearly all countries.

Little work has been done to date; generally only low concentrations of residues have deen detected. Many governments state there is a need for residue work, especially in association with experimental trials.

The four existing facilities at UPNG (PNG), INR/USP (Fiji), Guam EPA and LESE (French Polynesia) need upgrading, especially more funds. The Organochlorine Workshop provided some training, but much more extensive training of national staff in the region is required. There needs to be more co-operation/co-ordination between these laboratories. Assistance from laboratories overseas would be appreciated, eg in Australia or GTZ in Germany.

At present SPREP (with UNEP assistance) is funding two projects within the region involving pesticide residues. Recommendations on improving residue facilities for the region are further discussed in Part C.

CHAPTER 12 PESTICIDE LEGISLATION AND REGISTRATION

12.1 INTRODUCTION.

It is recognized universely that if any control is to be implemented to ensure safe and efficient use of pesticides in a country then a legislative framework including a registration system must be established. Furthermore machinery and infrastructure to enforce the legislation must be workable. In countries of the South Pacific there is a general lack of technical expertise available, and such infrastructure for enforcement is often not available. Hence legislation must be simple and controls should be mainly concentrated on importation, and to a lesser degree on sale. Any pesticides for which safe use can not be guaranteed should be thoroughly scrutinised before their importation is permitted. FAO (1985 - Publ. no A4) review the alternatives and suggest guidelines for the implementation of a system of registration and controls on pesticides.

12.2 LEGISLATION IN SOUTH PACIFIC COUNTRIES

Refer Question 4.8 in Table 2.

Table 49 lists relevent legislation covering aspects of pesticide use in South Pacific countries. Legislation specifically on pesticide control or major legislation regulating pesticides is marked with an *. A list of major Australian and New Zealand legislation is also included for information and comparison.

Table 50 List of Pesticide related Legislation in South Pacific countries and territories

American Samoa	* 1.	U.S.Federal Insecticide, Fungicide and Rodenticide Act.
	* 2.	Code of Federal Regulations (40 CRF).
	* 3.	American Samoa Pesticide Act 1979.
	* 4.	American Samoa Pesticide Regulations (pending EPA approval).
Commonwealth of Northern Mariana Islands	1.	Commonwealth Environmental Protection Act.
	* 2.	CNMI Pesticide Regulations,1983.
	*3.	U.S.Federal Insecticide, Fungicide and Rodenticide Act.
	4.	CNMI Drinking Water Regulations,1982.
	5.	CNMI Hazardous Waste Management Regulations, 1984 (draft).

Cook Islands	1.	Conservation Act, 1975
Fiji	* 1.	Pesticide Act, 1971, 1976 (Chapter 157, 1978) and Pesticide Regulations 1971, 1972.
	2.	Pharmacy and Poisons Act (Chapter 115)
French Polynesia	1.	Deliberation no 74-86, 3 July 1974, modified by deliberation no 76-6, 9 July 1976, made applicable by arrete no 4540 AA, 6 August 1976.
	* 2.	Arrete no 1701, 2 September 1980
	3.	Decision no 1702, 2 September, 1980
	4.	Arrete no 1350/ER, 26 March 1981
	5.	Decision no 1351/ER, 26 March 1981
	6.	Decision no 156/ER, 3 February 1982
	7.	Arrete no 1175/ER, 3 December 1982.
Guam	* 1.	Public Law 10-142, The Uniform Insecticide, Fungicide and Rodenticide Act, Titles LXI and LXII.
	* 2.	Executive Order 75-29.
	* 3.	Guam Pesticides Act, 1977
	* 4.	U.S. Federal Insecticide, Fungicide and Rodenticide Act, 1972.
New Caledonia	* 1.	Deliberation no 183, 17 September 1969 (contains rules for sale and use of poisonous substances.)
	2.	Arrete no 72-017 / CG, 13 January 1972
	3.	Arrete no 77-364 / CG, 2 September 1977
	4.	Arrete no 82-578-583 / CG 9, November 1982
	* 5.	Arrete no 86-040, 5 February 1986 (contain new regulations to control sale and use of agricultural pesticides)
Papua New Guinea		
	* 1.	Environmental Contaminants Act 1978
	* 2.	Pesticide Regulations 1986
	* 3.	Pesticide Guidelines 1986
	4.	Environmental Planning Act 1978
	5.	Public Health Act.
	* 6.	The Poisons and Dangerous Substances Act 1952.
	7.	The Industrial Safety, Health & Welfare Act 1961
	8.	Water Resources Act 1982
	9.	Quarantine Act Chapter 234.
	10.	Customs Act Chapter 234

Upto present control has been implemented through (6) since (1) had no regulations covering pesticides. Regulations (2) and Guidelines (3) on Pesticides under (1) have now been drafted, and should be gazetted in late 1986. Proceedures on registration have also being drafted.

Solomon Islands
*1. The Safety at Work Act, (Pesticide) Regulations 1982.
2. The Pharmacy and Poisons Act (1964) - controls import of arsenicals
3. Agricultural Quarantine Act (198?)

Tonga
* 1. The Pesticides Act, 1975, ammended 23 September 1981.

T.T.P.I.
* 1. TTPI Pesticide Regulations, Title 63, Chapter 13, 1980.
* 2. U.S. Federal Insecticide, Fungicide and Rodenticide Act.

Western Samoa
* 1. The Poisons Act, 1968, and Poisons Regulations 1969.
2. Agriculture, Forests and Fisheries Ordinance 1959 (?)
3. Forests Act 1967 (?)

Australia (principal legislation only):

Queensland
* 1. Agricultural Standards Act 1952 1972

New South Wales
* 1. Pesticides Act 1978
2. The Poisons Act 1966

Victoria
* 1. Agricultural Chemicals Act 1958 (formerly Pesticides Act 1958)
2. The Poisons Act 1962.
3. The Household Insecticides Regulations 1973

South Australia
* 1. Agricultural Chemicals Act 1955.

Western Australia
* 1. Health Act 1911 - 1979 (includes Pesticide Regulations)
2. Poisons Act 1964 - 78

Tasmania
* 1. Pesticides Act 1968.
2. Poisons Act 1971 - 73
3. Environmental Protection Act 1973.

New Zealand
* 1. Pesticide Act 1979
2. Pesticides Regulations 1983
3. Pesticides (Vertebrate Pest Control) Regulations 1983
4. Pesticides (Organochlorine) Notice 1983.
5. Toxic Substances Act 1979
6. Toxic Substances Regulations 1983
7. Noxious Substances Act 1954.
* 8. Agricultural Chemicals Distribution Control Act 1966-1978, Provisions 8-79-3.

Nine countries have legislation specifically on pesticides. Two more control sale of pesticide under a 'Poisons' Act. PNG is about to gazette legislation, and two others hope to introduce legislation in the near future. The situation in the South Pacific can be summarised as follows:

Table 51 Summary of Pesticide Legislation Situation in South Pacific

Type of Control	Country
Own pesticide legislation	Fiji, Solomon Islands, Tonga
About to introduce own pesticide legislation (with NZ assistance)	Papua New Guinea
Thinking about introducing own pesticide legislation in near future (with NZ assistance).	Cook Islands Vanuatu
Own pesticide legislation, but also under French laws	French Polynesia, New Caledonia
Own pesticide legislation, but also number US FIFRA	American Samoa, CNMI, Guam, TTPI (Federated States of Micronesia, Marshall Islands, Palau)
No pesticide legislation, but partial control under 'Poisons Act.	PNG, Western Samoa
No pesticide legislation, but follow New Zealand regulations	Cook Islands, Niue
No pesticide legislation	Kiribati. Tokelau, Tuvalu, Pitcairn Island, Vanuatu
Unknown situation	Nauru, Wallis et Futuna

A thorough review of pesticide legislation for all countries needs to be done with the aim of recommending harmonization of legislative requirements . What follows in this and the following

chapter is an attempt to review aspects of pesticide legislation and regulations in the light of the situation in countries of the region. Information was obtained from the responses to the questionnaire, from legislation and from personal communication and observation. Reference is also made to FAO, WHO, Australian and New Zealand documents which should assist individual countries improve their legislation and regulations.

In recent years in some of the countries new legislation has been created or existing legislation has been improved to control registration, importation, sale and use of pesticides (and formulation). However in almost all countries it is generally recognised that the machinery for enforcement of these rules and regulations must be strengthened, and a workable infrastructure established to make control effective.

12.3 REGISTRATION OF PESTICIDES.

Refer Question 1.1 of Table 2.

Fiji, Solomons and now PNG have designated Registrars.

Fiji, French Polynesia, Solomons and Tuvalu keep a register of pesticides permitted into the country. PNG is presently compiling their register.

Fiji, French Polynesia, PNG and Solomons have a Pesticide Advisory Committee or 'Working Party'.

Solomons has a Pesticides Registration Advisory Committee, defined by law.

Tonga, by law is supposed to have a Registrar and a register of pesticides, but the law is presently not implemented.

American Samoa, CNMI, Guam and TTPI only permit into their countries pesticides registered by U.S. EPA under FIFRA, although Guam and TTPI may register some pesticides for local use. All pesticides used in US-affiliated countries/territories must be registered with the USEPA. However officials of the local EPA's and local departments of agriculture can unofficially decide which pesticides to prohibit from their islands due to either environmental or health reasons.

Cook Islands, Niue and Pitcairn Island only permit into their countries pesticides registered in New Zealand.

French Polynesia and New Caledonia are assisted by L'Association de Coordination Technique Agricole in Paris which publishes lists of pesticide products and summarises French legislation.

Information required by law for registration varies between countries which have laws as given in Table 2 , all information

taken from responses to Question 1.2. A comparison of information required by law in Fiji, PNG and Solomon Islands and Tonga is given in Table 52.

Table 52 Information on Pesticides required by law for registration in Fiji, Papua New Guinea[a], Solomon Islands and Tonga.

Information Required		Country			
		Fiji	PNG	Solomon Islands	Tonga
1.	trade name	*	*	*	*
2.	common name	*	*	ISO *	*
3.	nature of pesticide	*	*	*	*
4.	formulation	*	*	*	*
5.	use, including efficacy data, information re application, with holding period	*	*	*	*
6.	chemical/physical properties	*	(*)	*	*
7.	analytical methods	*	(*)	*	*
8.	residue information	*	(*)		*
9.	toxicological data	*	(*)	*	*
10.	use precautions	*	*		*
11.	environmental effects	*	(*)		
12.	packaging information	*	*		*
13.	copy of draft label	*	*	*	*
14.	name and address of manufacturer	*	*	*	*
15.	name and address of proprietor/importer	*	*	*	*
16.	evidence of registration elsewhere	*	*	*	*

a. In PNG, under the new regulations about to be gazetted, most aerosols do not have to be registered. Applicants will not have to submit detailed information in most instances if their products are already registered in Australia and New Zealand. If the product is not registered in either country or another country with acceptable registration proceedures then detailed information on all listed as (*) will be required.

One real problem all countries within the region face is to evaluate data provided for registration. The region lacks persons with expertise to evaluate chemicals, though some countries rely on information provided by Australia and New Zealand (eg Papua New

Guinea, Tonga, Cook Islands...), or by USA (countries associated with the USA). Information and assistance is also available from UNEP's IRPTC based in Geneva. As mentioned in section 8.3 at present only three countries within the region have national correspondants and receive the IRPTC Bulletin. These are Papua New Guinea (Department of Environment and Conservation), Tonga (Ministry of Agriculture, Fisheries and Forestry), and Western Samoa (Health Department). Other countries should be encouraged to nominate national correspondents to IRPTC, and so receive regular updated information on the changed status of many pesticides. In Part C.3 it is proposed that a 'Pesticide Advisory Scheme for Pacific Island countries be established. This should assist to lessen the burden of each country attempting to evaluate/reevaluate each pesticide.

12.4 SUMMARY

For a country to control the major aspects of importation, sale and distribution , and to ensure safe and efficient use, it must have effective legislation which is enforceable; and it must have a system of registration. Half the countries and territories of the South Pacific have laws to control pesticides; half do not! Information required by law for registration and labelling vary between the countries. Countries face difficulties in evaluating data submitted for registration, and face problems in enforcing their legislation. These problems are further discussed in Chapter 13.

CHAPTER 13 CONTROL OF PESTICIDES

13.1 IMPORTATION, SALE AND DISTRIBUTION OF PESTICIDES

Refer to Question 4.1 in Table 2.

This is controlled by legislation in the nine countries with their own legislation; PNG (very soon) and Cook Islands and Vanuatu(in the forseeable future) are about to introduce legislation (Table 50). Some countries classify pesticides either for general use or restricted use, as under EPA. The latter are only sold to and used by certified applicators who must keep detailed records. In these cases sale can be only through certified outlets, eg in Guam and American Samoa. New Caledonia and the Solomon Islands restrict the use of some chemicals; hopefully this will also be done in PNG. In PNG upto now and in Western Samoa some pesticides (but not all) are partially controlled under Poisons regulations. Unfortunately few of the countries in the South Pacific can adequately enforce their legislation.

Kiribati, Pitcairn Island, Tokelau and Tuvalu all report that pesticides are only used by government officers. Tokelau reports that pesticides are not for sale.

In PNG upto the present, the importation, sale and distribution of pesticides has been regulated according to which schedule the pesticide or pesticide formulation is classed under in the 'Poisons Act', but most pesticides have not been listed in the schedules. Also specific pesticides might have particular requirements, eg paraquat can only be sold if it contains an emetic and a stenchant, and can only be sold in the original containers. Paraquat can presently still be imported without these additives, as long as it is not sold.

Under the new pesticide regulations (about to be gazetted) pesticides and pesticide formulations are classified according to the 'WHO Recommended Classification of Pesticides by Hazard'. Importation, sale and distribution of pesticides will be regulated according to this internationally accepted series of schedules; eg: some pesticides may only be sold through specified outlets. Such persons selling these pesticides must keep an inventory of all sales; sales must be to holders of permits allowed to handle such pesticides. Other pesticides under another less hazardous schedule may be sold by food vendors or in stores, although the pesticides must be kept separate from food-stuffs. Furthermore pesticides can only be sold in containers which have the approved label.

Countries with legislation forbid sale of pesticides in other than original containers although in some cases the legislation is ambiguous, eg Tonga: if the new containers were adequately labelled it might be legal to sell pesticides in other than the original containers. In Fiji, French Polynesia and Solomon Islands special permission must be given for such 're-bottling'. In PNG most pesticides can only be sold in their original containes, however special permits will be issued to enable sale of pesticides in new containers, but these must also contain an approved label.

Countries which report that pesticides are or have been sold in secondary containers were New Caledonia, Papua New Guinea, Vanuatu and Western Samoa. Usually they are sold in old drink containers.

As part of a study instigated by the Tropical Development and Research Institute, a survey was carried out on re-use of pesticide containers or their disposal in PNG. This is given in Appendix D. It was found that pesticides containers are used by some in quite unacceptable ways (to carry water, storage of food, animal feed, plant seeds), and were not deposed of correctly. Users must be educated not to use old pesticide containers!

13.2 LABELLING

Refer to Question 4.2 in Table 2.

A thorough review of labelling requirements in the countries with legislation is required with the aims of harmonizing requirements; and consideration of the introduction of a South Pacific label, language requirements considered. Table 52 shows a comparison between some of the information required on labels in American Samoa, Cook Islands, Guam, New Caledonia, PNG, Solomon Islands and Tonga. PNG and the Solomon Islands accept Australian and New Zealand approved labels, but label must be submitted at time of registration. In PNG a 'PNG approved' label will be required if specified by the Working Party.

The 15 items of informations are recommended to be included on the label by FAO (1985 - Publ. no D3)

Table 53 Information on labels required by law in American Samoa, Cook Islands, Fiji, Guam, New Caledonia, PNG, Solomon Islands and Tonga.

		Country							
		American Samoa	Cook Islands	Fiji	Guam	New Caledonia	PNG	Solomon Islands	Tonga
1.	trade name	*	*	*	*	*	*	*	*
2.	common name & % a.i.	*	*	*	*	*	*	*	*
3.	net vol/wt	*	*	*	*	*	*	*	*
4.	use category						*		
5.	direction for use	*	*	*	*	*	*	*	*
6.	warning & precautionary statements	*	*	*	*	*	*	*	*
7.	Withholding periods	*	*	*		*	*	*	*
8.	directions in case of poisoning, first aid	*	*	*	*	*	*	*	*
9.	'Poison' label/Graphics or Color Coding	*	*		*	*	*	*	*
10.	Instructions re disposal of containers	*	*	*	*		*	*	*
11.	Language requirement (parts only)		* M	* E/H/F		* FR	* E(TP/MO)	* E	* E/T
12.	Citation that is registered and registration no.	*	*	*	*		*	*	*
13.	Classification state (general, restricted)	*			*				
14.	Name and address of manufacturer.		*	*	*		*	*	*
15.	Name and address of importer.			*	*		*		*

E = English; F = Fiji; FR = French; H = Hindustani; M=Cook Island Maori; Mo = Motu; T = Tongan; TP = Tok pisin

Laws on labelling are not always enforced, especially re language requirements, and may need modification.

In American Samoa many farmers who wish to use pesticides are not fluent in English. Labels are printed in English, but it is intended that labels be translated into Samoan, Korean and Chinese. However EPA regulations prohibit the altering of pesticide labels, even to the extent of translating the label into the local language. New Zealand chemical companies, however, manufacture pesticides with local language labels. But these pesticides are not registered with the USEPA and, therefore are unavailable to the territory's farmers (Vargo, 1986 - Biblio no 550). Vargo suggests that legislation be formulated to modify this EPA regulation so that local language labels, either on approved US - manufactured pesticides or foreign - manufactured pesticides which meet local EPA approval, be made available to US - Affiliated Pacific Island farmers. Vargo also states that EPA specifies that a pesticide may only be used against certain pests on certain crops listed on its labels. This list often neglects pests and crops found in the tropics, so, she states, a Special Local Needs Label must be obtained. The requirements to obtain this label require extensive research and residue analysis, and the cost in time may be prohibitively high given the limited size of staff and facilities on the islands. These studies, however, may have been performed by and for neighbouring nations. Vargo recommends that research results from these other studies be applicable for obtaining a Special Local Needs Label.

In Fiji, I observed both agricultural and household aerosol pesticides being sold in containers with labels only in English and not in Hindustani or Fijian. Pesticides sold in aerosol packer for domestic use do not require any vernacular language translations.

In French Polynesia, regulations require sellers to use labels in French and Tahitian stating the name, conditions of use and precautions. However, since many products come from USA, New Zealand and Australia, this is not complied with.

In New Caledonia, regulations require use of words POISON and DANGEROUS, and also labels in French. Many products are imported from Australia and New Zealand and these labels are not translated into French. Generally upto when the new regulations were introduced this year, the laws on labelling have been ignored. Under the new regulations labelling in French is mandatory.

In Papua New Guinea, upto date regulations under the 'Poisons Act' should have been complied with. There has not been requirements to translate labels, although a few companies produce labels in Tok Pisin. Under the new regulations Australian and New Zealand approved labels will be acceptable, as will most for USA and UK; and these generally contain all the information listed as required in Table 52. However the Working Party may require a PNG label, which may or may not require parts in Tok Pisin or Motu.

The law in the Solomon Islands requires all labelling in English.

It does not require labels to be in Solomon Islands Pidgin as it is not as yet a written language with an accepted format, grammar or spelling (Meafarlane, pers. comm). I observed one pesticide being sold with a label only in Japanese language.

In Tonga, I was told that most manufacturers will not produce labels in Tongan since it is uneconomical for them to do do. However a few do.

In Vanuatu most labels are in English despite the fact that many people do not understand it. They speak either French and/or Bislama.

In Western Samoa, the Poisons regulations specifies that every label must be in both English and Samoan. Yet only 3 of 65 different pesticides marketed in 1981 were in both languages. Manufacturers do not feel it is profitable to produce dual language lables. I observed one pesticide labelled only in Japanese language.

13.3 STORAGE

Refer to Questions 4.3 in Table 2.

Haines (1985 - Biblio No 77) estimated that less than 0.2% of all pesticides manufactured for agricultural purposes in industrialised countries is wasted before use. However in developing countries as much as 10% of agricultural pesticide may be wasted before application. principally due to poor storage and transport facilities. Haines summarises a survey conducted by TDRI which included Fiji. He lists commonly found undesirable criteria in the siting, design and construction of pesticide stores, in storage systems and storage management practices, and in safety and training.

As for sale, countries with legislation prohibit storage in other than original containers, unless special approval is given. Kiribati also prohibits storage in secondary containers. Some countries specify that storage must be separate from foodstuffs, and must be checked for leaks and breaks. Only three countries stated storage room conditions (cool, dry concrete floor; American Samoa, Kiribati, Western Samoa). In three countries I observed containers on shop shelves which were leaking or broken (Fiji, Tonga, PNG); some contained toxic pesticides eg paraquat. In PNG I have observed many badly rusted containers. I also observed large '44 gallon' drums containing toxic pesticides which had either been badly dented or even broken open after rough handling on wharves. One government department allowed a massive quantity of timber treatment chemical to stand in the open in rusty drums exposed to the weather for over 5 years (See section 7.2). In October 1986 a spillage of paraquat occurred in a storage shed in a highlands town in PNG. The paraquat leaked over cartons containing beer. Fearing that the beer would be confiscated the owner quickly sold the beer. In this instance as long

as the bottles were washed no problem hopefully would arise; but if the same occurred to foodstuff a major problem could arise. In New Caledonia I observed old partially rusted drums (containing parathion and malathion being used as door-stops. Storage facilities in both private and Government stores varied. The few I observed varied from excellent to very poor.

In New Caledonia I observed copper sulphate being sold in an unlabelled plastic bag, and dieldrin, chlordane and Camellia (arsenic based herbicide) being sold in whisky bottles.

No countries mentioned type and size of packaging. However, in PNG some pesticides can only be sold in specific types of containers of specific sizes. International shipping and air transport regulations also specify types of packaging/ vessels. The only mention of 'standards' was by the Standards Officer in PNG.

In PNG 1983 a large fire destroyed a bond store containing large amounts of agricultural chemicals. Specific precautions and fighting equipment are required in such instances.

13.4 TRANSPORTATION

Refer to Question 44 in Table 2.

In most countries special regulations on transportation do not exist, though all would have to conform to international airline and shipping regulations. American Samoa, Guam and TTPI controls are according to US transport regulations. Some countries mention that pesticides are forbidden to be transported with foods and this is general practice.

One instance was reported to me in PNG when food had to be destroyed after it was contaminated by leakage from paraquat carried in the same cargo on a large truck.

13.5 DISPOSAL OF PESTICIDES

Refer to Question 4.5 in Table 2

Only French Polynesia and Guam stated that disposal of pesticides is regulated by law. Golob and Egan (1983 - Biblio no 586) report that pesticides are shipped from Guam to an approved EPA disposal site in California. American Samoa often ships old, expired and unwanted pesticides back to the US mainland for burial at an EPA approved landfill. Fiji has re-exported unused pesticide back to Australia and Canada. Some countries require instructions for disposal on labels (see Table 52) . Tonga returned a large amount of DDT given to it as aid by NZ, since it is banned in Tonga . Most countries dispose of pesticides by burning, burying or disposing in diluted from. Western Samoa mentioned it was about to build a 'pesticide disposal site'.

After severe spills by pesticides into Yap Harbour the TTEPB removed much DDT from various Trust Territory atolls, in order to minimise the stockpilling of pesticides in the Trust Territory.

Some countries stated that since they use very little pesticide or because of rapid turnover, they have had no problems to date. (Kiribati, New Caledonia respectively.)

In PNG, in the past, an apparently 'not uncommon' solution to the disposal of unused DDT after mosquito spraying was to leave it behind in a village shed such that villages could use it as they wished. Villages are known to have used it to 'spray around latrines' and for putting in creeks 'to catch fish'.

In PNG the Health Department recently requested information on how to dispose of the large quantities of the CCA timber treatment chemicals left out in the rusty drums (referred to above). The solution here was simply 'to use it' at nearby treatment plants. Often the solution is not so simple.

Vanuatu had left-over stocks of unwanted pesticides from before Independence. Some of these were not able to be identified easily , eg 'oleoparaphene' (parathion). In PNG I have observed many "old stocks' that no one knows how to dispose of.

Reports of old pesticide containers being used, as eg as water containers, and such are common in PNG (See Appendix D). I observed old pesticide containers being used as markers (bags) in Tonga.

Vanuatu and Wallis et Futuna have requested information and advice on how to disposed of old stocks of pesticides. Articles which give advice on the disposal of pesticides are Munnecke (1979) and the articles listed in section I in chapter 14.

It is suggested that combined effort be made for all countries to list their old stock and organize a combined collection and shipping to an EPA disposal site in California.

13.6 PROTECTIVE CLOTHING

Refer to Question 4.6 in Table 2.

Legislation in Ameican Samoa, Guam, French Polynesia and TTPI require use of protective clothing when using specific pesticides. In Fiji, New Caledonia, PNG, Solomon, Tonga, Tuvalu, Vanuatu and Western Samoa protective clothing is used by some workers and is highly recommended. Officials in Kiribati, Pitcairn Island and Tokelau knew of no-one wearing protective clothing. Officials in all countries I visited as well as French Polynesia reported that people do not wear all the necessary clothing because of the heat. Sometimes protective clothing is not worn, because it is not availble, eg in American Samoa.

It is generally recommended that when using hazardous pesticides one should use gloves, footwear, clothing, hats, goggles and respiratory protection which should all meet national or international standards. No country reported that they use 'Standards'. I would presume that most equipment from Australia and New Zealand meet their standards, but this needs to be checked, especially due to the different climatic conditions.

It seems there is no adequate protective clothing presently available which is suitable for hot humid tropical conditions. In one instance reported in the Solomons, a researcher from the Centre for International Pesticide Research tested the latest light-weight protective clothing, but within 45 minutes his body temperature rose by 3:^{o}C. Protective clothing, if incorrectly worn, can in fact provide a greater hazard to the user; for example, if the inside of gloves become saturated with pesticide or if a respirator is inadequately cleaned or becomes contaminated. In these instances the users would be better off regularly washing their hands and by covering their mouth and nose with clean cloth. Generally hazardous pesticides should not be used if appropriate protective clothing can not be correctly worn.

13.7 HEALTH CHECKS

Refer to Question 4.7 in Table 2.

Residue analyses of blood of workers who use organochlorines and organophosphates have only been done in PNG. No one has been found to contain abnormally high residues. The results of this study have yet to be published (Baria et al - Biblio no 350).

Three countries reported that cholinesterase tests are regularly and routinely done on workers exposed occupationally to the more toxic organophosphates; in French Polynesia, New Caledonia and Solomon Islands. Only occassionally have persons been detected with low cholinesterase levels.

At UPNG, we have recently commenced a program where we do cholinesterase tests on persons occupationally exposed to organophosphates. To date most worker tested had normal cholinesterase levels; only four out of 168 agricultural, health and pest control workers had lower than normal levels (and none were dangerously low). Some pest control operators in PNG have regular medical check ups.
Tonga reported that persons occupationally exposed have regular check ups.

Western Samoa is establishing a 'Poisons Centre'.

I would recommend that SPC ensure that at least one major hospital in all South Pacific countries be provided with a WHO cholinesterase spectrophotometer kit (WHO, 1984 - Publ. no M25. Larger countries (Fiji and PNG) should have them in the main regional hospitals, in

areas where organophosphates and carbamates are widely used. This will enable regular cholinesterase tests to be done (pre- and post-pesticide use).

In all countries where paraquat is widely used 'treatment kits' (provided by ICI) must be readily available. ICI has infact distributed these kits extensively in some countries including Fiji, PNG and Western Samoa.

Poisons Centres should also be established in each country to provide ready access to information and recommended treatment.

13.8 SOME PROBLEMS FACED IN ENFORCING LEGISLATION.

Some of the problems South Pacific countries face in producing legislation, then enforcing it, are mirrored by 5 examples:

a. Tonga has legislation and appropriate regulations. However for several reasons it cannot implement its law. These include the following:

- The Technical Advisory Committee set up to register pesticides was not able to function.
- Registration procedures are very time consuming and require expertise. Tonga lacks the expertise. The few persons with that expertise have limited time and have other priorities.
- Chemical Companies stated that they would not be able to comply with labelling requirements that parts of the label be in Tongan. It would be uneconomical to do so for all but the main pesticidies, and they would have to withdraw their products.

b. In Papua New Guinea the main Act which upto now covered pesticides pesticides is The Poisons and Dangerous Substances Act, 1952 and the regulations and schedules thereunder. Despite a few ammendments (eg, re paraquat in 1980), this Act is both inadequate and outdated in its control on pesticides. In 1978 the Government enacted the Environmental Contaminants Act (ECA), 1978. Pesticide regulations under this Act were drafted in 1981 and circulated. The person responsible left at the end of his contract. It was never gazetted. A Pesticide Bill was initially drafted in 1976, but subsequently dropped in favour of the ECA. The ECA is the responsibility of 'Environment' department. The Pesticide Bill was the responsibility of the 'Agricultural' department. There has in the past been disagreement between departments on whom should be responsible. However, both the ECA 'pesticide regulations', as proposed in 1981, and the old Pesticide Bill were inadequate. The Pesticide Bill was too complicated. In 1985 and 1986 new pesticide regulations have been drawn up with the assistance of the Pesticide Registrar from New Zealand and his staff. These regulations will be administered under the ECA. In late 1985 a Chemicals Officer was appointed to co-ordinate registration of pesticides and to ensure the enforcement of the new regulations which will be gazetted in late 1986. Registration will commence immediately and enforcement will commence in late 1987.

The present 'Poisons Act' has not been properly enforced. Some pesticides are sold in a manner contravening the existing regulations. The existing 'Poisons Act' will be rewritten and updated probably in 1987-88, and maintain some control on the sale of pesticides.

It has taken nine years of effort to finally establish pesticide legislation in PNG.

c. Solomon Islands has legislation and regulations and a registration process. By December 1983 only agricultural chemicals used by large companies were registered. Household and 'small' packet pesticides were not registered. Most retailers were 'unaware' that the pesticides they were selling should have been registered by January 1st 1984, or they were not prepared to pay for cost of registration themselves. By 12 March 1985, 133 products were registered with 91 active ingredients. By 28 September 1986, 174 products were registered with 89 active ingredients. Of these 36 formulations were restricted and 13 had conditions on sale.

Authorities state that they find it difficult to cope with the administration of pesticide regulations, and in policing the regulations ; and the Solomons is a small country with only one major port of entry. They lack also the expertise to evaluate the information required for registration.

d. Fiji has legislation and regulations and a registration process. The Registrar of Pesticide believes that he is adequately staffed to implement pesticide registration and enforce the regulations. Other persons within Fiji believe that given more staff, the legislation could be better enforced. Two examples are given:

There is lack of staff to implement all aspects of the legislation; eg labelling requirements are not always enforced in that not all products sold in stores have labels in Hindustani and Fijian affixed to the containers.

In an article in 'The Fiji Times' on August 2, 1984, the Director of Agriculture was reported to have admitted that 1080 (sodium monofluoroacetate) had been used for 6 years to kill sewer rats. It was used by a Suva Pesticide company together with the Suva City Council personnel, despite the fact that it was not registered as a pesticide in Fiji.

A further problem faced in Fiji, is one which could well be encountered in other South Pacific countries in the future; that of political pressure. The Fiji government had, after first refusing to do so, granted a licence to a local company to import and market a Taiwanese paraquat formulation. This formulation did not have the required emetic agent. This probably come about after political pressure was exerted to allow registration.

e. Guam is a small country. It has an 'active' University agricultural extension service (CALS) and Guam EPA pesticide regulations. 561 persons were certified following pesticide training courses.

Pesticide laws are enforced, because (1) Guam is small, (2) assistance is provide by the University staff, and (3) staff are employed specifically to enforce the legislation. In most other countries, (most ofwhich are much layer than Guam), the staff responsible for pesticide regulations and registration do it only 'part-time'.

Co-ordinating pesticide registration and enforcing the legislation is a 'full time job'. The larger countries must allocate permanent staff full time responsible for this job alone!

13.9 SUMMARY

(1) South Pacific countries have limited expertise to evaluate information necessary for the implementation of pesticide registration requirements.

Countries in association with USA (TTPI and American Samoa) or territories of the USA (Guam), and countries which are territories of France, (French Polynesia, New Caledonia) may have that expertise, or may have ready access to it or may rely on authorities in the USA or France to provide that expertise. But most other countries do not, although they are often assisted by Australia or New Zealand. To evaluate compounds for registration South Pacific countries will have to rely upon overseas information. A technical advisory committee set up by SPC could assist. (See Part C.3). Most 'experts' within South Pacific countries are non-nationals on short-term contracts, and if they leave, there is often no one to take their place. If there is, that person often lacks the experience, and is often likely to change jobs quickly.

(2) South Pacific countries lack the funds, facilities, manpower and infrastructure/ machinery to enforce their legislation and registration requirements, Guam excepted.

This situation will remain unless governments change their priorities.

(3) Countries without laws and/or regulations need 'experts' to assist in writing enforceable legislation and/or regulations. Recently New Zealand has assisted PNG prepare regulations, and is presently assisting/about to assist Cook Islands and Vanuatu.

(4) The South Pacific countries should be considering harmonization of pesticide legislation and pesticide registration requirements for the region.

(5) Most countries will probably have to rely on expatriate contract workers to provide expertise for the next few years, but training of locals will need to be regarded as a top priority.

(6) Many users of pesticides are illiterate and little educated, who may not understand English. Many of these people can and do use what in many other countries are classed as 'restricted-use' pesticides which require the user to be certified before they can use it. Such compounds should not be registered when/where safe use can not be guaranteed.

(7) In countries where toxic pesticides are needed, more emphasis needs to be put on training and certification of applicators, though this would add an extra administrative load.

Education and training of users, particularly at village level should also be extended. Such programmes of users exist eg in American Samoa, Cook Islands, Guam and PNG. In some cases they are inadequate. They need to reach more people.

(8) Countries need to ensure that all labels can be produced in local languages and convince manufacturers and distributors that it is in their interests to do so, irrespective of cost.

(9) Much concerning the safe use of pesticides, what pesticides are used, what restrictions apply still depend upon the goodwill of distributors. At times some South Pacific countries have got supplied with low quality, ill-labelled products. some of which in their concentrated form are very toxic, and are not used safely. Companies operating in the region should be asked to adhere to the FAO 'Code of Conduct' (FAO, 1986 - Publ. no 02).

(10) Until all countries have their own legislation and can enforce it, government officials and chemical companies have a special responsibility. They must work together to ensure that every effort is made so pesticides are handled only in accordance with safe and recognised practice, as is expected in countries with strong and enforced legislation.

CHAPTER 14 INTERNATIONAL PUBLICATIONS ON PESTICIDE LEGISLATION AND REGISTRATION REQUIREMENTS

14.1 INTRODUCTION

Over the last few years many useful publications have been produced by international organisations. These organisations include:

UNITED NATIONS AGENCIES -

FOOD AND AGRICULTURE ORGANISATION (FAO)

WORLD HEALTH ORGANISATION (WHO)

UNITED NATIONS ENVIRONMENT PROGRAMME/ INTERNATIONAL REGISTER FOR POTENTIALLY TOXIC CHEMICALS (UNEP/IRPTC))

REGIONAL ORGANISATIONS -

COUNCIL OF EUROPE

INTERNATIONAL ORGANISATIONS -

GROUPEMENT INTERNATIONAL DES ASSOCIATIONS NATIONALES DE FABRICANTS DE PRODUITS AGROCHIMIQUES (GIFAP)

INTERNATIONAL ORGANISATION OF CONSUMER UNIONS (IOCU), PESTICIDE ACTION NETWORK.

GOVERNMENTS -

AUSTRALIA, DEPARTMENT OF PRIMARY INDUSTRY - PESTICIDE SECTION

PUBLISHERS -

THOMSON PUBLICATIONS, Fresno California, USA.

This list is not exclusive. However their publications feature prominently in the listing in 14.2.

Important series of publications regularly produced by UN agencies on 63esticides, but which are not included in 14.2 include:

(a) WORLD HEALTH ORGANISATION AND FOOD AND AGRICULTURE ORGANISATION
Data Sheets on Pesticides. VBC/DS Series.
Includes technical information on pesticides. giving common name. synonyms. selected properties,toxicology, recommendations on regulation. information on prevention of poisoning, medical information and analytical methods.
Available from WHO, Geneva or FAO, Rome

(b) FOOD AND AGRICULTURE ORGANISATION
Specifications for Plant Protection Products
Includes technical information providing description of chemical, naming active ingredient and impurities and giving FAO specification code
Available from FAO, Rome.

(c) IRPTC Bulletins
Published twice or thrice per year.
Available from IRPTC/UNEP, Geneva.

(d) IRPTC
Data Profile
Lists properties, including environmental information and toxicity data, analytical methods, treatment of poisoning and disposal methods.
Available from IRPTC/UNEP, Geneva.

(e) IPCS
Environmental Health Criteria.
Includes small/not so small books/monographs either on specific pesticides, or on toxicological methods.
Published jointly by UNEP, ILO and WHO
Available from WHO, Geneva.

14.2 LISTING OF PUBLICATIONS

The following is a list of publications produced by or for U.N. agencies or other national goverment agencies or other international organisations. These publications should assist governments in drawing up and implementing their own pesticide legislation and registration schemes, and help to ensure more safe and efficient use of pesticides. Some publications outline further some of the problems of pesticide use in developing countries.

A. REGISTRATION SCHEMES AND REGISTRATION REQUIREMENTS

1 COUNCIL OF EUROPE. 1981
Pesticides.
5th Edition

2 FOOD AND AGRICULTURE ORGANISATION 1982
Report of the Second Government Consultation on international harmonization of pesticide registration requirements.
Rome, FAO.

3 FOOD AND AGRICULTURE ORGANISATION 1983
Working papers and report of the Regional Consultation on Harmonization of Pesticide Registration Requirements for Regional Network for Promotion, Marketing and Control of Pesticides in Asia and Far East, organised by UNIDO in co-operation with FAO and Pesticide and Fertilizer Authority of Philippines
Manila, Philippines.

4. FOOD AND AGRICULTURE ORGANISATION 1985
Guidelines for the Registration and Control of Pesticides.
FAO Rome-March 1985. M/R5021/E/7.85/1/1000.

5. FROST, N.T. 1983
Draft FAO Guidelines and Model Scheme for the establishment of national organisations for the registration and control of pesticides.
FAO, Plant Protection Service .

6. GIFAP 1982
GIFAP Viewpoints on harmonization of pesticide registration requirements. Paper contributed to FAO Plant Protection Service by Groupement International des Associations Nationales de Fabricants de Produits Agrochimiques (GIFAP), Brussels, Belgium.

7. AUSTRALIA. DEPARTMENT OF PRIMARY INDUSTRY, PESTICIDES SECTION. TECHNICAL COMMITTEE ON AGRICULTURAL CHEMICALS. 1983
Requirements for clearance of agricultural chemicals. Canberra, Pesticides Section, Document PB 310.

8. WATTS, B.B. 1982
Procedures for Registration and Experimental Use Permits under the Pesticide Act. 1979 (New Zealand), Wellington.

9. WATTS, B.B. 1983
A phased registration scheme for pesticides.
Rome, FAO, Plant Protection Service.

10. WATTS, B.B. 1983
A summary of the main aspects of the Pesticide Registration Schemes in member countries of the Regional Network for Production, Marketing and Control of Pesticide in Asia and the Far East (RENPAF), prepared for the Regional Conference, Baguio, Philippines.

11. WATTS, B.B. 1983
A proposal for the Harmonization of Pesticide Registration Requirements for the Regional Network for Production, Marketing and Control of Pesticides in Asia and the Far East (RENPAF), Baguio, Philippines.

B. REQUIREMENTS ON PHYSICAL/CHEMICAL PROPERTIES

1. FOOD AND AGRICULTURE ORGANISATION 1979
The use of FAO specifications for plant protection products.
Rome, FAO. Plant Production and Protection Paper No 13.

2. FOOD AND AGRICULTURE ORGANISATION 1981
Role and use of pesticide specifications, excert from report of third session of the 'Group on Specifications' of the FAO Panel of Experts on Pesticide Specifications, Pesticide Registration Requirements and Application Standards, Rome 5 - 9 October, 1981.

C. REQUIREMENTS ON EFFICACY DATA

1. FOOD AND AGRICULTURE ORGANISATION [1982?]
Food and Agriculture Organisation guidelines on efficacy data for the registration of pesticides by 'Group on Registration Requirements' of the FAO Panel of Experts on Pesticide Specifications Registration Requirements and Application Standards based on an original draft by A. Besemer for FAO Plant Protection Service.

2. FOOD AND AGRICULTURE ORGANISATION 1985
Guidelines on Efficacy Data for the Registration of Pesticides for Plant Protection. FAO Rome-March 1985 M/R5024/E/7.85/1/1000.

D. REQUIREMENTS ON LABELLING

1. AUSTRALIA. DEPARTMENT OF PRIMARY INDUSTRY 1980
Code of Practice on labelling for agricultural and veterinary chemicals.
Canberra, Pesticide Section, Document No. PB 375.

2. EDSON, E. [1984?]
Guidelines on good labelling practice for pesticides, paper prepared for FOOD AND AGRICULTURE ORGANISATION Plant Protection Service.

3. FOOD AND AGRICULTURE ORGANISATION 1985
Guidelines on Good Labelling Practice for Pesticides.
Food and Agriculture Organisation Rome-March 1985
M/R6095/E/10.85/1/1000.

E. REQUIREMENTS FOR PACKAGING, STORING AND TRANSPORT

1. FOOD AND AGRICULTURE ORGANISATION 1982
Food and Agriculture Organisation guidelines for the packaging and storage of pesticides, paper prepared by 'Group on Registration Requirements' of FAO Panel of Experts on Pesticide Specifications, Registration Requirements and Application Standards

2. FOOD AND AGRICULTURAL ORGANISATION 1985
Guidelines for the packaging and storage of pesticides.
FAO Rome March M/R5022/E/ 7.85/1/1000.

3. GIFAP 1982
Guidelines for the safe handling of pesticides during their formulation, packing, storage and transport.
Brussels. Belgium, Groupement International des Associations de Fabricants de Produits Agrochimques.

4. REYNOLDS, R.P. (?)
Report and guidelines for the packaging and storage of pesticides, prepared for the Food and Agriculture Organisation, Plant Protection Division.

5. IMCO 1982
The evaluation of the hazards of harmful substances carried by ships, Reports and Studies No 17 IMCO/FAO/UNESCO/WMO/WHO/IAEA/UN/UNEP. Joint Group of Experts on the Scientific Aspects of Marine Pollution (GESAMP) Inter-governmental maritime consultative organisation.

F RESIDUE ASPECTS OF REGISTRATION REQUIREMENTS

1. AUSTRALIA. DEPARTMENT OF PRIMARY INDUSTRY 1982
Withholding periods, maximum residue limits and poisons schedules for agricultural and veterinary chemicals. Canberra, Pesticides Section, Document PB 431 (4th ed.)

2 AUSTRALIA. COMMONWEALTH DEPARTMENT OF HEALTH 1985
Standard for Maximum Residue Limits of Pesticides, Agricultural Chemicals, Feed Additives, Veterinary Medicines and Noxious Substances in Food Canberra, Australia Government Publishing Service.

3. BATES, J.A.R. and GORBACH S. 1982
Recommended approaches to the production and evaluation of data on pesticide residues in food. IUPAC Reports on Pesticides (16), Pure and Applied Chem.. 54 (7): 1361-1450

3. FOOD AND AGRICULTURE ORGANISATION 1982
Pesticide residues in food - 1981, report of the Joint Meeting of the Food and Agriculture Organisation Panel of Experts on Pesticide Residues in Food and the Environment, and the World Health Organisation Expert Group on Pesticide Residues.
Rome, Food and Agriculture Organisation, Plant Production and Protection Paper 37.

4. FOOD AND AGRICULTURE ORGANISATION 1983
Pesticides residues in food - 1982. Report sponsored jointly by FAO and WHO.
Rome, Food and Agriculture Organisation, Plant Production and Protection Paper 49.

5. FOOD AND AGRICULTURE ORGANISATION 1984
Pesticide residues in food - 1983. Report sponsored jointly by FAO and WHO.
Rome, Food and Agriculture Organisation Plant Production and Protection Paper 56.

6. FOOD AND AGRICULTURE ORGANISATION 1984
Pesticide residues in food - 1983. Report sponsored jointly by FAO and WHO.
Rome, Food and Agriculture Organisation Plant Production and Protection Paper 60.

7. FOOD AND AGRICULTURE ORGANISATION/WORLD HEALTH ORGANISATION 1983
Codex Alimentarius Volume XXIII.
Codex Maximum Limits for Pesticide Residues, CAC/Vol XXIII, First Edition, Rome.

RESIDUE ASPECTS OF REGISTRATION REQUIREMENTS - continuing

8. FOOD AND AGRICULTURE ORGANISATION/WORLD HEALTH ORGANISATION 1984
Guidelines levels for pesticide residues. FAO/WHO Standards Programme Codex Alimentarius Commission, Rome.

9 FOOD AND AGRICULTURE ORGANISATION/WORLD HEALTH ORGANISATION 1985
Recommended natural regulatory practices to facilitate acceptance and use of Codex maximum limits for pesticide residues foods ALINORM 85/24A-Add 2. Joint FAO/WHO Food Standards Program. CAC. Rome. 29p.

10. CODEX COMMITTEE ON PESTICIDE RESIDUES 1981
Guidelines on pesticide residue trials to provide data for the registration of pesticides and the establishment of maximum residue limits.
FAO Plant Protection Bulletin 29(1/2). P(1)/P2400/E/4.82/1/400; and reprinted as GIFAP Technical Monograph No 4. GIFAP, Brussels.

11 GIFAP 1983
Joint FAO/WHO Food standards programme Codex Alimentarius Commission. Guidelines in Good Analytical Practice in Residue Analysis, and Recommended for Methods of Analysis for Pesticide Residues. Technical Monograph No 8. GIFAP, Brussels.

G ENVIRONMENTAL ASPECTS OF PESTICIDES REGISTRATION REQUIREMENTS.

1. FOOD AND AGRICULTURE ORGANISATION 1981
Second expert consultation on environmental criteria for registration of pesticides.
Rome, Food and Agriculture Organisation Plant Production and Protection Paper 28.

2. GROUPMENT INTERNATIONAL DES ASSOCIATIONS NATIONALE DE FABRICANTS DE PRODUITS AGROCHIMIQUES (GIFAP) (ND)
Environmental criteria for registration of agrochemicals. Technical Monograph No 3. GIFAP, Brussels.

3. FOOD AND AGRICULTURE ORGANISATION 1985
Guidelines on Environmental Criteria for the Registration of Pesticides. FAO Rome-March 1985. M/R5020/E/7.85/1/1000.

H QUARANTINE

1 STOUT, O. O. and ROTH H. L. 1983
International plant quarantine treatment manual.
Rome, Food and Agriculture Organisation.

I REQUIREMENTS ON DISPOSAL OF PESTICIDES AND PESTICIDE CONTAINERS

1. AUSTRALIA ENVIRONMENT COUNCIL 1985
Discussion paper on disposal of stable organochlorine and related chemical wastes. Canberra.

2. COUNCIL OF EUROPE 1982
Guidance for the disposal of surplus pesticides and pesticide containers, from document:
"Pesticides" (5th ed.) Strasburg. Council of Europe.

3. MUNNECKS D.M. 1983.
Methods of disposal of surplus pesticides and pesticide containers in developing countries.
WHO/VBC/83-884, Geneva, WHO.

4. FOOD AND AGRICULTURE ORGANISATION 1985
Guidelines for The Disposal of Waste Pesticide and Pesticide Containers on the Farm. FAO, Rome-March 1985
M/R5023/E/7.85/1/1000.

J SAFETY ASPECTS OF PESTICIDE REGISTRATION REQUIREMENTS

1. AUSTRALIA. COMMONWEALTH SCIENTIFIC AND INDUSTRIAL RESEARCH ORGANISATION 1976
Code of practice for safe use of pesticides.
Melbourne. CSIRO.

2. WORLD HEALTH ORGANISATION 1982
Guidelines to the use of the WHO Recommended Classification of Pesticides by Hazard.
VBC/78. 1 Rev 3

3. WORLD HEALTH ORGANISATION 1983
WHO Activities on safe use of pesticides and their relationship to international harmonization of pesticide registration requirements, for FAO Plant Protection Service.

SAFETY ASPECTS OF PESTICIDE REGISTRATION REQUIREMENTS - continuing

4. WORLD HEALTH ORGANISATION 1986
The WHO Recommended Classification of Pesticides by Hazard, and Guidelines to Classification 1986-87. VBC/86.1, Geneva. WHO.

K PROBLEMS ASSOCIATED WITH LOCAL FORMULATION OF PESTICIDES AND PESTICIDE PRODUCTION

1. GIFAP 1983
The Manufacture and formulation of pesticide developing countries. Technical Monograph No 9. Groupment International des Associations Nationales de Fabricant de Agrochimiques (19 pages)

2. GIFAP 1985
Guidelines for quality control of pesticides during formulation and packing.
Brussels, Belgium, Groupement International des Associations Nationales de Fabricants de Produits Agrochimiques (GIFAP).

3. UNITED NATIONAL INDUSTRIAL DEVELOPMENT ORGANISATION 1983
Formulation of Pesticides in developing countries. UN. New York. 217p.

4 WORLD HEALTH ORGANISATION 1983
Interagency consultation on the impact on human health and the environment of small scale formulation of pesticides for local use.
WHO/VBC/83.882, Geneva, WHO.

L LEGAL ASPECTS OF PESTICIDE REGISTRATION REQUIREMENTS

1. GIFAP 1982
GIFAP views on international principles for safe-guarding proprietory rights on registration data of pesticide active ingredients. Paper contributed by Groupement International des Associations Nationales de Fabricants de Produits Agrochimiques (GIFAP) to Food and Agriculture Organisation, Plant Protection Service Brussels, Belgium.

LEGAL ASPECTS OF PESTICIDE REGISTRATION REQUIREMENTS - continuing

2. IRPTC 1983
IRPTC Legal file 1983. Vols I and II. International Register of potentially toxic chemicals.
IRPTC/UNEP, Geneva.
Includes administrative, bans and regulations.

M SAFE USE OF PESTICIDES AND TOXICOLOGICAL INFORMATION

1. AUSTRALIA. DEPARTMENT OF PRIMARY INDUSTRY 1978
Aerial agriculture. Chemical rating manual.
Canberra, A.G.P.S., 1978.

2. AUSTRALIA. DEPARTMENT OF PRIMARY INDUSTRY. PESTICIDES SECTION 1980
A manual of safe practice in the handling and use of pesticides.
Canberra, AGPS, Dept of Primary Industry, Pesticides Section Document PB 377

3. BLACK, A. L. 1985
Use of toxicological data for registration purposes.
RFPT/85.1
Paper presented to Regional Forum on Pesticide Toxicology of the Regional Network for the Production, Marketing and Control of Pesticides in Asia and the Pacific, Baguio City and Manila. the Philippines, 22-26 April, 1985.

4. BLACK, A. L. 1985
Influence of mode of action on registration.
RFPT/85.6
Paper presented to Regional Forum on Pesticide Toxicology of the Regional Network for the Production, Marketing and Control of Pesticides in Asia and the Pacific, Baguio City and Manila, the Philippines, 22-26 April, 1985.

5 BLACK, A. L. 1985
Transferability of toxicological information.
Paper presented to Regional Forum on Pesticide Toxicology of the Regional Network for the Production, Marketing and Control of Pesticides in Asia and the Pacific, Baguio City and Manila, the Philippines, 22-26 April, 1985.

6. COPPLESTONE, D. F. 1985
Classification of pesticides by hazard.
Paper presented to Regional Forum on Pesticide Toxicology of the Regional Network for the Production, Marketing and Control of Pesticides in Asia and the Pacific, Baguio City and Manila, the Philippines, 22-26 April 1985.

7 COPPLESTONE, D. F. and PELFRENE, A. F. 1985
Influences of toxicology tests on education and safe use of pesticides.
Paper presented to Regional Forum on Pesticide Toxicology of the Regional Network for the Production, Marketing and Control of Pesticides in Asia and the Pacific, Baguio City and Manila, the Philippines, 22-26 April, 1985

8. GIFAP 1983
Guidelines for the safe and effective use of pesticides.
Brussels, Belgium. Groupement International des Associations Nationales de Fabricants de Produits Agrochimiques (GIFAP).

9. GIFAP 1984
Guidelines for emergency measures in cases of pesticide poisoning.
Brussels, Belgium Groupement International des Associations Nationales de Fabricants de Produits Agrochimiques (GIFAP).

10. LOTTI, M. 1985
Toxicological assessment of pesticides : an outline for long term toxicological and carcinogenicity studies.
RFPT/85.3
Paper presented to Regional Forum on Pesticides Toxicology of the Regional Network for the Production, Marketing and Control of Pesticides for Asia and the Pacific, Baguio City and Manila, the Philippines, 22-26 April, 1985.

11 LOTTI, M. 1985
Toxicological assessment of pesticides : an outline for teratogenicity, reproduction and mutagenicity studies.
RFPT/85.4
Paper presented to Regional Forum on Pesticides Toxicology of the Regional Network for the Production, Marketing and Control of Pesticides in Asia and the Pacific, Baguio City and Manila, the Philippines, 22-26 April, 1985.

SAFE USE OF PESTICIDES AND TOXICOLOGICAL INFORMATION - continuing

12. LOTTI, M. 1985
Toxicological assessment of pesticides : an outline for studies on human exposures. RFPT/85.8
Paper presented to Regional Forum on Pesticides Toxicology of the Regional Network for the Production, Marketing and Control of Pesticides in Asia and the Pacific, Baguio City and Manila, the Philippines, 22-26 April, 1985.

13. MORGAN D.P. 1984
Recognition and Management of Pesticide Poisonings Reference EPA 540/9-80-005 US Environmental Protection Agency Washington.

14. PLEISTINA, R. 1985
Acute and short term toxicity testing. RFPT/85.2
Paper presented to Regional Forum on Pesticides Toxicology of the Regional Network for the Production, Marketing and Control of Pesticides in Asia and the Pacific, Baguio City and Manila, the Philippines, 22-26 April, 1985.

15. PLEISTINA, R. 1985
Influence of toxicology tests on distribution and use of pesticides. RFPT/85.7
Paper presented to Regional Forum on Pesticides Toxicology of teh Regional Network for the Production, Marketing and Control of Pesticides in Asia and the Pacific, Baguio City and Manila, the Philippines, 22-26 April, 1985.

16. PLEISTINA, R. 1984
Influence of toxicology tests on labelling. RFPT/85.9
Paper presented to Regional Forum on Pesticides Toxicology of the Regional Network for the Production, Marketing and Control of Pesticides in Asia and the Pacific, Baguio City and Manila, the Philippines, 22-26 April, 1985.

17. PLEISTINA, R. 1984
Prevention, diagnosis and treatment of insectide poisoning. WHO/VBC/84.889
Geneva, WHO.

18. SELF, L.S. 1981
Guidelines on the safe use of insecticides for vector control personel.
Manila, WHO Regional Office for the Western Pacific.

SAFE USE OF PESTICIDES AND TOXICOLOGICAL INFORMATION - continuing

19. UNITED STATES DEPARTMENT OF HEALTH AND HUMAN SERVICES 1982
A guide to the development of a pesticide health hazard management program. Rockville, Maryland 88p.

20. WORLD BANK 1984
Short course on Prevention of Pesticide Poisoning in Developing Countries (51 slides plus background information).

21. WORLD HEALTH ORGANISATION 1978
Principles and methods for evaluating the toxicity of chemicals. Part I.
Geneva, WHO. Environmental Health Criteria 6.

22. WORLD HEALTH ORGANISATION 1978
Multilevel course on the safe use of pesticides and on the diagnosis and treatment of pesticide poisoning.
Course manual. WHO/VBC/78.7
Geneva, WHO.

23. WORLD HEALTH ORGANISATION 1980
National multilevel courses on the safe use of pesticides. Establishment manual.
Geneva, WHO.

24. WORLD HEALTH ORGANIZATION 1982
Field Survey of Exposure to Pesticides. Standard Protocol VBC/82.1 Geneva.

25. WORLD HEALTH ORGANISATION. PESTICIDE DEVELOPMENT AND SAFE USE UNIT 1984
Spectrophotometric kit for measuring cholinesterase activity. WHO/VBC/84.888
Geneva, WHO.

N INFORMATION SOURCES

1. HOFSTEN, B. V. and EKSTROM, G. 1985
Control of pesticide applications and residues in food: a guide and directory - 1986.
Uppsala, Swedish Science Press.

2. UNITED NATIONS INDUSTRIAL DEVELOPMENT ORGANISATION 1982
Information sources on the pesticides industry.
UNIDO Guides to information : no. 10 (Revised edition)
New York, UNIDO.

O CODE OF CONDUCT

1. FOOD AND AGRICULTURE ORGANIZATION 1984
International code of conduct on the distribution and use of pesticides. Draft. Rome FAO.

2. FOOD AND AGRICULTURE ORGANISATION 1986
International code of conduct on the distribution and use of pesticides. M/R8130/E/8.86/1/5000, Rome, FAO.

3. GIFAP 1985
GIFAP Position Papers on Freedom of Information, Hazardous Substance Export and Product Stewardship Brussels, Belgium.

P BANNED OR RESTRICTED PESTICIDES

1. IRPTC/UNEP 1983 (updated 1985)
International register of potentially toxic chemicals. Part A.
Geneva. UNEP.

2. UNITED NATIONS. SECRETARIAT 1984
Consoldiated list of products whose consumption and/or sale have been banned, withdrawn, severely restricted or not approved by Government. First issue revised. DIESA/WP/1. (Available in English, French and Spanish)
New York. UN Secretariat
(An updated and revised 1986 edition is now available)

3. UNITED STATES ENVIRONMENTAL PROTECTION AGENCY 1985
Suspended, cancelled and restricted pesticides. 3rd rev. USEPA, Washington DC.

4. INTERNATIONAL ORGANISATION OF CONSUMER UNIONS (IOCU) 1984
The Pesticide Handbook. Profiles for Action. 1st edition. Penang, Malaysia, IOCU.

5. INTERNATIONAL ORGANIZATION OF CONSUMER UNIONS (IOCU) 1986
The Pesticide Handbook. Profiles for Action. 2nd edition. Penang, Malaysia, IOCU.

Q TECHNICAL TERMS

1. AUSTRALIA. DEPARTMENT OF PRIMARY INDUSTRY
PESTICIDE SECTION 1983
Glossary of terms applicable to agricultural and veterinary chemicals. Pesticides Section, Document : PB 458. Canberra, the Department.

2. EESA, N. and CUTKOMP, L. K. 1984
A Glossary of pesticide toxicology and related terms. Fresno, Calif., Thomson Publications.

R SYNONYMS AND CHEMICAL NAMES

1. AUSTRALIA. COMMONWEALTH DEPARTMENT OF HEALTH 1985
Pesticides: synonyms and chemical names. Seventh edition Canberra Australian Government Publishing Service.

2. GROUPMENT INTERNATIONAL DES ASSOCIATIONS NATIONALS DE FABRICANTS DE PRODUITS AGROCHIMIQUES (GIFAP) 1984.
Catalogue of Pesticide Formulation Types and International Coding systems. Technicial Monograph No 2 (revised), Brussels, Belgium

3. INTERNATIONAL ORGANISATION FOR STANDARDIZATION (ISO) 1981
Pesticides and other agrochemicals - common names.
(First edition: 1981-12-15) ISO 1750-1981(E/F)
(Addendum 1: 1983-08-15) ISO 1750-1981/Add.1-1983(E/F)
(Addendum 2: 1983-12-15) ISO 1750-1981/Add.2-1983(E/F)
(Amendment 1: 1982-12-15) 1750-81/A1-1982 E/F.

4. OUDEJANS, J. H. and STARING, W. D. E. 1984
ARSAP Agro-pesticides index: a directory of common and trade names of agro-pesticiqes compiled for the Asia and Pacific.
Bangkok Agricultural Requisites Scheme for Asis and the Pacific.

5. SOCIETY OF AGRICULTURAL CHEMICAL INDUSTRY 1981
Pesticides: synonyms and chemical names. First edition.
Tokyo, Society of Agricultural Chemical Industry.

6. MCDONALD D.P. 1981.
International Pesticide Directory. Supplement to the September/October 1981 issue of International Pest Control (includes proprietors, trade names and active ingredients of herbicides.

7. WEED RESEARCH 1984.
Glassary of Common Names and Abbreviations of Herbicides Weed Research 24:449-452.

S. PESTICIDE MANUALS

The following is a list of publications most useful when determining detailed technical information on pesticide use and recommendations. See also PESTKEM and PESTLIST microfiche listed on p--- (3.2):

1. ASSOCIATION DE CO-ORDINATION TECHNIQUE AGRICOLE (ACTA) 1983
Index Phytosanitaire Produits insecticides, fongicides, herbicides. France, Afrique mediterraneene et tropicale.
Paris, ACTA.

2. CPCR 1986
Crop Protection Chemicals Reference, 2nd edition
John Wiley and Sons, Singapore.

3. MEISTER PUBLISHING COMPANY 1985
Farm Chemicals Handbook.
Willoughby, Meister Publishing Company.

4. McDONALD PUBLICATIONS 1985
International Pesticide Directory. Fifth Edition
London.

5. PAGE, B. G. and THOMSON, W. T. 1985.
Insecticides, herbicides, fungicides. Quick Guide.
Fresno, Calif., Thomson Publications.

6. THOMSON, W. T. 1983.
Agricultural chemicals. Book II Herbicides 1983-84 Revision.
Fresno, Calif., Thomson Publications.

7. THOMSON, W. T. 1983
Agricultural chemicals. Book III Fumigants, growth regulators, repellants and rodenticides.
Fresno, Calif., Thomson Publications.

8 THOMSON, W. T. 1984
Agricultural chemicals. Book IV Fungicides.
Fresno, Calif.. Thomson Publications.

9. THOMSON, W. T. 1985.
Agricultural chemicals. Book I Insecticides 1985-86 revision.
Fresno. Calif., Thomson Publications.

PESTICIDE MANUALS - continuing

10. UNITED STATES. DEPARTMENT OF AGRICULTURE 1982
Guideline for the control of insect and mite pests of foods, fibres, feeds. ornaments, livestocks and households.
Washington, D.C., US Government Printing Office
USDA Agricultural Research Service, Agricultural Handbook No. 584.

11. WORTHING, C. B. and WALKER, S. B. (eds) 1983
The pesticide manual. A world compendium. Seventh edition.
London, The British Crop Protection Council.

12. WORLD HEALTH ORGANIZATION 1984
Chemical methods for the control of arthropod vectors and pests of public health importance.
Geneva, WHO.

T. PESTICIDE TEXTS

The following two testbooks by George Ware give on excellent overview of pesticide theory, and are worth reading and studying by new comers to pesticides.

1. WARE, G. W. 1983
Pesticides. Theory and Application.
San Francisco, W H. Freeman and Company.

2. WARE, G. W. 1982.
Fundamentals of Pesticides. A Self-instruction guide.
Fresno, Calif., Thomson Publications.

U. PESTICIDES IN DEVELOPING COUNTRIES

The following is a list of some publications that stress the problems associated with the increasing use of pesticides in third world countries.

1. ARENA PRESS 1985
Bhopal: Industrial Genocide. An unique compilation of documents from Indian publications. Asean Regional Exchange for New Alternatives (ARENA). ARENA Press, Hongkong.

PESTICIDES IN DEVELOPING COUNTRIES - continuing

2. ABRAHAM, M. 1985
The lessons of Bhopal. A community action resources manual on hazardous technologies.
International Organization of Consumer Unions, IOCU, Penang, Malaysia.

3. BULL, D. 1982
A growing problem. Pesticides and the third world poor.
Oxford, UK, Oxfam.

4. FARMERS ASSISTANCE BOARD 1982
Profits from poison : a look into the socio-economics and politics of pesticides.
Manila, Philippines, The Board.

5. GERMAN AGENCY FOR TECHNICAL CO-OPERATION (GTZ) 1975.
Pesticide Resodie Problem to the Third World.
GTZ, Germany.

6. HEALTH AND WORKERS GROUP. 1985
Will my work make me sick? A preliminary report on the effects of pesticides and other agro-chemicals on banana and pineapple plantation workers in the Philippines, Council for Primary Health Care, Manila, 1985. 96p.

7. INTERNATIONAL ORGANISATION OF CONSUMER UNIONS (IOCU) 1984
The Pesticide portfolio.
Penang, Malaysia, IOCU.

8. MALARET, L. 1985
Safe Pest Control. An NGO action guide.
Nairobi, Environment Liaison Centre.

9. NORRIS, R. (ed) 1982
Pills, pesticides and profits. The International Trade in Toxic Substances.
New York, North River Press. Inc.

10. SAHABAT ALAM MALAYSIA 1984
Pesticide Dilemma in the third world. Case study of Malaysia.
Penang, Malaysia, Sahabat Alam Malaysia

11. SIM. F. G. 1985
Pesticide Poisoning Report. A survey of some Asian countries.
PENANG, MALAYSIA, IOCU.

12. WEIR, D. and SHAPIRO, M. 1981
Circle of Poison Pesticides and People in a Hungry World.
San Francisco, Institute for Food and Development Policy.

13. WEIR. D. 1986
The Bhopal Syndrome. Pesticide manufacturing and the third world.
Penang, Malaysia, IOCU.

14. WHEELWRIGHT E.L. 1984
Consumers, trans national corporations and the developing world in the 80's II The Pesticide Industry. Australian Consumers Association, Marrickville, 14p.

15. WORLD BANK 1985
Guidelines for the selection and use of pesticides in bank financed projects and their procurement when financed by the bank.
Washington, DC, 1785.9p.

CHAPTER 15 SUMMARY AND RECOMMENDATIONS

Many pesticides are used in the South Pacific. Most countries lack the manpower and technical expertise and infrastructure to advise on the efficient use of pesticides and to enforce effective regulations to control use and abuse of pesticides. Records kept on what pesticides are used are incomplete. Some pesticides used are those banned or restricted elsewhere, or classified by WHO as extremely or highly hazardous. Poisonings of humans, domestic animals and wildlife have been reported. and many further reports are unconfirmed. There may be cases not reported. Residue studies are all 'too small scale'. Very little is known anywhere on the fate of pesticides in small island ecosystems.

What is needed is a regional approach to create:

1. **Regional Information Centre** able to:

   a) Collate and compile data on pesticides used in the region, and to create a 'register' for the South Pacific.

   b) Provide a library service and maintain a bibliography of articles on pesticide use and associated problems in the region.

   c) Provide individual countries and territories with technical information as required.

   d) Conduct/assist with training and educational program on the safe and efficient use of pesticides within the region.

2 **Regional Pesticide Advisory Committee** to:

   a) Provide a 'collective expertise' using persons from within the region.

   b) Recommend to regional countries and territories what pesticides should be registered or used, for which crops etc...This would constitute a **Regional Pesticide Advisory Scheme**

   c) Establish guidelines for harmonisation of pesticide registration requirements, and for suggesting other forms of controlling pesticide use in the region, possibly including standardisation of labelling.

3. **Regional Pesticide Residue Laboratory Network** to:

Do small scale monitoring of pesticide residues. Studies would involve water supplies, agricultural products, environmental samples (including 'Mussel Watch'), human tissues, checking formulations. Ensure better co-ordination between existing laboratories.

These proposals are oulined in greater detail in **Part C** .

The problem is that the region lacks the manpower and funds to effectively establish any of the three above. Most countries are poor countries with 'more pressing development priorities'. Most countries will depend foramany years to come on exptriates to provide the necessary technical expertise. Very few suitably qualified nationals are available for training in these technical areas.

Both the South Pacific Commission Plant Protection Office and SPREP support the establishment of all three. UNIDO, UNEP, FAO, WHO and ILO all agreed at an interagency meeting held 21-22 November, 1984 on the South Pacific Regional Environment Programme that the 'Pesticide Project' and the recommendations are very important, and worth supporting. These UN and other international agencies have been approached for financial support and technical assistance. Except for limited support from UNEP's Regional Seas Programme and the IOC (Intergovernment Oceanographic Commission), no support has yet been forthcoming. We are continuing to seek support for our proposals.

REFERENCES - LITERATURE CITED

This is a reference list of items directly cited in the text of this report, but not included either in Chapter 14.2 on international publications, nor in Bibliography of South Pacific (Part B of this report).

1. BALAT, N. (1982)
Effects of copper on fish and shrimps.
Honours Thesis, University of Papua New Guinea 1981

2. BOWEN, R. and TEMPLETON, R. 1984
Pesticides and non-target fauna.
Report in three volumes prepared for the Co-ordinating Committee on Agricultural Chemicals, New South Wales Department of Agriculture, Sydney.

3. CAUFIELD, C. 1984.
Pesticides : exporting death.
New Scientist, 16 August : 15-17.

4. DREISBACH, R.H. 1983.
Handbook of Poisoning (11th edition)
Lange Medical Publications, Los Altos, California.

5. DACRE, J.C. and SCOTT, D. 1975
Possible DDT mortality in young rainbow trout.
N.Z. J. Mar. Freshwater Res., 5 (1) : 58 65

6. ELLIS, M.L. and PIERCE, D.A. 1976
Principles of pesticide use, handling and application. Instructional modules for Vocational Agricultural Education. Teacher Manual.
Developed for Office of Pesticide Programs, EPA under contract No. 68-01-1936
Washington, D.C., US Government Printing Office.

7. FAIRCHILD, E.J. 1980
Agricultural chemicals and pesticides: A handbook of toxic effects.
For US Dept of H.E.W. , Castle House Publications.

8. GIPS, T. 1986
Alternatives to 12 Hazardous Pesticides.
Preliminary Report. International Alliance for Sustainable Agriculture, Minneapolis.

LITERATURE CITED - continuing

9. HAINES, I.H. 1986
The Re-use of Pesticide Containers in Developing Countries. WHO/VBC/86.933 WHO, Geneva.

10. HOPKINS, C.L., SOLLY, S.R.B. and RITCHE, A.R. 1969
DDT in trout and its possible effect on reproductive potential
N.Z. J. Mar. Freshwater Res., 3 : 220 - 229

11. INTERNATIONAL ORGANIZATION OF CONSUMER UNIONS/ PESTICIDE ACTION NETWORK 1985
Dirty Dozen Information Kit.
IOCU, Penang, Malaysia.

12. INTERNATIONAL REGISTER OF POTENTIALLY TOXIC CHEMICALS 1984
Provisional Notification Scheme for Banned and Severely Restricted Chemicals. IRPTC Bulletin 7(1) 7.

13. INTERNATIONAL REGISTER OF POTENTIALLY TOXIC CHEMICALS 1985
Bans and severe restrictions - the role of IRPTC (Editorial) IRPTC Bulletin 7(3) 1-2.

14. IPC INTERNATIONAL PROGRAM ON CHEMICAL SAFETY
Environmental Health Criteria
(no publication details)

15. LAM, M. 1984
Toxicity analysis for the heavy metals: copper, zinc and iron. Part of requirement of course 55.241 'Resource and Environmental Management', UPNG, Mimeo.

16. LEVINE, D. 1986
Assessment of mortality and moridity due to unintentional pesticide poisonings.
WHO/VBC/86.929

17. MORGAN, D.P. 1977
Recognition and Management of pesticide poisonings. (2nd Ed)
Washington. D.C., USEPA. Office of Pesticide Programs.

18. MOWBRAY, D.L. 1978
The ecological effects of pesticides on non-target organisms.
Ph.D Thesis, University of Sydney.

19. MOWBRAY, D. L. 1986
Pollution problems in Papua New Guinea: Ok Tedi The Siren 31: 11 - 14.

20. MOWBRAY, D. L. 1986
Biological impact of Ok Tedi mine tailings, cyanide and heavy metals on the Ok Tedi / Fly River ecosystems in Papua New Guinea.

21 MUNNECKE, D. 1979
Chemical, physical and biological methods for the disposal and detoxification of pesticides.
Res. Rev. : 70 : 1-26

22. NEW ZEALAND. DEPARTMENT OF HEALTH 1981
Poisoning notifications 1980.
Wellington, N.Z., Dept of Health.

23. OLSEN, P. and OLSEN, S. 1979
Eggshell thining in the Australian peregrin, Falco peregrinus.
Australian Wildlife Research : 6

24. PEPPERELL, J. 1975
Effects of DDT on birds and fish.
Ph. D Thesis, University of Sydney

25. PESTICIDE ACTION NETWORK 1983
Forty-four problem pesticides. A consumer action and resource kit on pesticides.
IOCU Pesticide Digest Pesticide Action Network Newsletter No 3.

26. REGIONAL NETWORK FOR THE PRODUCTION, MARKETING AND CONTROL OF PESTICIDES IN ASIA AND THE FAR EAST 1985
Supply of Pesticides in Nine Countries, based on RENPAF Pesticide Data Collection Project, July, 1985 Manila.

27. SCHATZOW, S. 1985
Domestic and international pesticide policies in the United States. UNEP Industry and Environment July/August/September, p18-20.

LITERATURE CITED - continuing

28. SOUTH PACIFIC REGIONAL ENVIRONMENT PROGRAMME 1985
Pesticides. Environmental Education Notes Fact Sheet No. 1: Noumea, New Caledonia.

29. SPURRIER, E.C. 1985
Pesticide safety programmes geared to needs of developing countries.
UNEP Industry and Environment, July/August/September, 1985 : 13 - 14.

30. UNIDO 1983
Report prepared for Regional Network for the Production Marketing and Control of Pesticides in Asia and the Far East, Experts' Meeting on the Pesticide Data Collection System, Chiangmai, Thailand, 8-11 March 1983. Organised by UNIDO in co-operation with ARSAP/Agro-Pesticide of ESCAP.
Report DP/RAS/82/006.

31. WORLD HEALTH ORGANIZATION , PESTICIDE AND SAFE USE UNIT, 1986
Workshop on the re-use of pesticide containers in developing countries . held at Tropical Research and Development Institute WHO/VBC/86.933 WHO, Geneva.

PART B

BIBLIOGRAPHY

compiled by
David L. and B. Mowbray

1. INTRODUCTION

This bibliography covers pesticides in the following areas, for countries in the South Pacific Commission only:

1. Agricultural and economic applications of pesticides, including:

   A: Insect control/general pest control

   B: Plant disease (fungi) control

   C: Weed control

   D: Other animal pest control (rats, etc)

   E: Quarantine

2. Environmental aspects of pesticide use (i,e. : effects on non-target organisms, plus residues, excluding effects on humans);

3. Legal aspects of pesticide use;

4. Public health which covers effects of pesticides on human health (including poisonings and residues) and the use of pesticides for vector control;

5. Recommendations/advice on handling and usage of pesticides [safety booklets etc.].

Information was obtained from the following sources:

1. Four library database searches were done by the National Library of Australia. Two were entitled "Pesticides in the South Pacific". The other two were entitled Pesticide legislation in the South Pacific". The first search on each topic was done in November 1983 and the second in June 1985. Other library searches were done at the libraries of USP and UPNG. A full computer listing of all holdings on pesticides was prepared by the Library of SPC for both Noumea and Fiji libraries.

2. Responses to questionaires forwarded in July, 1983, responses to the draft report circulated in February and March, 1984 and responses to questionnaire on quarantine forwarded in December, 1985.

3. By personal communication from individuals in PNG and from those countries visited.

4. Searches were made in indices for appropriate journals published in the region.

Many countries produce small booklets, brochures, pamphlets, roneoed notes, technical bulletins and advisory leaflets on recommended pesticides and safe use of pesticides. Unfortunately, many of these publications are unavailable outside the country of origin. Small numbers of such publications, however, are held in the following libraries: USP, UOG, UPNG and SPC and in the Plant Protection Office of SPC in Fiji. Some of these publications are listed in the bibliography.

A number of countries have produced substantive publications with recommendations for pest control, as has the South Pacific Commission. These are included in the national listings below, and may have brief annotations.

A short annotated list of Australian and New Zealand publications on recommended pesticides and use of pesticides is included at the end of the bibliography.

Three recently published bibliographies on plant protection and environmental issues in the Pacific, contain many of the articles found in the literature searches. Neither the bibliographies nor the articles listed in them will be included here. The bibliographies are:

FIRMAN, I. D.: 1982.
Bibliography of plant protection in the area
of the South Pacific Commission 1970 - 1979.
Suva, Fiji. Pacific Information Centre and Ireta.
P.I.C. Selected bibliography (2).

UNIVERSITY OF SOUTH PACIFIC LIBRARY: 1983.
Environmental issues in the South Pacific:
a preliminary bibliography.
Suva, P.I.C., USPL, 1983.

FIRMAN, I.D.: 1978.
Bibliography of plant pathology and mycology
in the area of the South Pacific Commission
1820-1976.
Noumea, New Caledonia. SPC, Technical Paper (176).

Publications dated before 1980, with a few exceptions, are not included in the bibliography.

Literature searches need to be done for the region on entomology and other animal pests (in both agriculture and public health). These are beyond the brief of this report. The University of Guam, Department of Agriculture is currently preparing a bibliography of agriculture for Micronesia.

Many references published by government departments in the region, in annual reports, as cyclostyled notes or advisory leaflets are not

included in this bibliography. Other documents not included are reports of meetings and conferences. As Firman (1982) states "there remains a need for the ... content of these to be systematically extracted". Though such "unconventional" publications should be included in any complete bibliography, they are unfortunately very difficult to obtain.

This bibliography is neither complete nor definitive. Some items need to be checked. Bibliographic listings need to be standardised.

The bibliography is arranged internally as follows:

(a) alphabetically by country;

(b) within countries, materials are listed in categories 1 to 5 as given above;

(c) within categories materials are listed alphabetically by author and title;

(d) each item is given an entry number, numbering runs serially straight through all sections and categories.

BIBLIOGRAPHY

2. AMERICAN SAMOA

1. AGRICULTURAL AND ECONOMIC APPLICATIONS OF PESTICIDES

A. INSECT CONTROL AND GENERAL PEST CONTROL

1. LAI, Poyung and NAKAHARA, Larry M. 1980.
Evaluation of the giant African snail control program in American Samoa.
Honolulu, Hawaii, Department of Agriculture: 12pp.

E. QUARANTINE

2. AMERICAN SAMOA. DEPARTMENT OF AGRICULTURE. 1975
General quarantine regulations of American Samoa.
Preliminary draft. (Ian Swan) Pago Pago, The Department.
1 vol.

3. AMERICAN SAMOA. DEPARTMENT OF AGRICULTURE 1975.
Plant quarantine in American Samoa: a general guide.
(Ian Swan) Pago Pago, The Department, 15pp.

3. COMMONWEALTH OF THE NORTHERN MARIAN ISALNDS (CNMI)

1. AGRICULTURAL AND ECONOMIC APPLICATIONS OF PESTICIDES

A. INSECT CONTROL AND GENERAL PEST CONTROL

4. HALE, L. Darrel 1973
Insect control guide for vegetable crops in the Mariana Islands. Revised edition.
Saipan, Marianas Department of Agriculture. Marianas Agriculture Circular (1): 14pp.

B. PLANT DISEASE (FUNGI) CONTROL

5. TRUJILLO, E.E. 1971
Plant disease agricultural extension advisory leaflets, nos 1 - 35.
Saipan, TTPI. Deparment of Resources and Development, Division of Agriculture.

COMMONWEALTH OF THE NORTHERN MARIANS ISLANDS (CNMI) - continuing

5. RECOMMENDATIONS/ADVICE ON HANDLING AND USAGE OF PESTICIDESS

6. TRUJILLO, E.E. 1971
Advisory leaflets, nos 1 - 35.
Saipan, Division of Agriculture.

4. COOK ISLANDS

1. AGRICULTURAL AND ECONOMIC APPLICATIONS OF PESTICIDES

A. INSECT CONTROL AND GENERAL PEST CONTROL

7. DUVAL, Jacques 1978
Localisation and control programme for Culicoides belkini breeding sites on Aitutaki (Cook Islands).
Noumea, SPC. iii, 25pp.

8. FULLERTON, R.A. 1979
Report of a visit to Rarotonga to participate in the SPC pesticide application course and for discussions with the MFA Totokoitu Evaluation Team: 19 April-10 MAY, 1979.
Noumea, SPC. 22pp.

9. FULLERTON, R.A. 1979.
Use of the synthetic pyrethroids fenvalerate and cypermethrin to control diamondback moth (Plutella xylostella) (L.) and the large cabbage moth (Crocoidolomia binotallis (Zeller) in Rarotonga, Cook Il. Fiji Agricultural Journal, 41(1): 49-51.

10. FULLERTON, R.A. 1984
Totokoitu Research Station, Rarotonga, Cook Islands.
Paper presented to Fourth Regional Technical Meeting on Plant Protection, 13-17 February, 1984, Noumea.
[Noumea, SPC]

11. LEITMANN, J. 1983
Pesticides and alternatives. A handbook for the Cook Islands.
Ministry of Agriculture and Fisheries. Rural Technology Centre.

12. MANARANGI, A. and LEITMANN, J. 1982
Alternatives: Pest ontrol. A handbook for the Cook Islands.
Ministry of Agriculture and Fisheries.

1. AGRICULTURAL AND ECONOMIC APPLICATIONS OF PESTICIDES

A. INSECT CONTROL AND GENERAL PEST CONTROL

13. MANARANGI, A. 1979.
Crop protection.
Ministry of Agriculture and Fisheries. Information Division, Bulletin (2),

14. SAMUEL, N.P. 1984
Plant Protection in the Cook Islands. Paper presented to the Fourth Regional Technical Meeting a Plant Protection, 13-17 February, 1984.
Noumea, SPC. SPC/Plant Protection 4/WP.12.

15. RAAD, H.J. 1981
Ecomonics of citrus cultivation on Rarotanga.
Agriculture and Fisheries Management Notes (6).

16. WALKER, Annette K. and DEITZ, Lewis L. 1979
Review of entomophasous insects in the Cook Islands.
New Zealand Entomologist, 7(1):70-80.

E. QUARANTINE

17. COOK ISLANDS. HIGH COURT. 1976
Plant introduction and quarantine regulations, 1976.
Rarotonga, Cook Islands, High Court. Document.

18. COOK ISLANDS. CUSTOMS. n.d
Passenger's baggage declaration.
(S.l.: s.n., n.d.)

19. STOUT, Oliver O. 1978
Analysis of the Plant Act, 1973, of the Cook Islands.
Suva, Fiji, FAO, Survey of Agricultural Pests and Diseases in the South Pacific.

COOK ISLANDS - continuing

5. RECOMMENDATIONS/ADVICE ON HANDLING AND USAGE OF PESTICIDES [Safety booklets etc.]

20. BOTTRELL, Dale 1982
Suggested guidelines for economically efficient and evironmentally sound use of pesticides.
The Cook Islands Agricultural Diversification Project developed by Consortium for International Crop Protection Berkeley, California, USA and United States Agency for International Development, Bureau of Science and Technology, Office of Agriculture, D.C. at the request of South Pacific Regional Development Office, United States Agency for International Development, Suva, Fiji.
*Sections 7 and 8.
Reviews present use of pesticides in Cook Islands and makes recommendations. Limits recommendations to those that are not rated by WHO as being either extremely or highly hazardous, are registered by EPA, and do not bear the word DANGER under US registration, and for which FAO and WHO have established tolerances.

Recommends that the following pesticides only be used by restricted personel and not be for general use: carbofuran, fenamiphos, fenvalerate, lindane, methomyl, methyl bromide and paraquat.

21. MANARANGI, Anua 1979
Crop protection for Cook Islands growers.
Avarua, Cook Islands, Department of Agriculture and Fisheries. Information Division.

5. FIJI

1. AGRICULTURAL AND ECONOMIC APPLICATIONS OF PESTICIDES

A. INSECT CONTROL AND GENERAL PEST CONTROL

22. FIJI. DEPARTMENT OF AGRICULTURE. 1980
Annual Research Report 1974 and 1975.
Suva, The Department: 141 pp.

23. FIJI. DEPARTMENT OF AGRICULTURE AND FISHERIES. 1979
Annual Report for the year 1977.
Suva, the Ministry.

FIJI - continuing

1. AGRICULTURAL AND ECONOMIC APPLICATIONS OF PESTICIDES

A. INSECT CONTROL AND GENERAL PEST CONTROL

24. FIJI. MINISTRY OF AGRICULTURE AND FISHERIES. 1980.
Report. Ministry of Agriculture and Fisheries, Fiji. 1979.
Parliamentary Paper (1), 1979.

25. FIJI. DEPARTMENT OF AGRICULTURE. 1982
Annual Research Report 1981.
Suva, [The Department]

26. FIJI. DEPARTMENT OF AGRICULTURE. 1983
Annual Research Report 1982.
Suva, [The Department]

27. KARAN, B. 1982
The availablity of pesticides and application equipments at the farm level in Fiji.
Paper presented at the United Nations Economic and Social Commission for Asia and the Pacific (UN/ESCAP) Workshop on Pesticides and Fertilisers, at the Fiji College of Agriculture, Suva, Fiji, 31 May-11 June, 1982.

28. KARAN, B. 1982
The Organization of the Retail Distributors of Agropesticides in Fiji
Paper presented at the United Nations Economic and Social Commission for Asia and the Pacific (UN/ESCAP) Workshop on Pesticides and Fertilisers, at the Fiji College of Agriculture, Suva, Fiji, 31 May-11 June, 1982.

29. KUMAR, K. 1982
Country Statement. Review of Plant Protection and Quarantine in Fiji. Paper presented to Fourth Regional Technical Meeting of Plant Protection, 13-17 February, Noumea. SPC/Plant Protection 4/WP.11.

30. LANDELL MILLS ASSOCIATES. 1984
Key markets for agro-chemicals in Southeast Asia.
2. Fiji.
London, Landell Mills Associates Ltd.

31. MUNRO, R and MUNRO, H.M. 1980
Psoroptic mange Psoroptes cuniculi in goats in Fiji.
Trop. Anim. Health Prod., 12(1):1-5.

32. O'CONNOR, B.A. 1964
A farmer's guide to pest control: insects and mites.
Suva, Department of Agriculture. ITS Bulletin (42). 20pp.

FIJI - continuing

1. AGRICULTURAL AND ECONOMIC APPLICATIONS OF PESTICIDES

A. INSECT CONTROL AND GENERAL PEST CONTROL

33. PARTRIDGE, I.J. 1973
The control of insects in stored maize.
Fiji Agric. J., 35(2): 100-101.

34. RHODES, P. L. 1960
A combination spraying and dusting for banana scab moth control.
Fiji Agricultural Journal, 30: 23-28.

35. SINGH, S.R. 1983
Biology and control of rice leaf-roller Susumia exigua Lepidoptera Pyralidae.
Pacific Science Association. 15th Congress, Dunedin, New Zealand, February 1-11, 1983. Pac. Sci. Congr.. 15(1-2): 215-216.

36. SINGH, S.R. 1960
The Hawaiian beet web-worm (Hymenia recurvalis), a serious pest of Indian spinach (Amaranthus viridus).
Fiji Agricultural Journal, 30: 35-38

37. SINGH, S.R. 1973
Common agricultural pests of Fiji.
Suva, Fiji, Department of Agriculture: 157pp.

B. PLANT DISEASE (FUNGI) CONTROL

38. FIRMAN, I.D. 1972
Black leaf streak of bananas in Fiji.
Ann. Appl. Biol., 70(1): 19-24.

39. KUMAR, J.; VILSONI, F. and NUMBIAR, V. 1981
Fungicidal control of Kumala (Ipomoea batatus) scab in Fiji.
Fiji Agricultural Journal, 43(1): 9-12

40. RHODES, P.L. 1960
Oil spraying to control banana leafspot disease.
Fiji Agricultural Journal, 30: 29-32

C. WEED CONTROL

41. BELL, T. I. W. 1979
Herbicide control of mission grass (Pennisetim polystachyon) in Pinus caribaea plantations
Fiji Pine Research Paper, (1): 4pp.

FIJI - continuing

1. AGRICULTURAL AND ECONOMIC APPLICATIONS OF PESTICIDES

B. WEED CONTROL

42. FIJI. DEPARTMENT OF AGRICULTURE. 1980 Annual Research Report 1974 and 1975. Suva, The Department. 141 pp.

43. Hughes, H.M. 1977
Aquatic weed control in Fiji : studies of the ecology of Hydrilla verticulata in the Rewa River and possible methods of control.
Wellington, New Zealand Department of Scientific and Industrial Research. Research Reports, 1969-1970: 206pp.

44. KARAN, B. 1976
Studies of Navua sedge Cyperus aromaticus. Part 2 Control studies.
Fiji Agric. J., 38(2): 61-72.

45. MUNE, T.L. and PARHAM, J.W. 1956
The declared noxious weeds of Fiji and their control.
Fiji. Department of Agriculture, Bulletin (31).

46. MUNE, T.L. and PARHAM, J.W. 1967
Declared noxious weeds of Fiji and their control.
3rd edition. Fiji, Department of Agriculture, Bulletin (48): v,87pp.

47. MUNE, T.L. 1960
The chemical control of weeds in rice fields.
Fiji Agricultural Journal, 30: 33-34.

48. PARHAM, J.W. 1958
Weeds of Fiji.
Fiji, Department of Agriculture, Bulletin, (35): 196pp.

49. PATEL, N.P. 1972
Rice research in Fiji 1960-1970. Part 3: Weed control.
Fiji Agric. J., 34(1): 27-34.

50. RHODES, P.L. 1961
Weed control in drilled rice.
Fiji Agricultural Journal, 31: 3-8.

FIJI – continuing

1. AGRICULTURAL AND ECONOMIC APPLICATIONS OF PESTICIDES

D. OTHER ANIMAL PEST CONTROL

51. WILLIAMS, J.M. 1974
Rat damage to coconuts in Fiji. Part 1: Assessment of damage.
PANS, 20(4): 379-391.

52. WILLIAMS, J.M. 1975
Rat damage to coconuts in Fiji. Part 2: Efficiency and economics of damage reduction methods.
PANS, 21(1): 19-26.

E. QUARANTINE

53. AUSTRALIA. DEPARTMENT OF HEALTH. 1978
Correspondence with Fiji. Ministry of Agriculture and Fisheries on the subject of import of fruit and vegetables from Fiji to Australia.
(S.l. : s.n.)

54. FIJI. DEPARTMENT OF AGRICULTURE. n.d.
Circular letter to produce exporters: export standards of produce.
Suva, the Department

55. FIJI. DEPARTMENT OF AGRICULTURE. QUARANTINE SERVICE. 1970
Summary of plant and animal quarantine legislation.
Suva, Fiji, the Service. 47pp.

56. FIJI. MINISTRY OF AGRICULTURE, FISHERIES AND FORESTS. 1974.
Guide to importers in Fiji for plant and animal products.
Suva, the Ministry.

57. SALE, L. 1976.
Report of discussions in Fiji on matters of plant quarantine interest.
Canberra, Australian Development Assistance Bureau.

58. STOUT, Oliver O. 1977
Analysis of plant quarantine law of Fiji.
Suva, FAO. Survey of Agricultural Pests and Diseases in the South Pacific.
(Confidential).

FIJI - continuing

2. ENVIRONMENT

59. MORRISON, R.J. 1978
The toxicity to fish of diquat-copper sulphate mixtures.
Fiji Agric. J., 40(2): 105.

60. SUN, L.T. and GORMAN, M.L. 1973
The toxicity to fish of herbicides recommended for weed control in the Rewa.
Fiji Agric. J., 35: 31-33.

3. LEGAL ASPECTS OF PESTICIDE USE

61. FIJI. GOVERNMENT. 1971
Act to regulate the registration and sale of pesticides: Act no. 41 of 1971.
Suva, Fiji, Government Press.

62. FOOD AND AGRICULTURE ORGANISATION. REGIONAL OFFICE FOR ASIA AND THE FAR EAST. 1974.
Fiji Pesticides Act and Pesticides Regulations, 1971.
FAO. Plant Protection Committee for the Southeast Asia and the Pacific. Information Letter, (101), (FAO 12).

4. PUBLIC HEALTH

63. DAVIES, R.E. 1980
Paraquat: letter to the editor.
Fiji Med. J. , 8(9): 616.

64. DAVIES, R.E. 1980
Pesticides: paraquat.
Fiji Med. J., 8(4): 450-452.

65. GEOTTEL, M.S., TOOHEY, M.K., RAM, R.C. and PILLAI, J.S. 1982
Field evaluation of Bacillus thuringiensis var-Isrealensis against Aedes viglax and Culex sittiens in Fiji.
Mosq. News, 42(2): 277-279

66. GOETTEL, M.S., TOOHEY, M.K. and PILLAI, J.S. 1980
The urban mosquitoes of Suva, Fiji; seasonal incidence and evaluation of environmental sanition and ULV spraying for their control.
J. Trop. Med. Hyg., Aug, 83: 165-171.

FIJI - continuing

4. PUBLIC HEALTH

67. GOUNDAR, R.P.S. 1984
Paraquat poisoning in Fiji.
J. Forsenic Sci. Soc., 24(4): 376.

68. HAYNES, R.H. 1984a
A preliminary survey of suicide in a province of Viti Levu.
Suva, Fiji, Ministry of Economic Planning and Economic Development. Central Planning Office. Technical Paper (7).

69. HAYNES, R.H. 1984b
Suicide in Fiji a preliminary study.
Br. J. Psychiatry, 145(Oct): 433-438.

70. KEITH-REID, R. 1983a
Fijians step up the suicide trail.
Islands Business, May 1983.

71. KEITH-REID, R. 1983b
The horror of the Death Wish.
Islands Business, May 1983.

72. LARKHAN, A. 1983
Poison deaths alarm doctors.
Fiji Times, 20 July 1983.

73. RAM, P. and ROA, U. 1983
Paraquat poisoning in Fiji.
Fiji Medical J., Jan-Feb, 1983: 12-16.

74. WORLD HEALTH ORGANISATION. 1976
Dengue fever surveillance in some countries of Asia and the South West Pacific.
WHO weekly Epidemiological Record, 51(5): 113-116.

5. RECOMMENDATIONS/ADVICE ON THE SAFE HANDLING AND USAGE OF PESTICIDES

75. FIJI. DEPARTMENT OF AGRICULTURE AND FISHERIES. PLANT PROTECTION SECTION:ESCAP. 1983
Training course for agro-pesticide distributors on safe-handling and efficient use of agro-pesticides in the South Pacific.
Bangkok, Plant Protection Section, Fiji; ARSAP; ESCAP.
2 vols.
Vol. 1: Training manual.
Vol. 2: Lesson Plan.

76. GRAHAM, K.M. 1971
Plant diseases of Fiji.
London, HMSO, Overseas Research Publication (17).
A working manual of plant diseases of agriculture and horticulture; includes recommendations for remedial action or control.

77. HAINES, I.H. 1985
Problems of pesticide storage in developing countries.
Chemistry anD Industry, 16 September, 1985: 621-623.
(result of survey includes Fiji).

78. SINGH, S. R. 1973
Common agricultural pests of Fiji and their control.
Fiji, Department of Agriculture.
Manual which provides information on chemical control of agricultural pests in Fiji, and includes small section on safety precautions.

79. SWAIN, G. 1971
Agricultural zoology in Fiji.
London, HMSO, Overseas Research Publication (18).
Includes recommendations for pest control.

6. FRENCH POLYNESIA

1. AGRICULTURAL AND ECONOMIC APPLICATIONS OF PESTICIDES

A. INSECT CONTROL AND GENERAL PEST CONTROL

80. FABRES, G. and BROWN, W.L. Jr. 1978
The recent introduction of the pest ant Wasmannia auropunctata into New Caledonia.
J. Aust. Entomol. Soc., 17(2): 139-142.

81. Manuel practique de culture des principaux legumes.
French Polynesia. Service de l'Economie Rurale. Bulletin Technique, 1977, (14).

82. REBOUL, Jean Louis 1977
Lutte control les mouches de fruits en Polynesie
Pirae, Polynesie Franciase, Service de l'Economie Rurale.

83. REBOUL, Jean Louis, TAEAETUA, A. and YAU, R. 1978
Manuel abrege de protection des principales cultures maraicheres et vivrieres.
French polynesia. Service de l'Economie Rurale. Bulletin Technique, (15-16).

E. QUARANTINE

84. FRENCH POLYNESIA. SERVICE DE L'ECONOMIE RURALE. SECTION CONDITIONNEMENT ET POLICE PHYTOSANITAIRE. 1979
Installations de disinsectisation: caracteristiques techniques. (Installations for fumigation: technical characteristics).
Papeete, le Service.

2. ENVIRONMENT

85. ERHART, J.P.: HEROS, M.: NIAUSSAT, P.: TRICHET, J, and N'GUYEN, T.L. 1977
Biological techniques supporting the determination of benzo-3,4-pyrene in water of sediments apparently free of pollution. Results obtained in pools or brackish water and in South Sea lagoons.
Revue Internationale d'Oceanographie Medicale, (48): 97-101.

86. DENARDI, J. L.: RAYMOND, A. and RICARD, M. 1983
Etude des consequences pour le lagon de Taunoa des travaux d'extension du Port de Papeete.
Rapport CEA-R-5222, 108pp.

FRENCH POLYNESIA -continuing

2. ENVIRONMENT

87. FRAZIER, A.: DEBIARD, J. P.: FRANCK, D.: BENENTE, P. and JOUEN, R 1985
Observations sur diverses formes de pollution d'un sector Littoral de Tahiti.
Rapport CEA-R-5307: 56pp

88. FRAZIER, A. (in press)
Observations preliminaires sur le qualite des eaux douces dans deux atolls des Tuamotu.
Commission du Pacifique Sud. Programme Regional Oceanien pour l'Environnement

89. FRAZIER, A.: et al 1985
Observations diverses formes de pollution du lagon de Tahiti, Veme Congres International sur les recifs coralliens. Association internationale d'oceanographie biologique, Tahiti, 27 Mai-lier Juin, 1985.

90. FRENCH POLYESIA. LABORATOIRE D'ETUDE ET SURVEILLANCE DE L'ENVIRONNEMENT (in preparation)
Analyse de 72 echantillons de vegetaux en provenance de maraichers de Tahiti.

91. FRENCH POLYESIA. LABORATOIRE D'ETUDE ET SURVEILLANCE DE L'ENVIRONNEMENT (in preparation)
Analyse prevue fin 86 de 72 echantillons (vegetaux, sediments, eau) en provenance de l'Ile de Huahine

92. FRENCH POLYNESIA. LABORATOIRE D'ETUDE ET SURVEILLANCE DE L'ENVIRONNEMENT. 1986
Suivi de l'atoll de Takapoto:
Analyse de pesticides et de metaux lourds dans eau, sediment, matiere vivante. Mars, 1986

93. FRENCH POLYNESIA. LABORATOIRE D'ETUDE ET DE SURVEILLANCE DE L'ENVIRONNEMENT 1985
Suivi de l'Ile de Huahine:
Une premiere etude sur les pesticides (eau, sediment) en September, 1985.

94. FRENCH POLYNESIA. LABORATOIRE D'ETUDE ET DE SURVEILLANCE DE L'ENVIRONNEMENT 1986
Suivi de l'Ile de Huahine:
Une deuxieme etude sur les pesticides (eau, sediment) en Avril, 1986.

FRENCH POLYNESIA - continuing

2. ENVIRONMENT

95. FRENCH POLYNESIA. LABORATOIRE D'ETUDE ET DE SURVEILLANCE DE L'ENVIRONNEMENT 1986 (in press)
Suivi de l'Ile de Huahine
Une troisieme etude sur les pesticides (eau, sediment) en cours (Septembre, 1986)

96. FRENCH POLYNESIA. LABORATOIRE D'ETUDE ET SURVEILLANCE DE L'ENVIRONNEMENT. (in preparation)
Suivi des eaux du Port de Papeete

97. FRENCH POLYNESIA. LABORATOIRE D'ETUDE ET SURVEILLANCE DE L'ENVIRONNEMENT (in preparation)
Suivi de la qualite des lentilles d'eau douce dans quelques atolls des Tuamotu (with SPREP)

98. GALZIN, R. 1979
The fish community of a coral reef of Moorea, French Polynesia.
Terre Vie, 33(4): 623-643.

99. GROS, R. 1980
Developpement agricole et problems de population de l'environment sur atolls. Communication presentee a la conference technique regionale sur la culture sur les atolls.
Papeete, 14-19/04/80, 8pp

3. LEGAL ASPECTS

100. DELEBEQUE, P. 1975
Apercus sur le probleme des pesticides en Polynesie Francaise.
Medecine Oceanienne, (9): 16-20

101. FRENCH POLYNESIA. ASSEMBLEE TERRITORIALE. 1976
Deliberation no. 76-6 (du Juillet, 1976).
Papeete, l'Assemblee.

102. FRENCH POLYNESIA. SERVICE DE L'HYGIENE. 1976.
Circulaire definissant les criteres d'aptitude du personnel vendant ou utilisant des pesticides a titre professionel.
Papeete, le Service, Service de l'economie rurale.

FRENCH POLYNESIA - continuing

3. LEGAL ASPECTS

103. ANON (nd)
Pesticides utilisables en hygiene domestique et publique.
Papeete, French Polynesia.

104. ANON (nd)
Pesticides a usage agricole et veterinaire.
Papeete, French Polynesia.

4. PUBLIC HEALTH

105. FRENCH POLYNESIA. SERVICE DE L'HYGIENE. SERVICE DE ECOMONIE RURALE. 1976
Recommandations generales sur les conditions et precautions d'emploi des pesticides.
Papeete. les Services.

106. LAGRAULET, J., BARSINAS, M., FAGNEAUX, G. and TEAHUI, M. 1973
[Current status of filariasis in the Marquises and different epidemiologocal aspects].
Bull. Soc. Pathol Exot. Jan-Feb, 66(1): 139-55.

107. LAGRAULET. J. 1973
[Prophylaxis and treatment of lymphatic filariasis in French Polynesia]
Bull. Soc. Patho. Exot. Mar-Apr, 66(2): 311-20.

108. MOUCHET, J. et al 1967
Resistance to insecticides at Tahiti.
Med. Trop., 27(6): 685-692.

109. OUTIN-FABRE, D.; SAUGRIN, J.; STANGHELLINI, A.; PICHON, G. 1972
An experimental anti-filariasis campaign in Moorea, French Polynesia.
Bull. WHO, 46(2): 253-256.

110. PICHON, G., PERRAULT,G. and LAIGRET, J. 1974
Parasite yield in filariasis vectors.
Bull. WHO, 51(5): 517-524.

111. RIVIERE, Francois 1976
Lutte contre les insects hematophages nuisants au tourisme dans la presqu'ile de Temae a Moorea.
Papeete, Institut de Recherches Medicales Louis Malarde.
11pp.

4. PUBLIC HEALTH

112. RIVIERE, Francois, DUVAL, J. and BAGNIS, Raymond 1977
Compte rendu sur l'essai preliminaire de lutte insecticide contre les adultes 'nonos' para voie aerienne (ULV) sur la presqu'ile Temae (Moorea).
Papeete, Institut de Recherches Medicales Louis Malarde. 19pp.

113. RIVIERE, Francois, PICHON, G. and CHEBRET, M. 1979
[Ecology of Aedea polynesiensis Diptera culicidae in French Polynesia. 1. Resting sites of adults and mosquito control in Bora-Bora. (in French)
Cah. ORSTROM Ser. Entomo;. Med. Parasitol., 17(4): 235-242.

114. SAUGRAIN, J. and OUTIN-FABRE, D. 1972
Filariasis control in French Polynesia : results after 20 years.
Bull. WHO, 46(2): 249-252.

115. WORLD HEALTH ORGANISATION. 1976
Dengue fever surveillance in some countries of Asia and the south west Pacific.
WHO, Weekly Epidemiological Record, 51(15): 113-116.

5. RECOMMENDATIONS/ADVICE ON HANDLING AND USAGE OF PESTICIDES.

116. REBOUL, J.L., TAEAETUA, A. and YAU, R. 1973
Manuel abrege de protection des principales cultures.
Bulletin Technique Sommaire, (7), January.

117. REBOUL, J.L,: TAETAETUA, A and YAU DIT AKUI, R. 1978
Manuel abrege de protection des principales cultures maraicheres et vivrieres.
Bulletin Technique, (15), 25 September.

118. REBOUL, J.L., TAETAETUA, A., and YAU DIT AKUI, R. 1978
Manuel abrege de protection des principales cultures maraichers et vivrieres (suite)
Bulletin Technique, (16), 25 September.

7. GUAM

1. AGRICULTURAL AND ECONOMIC APPLICATIONS OF PESTICIDES

A. INSECT CONTROL AND GENERAL PEST CONTROL

119. BJORK,C., NAFUS, D. AND SCHNEINER, I.H. [in press]
Control of leafminer and podborers on Yardlong beans, 1982.
[Insecticide and Acaricide Test: in press]

120. BJORK, C.D. 1982
Pesticide and crop survey of Guam farmers, August and September, 1982.
Mimeo.

121. BJORK, C.D. 1983
Pesticide and crop survey of Guam farmers, April through September, 31, 1983.
Mimeo.

122. GUAM AGRICULTURAL EXPERIMENTAL STATION. 1979
Annual Report.
College of Agriculture and Life Sciences, Univ. of Guam.
[Entomology: 13-19; Plant pathology: 20-24].

123. GUAM AGRICULTURAL EXPERIMENTAL STATION. 1980
Annual Report.
College of Agriculture and Life Sciences, Univ. of Guam
[Entomology: 9-10; Plant pathology: 11-13]

124. GUAM AGRICULTURAL EXPERIMENTAL STATION. 1981
Annual Report.
College of Agriculture and Life Sciences, Univ. of Guam
[Entomology: 11-20 ; Pesticide residues: 25-30].

125. GUAM AGRICULTURAL EXPERIMENTAL STATION 1983
Current research projects.
Agricultural Experiment Station, College of Agriculture and Life Sciences, Univ. of Guam, Mangilao, August, 1983.
23pp.

126. MUNIAPPAN, R., CRUZ, Frank and CRUZ, Jose A. n.d.
Insect pests of cucurbitaceous crops and their control on Guam.
Masilao, University of Guam, Co-operative Extension Service. 16pp.

127. NAFUS, D: SCHREINER, I.H. and BJORK, C. [in press]
Dry season control of leafminer on pole beans, 1982.
[Insecticide and Acaricide Test: in press]

1. AGRICULTURAL AND ECONOMIC APPLICATIONS OF PESTICIDES

A. INSECT CONTROL AND GENERAL PEST CONTROL

128. SCHREINER, I.H. and NAFUS, D.M. [in press]
Wet season control of leafminer on polebeans, 1981.
[Insecticide and Acaricide Test: in press]

129. STEVENS, L.M.: BLAS, TOM and DUENAS, Joseph G. [1979]
Control of diamondback moth on cabbage, 1979.
Insecticide and Acaricide Tests, 6:64 (98b).

130. STEVENS, larry M; CRUZ,Frank and BLAS, Tom [1978]
Control of tomato fruitworm on tomato, 1978.
Insecticide and Acaricide Test, 6:100 (168a).

131. STEVENS, Larry and KIKUCHI, Rosalie [1978]
Control of corn earworm on cabbage, 1978.
Insecticide and Acaricide Test, 6:63 (98).

132. STEVENS, Larry M., KIKUCHI, Rosalie and BLAS, Tom [1979]
Control of cabbage borer and diamondback moth on cabbage.
Insecticide and Acaricide Test, 6:63 (98a).

133. STEVENS, Larry M., KIKUCHI, Rosalie and OELA GARZA, Sandra [1979]
Control of bagworm on lawngrass.
Insecticide and Acaricide Test, 6:176 (317).

C. WEED CONTROL

134. DRISKO, R.W. and CRILLY, J.B. 1973
Control of algal growth on paints at tropical locations (Technical Report. (Final) Jul 70 - Jan 73).
Report No.: NCEL-TR-802, Dec. 1973. 19pp.

E. QUARANTINE

135. GUAM. DEPARTMENT OF AGRICULTURE. 1972
Regulations for importation of plants and plant products into the Territory of Guam.
Agana, the Department. 17pp.

GUAM -continuing

2. ENVIRONMENT

136. ANDERSON, C (ed.) 1983
Guam Environmental Protection Agency. Tenth Annual Report 1982.
[Agana, the Agency]
[Biological monitoring: 48-49; Pesticides Control Programme: 68-69; Monitoring Services Division: 70-74]

137. DIAMOND, J. 1984
[Letter]
Nature, 310(452): ?pp.

138. GRUE, C.E. 1985
Pesticides and the decline of Guam's native birds. (Letter)
Nature, 316(25 July, 1985): 301.

139. GUAM ENVIRONMENTAL PROTECTION AGENCY. 1983
The impact of agricultural activity on Guam's water quality.
Agana, the Agency. 34pp.

140. GUAM ENVIRONMENTAL PROTECTION AGENCY. 1979
Guam water quality management Plan. Plan 208.
Agana, The Agency: 11.18-11.31.

141. JENKINS, J.M. 1983
The native forest birds of Guam.
Washington, D.C., American Ornithologists' Union.
Ornithological Monographs (31).

142. SAVIDGE, J.A. 1983
Guam: Paradise lost for wildlife.
Biological Conservation, 30(4): 305-317.

143. SAVIDGE, J.A. 1985
[Letter]
Nature, 316(25 July 1985): 301.

144. WORTMAN, C.J.G. 1976
Toxicity of five pesticides to the tropical hermit crab Clibanarius humilis.
M. Sc. Thesis, University of Guam.

3. LEGAL ASPECTS

145. GUAM ENVIRONMENTAL PROTECTION AGENCY. 1975
Guam pesticides profile, March 1975.
Agana, the Agency.

4. PUBLIC HEALTH

146. GUAM DEPARTMENT OF HEALTH AND SOCIAL SERVICES, AGANA OFFICE OF COMPREHENSIVE HEALTH PLANNING. 1972
Health problems and goals of Guam: (Second and Third Components). Comprehensive health plan for the Territory of Guam.
Agana, The Office of Comprehensive Health Planning. 411pp.

147. SWAW, R. Jr 1977
Preventive medicine in the Vietanmese refugee camps on Guam.
Military Medicine, 142(1): 19-28.
(Sec. Jnl Source: Tropical Diseases Bulletin, 75: 1151)

5. RECOMMENDATIONS/ADVICE OF SAFE HANDLING AND USAGE OF PESTICIDES

148. BJORK, C. 1977
Guam supplement for commercial applicators to supplement USDA-EPA manual : "Apply Pesticides correctly - a guide for commercial applicators".
Mangilao, Guam, Co-operative Extension Service, College of Agriculture and Life Science, University of Guam.
Supplement to Pesticide training manual.

149. BJORK, C. 1977
Guam supplement for private applicators to supplement USDA-EPA manual: "Apply pesticides correctly - a guide for private applicators".
Mangilao, Guam , Co-operative Extension Service, University of Guam.
Supplement to Pesticide training manual

150. BJORK, C and BEVACQUA, R. 1980
Insecticide guide for vegetable growers.
Mangilao, Co-operative Extension Service , College of Agriculture and Life Sciences, University of Guam.

151. GUAM ENVIRONMENT PROTECTION AGENCY. 1982
Northern Guam lens study.
Agana, the Agency.

152. MUNIAPPIN, R [?]
Pests of Guam series. Circulars nos. 1 - 10.
Mangilao, Co-operative Extension Service, College of Agriculture and Life Sciences, Univ. of Guam.
Series of small publications on insect pest control, particularly for pests of vegetable crops.

GUAM - continuing

5. RECOMMENDATIONS/ADVICE ON SAFE HANDLING AND USAGE OF PESTICIDES

153. MANIAPPIN, R.; CRUZ, I. and CRUZ, J.A. [?]
Insect pests of cucurbitaceous crops and their control on Guam.
Mangilao, Guam, Co-operative Extension Service, College of Agriculture and Life Sciences, Univ. of Guam.

8. KIRIBATI

1. AGRICULTURAL AND ECONIMIC APPLICATIONS OF PESTICIDES.

A. INSECT AND GENERAL PEST CONTROL

154. FOOD AND AGRICULTURE ORGANISATION. 1974
Report to the Government of the Gilbert and Ellice Islands Colony on a survey of insect pests of crops. (FAO, based on the work of Peter D. Manser). Rome, FAO, UNDP Report (TA3246): v,35pp.

B. PLANT DISEASE (FUNGI) CONTROL

155. SHANMUGANATHAN, N. 1980
Virus and virus-like diseases of plants in the Gilbert Islands.
FAO Plant Protection Bulletin, 28(1): 29-38

D. OTHER ANIMAL PEST CONTROL

156. GILBERT AND ELLICE ISLAND COLONY. AGRICULTURAL REPORT 1968
[Tarawa] [The Dept]
[Mentions rat problems and use of zinc phosphide and warfarin]

KIRIBATI - continuing

E. QUARANTINE

157. CHOCK, A.K. 1977
Current quarantine procedures and facilities: Gilbert Islands.
Suva, FAO, Survey of Agricultural Pests and Diseases in the South Pacific.
(Confidential)

158. GILBERT ISLANDS. 1976
Plants ordinance 1976.
(S.l., s.n.)

159. GILBERT ISLANDS. AGRICULTURE DIVISION. n.d.
Agricultural Division of the Gilbert Islands welcomes you "mauri o".
Tarawa, the Division. (quarantine pamphlet).

160. KIRIBATI. DIVISION OF AGRICULTURE. 1977
Plant and animal quarantine: a guide to importers in the Islands.
Tarawa, the Division.
(Also a 1976 edition)

161. STOUT, Oliver O. 1976
Analysis of the plant quarantine law of the Gilbert Islands: an ordinance....1976.
Suva, FAO, Survey of Agricultural Pests and Diseases of the South Pacific.
(Confidential)

2. ENVIRONMENT

162. DHARMARAJU, E. 1982
The Babai beetle problem in Kiribati.
Alafua Agricultural Bulletin, 7(3): 90-94.

163. DHARMARAJU, E. 1983a
Post-harvest losses in the South Pacific. An over-view.
Alafua Agric. Bull., 8(2): 27-35.

164. DHARMARAJU, E. 1983b
Transport and the spread of crop pests in tropical Polynesia. Chapter 13: Commerce and the spread of harmful insects.
Praeger Press: 257-272.

9. NAURU

NO REFERENCES

10. NEW CALEDONIA

1. AGRICULTURAL AND ECONOMIC APPLICATIOS OF PESTICIDES

A. INSECT CONTROL AND GENERAL PEST CONTROL

165. BRUN, L.O. 1982
Etude de la resistance de la Tique du Betail (Boophilus microplus) Canestrini au diethion (Rhodiacide) en Nouvelle Caledonie.
ORSTOM, Laboratoire de Zoologie Appliquee.

166. BRUN, L.O. and CHAZEAU, J. 1980
Catalogue des ravageurs d'interet agricole de Nouvelle Caledonie.
Noumea, ORSTROM, Laboratoire de Zoologie Appliquee. 125, 11pp.

167. BRUN, L.O., CHAZEAU, J. and EDGE, V. E. 1983
Toxicity of our insecticides to Phytoseiulus marcropilis (Banks) and P. persimilis Athias-Henriot (Acarina: Phytoseiida.
J. Aust. Ent. Soc., 1983, 22: 303-305

168. BURN, L.O., WILSON, J. T. and DAYNES, P. 1983
Ethion resistance in the cattle tick (Boophilus microplus) in New Caledonia.
Tropical Pest Management, 29(1) : 16-22

169. BRUN, L.O. 1981
Experimentation de neuf insecticides destines a le protection des cultures de tomates en Nouvelle Caledonie. (Article presente au cours de la 3^{e} Conference Regionale sur la protection des vegetaux, organisee par la Commission du Pacifique Sud, Port Moresby, Papouasie Nouvelle-Guinee, 28 Avril-3 Mai, 1980.)
Cah. ORSTOM, Ser. Biol., (44): 35-42.

170. BRUN, L.O. and MAZARD, P. 1981
Experimentations menees sur la terrain et en serrre pour la protection de cultures de mais contre les noctuelles Helicoverpa armigera et Pseudaletia separata en Nouvelle Caledonie.
Convention Territoire, ORSTOM du 27-12-79. Ref: 003193.

1. AGRICULTURAL AND ECONOMIC APPLICATIONS OF PESTICIDES

A. INSECT CONTROL AND GENERAL PEST CONTROL

171. BRUN, L.O. and ATTIA, F.I. 1983
Resistance to lindane, malathion and fenitrothion in Coleopterous pests of stored products in New Caledonia.
Hawaiian Entomological Society. Proceedings, 24(2-3).

172. DAYNES, P.: BRUN, L. and WILSON, J.L. 1980
[Preliminary note on the appearance of resistance to ethion in several strains of Boopilus microplus in New Caledonia]
Note preliminaire sur l'apparition de resistances a l'ethion chez certaines souches de Boophilus microplus en Nouvelle Caledonie.
Rev. Elev. Med. Vet. Pays. Trop., 33(4): 399.

173. DELOBEL, A. 1978
Protection of cruciferous crops against the cabbage moth Plutella xylostella Lepidoptera Hyponomeutidae in New Caledonia.
Cah. ORSTOM Ser Biol, 13(1): 35-40.

174. FABRES, G., and BROWN, W.L. JR 1978
The recent introduction of the pest ant Wasmannia auropunctata into New Caledonia.
J. Aust. Entomol. Soc, 17(2) : 139-142

175. FONCE, Jacques 1971
Les principaux insectes nuisables de Nouvelle Caledonie.
Noumea, New Caledonia, Service d'Agriculture. Section Phytosanitaire. 1 vol.

176. FONCE, Jacques n.d.
Les principaux insectes nuisables de Nouvelle Caledonie.
Noumea, New Caledonia, Service d'Agriculture, Bulletin d'information. 10pp.

177. PELLEGRIN, F., BOCCAS, B. and KOHLER, F. 1984
Recherches effectuees au Laboratoire de Phytopathologie du Centre ORSTROM de Nouvelle Caledonie. Paper presented to Fourth Regional Technical Meeting of Plant Protection, 13-17 February 1984, Noumea.

178 RAGEAU, Jean n.d.
Possibilites de lutte contre les mouches en Nouvelle Caledonie.
Noumea, ORSTROM, Centre de Noumea. 8pp.

NEW CALEDONIA -continuing

1. AGRICULTURAL AND ECONOMIC APPLICATIONS OF PESTICIDES

B. PLANT DISEASE (FUNGI) CONTROL

179. BOCCAS, B., PELLEGRIN, F., KOHLER, F., SEIVERT, B. and PILECKI, A. 1984 (rec'd 1985)
Arabica coffee rust in New Caledonia. 2: Chemical control tests.
Cafe Cocoa The, 28(3): 203-208.

C. WEED CONTROL

180. BOTTON, H.
Chemical control of wild basil (Ocimum gratissimum) in New Caledonia.
In Fourth Asia Pacific Weed Science Society Conference. Proceedings: 513-517. (Reprint)

181. BOTTON, H.
Use of herbicides in establishing improved pastures in New Caledonia.
In Fourth Asia-Pacific Weed Science Society Conference. Proceedings: 49-54. (Reprint)

182. FERRE, E.E. 1977
Le metribuzin [herbicide]: l'eradication du charancon du bananier.
Revue Agricole de la Nouvelle Caledonie, Jan., 37: 12-13.

E. QUARANTINE

183. AMICE, R. 1984
Status of plant protection in New Caledonia in 1983.
Paper presented to Fourth Regional Technical Meeting of Plant Protection, 13-17 February, 1984, Noumea.
[Noumea, SPC].

184. NOUVELLE CALEDONIE. SERVICE D'AGRICULTURE. CONTROL PHYTOSANITAIRE. n.d.
Note to importers and travellers.
Noumea, the Service.

4. PUBLIC HEALTH

185. NEW CALEDONIA. SERVICE MUNICIPAL d'HYGIENE, EDUCATION SANITAIRE. 1980
Le Moustique: tuez le.
Noumea, le Service; La Federation de l'Hotellerie Interieur et iles. 23pp.

11. NIUE

1. AGRICULTURAL AND ECONOMIC APPLICATIONS OF PESTICIDES

A. INSECT CONTROL AND GENERAL PEST CONTROL

186. DHARMARAJU, E. 1980
Pest problem in Niue.
Apia, Alafua Agricultural Bulletin, 5(3): 24-26.

187. DHARMARAJI, E. 1980
Consultancy report on the incidence of the stick insect pest in Niue and recommendations for its control.
Alofi, Niue, Department of Agriculture, 1980. 7 pp.

188. SMULDERS, C. FRANS 1980
Agricultural developments in Niue.
Apia, Alafua Agricultural Bulletin, 5(3) : [?]

B. PLANT DISEASE (FUNGI) CONTROL

189. FULLERTON, R.A. 1982
Brown spot of passionfruit, Passiflora edulis - F-flavicarpa, on Niue Island, South Pacific caused by Alternaria alternate.
N.Z. J. Agric. Res., 25(3): 421-424.

E. QUARANTINE

190. BAIRD, Jaimie D. 1980
Report on Niue Island's fumigation facilities: agricultural quarantine training.
Alofi (Samoa), Niue, Department of Agriculture. Quarantine Section.

NIUE - continuing

1. AGRICULTURAL AND ECONOMIC APPLICATIONS OF PESTICIDES

E. QUARANTINE

191. NIUE. DEPARTMENT OF AGRICULTURE. QUARANTINE SECTION. 1980
Fumigation instruction manual.
Alofi, the Department.

12. **PAPUA NEW GUINEA**

1. AGRICULTURAL AND ECONOMIC APPLICATIONS OF PESTICIDES

A. INSECT CONTROL AND GENERAL PEST CONTROL

192. ANON. 1979
Fumigation of stored products using methyl bromide.
Entomology Bulletin (1), in Harvest, 5(1): 131-132.

193. ARURA, M. 1984
Pests of coconut palm. The Black Palm weevil.
Entomology Bulletin (36), in Harvest, 11(1): 33-35.

194. ARURA, M. 1984
Pests of coconut palm. The New Guinea rhinoceros beetle.
Entomology Bulletin (32); in Harvest, 10(3): 115-117.

195. BAILEY, P. 1979
Cocoa webworm ; a pest of young cocoa trees.
Harvest, 5(1): 59-63.

196. BOURKE, R.M. 1985
Sweet potato (Ipomoea batatus) production and research in Papua New Guinea.
Papua New Guinea Journal of Agriculture, Forestry and Fishing, 33(3-4): 89-108.

197. BULL, P.B. 1984a
Cabbage.
Horticulture Note (3), in Harvest, 10(3): 122-125.

198. BULL, P.B. 1984b
Capsicums.
Horticulture Note (1), in Harvest, 10(1): 45-48.

1. AGRICULTURAL AND ECONOMIC APPLICATIONS OF PESTICIDES

A. INSECT CONTROL AND GENERAL PEST CONTROL

199. BULL, P.B. 1984c
Chinese cabbage and Pak Choi.
Horticulture Note (5), in Harvest, 10(4): 167-170.

200. BULL, P.B. 1984d
Tomatoes.
Horticulture Note (2), in Harvest, 10(2): 90-93.

201. DORI, F.M. 1984
Heliothis caterpillars - a Pest of Sorghum.
Entomology Bulletin (35), in Harvest, 10(4): 164-166.

202. DORI, F.M.
The Sorghum midge.
Entomology Bulletin (15), in Harvest,8(1) :32-35.

203. ENTWISTLE, P.F. nd
Viral spray trials for control of insect defoliation of Pine trees in the Highlands of PNG.
Klinki (no details)

204. GARDINER, G. 1984
Preservation specification for sawn and round timber.
PNG STANDARD.
Hohola, Office of Forests. Forest Products Research Division.

205. GORICK, B.D. 1979
Control of the Asiatic rhinoceros beetle, Oryctes rhinoceros, in coconuts.
Lowlands Agricultural Experiment Station, Kerevat.
LAES Information Bulletin, (27).

206. GREVE, J.E. van S. 1983
A Code of Practice for hygiene in registered cocoa stores.
Entomology Bulletin (27), in Harvest, 9(3-4): 185-188.

207. HALE, PETER, R. 1977
Book review : Pest control in rice.
Papua New Guinea Agricultural Journal, 28(2,3-4): 103.

208. ISMAY, J.W.
House flies.
Entomology Bulletin (14), in Harvest, 8(1) : 29-31.

1. AGRICULTURAL AND ECONOMIC APPLICATIONS OF PESTICIDES

A. INSECT CONTROL AND GENERAL PEST CONTROL

209. ISMAY, J.W. 1982
Fruit flies.
Entomology Bulletin (19), in Harvest, 8(3): 134-137.

210. JOLLANDS, P. 1985
Know your knapsack sprayer. Cooper Pegler CP15.
Rabaul, Cocoa Board, Technical Bulletin, (3).

211. KIMBER, A.J. and CALCINAI, B.L. 1980
An easy way to control cutworms.
Aiyura, Highlands Agricultural Experiment Station.
Technical Bulletin (13).

212. LAMB, K.P. 1974
Economic entomology in the tropics.
London, Academic Press. vii, 195pp.

213. LAMB, K.P. 1978
Pests of winged beans and their control in Papua New Guinea. In
SINGH, S.R., VAN EMDEN, H.F. and AJIBOLA TAYLOR, T. (eds)
Pests of grain legumes: Ecology and Control.
Symposium on pests of grain legumes. Ibadan, Nigeria, Nov. 8-13, 1976. London, Academic Press: 53-58.

214. LAMB, K.P. and JOHNSTON, A.D. 1976
Some insect pests of Papua New Guinea. 3rd Edition.
Port Moresby, University of Papua New Guinea. 59pp.

215. McGREGOR, A.J. 1983a
Black Pod disease of cocoa. (Revised)
Plant Pathology Note (26), in Harvest, 9(3-4): 189-192.

216. McGREGOR, A.J. 1983c
Seedling blight of cocoa.
Plant Pathology Note (22), in Harvest, 9(3-4): 201-204.

217. MALLARD, A. 1979
Pest control in the Markham Valley.
Lae, Papua New Guinea University of Technology.
Mimeo. 38pp.

218. MASAMDU, R.T.M. 1984
The Beanfly.
Entomology Bulletin (28), in Harvest 10(1): 29-31.

1. AGRICULTURAL AND ECONOMIC APPLICATIONS OF PESTICIDES

A. INSECT CONTROL AND GENERAL PEST CONTROL

219. MENGGE-NANG, A. 1980
Growing pyrethrums in the highlands.
Harvest, 6(2): 47-52

220. MERCER, C.W.L., LEWIS, D. AND ROBERTS, H. 1986
A trial in Labu to test the effectiveness of three insecticides against Ambrosia beetle attacks on logs.
(in press , Klinki).

221. MOXON, J.E. 1983a
Bed bugs.
Entomology Bulletin, No 22, in Harvest, 9(2): 104-107.

222. MOXON, J.E. 1983b
Pests of cocoa. Leaf eating insects.
Entomology Bulletin (25), in Harvest, 9(3-4): 178-181

223. MOXON, J.E. 1983c
Pests of cocoa. Mealy bugs.
Entomology Bulletin (26), in Harvest, 9(3-4): 182-184.

224. MOXON, J.E. 1983d
Pests of cocoa. Mirids.
Entomology Bulletin (23), in Harvest, 9(3-4): 171-177.

225. MOXON, J.E. 1983e
Pests of cocoa. Pantorhytes. (Revised)
Entomology Bulletin (5), in Harvest 9(3-4): 165-170.

226. MOXON, J.E. 1983f
Pests of cocoa. Use of crazy ants for control of Pantorhytes. (Revised)
Entomology Bulletin (4), in Harvest, 9(3-4): 159-164.

227. NAGLE, W.G. 1981
Notes on pyrethrum.
Harvest, 7(1): 43-46.

228. O'SULLIVAN, D.F. and BOURKE, R.M. 1975
Effectiveness of lindane, DDT and monocrotophos for the control of the corn borer Ostrinia furnicallia Guenee (Lepidoptera, Pyralidae) in maize on New Britain.
Papua New Guinea Agricultural Journal, 26(1): 17-19,22.

1. AGRICULTURAL AND ECONOMIC APPLICATIONS OF PESTICIDES

A. INSECT CONTROL AND GENERAL PEST CONTROL

229. OWEN, I and ISMAY, J.W. 1984
Buffalo fly.
Entomology Bulletin (38), in Harvest, 11(2): 78-81.

230. PERRY, C.H. 1976
Control of the indigenous rhinoceros bettle in coconuts Kerevat, Lowlands Agricultural Experiment Station.
LAES Information Bulletin (11).

231. PERRY, C.H. 1977
The ecology and control of some taro pests in Papua New Guinea.
In ENYI, B.A.C. and VARGHESE, T, (eds) 1977
Agriculture in the tropics. Proceedings of the 10th Waigani Seminar, Port Moresby. University of Papua New Guinea.

232. PRIOR, C. 1983
Bark canker in cocoa.
Plant Pathology Note (20), in Harvest 9(3-4): 193-196.

233. PRIOR, C., KIDD, D.W. and MOXON, J.W. 1983
Insecticide mixtures and damage to cocoa bark.
Harvest, 9(3-4): 134-135.

234. ROBINSON, M.H. and ROBINSON, B. 1974
A census of web building spiders in a coffee plantatin at Wau, New Guinea and an assessment of their insecticidal effect.
Trop. Ecol., 15(1-2): 95-107.

235. ROGERS, A.E. 1984
The giant Vietnam guava.
Horticulture Note (6), in Harvest, 11(1): 40-42.

236. ROOM, P.M. AND SMITH, E.S. 1975
Relative abundance and distribution of insect pest, ants and other components of the cocoa ecosystem in Papua New Guinea.
J. Appl. Ecol., 12(1): 31-46.

237. ROOM, P.M. 1975
Relative distributions of ant species in cocoa plantations in Papua New Guinea.
J. Appl. Ecol., 12(1): 47-62.

1. AGRICULTURAL AND ECONOMIC APPLICATIONS OF PESTICIDES

A. IINSECT CONTROL AND GENERAL PEST CONTROL

238. SHAW, Dorothy and FENNER, T.L. 1974
Book review : Pest control in ground nuts.
Papua New Guinea Agricultural Journal, 25(1-2): 23.

239. SMITH, E.S.C. 1981
The cardamom mirid and its control
Entomology Bulletin (10), in Harvest, 7(1): 47-49.

240. SMITH, E.S.C. 1977
The cardamom mirid Ragwelellus horvathi Poppius
(Heteroptra: Miridae) in Papua New Guinea
Papua New Guinea Agricultural Journal, 28 (2/4): 97-101.

241. SMITH, E.S.C. 1979a
Cocoa pest and their control.
Harvest, 5(3): 186-196.

242. SMITH, E.S.C. 1976
Control of green scale on coffee
Aiyura, Highlands Agricultural Experiment Station.
Technical Bulletin (1).

243. SMITH, E.S.C. 1979b
Control of termites in cocoa.
Entomology Bulletin (2), in Harvest, 5(3):197-199.

244. SMITH, E.S.C. 1979c
Control of termites in cocoa.
Kerevat, Lowlands Agricultural Experiment Station.
LAES Information Bulletin (17).

245. SMITH, E.S.C. 1979
Control of trunk longicorns in cocoa.
Entomology Bulletin (3), in Harvest, 5(3): 200-202.

246. SMITH, E.S.C. and THISTLETON, B.M. 1984
Green scale: a pest of coffee.
Entomology Bulletin (33), in Harvest 10(3): 118-121.

247. SMITH, E.S.C. 1981
An integrated control scheme for cocoa pests and diseases
in Papua New Guinea.
Trop. Pest Manage., 27(3): 351-359.

1. AGRICULTURAL AND ECONOMIC APPLICATION OF PESTICIDES

A. INSECT CONTROL AND GENERAL PEST CONTROL

248. SMITH, E.S.C. 1983
Pests of cocoa-trunk longicorns. (Revised)
Entomology Bulletin (3), in Harvest 9(3-4): 156-158.

249. SMITH, E.S.C. 1977
Presence of a sex attractant pheromone in Heliopeltis clavifer (Heteroptera, Miridae).
J. Aust. Entomol. Soc., 16(2): 113-116.

250. SMITH E.S.C. 1979e
Recommendations for the control of Pantorhytes in cocoa.
Kerevat, Lowlands Agricultural Experiment Station.
LAES Information Bulletin (26).

251. SMITH, C.S.C. 1980
Recommendations for the control of Pantorhytes in cocoa.
Entomology Bulletin (5), in Harvest, 6(1): 41-42.

252. SMITH, E.S.C. 1984
Results of three insecticide trials against cocoa pod suckers in the Northern Province.
Papua New Guinea Journal of Agriculture, Forestry and Fisheries, 33(1-2): 1-11.

253. SMITH, E.S.C. 1981 [rec'd 1982]
Review of control measures for Pantorhytes coleoptera curculionidae in cocoa.
Prot. Ecol., 3(4): 279-298.

254. SMITH, E.S.C. 1981
Rice insects in the Northern Province.
Harvest, 7(1): 31-34.

255. SMITH, E.S.C. 1981
Using lindane granules to establish young coconuts.
Harvest, 7(1): 28-30.

256. SMITH, E.S.C. 1980
Zophiuma lobulata Ghauri (Homoptera: Lophopidae) and its relation to the Finschhafen coconut disorder in Papua New Guinea.
Papua New Guinea Agricultural Journal, 1980 (recd) 1982 31(1/4): 37-45.

257. SPRADBERY, J.P.: TOZER, R.C. and POUND, A.A. 1983
The efficacy of some acaricides against screw-worm fly larvae.
Australian Veterinary Journal, 60(2): 57-58.

1. AGRICULTURAL AND ECONOMIC APPLICATIONS OF PESTICIDES

A. INSECT CONTROL AND GENERAL PEST CONTROL

258. SPRADBERY, J.P.: SANDS, D.P.A. and BAKKER, P. 1976
Evaluation of insecticide smears for the control of screw-worm fly, Chrysomya bezziana.
Papua New Guinea Journal of Agriculture
(no details)

259. SPRADBERY, J.P. 1979
The reproductive status of Chrysoma spp - Diptera Calliphoridae attracted to liver baited Blow Fly traps in Papua New Guinea.
J. Aust. Entomol. Soc., 18(1): 57 - 61.

260. SPRADBERY, J.P. and ISMAY, J.W. 1981
The screw worm fly.
Entmology Bulletin (12), in Harvest, 7(3): 132-135.

261. SUTHERLAND, J.A. 1982
The sweet potato weevil.
Entomology Bulletin (17), in Harvest, 8(2): 90-93.

262. SUTHERLAND, J.A. 1984
The sweet potato weevil. (Revised).
Entomology Bulletin (17), in Harvest, 11(1): 28-32.

263. SUTHERLAND, J.A. 1985
The human flea
Entomology Bulletin (39), in Harvest, 11(3) : 121-123

264. THISTLETON, B.M. 1983
African armyworm.
Entomology Bulletin (21), in Harvest, 9(1): 45-47.

265. THISTLETON, B.M. 1980
Control of diamondback moth in brassicas.
Entomology Bulletin (8), in Harvest 6(2): 91-93.
(reprinted with corrections in 1982, Harvest, 8(1): 26-28.)

266. THISTLETON, B.M. 1984
Heliothis caterpillars
Entomology Bulletin (34), in Harvest, 10(4): 159-163.

267. THISTLETON, B.M. 1984
Oribius beetles.
Entomology Bulletin (30), in Harvest, 10(1): 36-40.

1. AGRICULTURAL AND ECONOMIC APPLICATIONS OF PESTICIDES

A. INSECTS CONTROL AND GENERAL PEST CONTROL

268. THISTLETON, B.M. 1980/1985
Protection of seedlings from cutworm damage.
Entomology Bulletin (7), in Harvest, 5(2): 89-90.
and revised in Harvest, 11(3): 117-120

269. THISTLETON, B.M. 1984
Taro beetles.
Entomology Bulletin (29), in Harvest, 10(1): 32-35.

270. VANCE, P.N. and DORI, F.M. 1979
Grain sorghum in the Morobe and Central Provinces.
Harvest, 5(1): 22-27.

271. WOHUINANGU, J. 1984
Some guidelines for growing rice under upland (dryland) conditions.
Harvest, 10(4): 133-137.

272. YOUNG, G.R. 1979
Biological and Chemical control of Ostrinia furnicalis Guenee (Lepidoptera: Pyralidae) on the mainland of Papua New Guinea.
Papua New Guinea Agricultural Journal, 30(1/3): 21-24.

273. YOUNG, G.R. 1979
Hand held ULV sprayers
Harvest, 5(1): 52

274. YOUNG, G.R. 1982
Nezara - the green vegetable bug.
Entomology Bulletin (16), in Harvest, 8(1): 36-38.

275. YOUNG, G.R. 1981
Sexava: a pest a coconut and oilpalm.
Entomology Bulletin (11), in Harvest, 7(2): 84-86.

276. YOUNG, R.G. 1981
Nezara viridula - a pest of beans and vegetables.
Bubia Agricultural Research Centre, Lae.
Information Bulletin (38).

1. AGRICULTURAL AND ECONOMIC APPLICATIONS OF PESTICIDES

B. PLANT DISEASE (FUNGI) CONTROL

277. ANON. 1980
Coffee rust disease.
Plant Pathology Notes (2), in Harvest, 6(1): 43-44.

278. ANON. 1980
Collar rot.
Plant Pathology Notes (3): in Harvest, 6(2): 94-95.

279. CLARKSON, D. and MOLES, D.J. 1984.
Effects of four fungicides on the growth of Phytophthora colocasiae.
Papua New Guinea Journal of Agriculture, Forestry and Fisheries, 33(1-2): 51-53.

280. CLARKSON, D. and TOMLINSON, D. 1982
Fungal diseases of tomato.
Plant Pathology Note (16), in Harvest, 8(1):39-42.

281. CLARKSON, D. 1980
Root knot nematode.
Plant Pathology Note (5), in Harvest 6(3): 154-156.

282. CLARKSON, D. 1983
South American leaf blight of rubber.
Plant Pathology Notes (7):

283. CLARKSON, D. 1981
Taro blight.
Plant Pathology Note (9), in Harvest, 7(2): 87-88.

284. DODD. P. 1979
Effects of pests and diseases on the yield and quality of tomatoes in the Port Moresby area, Papua New Guinea.
Papua New Guinea Agricultural Journal, 30(4): 53-59.

285. GOODBODY, S. 1982
Sweet potato leaf scab.
Plant Pathology Note (17), in Harvest, 8(2): 99-100.

286. FOREST PRODUCTS RESEARCH DIVISION. 1984
Code of practice for safety in timber perservation.
Hohola, Forests Products Research Division. Mimeographed notes.

1. AGRICULTURAL AND ECONOMIC APPLICATIONS OF PESTICIDES

B. PLANT DISEASES (FUNGI) CONTROL

287. GARDINER, J. 1983
PNG Standard preservation specification for sawn timber and round timber.
[Port Moresby], Forest Products Research Centre. Mimeo.

288. GREAVES, H 1975
Microbiological aspects of woodchip storage in tropical environments.
Aust. J. Biol. Sci., 28(3): 315-322.

289. JOLLANDS, P. 1985
Black pod control using knapsack pressure sprayers.
Rabaul, Cocoa Board. Technical Bulletin (6).

290. KING, G.A., 1985
Cassava.
Horticulture Note, No 8, in Harvest, 11(2): 84-86

291. KONABE, C. 1984
Survey of antisapstain chemicals used in Papua New Guinea.
Forest Products Research Centre, April 1984.
[Port Moresby], Forest Products Research Centre. Mimeo.

292. KONABE, C. AND OTENG-AMOAKO, A. 1984
Preliminary trials of Busan 1009 and captafol as antisap chemicals in Papua New Guinea. Paper prepared for the 21st Forest Products Research Conference at CSIRO Division of Chemical and Wood Technology: 6p.

293. KONABE, C. and OTENG-AMOAKA, A. 1985
Further field trials of some potential antisap chemicals
Forest Products Research Centre: 9p.

294. KULA, G.R. and CLARKSON, D. 1980
Coffee disease in the Western Highlands.
Harvest, 6(4): 199-201.

295. KULA, G.R. and YOUNG, G.R. 1981
Fiji disease of sugar cane and its vector.
Plant Pathology Note (10), in Harvest, 7(2): 89-92.

296. McGREGOR, A. 1983
Black pod disease of cocoa.
Plant Pathology Notes (6), in Harvest, 8(4): 189-192.

1. AGRICULTURAL AND ECONOMIC APPLICATIONS OF PESTICIDES

B. PLANT DISEASES (FUNGI) CONTROL

297. McGREGOR, A.J. 1984
Comparison of cuprous oxide formulations and stickers for control of Phytophthora pod rot of cocoa..
Ann. Appl. Biol., 104(Suppl.): 54-55.

298. McGREGOR, A.J. 1984
Comparisons of cuprous oxide and metalaxyl with mixtures of the fungicides for the control of Phytophthera pod rot of cocoa.
Plant Pathology, 33(1) : 81-87.

299. McGREGOR, A. 1984
Control of Phytophthora seedling blight of cocoa.
Papua New Guinea Journal of Agriculture, Forestry and Fisheries, 33(1-2): 39-50.

300. McGREGOR, A. 1982
Evaluation of five systemic fungicides for control of Phytophthora pod rot of cocoa.
In 8th International Cocoa Research Conference, 1982. Proceedings: 295-299.

301. McGREGOR, A. 1982
Evaluation of fungicides for control of black pod in Papua New Guinea.
Int. Conf. Plant Protection in the Tropics, Kuala Lumpur, 1982. Proceedings: 233-240.

302. McGREGOR, A. 1983
Experiments on the profitability of chemical black pod control in Papua New Guinea.
Trop. Pest. Manage., 29(2) : 139-136

303. McGREGOR, A. 1981
Ridimil tolerance.
Plant Pathology Note (14), in Harvest, 7(3): 139-141.

304. McGREGOR, A. 1982
A small-scale screening technique for evaluating fungicides against Phytophthora palmivora pod rot of cocoa.
Annals of Applied Biology, 101(1): 25-31.

305. MUTHAPPA, B.N. 1984
Brown eye spot disease of coffee.
Plant Pathology Note (23), in Harvest 10(1):41-42.

1. AGRICULTURAL AND ECONOMIC APPLICATIONS OF PESTICIDES

B. PLANT DISEASES (FUNGI) CONTROL

306. MUTHAPPA, B.A. 1985
Collar rot of abika.
Plant Pathology Notes (27), in Harvest, 11(2): 82-83.

307. MUTHAPPA, B.N. 1981
The importance of quarantine against coffee rust in Papua New Guinea.
Plant Pathology Note (12), in Harvest, 7(2): 93-95.

308. PRIOR, C. 1984
Approaches to the control of diseases of cocoa in Papua New Guinea.
Journal of Plant Protection in the Tropics, 1(1): 39-46.

309. PRIOR, C., O'DONOHUE, J., ROTSCHEID, R. and SITAPAI, E. 1981
Black pod, canker and seedling blight diseases of cocoa.
Kerevat, Cocoa Industry Board.

310. PRIOR, C. 1979
Cocoa canker and sudden death.
Kerevat, Lowlands Agricultural Experiment Station.
LAES Information Bulletin (25).

311. PRIOR, C. and SMITH, E.S.C. 1982
Control of bark canker in cocoa with Metalaxyl.
Trop. Pest Manage., 28(1): 45-48.

312. PRIOR, C. 1981
A new treatment for bark canker in cocoa.
Plant Pathology Note (11), in Harvest, 7(2): 91-92.

313. SMITH, E.S.C. 1981
An integrated control scheme for cocoa pests and diseases in Papua New Guinea.
Trop. Pest Manage., 27(3): 351-359.

314. TISSEVERASINGHE, A.E.K. 1983
Antisapstain trials (letter).
Forest Department, University of Technology: 2p.

315. TOMLINSON, D. 1981
Bacterial wilt.
Plant Pathology Notes (15), in Harvest, 7(4): 180-182.

1. AGRICULTURAL AND ECONOMIC APPLICATIONS OF PESTICIDES

B. PLANT DISEASES (FUNGI) CONTROL

316. TOMLINSON, D. 1983
Citrus canker.
Plant Pathology Note (19), in Harvest, 9(1): 48-49.

317. TOMLINSON, D. and PEARSON, M. (eds) 1981
3rd Papua New Guinea Plant Pathology Symposium.
1981, University of Papua New Guinea. Proceedings.
15pp.

318. TOMLINSON, D. 1984
Rice blast.
Plant Pathology Note (25), in Harvest, 10(2): 87-89.

C. WEED CONTROL

319. BALLARD, J.S. 1976
Use of herbicides under mixed coconut and cocoa stands in New Ireland.
Harvest, 3(5): 95

320. CHADHOKAR, P.A. 1976
Control of Devil's fig, Solarium torvum SW in tropical pastures in the Markham valley, PNG.
PANS, 22(1) : 75

321. CHADHOKAR, P.A. 1977
Resistance of tropical pasture species to herbicides.
Proceedings of the 13th International Grassland Congress. Sectional Papers, Sections 8, 9, 10.
Leipzig, GDR: 93-101.

322. CHADHOKAR, P.A. 1978
Weed problems of grazing lands and control of some problem weeds in the Markham Valley of Papua New Guinea.
PANS, 24(1): 63-66.

323. HENTY, E.E. and PRITCHARD, G.H. 1982
Weeds of New Guinea and their control.
Lae, PNG, Department of Forest. Division of Botany.
Botany Bulletin (7).
Lists common weeds in PNG, and makes recommendations on their control.

1. AGRICULTURAL AND ECONOMIC APPLICATIONS OF PESTICIDES

C. WEED CONTROL

324. JOLLANDS, P. 1984
Chemical weed control in cocoa.
Rabaul, Cocoa Board of Papua New Guinea. Cocoa Board Technical Bulletin (1): 58pp.

325. KIDD, D.W. 1978
Advice on weedicide.
Harvest, 4(2): 46-47.

326. LAMB, D. 1974
Chemical weed control in (pine) plantations at grassland sites.
Tropical Forestry Research Note, PNG, (SR 21). 13pp.

327. LAUP. S. 1985
The Sepik salvinia problem is beaten.
Harvest, 11(2): 49-52.

328. MITCHELL, D.S. 1979
The incidence and management of Salvinia molesta in Papua New Guinea.
Waigani, PNG, Office of Environment and Conservation and Department of Primary Industry.

329. PRITCHARD, G.H. 1971
Weed control in coffee in the New Guinea Highlands.
Papua New Guinea Agricultural Journal, 22(2): 87.

330. THOMAS, P.A. 1985
[Control of Salvinia by paraquat in Papua New Guinea]
Pl. Prot. Bull. FAO, 32:50-56.

331. THOMAS, P.A. and ROOM P.M., 1986
Taxonomy and control of Salvinia molesta
Nature, 320: 581-584.

D. OTHER ANIMAL PEST CONTROL

332. ANON., 1977
Baits for Giant African Snails.
Kerevat, Lowlands Agricultural Experiment Station.
LAES Information Bulletin (2).

PAPUA NEW GUINEA - continuing

1. AGRICULTURAL AND ECONOMIC APPLICATIONS OF PESTICIDES

D. OTHER ANIMAL PEST CONTROL

333. GREVE, J.E. vas S. 1981
Giant African Snail.
Entomology Bulletin (13), in Harvest, 7(4): 176-179

334. WOODHOUSE, S.D. 1981
Controlling rats and growing more food on Tingwon Island, New Ireland Province.
Harvest, 7(1): 1-4.

E. QUARANTINE

335. BENOIT, M.A. 1986
Plant quarantine perspectives in tropical root and tuber crop diseases.
Port Moresby, UPNG. Agriculture Department. Mimeo.

336. PAPUA NEW GUINEA. DEPARTMENT OF AGRICULTURE, STOCK AND FISHERIES. 1972
Animal and plant quarantine in Papua New Guinea: guide for importers.
Port Moresby, the Department.

337. SHAW, Dorothy E. 1976
Plant quarantine barrier and some breaches in Papua New Guinea.
Papua New Guinea Agricultural Journal, 27(4): 121-135.

2. ENVIRONMENT

338. BOURKE, T.V. 1973
Some aspects of insecticide application in malaria control programs other than the effect on the insect vectors.
Papua New Guinea Agricultural Journal, 24(1): 33-40.

2. ENVIRONMENT

339. KAPUSH, M., HAEI P., MOWBRAY, D.L. and BARIA A. 1986
Report on Coastal Water Quality Monitoring and Control Baseline Studies of Port Moresby Harbour Area, Final Report 1984-1985. Mimeograph . Prepared for Third Consultative Meeting of Research and Training Institutions in the South Pacific Region, Guam June 1986. Science Faculty, University of Papua New Guinea.
(includes details of initial studies on determining pesticide and heavy metal residues in marine animals).

340. LAUP, S. 1985
The Sepik salvinia problem is beaten.
Harvest 11(2):49-52

341. MOWBRAY, D.L. 1986
Likely effects of paraquat on the freshwater ecosystem in a Sepik River oxbow after experimental spraying to control Salvinia molesta. (in preparation).

342. OLAFSON, R.W. and MOWBRAY, D.L. 1980
Organochlorine residues in the Purari River Delta, Gulf Province, Papua New Guinea.
In PETR, T. (ed)
Environmental Study. Purari River (Wabo) Hydroelectric Scheme. Vol 11
Aquatic ecology of the Purari River Catchment.
Waigani, PNG, Office of Environment and Conservation.

343. PILOTTI, C.A. 1985
A survey of the status of environmental hazards from wood preservation plants in Papua New Guinea.
Forest Products Research Centre. Technical Report (18).

344. SMYTHE, L.E. 1979
Facilities for chemical analyses in Papua New Guinea.
Waigani, PNG, Office of Environment and Conservation.
21pp + 8pp (appendix)

PAPUA NEW GUINEA - continuing

3. LEGAL ASPECTS

345. MOWBRAY, D.L. 1979
Environmental contaminants in Papua New Guinea: Situation, legislation and role of IRPTC. Paper presented to UNEP/IRPTC Workshop for National Correspondents in Asia and the Pacific Region, Bangkok, Thailand, 1-3 August, 1979. 4pp.

346. MOWBRAY, D.L. 1985
Situation in PNG and South Pacific. Brief review of legislative situation and assessment of toxicological data for registration in PNG and countries of South Pacific. UNIDO Regional Forum on Pesticide Toxicology of Regional Network for the Production, Marketing and Control of Pesticides in Asia and the Far East, Baguio and Manila, Philippines, 22-26 April, 1985.

4. PUBLIC HEALTH

347. ANON. 1984
A note on paraquat.
Harvest 10(1) : 20

348. AFIFI, S.E.D., SPENCER, M., HUDSON, P.B. and TAVIL, N.W. 1984
A strategy of malaria control.
Papua New Guinea Medical Journal, 26(2): 111-113.

349. AITKEN, I. 1976
Arsenic poisoning associated with the burning of arsenic treated timber.
Papua New Guinea Medical Journal, 19(2): 103-104.

350. BARIA A. , MOWBRAY D.L. and KUMAR S.
Survey of organochlorine and organophosphate pesticide residues in the people of Papua New Guinea.
(in preparation)

351. BARKER-HUDSON, P. 1983
Simplification in malaria control as a response to complex problems.
Pac. Sci. Congr. Proc., 15(1-2): 14.

352. BINNS, C.W. 19?
A deadly cure for lice - a case of paraquat poisoning
Papua New Guinea Medical Journal, 19(2): 105-107

4. PUBLIC HEALTH

353. BINNS, C.W. 1978
Treatment for paraquat poisoning. (Letter)
Papua New Guinea Medical Journal, 21(2): 218.

354. BOURKE, T.V. 1973
Some aspects of insecticide application in malaria control programmes other than the effect on the insect vectors.
Papua New Guinea Agricultural Journal, 24(1): 33-40.

355. BOURKE, T.V.: MORRISON, W.B. and McCARTNEY, B.K. 1971
The effects of prolonged spraying with trichlorphon on blood cholinesterase levels of sprayers.
Papua New Guinea Agricultural Journal, 22: 151-164.

356. CHARLES. A.E. 1983
Paraquat poisoning in Papua New Guinea.
Harvest, 9(2): 96-100.

357. CHARLWOOD, J.D. and JOLLEY, D. 1984
The coil works (against mosquitoes in Papua New Guinea).
Royal Society of Tropical Medicine and Hygiene. Transactions, 78(5): 678.

358. EWERS, W.H. 1974
Parasites of man in Papua New Guinea.
Southeast Asian Journal of Tropical Medicine and Public Health, 3(1): 79-86.

359. EWERS, W.H., and JEFFREY, W.T. 1971
Parasites of Man in Niugini.
Brisbane, The Jacaranda Press.

360. FARRELL, K.T. 1978
An epidemic of Dengue fever in Wewak.
Papua New Guinea Medical Journal, 21(2): 191-196.

361. GUNTHER, J.T. 1974
The early history of malaria control in Papua New Guinea.
Papua New Guinea Medical Journal, 17(1): 4-7.

362. HORNABROOK, R.W., DYMENT, P.G., GOMES, E.D. and WISEMAN, J.S. 1972
DDT residues in human milk from New Guinea natives.
Medical Journal of Australia, 1(25): 1297-1300.

4. PUBLIC HEALTH

363. HOWARD, J.K. 1978
Treatment of paraquat poisoning. (Letter)
Papua New Guinea Medical Journal, 21(2): 217-218.

364. LEACH, D.N., LEACH, G.J and KALUWIN, C. 1984
Rotenone: its sources, chemistry and uses in Papua New Guinea.
University of Papua New Guinea. Unpublished manuscript.

365. MACLENNAN, R. and WALSH, R.J. 1973
Some hematological and biochemical effects of a malaria control program in New Guinea.
Hum. Biol. Oceanic, 2(1): 33-41.

366. McMAHON, J.E. 1973/74
Malaria epidemicity among the semi-nomadic people of the Karimui area of Papua New Guinea.
Papua New Guinea Medical Journal, 16/17(4/1): 99-107.

367. McMAHON, J.E. 1974
A note of changing concepts of malaria control.
Papua New Guinea Medical Journal, 17(1): 78-79.

368. McMAHON, J.E. 1972
Some brief comments on the anti-malarial campaign in Papua New Guinea and the recent WHO report. (Abstract)
Papua New Guinea Medical Journal, 15(4): 249.

369. MOIR, J. AND GARNER P 1986
Malaria Control through Health Services in Papua New Guinea.
Papua New Guinea Medical Journal, 29:27-33.

370. MOWBRAY, D.L. 1986.
Pesticide poisoning in Papua New Guinea and the South Pacific.
Papua New Guinea Medical Journal, 29: 131-141.

371. MOWBRAY, D.L. 1986
Comparison of LC50's of pesticides used in PNG for vector control on mosquitoes, freshwater shrimps and mosquitofish. (in preparation).

372. PAPUA NEW GUINEA, DEPARTMENT OF HEALTH
Annual Reports of the Malaria Control Branch, 1972 - 1984 (yearly). Port Moresby, Papua New Guinea.

4. PUBLIC HEALTH

373. PARKINSON, A.D. 1973/74
Malaria in Papua New Guinea, 1973.
Papua New Guinea Medical Journal, 16/17(4/1): 111-115.

374. RAY, A.P. 1974
Methods of malaria control and eradication.
Papua New Guinea Medical Journal, 17(1): 68-73.

375. REILLY, Q. 1986
The Control of Malaria in Papua New Guinea.
Papua New Guinea Medical Journal, 29(1) : 3-4.

376. ROY. P.K. 1985
Malaria control [in PNG]. Assignment Report, May 1980 - June 1985. WHO Regional Office for the Western Pacific. (WP)MAL/PNG/MAL/001.

377. SIYALI, D.S., WILKEY, I.S.and PARKINSON, A.D. 1973/74
Organochlorine pesticide residues in human fat samples from Papua New Guinea.
Papua New Guinea Medical Journal, 16/17(4/1):111-115.

378. SPENCER, M. 1977
Bionomics and behaviour patterns of the Anopheles punctulatus comples (Diptera : culicidar) in the D'entrecasteaux Islands, Papua.
Linnean Society of New South Wales. Proceedings, 101(2): 120-143.

379. SPENCER, M. 197?
Bionomics of vector anophelines in Papuan islands.
Papua New Guinea Medical Journal, 14(1): 14-23.

380. SPENCER, T., SPENCER, M.and VENTERS, D. 1973/74
Malaria vectors in Papua New Guinea
Papua New Guinea Medical Journal, 16/17(4/1): 20-30.

381. TOREU, Nelson 1979
What are food contaminants?
Harvest, 5(4): 232-235.

382. VINCE, J.D. 1981
Poisoning in Papua New Guinea. (Editorial)
Papua New Guinea Medical Journal, 24(2): 67-69.

4. PUBLIC HEALTH

383. VINCE, J.D., NUMAN, O. and LARSSON, L.O.H. 1981
Organophosphate poisoning.
Papua New Guinea Medical Journal, 24(2): 80-84.

384. WOHLFAHRT, D.J. 1982
Fatal paraquat poisoning after skin absorption.
The Medical Journal of Australia, June 12, 1982: 512-513.

385. WOHLFAHRT, D.J. 1981
Paraquat poisoning in Papua New Guinea.
Papua New Guinea Medical Journal, 24(3): 164-168.

386. WORLD HEALTH ORGANISATION. 1974
Malaria control in countries where time-limited eradication is impractical at present. Report of a WHO Interregional Conference.
Geneva, Switz., WHO, Technical Report Series No 537. 66 pp.

387. ZIGAS, V. and MOREA, V. 1973/74
Pre-operational malariometric survey, Kairuku subdistrict.
Papua New Guinea Medical Journal, 16/17(4/1): 93-98.

5. RECOMMENDATIONS/ADVICE ON SAFE HANDLING AND USAGE OF PESTICIDES

389. CHARLES, A.E. 1983
Paraquat poisoning in Papua New Guinea.
Harvest, 9(2): 96-100.

390. HILTON, R.G.B. 1985
A manual of pesticide safety in Papua New Guinean forestry.
Lae, University of Technology. Department of Forestry Report (2).

391. LANDELL MILLS ASSOCIATES. 1984
Key markets for agrochemicals in Southeast Asia. I : PNG
London, Ladell Mills Associates.

5. RECOMMENDATIONS/ADVICE ON SAFE HANDLING AND USAGE OF PESTICIDES

392. MOWBRAY, D. and BROUGH, E. 1983
Book review: Recommendations for the control of pests.
Konedobu, DPI. Technical Report 83/4.
The Safe and efficient use of pesticides.
Rural Handbook No 18. DPI, Konedobu.
Harvest, 9(2): 101-103.

393. MOWBRAY, D.L. and SUTHERLAND, J.A. (in press)
Pesticide use in Papua New Guinea.
Papua New Guinea Journal of Agriculture, Forestry and Fisheries

394. PAPUA NEW GUINEA. FOREST PRODUCTS RESEARCH DIVISION 1985
Code of practice for safety in timber preservation
Hohola, Forest Products Research Division, Department of Forestry.

395. SMITH, D.J. 1976
Pesticide labels.
Kerevat, Lowland Agricultural Experiment Station.
LAES Information Bulletin (10).
(In English and Tok Pisin)

396. SUTHERLAND, J.A. 1979
Evaluation of lever-operated knapsack and motorised sprayers.
PANS, 25(3): 332-364.

397. SUTHERLAND, J.A. 1980
Mistblowers.
London, Centre for Overseas Pest Research.

398. SUTHERLAND, J.A. 1979
Non-motorised hydraulic energy sprayers.
London, Centre for Overseas Pest Research.

5. RECOMMENDATIONS/ADVICE ON SAFE HANDLING AND USAGE OF PESTICIDES

399. SUTHERLAND, J.A. 1983
The safe and efficient use of pesticides
Konedobu, Department of Primary Industries,
Rural Development Series.
Handbook (18). 23pp.
Makes recommendations for insect and rodent control. Most sensibly only those insecticides less toxic are recommended. Those classified by WHO as being extremely or highly hazardous are not included. Suggests that pesticides other than those recommended should only be used if the need arises, and if DPI personel are satisfied the user has the necessary training to handle the more dangerous chemicals. Presently being rewritten and also tranlated into Tok Pisin.

400. SUTHERLAND, J.A. 1983
A manual for the safe and efficient use of pesticides.
Port Moresby, DPI, Agricultural Education Training Branch, Inservice Training Manual. (in press)

401. THISTLETON, B.M. (ED) 1983
Recommendations for the control of pests.
Konedobu, DPI, Entomology Section, Technical Report 83/4. v, 67pp.

402. THISTLETON, B.M. and GREVE, J.E. van S. 1980
Safe handling and use of pesticides - a code of practice.
Entomology Bulletin (9), in Harvest, 6(3): 149-153.

403. WOHLFAHRT, D.J. 1981
Recommendations and first-aids regarding poisons in Papua New Guinea.
Science in New Guinea, 8(1): 65-73.

13. PITCAIRN ISLAND

NO REFERENCES

14. SOLOMON ISLANDS

1. AGRICULTURAL AND ECONOMIC APPLICATION OF PESTICIDES

A. INSECT CONTROL AND GENERAL PEST CONTROL

404. BISSER, M. 1980
Forest pests of the Solomon Islands.
Honiara, Solomon Islands, Ministry of Natural Resources. Forestry Division. 10pp.

405. BROWN, E.S. and GREEN, A.H. 1958
The control by insecticides of Brontispa longissima (Gestro) on young coconut palms in the British Solomon Islands.
Bull. Ent. Res., 42(2): 239-272.

406. FENEMORE, P.G. 19 ?
The control of Brontispa (leaf beetle) of young coconuts. (roneoed publication)
Honiara, Solomon Islands.

407. MACFARLANE, R. 19?
Control of insect pests of Solomon Island crops.
no publication details.

408. MACFARLANE, R. 1983
Entomologist's Report 1981-1982.
Honiara, Solomon Islands, Ministry of Home Affairs and National Development.

409. MACQUILLAN, M.J. 1968
An insecticidal application for integrated control of the brown plant hopper in paddy rice.
J. Econ. Ent., 61(2): 568-576.

410. MACQUILLAN, M.J. 1975
Pests of rice in the Solomon Islands.
Fiji Journal of Agriculture, 37(1): 29-32

411. SOLOMON ISLANDS. MINISTRY OF AGRICULTURE AND LANDS 1981
Annual report of the Entomomogist 1980.
Solomon Islands, Ministry of Agriculture and Lands. 40pp.

1. AGRICULTURAL AND ECONOMIC APPLICATION OF PESTICIDES

A. INSECT CONTROL AND GENERAL PEST CONTROL

412. SOLOMON ISLANDS. MINISTRY OF AGRICULTURE AND LANDS. n.d.
How to use and maintain your sprayer.
Honiara, Government Printer.

413. STAPLEY, J.H. 1974
Annual report of the Entomologist for 1974, Solomon Islands.
Report. Ministry of Agriculture and Rural Economy. 12pp.

414. STAPLEY, J.H. 1975
Annual report ... for 1975, Solomon Islands.
Report of the Entomologist. Solomon Islands, Ministry of Agriculture and Rural Economy, 1975. 29pp.

415. STAPLEY, J.H. 1977
Annual report of the Entomologists for 1976, Solomon Islands.
Report. Ministry of Agriculture and Lands. 28pp

416. STAPLEY, J.H. 1978
Annual report of the Entomologist for 1977, Solomon Islands.
Report. Ministry of Agriculture and Lands. 42pp

417. STAPLEY, J.H. 1979
Annual report of the Entomologist for 1978, Solomon Islands.
Report. Ministry of Agriculture and Lands. 27pp.

418. STAPLEY, J.H. 1980
Annual report of the Entolomogist for 1979, Solomon Islands.
Report. Ministry of Agriculture and Lands. 30pp.

419. STAPLEY, J.H. 1981
Insect problems in tropical crops and the influence of the environment.
Alafua Agricultural Bulletin, 6(4): 88-103.

420. STAPLEY, J.H. 1978
The rice leaf roller in the Solomon Islands.
International Rice Research Newsletter, 1978: 13.

SOLOMON ISLANDS - continuing

1. AGRICULTURAL AND ECONOMIC APPLICATION OF PESTICIDES

B. PLANT DISEASE (FUNGI) CONTROL

421. GOLLIFER, D.E., JACKSON, G.V.H. and NEWHOOK, F.J. 1980
Survival of innoculum of the leaf blight fungus Phytophthora colocasiae infecting taro, Colocasia esculenta, in the Solomon Islands.
Annals of Applied Biology, 94: 379-390.

422. JACKSON, G.V.H. and GOLLIFER, D.E. 1975
Disease and pest problems of Taro, Colocasia esculenta in the Solomon Islands.
PANS, 21(1): 45-53.

423. JACKSON, G.V.H. and GOLLIFER, D.E. 1975
Storage rots of taro Colocasia esculenta in the Bristish Solomon Islands.
Ann. Appl. Biol., 80(2): 217-230.

424. JACKSON, G.V.H., GOLLIFER, D.E. and NEWHOOK, F.J. 1980
Studies on the taro leaf blight fungus Phytophthora colocassiae in Solomon Islands : control by fungicides and spacing.
Annuals of Applied Biology : 96(1): 1-10.

C. WEED CONTROL

425. BACON, P.S. 1982 (rec'd 1983)
The chemical control of Merremia spp in Forestry plantations on the Solomon Islands.
Trop. Pest Manage., 28(4): 355-358.

426. MILLER, F. 1982 (rec'd 1983)
Evaluation of glyphosate for use against Merrimia spp in the Solomon Islands.
Trop. Pest Manage., 28(4): 347-354.

427. NEIL, P.E. 1984
Climber problems in Solomon Islands forestry.
Commonwealth Forestry Review, 63(1): 27-34.

PART C PROPOSAL TO ESTABLISH A PESTICIDE INFORMATION, ADVISORY AND MONITORING NETWORK FOR THE SOUTH PACIFIC REGION.

1. INTRODUCTION

As is clearly shown in the report (Part A), a multitude of pesticides are available for use in the South Pacific region (Chapter 3), including use in agriculture and public health and in quarantine (Chapter 6) and forestry and timber preservation (Chapter 7). Incomplete records are kept on what is actually used. What is known is given in Chapter 4. Many of the pesticides used are banned or severely restricted somewhere else in the world; many are amongst those classified by WHO as extremely and highly hazardous despite the fact that many of the users are uneducated and untrained in the use of such toxic chemicals (Chapter 8). Many companies both outside and within countries actively promote increased use of pesticides (Chapter 5).

Many poisonings have been reported in three countries of the region, although many of the cases are deliberate and not accidental poisoning (Chapter 10). Most persons responsible for regulating pesticide use in their countries lack sufficient readily accessible information on the properties of pesticides. Yet it is available.(Chapters 9 and 14). Indeed much information is available from within the region (Part B - Bibliography). Such information needs to be brought to a central information centre where it can be readily disseminated as already suggested to SPREP by Harrow (1981 - Biblio no 597). Few, if any, records are kept on problems caused in each country by pesticides (poisoning of humans, fish, wildlife) (Chapter 10). Very little work has been done to determine residues in human tissues, foodstuffs and environmental samples. Very little is known anywhere on the fate of pesticides in tropical environments. (Chapters 10 and 11).

Furthermore the expertise to evaluate effects of pesticides used in the area of human health and on the environment is severely limited. Some expertise does exist in this area but it is scattered (Chapter 9). It should be 'harnessed' to serve the needs of the region.

At present three laboratories in the region (in French Polynesia, Guam, PNG) are doing or have done pesticide analyses. One other laboratory (at USP in Fiji) wishes to commence doing pesticide analyses. Of the first three laboratories, two (in Guam and PNG) are presently only capable of doing small numbers of analyses. The third, in French Polynesia, can do analyses on a large scale. (Chapter 11). The four laboratories would all be prepared to participate/cooperate together in serving the needs of the region given adequate funds and personnel.

At present few countries in the region have effective legislation (Chapter 12). Due to scarcity of technical expertise, and the lack of any infrastructure to enforce regulations those that do have problems in implementing their regulations to control pesticides and so ensure safe use (Chapter 13).

I propose the establishment of the following.

(1) Regional Pesticide Information Centre (PIC)
(2) Regional Pesticide Advisory Committee (PAC), which would administer a Regional Pesticide Advisory Scheme (PAS)
(3) Regional Pesticide Laboratory Network (PLAN)

All three would comprise a regional 'Pesticide Information and Advisory and Monitoring Network'. Funding should be sought from UN and other international agencies.

2. ESTABLISHMENT OF REGIONAL PESTICIDE INFORMATION CENTRE (PIC)

PIC could be based at UPNG, but it would work together with the South Pacific Plant Protection Officer in Fiji, or it could be established either with the SPREP office in Noumea or the SPC Plant Protection Office in Suva.

PIC would employ initially one fulltime staff to do the following:

(1) Collate information and data on the following:

(a) Compile a computer listing of all pesticides (a.i.) used, recommended for use or registered in the region, by country.

(b) Compile a computer listing of all formulations used, etc. in the region, by country.

(c) Compile a computer listing of all formulations used, etc. in the region, by crop use, and with special note of those recommended.

(d) Compile a computer listing of all formulations used, etc. in the region, by target organism with special note of those recommended.

(e) Compile a computer listing of all formulation used, etc. in the region, by importer, distributer, manufacturer and country of origin.

(f) Compile a computer listing of all pesticides banned, suspended or restricted in USA, EEC, Australia and New Zealand, with details.

(g) Compile a computer listing of all poisonings of

human/wildlife by pesticides imported into countries in the region.

(h) Compile, where possible, a listing of amounts of pesticides imported into countries in the region, and by manufacture/supplier.

(i) Compile a register on computer of 'pesticide experts' in the region, and their areas of expertise.

(j) Compilation of data on pesticides and the environment for the region.

(2) Collect a library of information on pesticides, including properties, data profiles and registration requirements of pesticides. Establish a collection of reference manuals, microfiche and books on all aspects of pesticide use; and a collection of company brochures, data sheets etc.. Other information is to be collected from United Nations and regional and 'overseas' sources, especially USEPA, EEC, IRPTC, RENPAF, FAO, WHO, IRPTC, Pesticide Section of Australian Government, Pesticide Board of New Zealand Government. Such a central collection of information could provide a quick 'query-response' service on pesticides for South Pacific countries.

(3) Compile a complete bibliography of articles on environment and health aspects of pesticide use in the region. Compile a bibliography on pesticide use in public health in the region. Assist the SPC Plant Protection Officer to update the current bibliography on Plant Protection in the region.

(4) Assist individual countries to produce small brochures and pamphlets on safe use of pesticides to be locally distributed in local languages as has been done in Guam.

(5) Regularly provide 'Pesticide Registrars' with updated information on pesticides.

Re (5): persons in South Pacific countries indicated a desire for copies of information on aspects of pesticide legislation and registration requirements. This material is now available but needs to be printed or obtained from UN, and then distributed. This can be done as soon as possible, providing sufficient funds are provided.

Financial Implications

Cost of printing and distribution of information

Costing need to be done, once project is approved but on estimate would be per annum at minimum US$ 30,000.

3. ESTABLISHMENT OF A REGIONAL PESTICIDE ADVISORY COMMITTEE (PAC) AND A REGIONAL PESTICIDE ADVISORY SCHEME.(PAS)

PAC should be established as soon as possible. It should meet to make recommendations to regional countries on what pesticides should be recommended for registration/use, and to recommend appropriate restrictions on use. The committee should include persons from plant protection, public health, environment departments, UN agencies, SPC, FAO and universities in the region with expertise in evaluating efficacy, toxicity and environmental aspects of pesticide use. Members should be restricted to persons residing in the region and who are actively involved in pesticide use. Observers and resource persons could be invited from industry and from either the New Zealand Pesticide Board or Australian Pesticide Branch. This committee should also establish guidelines for harmonisation of pesticide registration requirements in the region, and for suggesting other forms of controlling pesticide use in the region.

Robert MacFarlane, the SPC Plant Protection Officer (and formerly the officer mainly responsible for implementing the registration system in the Solomon Islands has suggested that a 'Regional Approval Scheme for Pacific Island nations' be established (pers. com.) . The mechanism for implementation of such a scheme would be as follows: Companies would submit details of registration elsewhere, and data and labels on any pesticide which they wished to market in the region to the Pesticide Advisory Committee. This committee would then review the product and issue an approval certificate for those pesticides and uses it thought suitable for the region. Countries could then import those products with comparative safety. The scheme would be voluntary with countries having the right to determine what they wished to import. Hopefully 'approved products' would be imported preferentially. If a country needed to import a non-aaproved product for a particular use the committee would advise on how to do that safely.

Financial Implications

Costing of travel to annual meeting in Noumea or Suva, estimated to be per annum (for 10 persons) US$ 15,000.

4. COOPERATION BETWEEN PESTICIDE LABORATORIES.

OR

Establishment of Regional Relationship between Laboratories - a Regional Pesticide Laboratory Network. (PLAN).

PLAN involves the upgrading of facilities and provision of extra personelle in the four laboratories in the region as follows:

Guam EPA	-	Micronesia
UPNG	-	Melanesia (excluding Fiji and New Caledonia)
USP	-	Polynesia and Fiji (ecl. French Polynesia)
LESE	-	French Polynesia and New Caledonia

Laboratories must be equipped to do small scale monitoring of residues of organochlorines, organophosphates and carbamates and other selected pesticides.

All laboratories will be equipped to do any of the following as the need arises, within limits:

(a) Monitoring/spot checks of water supplies.

(b) Monitoring/spot checks of human blood residues.

(c) Monitoring/spot checks of agricultural products-animal (meat, fish, eggs milk), plant (local and imported foodstuffs including vegetables), and soils.

(d) Do residue analyses of crop plants used in experimental trials

(e) Monitoring river and marine bivalves and other 'indicator' species, in conjunction with the 'Mussel Watch' program.

(f) Monitoring wildlife species in conjunction with appropriate research studies.

(g) Selected toxicity tests.

(h) Checking purity of pesticides/checking formulations.

The laboratories will need to be funded and staffed so program can be commenced by 1987,or as soon as possible thereafter, and be initially for two years until 1988 - 89.

It is essential that the laboratories collaborate and cooperate. Each government must be responsible for the training of the staff. Laboratories must be free to choose their own priorities, and work plans. Laboratories however should be encouraged to respond positively to request from governments given their limited facilities.

One person within the region should be designated PLAN co-ordinator. This persons is responsible to ensure:

(1) Sharing of information between laboratories
(2) Standardization of methods between laboratories and quality control (interlaboratory comparison / intercalibration exercises).

One proposal for funding by SPREP on upgrading laboratory

facilities, and for commencing some monitoring in the region is given in section 11.6 - 'Occupational and environmental hazards from use of pesticides'.

The above recommendations, though in a slightly different form, were put to the Fourth Regional Technical Meeting on Plant Protection in Noumea in February 1984 and received the meeting's support. It is time now to implement them!

5. FUNDING FOR CONTINUATION OF PESTICIDE PROJECT

5.1 BACKGROUND

The background to this report was given in the introduction (Chapter 1).

Implementation of the final recommendations of the 'pesticide report' is the responsibility of SPC and SPREP. Especially if a Pesticide Information Centre can not be established immediately, then funding for continuation of this project is critical, since

three jobs need to be done/continued. They are:

(a) Update this revised report. Country focal points should be requested to give an update of the present situation, and to make comments on the report. A new list of only those pesticides registered or actually used in each country for 1986-1987 should be included. A list of pesticides banned or restricted for use in other countries should be included with the reasons for such banning or restriction given.

(b) Write a 'condensed edition' of the report which can be easily understood by non-technical persons, politicians, planners etc. in South Pacific. It would be an enlarged and updated version of the Ambio paper.

(c) Update the bibliography. Bibliographies regularly become out dated. Many small articles, particularly xeroxed/roneoed editions are easily over looked. An attempt should be made be ensure all relevant material is included. Also, important key references should be annotated.

5.2 OBJECTIVES

To produce by December 1988 an updated and revised report, a 'condensed report' and an updated bibiography as listed (a) to (c) in 5.1.

5 3 WORKPLAN AND TIMETABLE.

First 6 months:	Printing by SPREP of this revised report. Distribution of report to all SPC countries and territories with attached request for revisions, addenda etc.
Second 6 months:	Update, revision of report, and extension of

bibliography using information received. List of current pesticides and banned/ restricted pesticides compiled.

Third 6 months: Write draft 'third edition' of report, and condensed edition. Continue with bibliography.

Fourth 6 months: Complete 'camera-ready' copy of 'third edition', 'condensed edition' and 'updated bibliography'.

5.4 METHODOLOGY

It is envisaged that travel will be necessary. The principle investigator will need to travel to Noumea to the Fifth Regional Technical Committee on Plant Protection in March-April 1987, and may be required to travel to Noumea or Fiji once more if the Pesticide Advisory Committee/Scheme is established. He will also probably be required to attend one other UNIDO/RENPAF consultation, probably in Manila over the two year period. It is envisaged that minimal travel will be required throughout the region Collation of all information will be done by correspondance with 'focal points' in each country listed in Table 1, and with SPC Plant Protection Officer, and SPC Library.

5.5 OUTPUTS

As listed in (a), (b), and (c), given in 5.1

5.6 INSTITUTIONAL ARRANGEMENTS

(a) Principal Investigator:

Dr David Mowbray. Science Faculty, University of Papua New Guinea, Port Moresby, Papua New Guinea.

(b) Lead Institution:

Science Faculty, University of Papua New Guinea, Port Moresby, Papua New Guinea.

5.7 BUDGET

The following funds are being sought for this project. At present no funds have been forthcoming. The University of Papua New Guinea would contribute service equivalent to in excess of US$ 2000 per year by allowing Dr Mowbray time to maintain this project.

Funds required are:

		1987	1988
Salaries:	Part time employment of South Pacific national to learn word processing and data storage skills, to compile a South Pacific register to assist Dr Mowbray in the above and in general correspondance.	1500	1500
Equipment: (technical information)	Chemical manuals and microfiche, ISO, UN and other relevant publications for South Pacific	850	500
Travel:	Attendance at regional conferences	1200	2500
Computing	UPNG Prime Computer	500	500
Reporting anda Printing Costs	Paper, letterhead, envelopes, printing.	450	500
	subtotal	4500	5500
	Total Cost of Project		10000

APPENDIX A

PESTICIDE QUESTIONNAIRE

(forwarded to South Pacific countries and territories initially on 12 July 1983)

The South Pacific Regional Environmental Program has initiated a "Pesticides Project" with the following general objectives:

a) The review existing information on pesticides' use and abuse within the region and on the level of residues within environmental samples;

b) To identify laboratories in the region with facilities for doing analyses of particular pesticide residues, to list equipment available and to list approporiate methods.

c) To identify personel in the region with expertise and experience for monitoring pesticide residues, and for evaluating environmental effects of pesticide use.

d) To identify the existing legislation on importation, sale, storage, use and disposal and its enforcement within the region.

e) To present a detailed proposal for monitoring of pesticides in environmental samples within the region.

UPNG Science Faculty has been requested to conduct this work. I have been asked by my Faculty to be the principal investigator.

In order to do (a) to (e) above I seek your assistance.

Could you please answer the following questions or supply the appropriate information, or give me the names of organisations and/or people who can assist me?

In the boxes I have included sample answers and information, to give an idea of what is required.

1. Registration of Pesticides

1.1 Do you have a Registrar of Pesticides, or Pesticides Advisory Committee and do you keep a register of pesticides allowed to be used in your country?

1. Registration of Pesticides (cont'd)

Eg. In Solomon Islands there is a specific person who is Registrar of Pesticides, a Pesticides Registration Advisory Committee and a register of all pesticides allowed to be used in the Solomons.

It is proposed to implement similar procedures in PNG.

1.2 When pesticides are considered for registration (or simply for use) does the importer/manufacturer have to provide information including such as ISO common name, chemical name, physical/chemical properties of pesticide and/or pesticide formulation, analytical methods for determining residues of active ingredient, toxicological data, and evience of registration elsewhere - for example in Australia, New Zealand, U.S.A., U.K. or Fiji.

2. List of Pesticides Used and Distributors

2.1 Attached is an alphabetical list of common names of many pesticides. Could you please tick all those pesticides used or recommended for use or registered for use in your country. Indicate in the appropriate column whether they are used or recommended for use on a small scale/on a large scale. Add at the end any pesticide used or imported for use in your country which is not included on the list.

2.2 Could you provide me with a list of names and addresses of companies that import and distribute pesticides in your country, or do Government Departments import directly?

E.g.: in PNG some of the main importers of pesticides for agriculture inlcude ICI, Farmset, Harrison and Crossfield, and Shell Chemicals. Vector Control and Malarial Control (of the Department of Public Health) often purchase their supplies directly from overseas.

---

3. Recommendations For Pesticide Use

3.1 Could you forward any booklet, brochure, pamphlet produced in your country which lists recommendations for use of pesticides?

E.g.: in PNG, the DPI has just published a booklet entitled: Thistleton, B.M. (ED); 1983: Recommendations for the Control of Pests, 1982-83

3.2 Alternatively do any of your departments advise following the recommendations of UN agencies or those of other countries e.g. U.S.A., N.Z., Australia or France?

E.g.: in PNG, The Urban Vector Mosquito Control Unit uses WHO guidelines in conjunction with the manufacturer's recommendations for mosquito control. in PNG, in the past use has been made by DPI of the following publications:

* Australia Department of Primary Industry, 1979: Uses of Insecticides in Australia 1979. Australian Government Printing Service.
* Australia Department of Primary Industry, 1982: Withholding periods, maximum residue limits and poisons schedules for agricultural and veterinary chemicals. 1982 Document PB431, 4th edition.

3.3 Could you state who makes recommendations for large scale use of pesticides - agricultural or health extension officers entomologist, plant pathologist, pest control operator, chemical company representative?

E.g.: in PNG recommendations are made by DPI scientific staff in conjunction with industry.

---

3. Recommendations for Pesticide Use (cont'd)

3.4 Could you forward a listing of any publications on safe use of pesticides published in your country?

E.g.: in PNG, the DPI has recently published a booklet entitled: Sutherland, J. 1983: The Safe and Efficient Use of Pesticides. DPI Rural Development Series Handbook No. 18.

---

4. Controls on Pesticides

4.1 Importation, Sale and Distribution of Pesticides

Are the importation, sale and distribution of pesticides controlled in any manner? Are Pesticides allowed to be sold in containers other than those in which they are imported?

E.g.: in PNG at present, the importation, sale and distribution of pesticides is regulated according to the schedule the pesticides/pesticide formulation is in under the 'Poisons and Dangerous Substances Act, 1952'. Also specific pesticides might have particular requirements, e.g. paraquat can only be sold if it contains an emetic and a stenchant, and can only be sold in original containers.

It has been proposed in PNG to classify pesticide and pesticide formulations according to the 'WHO Recommended Classification of Pesticides by Hazard' (WHO Chronicle, 29: 397 - 401 (1975)). Importation, sale and distribution of pesticides will be regulated according to this internationally accepted series of schedules; e.g.: Some pesticides may only be sold through specified outlets. Such persons selling these pesticides (classified under hazardous schedules) must keep an inventory of all sales; sales must be to holders of permits or licencees allowed to handle such pesticides. Other pesticides under another (less hazardous) schedule may be sold by food vendors or in stores, although the pesticides must be kept separate from foodstuffs. Furthermore pesticides cannot be sold in other than their original containers which all must be adequately labelled.

4.2 Labelling

What sorts of information are required on labels of pesticide containers? Are the labels in a language understood by all users?

4. Controls on Pesticides (cont'd)

4.2 Labelling (cont'd)

E.g.: in PNG it is proposed that labels on many pesticide containers must include:

* name of formulation
* % of each component of formulation
* approved ISO name of active ingredient
* prescribed methods of use
* precautions required
* symptoms of poisoning and methods of immediate treatment

and that such information should be written in English, Tok Pisin, and Motu. The type/amount of information required depends on the schedule in which the pesticide is classified.

4.3 Storage

Are pesticides allowed to be stored in containers other than the original labelled container in which they were imported? If so do you specify the type of storage vessel - e.g. glass, polythene, metal drum...? Are there restrictions on where pesticides may be stored?

E.g.: you may specifiy the type of storage facility. It may have to be a well ventilated, dry, cool shed with a concrete floor, with adequate fire protection and fighting equipment which meet 'National Standards'.

4.4 Transportation

Are there restrictions on the way pesticides are transported by road, ship, or air?

E.g.: There exist IATA and international shipping regulations concerning transportation of various pesticides by air and sea.

It is proposed in PNG to make it illegal to transport some pesticides in the same compartment as food, clothes etc where spillage may occur.

---

4. Controls on Pesticides (cont'd)

4.5 Disposal of Pesticides

Do you know how old/expired/unwanted pesticides are disposed of?

E.g.: it is usually recommended that such pesticides are diluted and dispersed on unused agricultural land or are buried in a sanitary landfill according to specified procedures. Pesticide containers should also be destroyed and buried.

4.6 Protective Clothing

Do you know of people who use protective clothing when using pesticides?

E.g.: It in generally recommended that when using hazardous pesticides one should use gloves, footwear, clothing, hats, goggles and respiratory protection which all should meet National/international standards.

4.7 Health Check-ups

Do you know of any regular users of pesticides who submit to regular medical examination?

E.g.: In Australia (and it is proposed in PNG) such persons should have regular blood tests and medical check ups.

---

4. Controls on Pesticides (cont'd)

4.8 Pesticide Legislation

Could you please forward a list of present or proposed legislation which has regulations controlling importation, sale, storage, use and disposal of pesticides in your country.

E.g.: in PNG all the following Acts or proposed bills or ammendments of them contain regulations which effect pesticide use in PNG:

1. Environmental Contaminants Act 1978
2. Environmental Planning Act 1978
3. Public Health Act
4. The Poisons and Dagerous Substances Act 1952
5. Industrial Safety, Health and Welfare Act 1961
6. Water Resources Act 1982
7. Pesticide Bill (DPI) 1983 (?)
8. Quarantine Act Chapter 234

At present control is implemented through (4) since (1) has no regulations for pesticides, (7) is still in drafting stage.

* In Solomon Islands the following Act and Regulations were passed in 1982:

  1. The Safety at Work Act, (Pesticide) Regulations 1982 under Safety at Work Act, 1982.

* In Fiji 'The Pesticide Act, 1972' regulates the registration and scale of pesticides.

---

5. Problems to Humans and Wildlife

5.1 Could you give any details of known poisonings of people by pesticides in your country over the last 10 years (preferrably give documented details)?

E.g.: In PNG in recent years there have been many reported cases of people poisoned by paraquat, and a few cases of persons poisoned by some of the organophosphates.)

5.2 Could you give any details of known poisonings of domestic animals or fish or wildlife in your country over the last 10 years (preferrably give documented details)?

E.g.: There is much literature dealing with wildlife poisonings and high residues in foodstuffs and wildlife in USA, Europe, Australia but none to my knowledge in PNG, probably because of small scale use of pesticides and no adequate facilities to check possible instances.

---

5. Problems to Humans and Wildlife (cont'd)

5.3 Do you know of any publications on problems/potential problems caused by pesticides in your country?

E.g.: in PNG in recent years a number of articles have appeared in PNG or Australian journals; they include:

* Bourke, T.V.; Morrison, W.B.; Macartney, B.K. 1971: The effect of prolonged spraying with trichlorphon on blood cholinesterase levels of sprayers. Papua New Guinea Agric. J. 1971; 22: 151 - 164.

* Wohlfahrt, D.J. 1981; Paraquat poisonings in Papua New Guinea. Papua New Guinea Med. J. 1981; 24 (3): 164 - 8

Also various articles have been published in the local newspapers, e.g. on Friday July 8, 1983 two articles on pesticides were published in PNG Post Courier, one on proposed legislation on pesticides, the second reviewing the Rural Development Handbook publication 'safe use of pesticides'.

---

6. Laboratory Facilities and Personel

6.1 Do you know of any laboratory/personel in your country capable of analysing any pesticide residues on a small scale/large scale?

6.2 Do you know of any work being done or that has been done in your country on analysing residues of pesticides in foodstuffs, fish, wildlife and other environmental samples, and human blood/tissues? If so please give name and address of persons or institutions involved. Are organisations/institutions from outside your country involved?

E.g.: in PNG recently some human blood samples have been sent to Australia for analysis; also at present at UPNG we are doing analyses of paraquat residues in fish, mud and water, and analyses of organochlorine and organophosphate residues in human blood.

APPENDIX B

QUARANTINE QUESTIONNAIRE

(forwarded to South Pacific countries and territories, initially on 2 December 1985.)

Respondents were asked to complete the questionnaire and to list those pesticides used in quarantine. Results of questionnaire is given in Chapter 6.

Questionnaire was as follows:

QUESTIONNAIRE ON PESTICIDES USED IN QUARANTINE IN SOUTH PACIFIC COUNTRIES AND TERRITORIES.

(prepared by David Mowbray and Alphonse Benoit)

Fill in: COUNTRY

NAME OF CONTACT PERSON

ADDRESS

DATE

Please answer the following questions:

1. List all legislation (laws, regulations....) which cover quarantine (animal and plant) in your country or territory.

2. What pesticides do you use in quarantine in your country/ territory?

Trade Name	Active Ingredient	Use

Please also tick separate list provided of pesticides used in South Pacific (attached).

[list of 50 active ingredients known to be used in quarantine was attached]

3. Do you, by law , have mandatory treatments of foodstuffs, planting materials, cultures, and other commodities? Please give details.

4. Please give details on your facilities for fumigation and other forms of treatment with pesticides, including dips, dusting, spraying, baits....

5. What problems do you have in using chemicals in plant quarantine and other quarantine procedures you use.

APPENDIX C

PESTICIDES USED IN SOUTH PACIFIC WHICH ARE BANNED,SEVERELY RESTRICTED OR CLASSED AS RESTRICTED-USE PESTICIDES ELSEWHERE IN THE WORLD,AND THOSE CLASSED AS EXTREMELY HAZARDOUS AND HIGHLY HAZARDOUS BY WHO.

For tables 54 to 60 reasons for categorization are generally due to human health and/or environmental reasons, but also include a few voluntary cancellations or withdrawals by the manufacturers.

Table 54. Compounds banned , withdrawn , not approved in United States of America

chloranil
chlordecone
copper acetoarsenite (paris green)
dinoseb
EDB
erbon
ethylan
a HCH
B HCH
HCH (mixed isomers)
isocyanurates
MH
nitrofen
oxyfluorfen
pirimicarb
2,4,5-T
strobane
2,3,6-TBA
TDE(DDD)
thallium

Table 55. Compounds severely restricted in USA

aldrin
arsenic compounds (arsenic troxide)
camphechlor
chlordane
chlorobenzilate
DDT
dibromochloropropane (DBCP)
dieldrin
dimethoate
endrin
fenoprop
fluoroacetamide
heptachlor
g HCH (lindane)
mercury compounds
mirex
parathion ethyl
phenyl mercury acetate
sodium arsenite
sodium cyanide
sodium fluoroacetate
strychnine

Table 56. Restricted use compounds in USA

acrolein	fonofos
acrylonitrile	g HCH (lindane)
aldicarb	heptachlor
allyl alcohol	hydrogen cyanide
aluminium phosphide	methamidophos
amitraz	methidathion
* azinphos methyl	methiocarb
calcium cyanide	* methomyl
* carbofuran	* methyl bromide
chlordimeform	mevinphos
* chlorfenvinphos	monocrotophos
chlorphacinone	nicotine
chloropicrine	* paraquat
* chlorpyrifos	parathion ethyl
chlonitralid	parathion methyl
cycloheximide	permethrin
* demeton	phorate
diallate	phosacetim
dicrotophos	phosphamidon
diflubenzuron	* picloram
* dioxathion	* sodium cyanide
* disulfoton	sodium fluoroacetate (compound 1080)
EDB	* strychnine
endrin	* sulfotep
EPN	sulprofos
ethoprop	TEPP
fenamiphos	terbufos
fensulfothion	zinc phosphide
fenvalerate	
fluoroacetamide	

* some formulations restricted-use.

Table 57. Compounds,banned,withdrawn,not approved by E.E.C.

camphechlor
chlordane
dieldrin
hexachlorobenzene
a HCH
B HCH
heptachlor

Table 58. Compounds severely restricted in E.E.C.

aldrin
DDT
endrin
phenylmercury acetate
mercury compounds

Table 59. Compounds banned,withdrawn,not approved in other countries but not in U.S.A. or E.E.C.

alachlor
aldrin
allidochlor
amitrole
antu
arsenic containing compounds (arsenic trioxide,calcium arsenate,lead arsenate,sodium arsenite)
azinphos methyl
benomyl
binapacryl
captafol
captan
carbaryl
carbophenothion
chlorbromuron
chlordimeform
chlorobenzilate
chloropicrin
cypruzine
2,4-D
DDT
demeton
dibromochloropropane (DBCP)
dinitramine
disulfoton
DNOC
endothal sodium
endrin
EPN
fenoprop
fentin hydoxide
fluoroacetamide
folpet
g HCH (lindane)
lead compounds
leptophos
malathion
maneb
methyl bromide
mephosfolan
mevinphos
MH
mirex
nicotine sulphate
oxythioquinox
paraquat
parathion ethyl
parathion methyl
PCP
phosphamidon
sodium arsenite
sodium cyanide
sodium fluoride
sodium fluoroacetate
strobane
strychnine
2,4,5 - trichlorophenol
TEPP
terbutylazine
thiometon

Table 60. Compounds severely restricted in other countries but not in U.S.A. and E.E.C.

aldicarb
aminocarb
carbosulfan
chlorthiophos
cycloheximide
dialifos
dichlorprop
dicrotophos
endosulfan
ethyl formate
ethoprop
fonofos
formaldehyde
hydrogen cyanide
methidathion
methomyl
methoxychlor
omethoate
phenthoate
phorate
sulfotep
sulprofos
tebuthiuron
thiophanate methyl

Tables 59 and 60 do not include those compounds which are only restricted 'for experimental purposes only'.

Table 61. List of pesticides classified in Class 1A "EXTREMELY HAZARDOUS"

aldicarb	hexachlorobenzene
arsenous oxide	leptophos
calcium cyanide	mephosfolan
chlorfenvinphos	mercuric chloride
chlormephos	mevinphos
chlorthiophos	parathion-ethyl
coumaphos	parathion-methyl
cycloheximide	phenylmercury acetate
demeton-O and -S	phorate
dibromochloropropane (DBCP)	phosfolan
diedrin	phosphamidon
dimefox	sodium fluoroacetate
disulfoton	sulfotep
EPN	TEPP
ethoprophos	terbufos
fenamiphos	thiomazin
fensulfothion	trichloronat
fonofos	

Notes to Class 1A:

Arsenous oxide is also known as arsenic trioxide, arsenious oxide, and white arsenic.

Table 62. List of pesticides classified in Class 1B "HIGHLY HAZARDOUS"

acrolein	heptenophos
aldrin	isazofos
allyl alcohol	isofenphos
aminocarb	lead arsenate
antu	
azinphos-ethyl	mecarbam
azinphos-methyl	methamidophos
azocyclotin	methidathion
bromophos-ethyl	methacarbate
butoxycarboxin	methomyl
calcium arsenate	methoxyethylmercury chloride (MEMC)
carbofuran	monocrotophos
carbophenothion	nicotine
chlordecone	omethoate
chlorophacinone	oxamyl
crotoxyphos	oxydemeton-methyl
demeton-S-methyl	paris green
dichlorvos	pentachlorophenol
dicrotophos	pirimiphos-ethyl
dimetilan	propetamphos
dinoseb	salithion
dinoseb acetate	sodium arsenite
dioxathion	sodium cyanide
DNOC	strychnine
edifenphos	thiofanox
endrin	thiometon
famphur	triazophos
fenthion	tributyltin oxide
fluoroacetamide	vamidothion
formetanate	zinc phosphide

Table 63 Most common compounds available in South Pacific but not registered for use in Australia nor New Zealand.

No of countries where reported to be available	Pesticide
8	zinc phosphide
5	difenacoum
	oxydemeton methyl
4	coumafuryl
	cythioate
	ethyl hexanediol *
	fonophos
	metobromuron
	sodium dichromate
3	chlorflurenol
	chlorobenzilate
	hydrocyanic acid
	monolinuron
	nicotine
	piperophos
	prometon
	quinalphos
	sodium arsenite
	4-(2,4,5-TB)
2	acrylonitrile
	aldicarb sulphonate
	benefin
	berelex
	bifenox
	bufencarb
	calcium arsenate
	carbosulfan
	chlormephos
	difenoxuron
	dimethametryn
	dipropetryn
	ditalimfos
	EXD
	fenac
	fluoroacetamide
	hexachlorobenzene
	hydrocarbon oil
	IBP
	ioxynil octanoate
	isoprocarb
	isopropalin

isoproturon
MEMC
methyl 5-hydroxy-2
benzimidazole carbamate
methyl thiophanate
mexacarbate
monalide
neptalam sodium
paris green
phosacetim
piperalin
plifenate
potassium azide
procyazine
profluralin
propetamphos
protect
ronnel
salicyanilide
sulfotepp
tetrasul
tolyfluanid

AC217,230
aldicarb sulphoxide
AMA
2 aminobenzimidazole
antu
arimiphos methyl
aspon
azobenzene
barium carbonate
benzadox
benzthiazuron
bromoxynil octanoate
brompyraxone
bronopol
bunema
buprofezin
butopyronoxyl
buturon
calcium cyanamide
calcium phosphide
calvinphos
carbon sulphide
cartap
CDEC
chinosol
chloramphenicol
chloraniformethan
chlorbromuron
chlorfenprop methyl
chlorhexidine glucon
chlorotoluron
chlorquinox
clofop-isobutyl

clonitralid
coumachlor
CPMC
credazine
cyanophos
cycloheximide
cycluron
cyperquat
diaphene
dibutyl succinate
dichloroethyl ether
diclobutrazol
dienochlor
dimefox
dimexano
dinobutan
EDC
ediphenphos
emitram
EPN
erbon
ethalfluralin
ethiofencarb
ethiolate
ethiphos
ethothexadiol
ethylene oxide
fenidim
fenuron - TCA
flumethrin
fluorodifen
fluotrimazole
flupropion
flurecol-n-butyl ester
flurenol
glyphosonate ammonium
halacrinate
hepteneophos
hexachloroacetone
hydrogen cyanide
hymexazol
isocarbanid
isifenphos
isonoruron
lesmethrin
lethane 384
mebenil
mephosfolan
methoprene
methoprotryn
methoxyethyl mercury
methyl mercuric chloride
methyl mercuric dicyanamide
MTC
1-naphthol
trans-nonachlor

parinol
phenobenzuron
phenothiazine
pindone
potassium cyanate
potassium dichromate
potassium diethyl
dithiophosphate
potassium diethyl
thiophosphate
potassium dimethyl
dithiophosphate
potassium dimethyl
thiophosphate
prothiocarb
pyridinitril
quinaceto-sulphate
quinonamid
rynia
sabadilla
salithion
sesamex
simetryn
sodium azide
sodium hypochlorite
sodium metaborate
sulphoxide
sulphamethazine
sweep
tebuthiuron
2,2,3,3, tetra fluoro-
proprionic acid
thiazfluron
thiocyclam
trichloronitromethane
2,4,5-trichlorophenol
tricyclazole
trifenmorph
validamycine acid
XMC
zinc sulphate

---

* probably registered in Australia/New Zealand, but not recorded as an active ingredient (in formulations containing synthetic pyrethroids)

SOURCES OF INFORMATION

1. I.O.C.U. The pesticide handbook. Second edition See Pub. No P5.

2. IRPTC Bulletins (various). UNEP, Geneva.

3. IRPTC 1983. IRPTC Legal File 1983. Vol I and II. See Pub No L2.

4. USEPA. Suspended, cancelled and restricted pesticides. See Pub. Nos P3 and P4.

5. USEPA. EPA Status Report on Rebuttable Presumption Against Registration (RPAR), 1982 US EPA, Washtington DC.

6 UN Secretariat. 1984 Consolidated list of products whose consumption and/or sale have been banned, withdrawn, severely restricted or not approved by Governments. First issue See Pub. No P2.

7. Ware G.W. 1983. Pesticides theory and application. See Pub No T1.

8. WHO Guidelines to the Use of WHO Recommended Classification of Pesticides by Hazard 1986-1987. See Pub No J4.

9. Personal correspondance.

Care must be taken in using the above lists since products may be withdrawn, not approved or placed on the restricted list for reasons other than human and environmental hazards, eg economic reasons. Products may be superceded or their market usage may diminish and the proprietor withdraws them.

These tables need to be revised so to clearly distinguish between products 'banned' or 'severely restricted' on toxicity and environmental grounds from those products withdrawn or not approved for other reasons. However it can be noted that according to the above sources must reasons for such categorization are based on matters related to human or environmental toxicology.

APPENDIX D

PESTICIDE CONTAINER USE QUESTIONNAIRE

In August 1985 this questionnaire was received from Dr I. H. Haines of the Tropical Development and Research Institute (TDRI) based in London in the United Kingdom. It was part of an international study to ascertain what happens to pesticide containers after use. Preliminary reports on the results of this world wide study have been published by Haines (1986) and WHO (1986) . 34 responses were received from PNG and forwarded to TDRI for inclusion in their study. Of these responses four were from government institutions and 30 from non-government organisations, eg chemical companies and plantations. The raw data received from their responses are summarised below. Although this report has yet to be written up it is included here because it shows clearly that sometimes pesticide containers are re-used in unacceptable ways or are not destroyed/disposed of correctly. Containers have been used to carry water and for storage of food, animal feeds and plant seeds. Container decontamination is a problem yet to be solved.

SUMMARY OF RESPONSES collated by Nora Dai and David Mowbray.

QUESTIONS		ANSWERS
1.	Do you use, handle, or are you responsible for, pesticides in any way?	YES 34 NO 0
2.	Do you keep, or are you responsible for, a stock or store of pesticides (indicate YES even if stock or store very small)?	YES 34 NO 0
3.	Do you stock or store pesticides in LARGE (greater than 100 litre/22 gal; typically, 200 litre/44 gal) metal drums?	YES 20 NO 14
4.	Do you stock or store pesticides in MEDIUM SIZE (20-100 litre/4.5-22 gal) metal drums or containers?	YES 29 NO 5
5.	Do you stock or store pesticides in SMALL (4.5 litre/1 gal up to, but NOT including, 20 litre/4.5 gal) metal containers?	YES 29 NO 5

6. Indicate the approximate size of your stock or store of pesticides in metal containers of each category:	APPROXIMATE NUMBER IN STOCK			
i. LARGE drums (greater than 100 litre/22 gal)	>100	10-100	<10	0
	2	9	9	14
ii. MEDIUM-SIZED drums or containers (20-100 litre /4.5-22 gal)	>100	10-100	<10	0
	4	15	9	6
iii. SMALL containers (4.5 litre/1 gal up to, but not including, 20 litre/4.5 gal)	>100	10-100	<10	0
	7	14	8	5

(> means "greater than")
(< means "less than")

---

7. Which of the following pesticide types are kept in metal drums drums or containers in your store?

Insecticides and acaricides	YES	29	NO	5
Herbicides	YES	23	NO	10
Fungicides	YES	12	NO	21
Others (eg rodenticides(1),molluscicides, nematicides(1), unspecified(3).	YES	5	NO	29

8. Which of the following pesticide formulations are kept in metal drums or containers in your store?

Emulsifiable concentrate (e.c.)	YES	29	NO	5
Wettable powder (w.p.)	YES	12	NO	20
Dust	YES	6	NO	26
Granule	YES	8	NO	24
Poison bait	YES	5	NO	27
Other Specify: sodium chlorate in drums	YES	1	NO	30

---

9. Do you stock emulsifiable concentrate (e.c) formulations of insecticides in metal drums or containers? YES 26 (go to 10) NO 7 (go to 12)

10. Do you stock e.c. formulations of insecticides in.

i. LARGE drums (greater than 100 litre/22 gal)? YES 11 NO 15

ii. MEDIUM-SIZE drums or containers (20-100 litre/ 4.5-22 gal)? YES 22 NO 4

iii. SMALL containers (4.5 litre/1 gal up to, but not including, 20 litre/4.5 gal)? YES 20 NO 6

11. Indicate the approximate size of your stock or store of insecticide e.c. formulations in metal containers of each category:

	APPROXIMATE NUMBER IN STOCK			
i. LARGE drums (greater than 100 litre/22gal)	>100	10-100	<10	0
	0	3	6	16
ii. MEDIUM-SIZE drums or containers (20-100 litre /4.5-22 gal)	>100	10-100	<10	0
	3	9	11	2
iii. SMALL containers (4.5 litre/1 gal up to, but not including, 20 litre/4.5 gal)	>100	10-100	<10	0
	2	12	6	6

(> means "greater than")
(< means "less than")

12.	Do you re-use empty metal insecticide e.c. containers IN ANY WAY?	YES (go to 15) 9		NO (go to 13) 23	
13.	If answer to 12. is NO, how are empty containers discarded or disposed?				
i.	sold or given away to others for re-use	YES	3	NO	12H
ii.	taken away by others for disposal	YES	0	NO	22
iii.	destroyed or otherwise made unusable by you or your staff.If YES to this question specify procedure: bury, squashed, holed; washed and buried in lime pit;clean & punctured; dumped and burned;crushed,thrown into a rubbish pit;crushed and buried in trenches,bomb holes; plastic ones burnt,metal drums punctured and dumped;used as culvert bridges on plantation; not specified.	Yes	3	NO	19
iv.	other (eg left empty on premises). Specify: only sell as new full containers, (some respondants replied NO but then specified ways inwhich they were reused, eg use as water container for spraying, storage of bulk items,for growing plants.	YES	4	NO	14

14. If answer to 13 i. or 13 ii. is YES, give following details:-

i. to whom are containers sold or given, or by whom are they taken away? Specify:
to plantations and village farmers (3)

ii. are containers cleaned or decontaminated YES 2 NO 2
If YES, specify procedure:
water and soda ash, water and wetting agent,

IF NO, why are they not cleaned or decontaminated? Specify:
packed in cartons (?),'used where much contact by people' (do not have empty containers as always sold full) Respondants not really understand question.

iii. If containers are re-used by others, for what purpose are they used? Specify (write "don't know" if uncertain):
collect water for spraying;end user arranges disposal; 'don't know';used for culvert; used for spray containers;used for containers in workshop,carrying cocoa,for storing wet beans, used as weedicide and insecticide containers.

(Although no respondant stated that containers were used for carrying water, cases of such usage are documented.)

iv. If containers are taken away for disposal, how are they disposed of? Specify (write "don't know" if uncertain):
dumped and burned;punctured;'don't know'.

---

15. If answer to 12. is YES, indicate purpose for which containers are used:

i.	re-used as containers for same insecticide (ie used to contain insecticide of same common name)	YES	4	NO	5
ii.	re-used as containers for insecticides of the same general type (eg organochlorine container re-used for other organochlorine insecticides; organophosphate container for other organophosphate insecticides)	YES	4	NO	5
iii.	re-used as containers for other types of insecticide (eg organochlorine container for organophosphate insecticides)	YES	1	NO	8
iv.	re-used as containers for different kind of pesticide (eg used for herbicides, fungicides, nematicides, rodenticides, molluscicides)	YES	5	NO	5
v.	re-used as containers for insecticide waste material (eg for outdated stock, to contain spilt insecticide). If YES, specify:	YES	0	NO	9
vi.	re-used as containers for waste material of different kind of pesticide (eg for herbicides, fungicides, rodenticides). If YES, specify:	YES	0	NO	9
vii.	re-used as containers for food or water.	YES	0	NO omit 16	9
viii.	re-used for other purposes. If YES specify: for storing kerosene;for carrying wet cocoa; for storing/carrying fuel;for washing cloths.	YES	3	NO	7

---

16. **Answer this question ONLY if your answer to 15 vii was YES. Containers are re-used for:**

i.	carrying food for human consumption	YES	NO
ii.	carrying food for livestock consumption	YES	NO
iii.	carrying water for human consumption	YES	NO
iv.	carrying water for livestock consumption	YES	NO
v.	carrying water for washing (human)	YES	NO
vi.	carrying water for washing (livestock)	YES	NO
vii.	carrying water for washing clothes	YES	NO
	(See answer to Question 15 viii washing cloths	YES 1	)
viii.	other (specify).	YES	NO

---

17. If answer to 12. is YES, are containers cleaned or decontaminated prior to re-used? YES 6 NO 5

18. If answer to 17 is YES, give details of cleaning or decontamination procedure:
water and detergent used;washed in petrol/kerosene, then in soapy water,then with storage solution; washed with water and wetting agent;repeated washing with water(3).

19. If answer to 17 is NO, explain why they are not cleaned or decontaminated:
are sold full;more-or-less same herbicides/ mixtures placed in same drum;same pesticide placed in container(2);'chemicals dangerous- people must not touch on washing"!(?)

20.	Have you, or anyone for whom you are responsible, ever suffered symptoms of pesticide poisoning? If YES, give details: methyl parathion poisoning of self;Gramoxone[R] blistering due to overfilled knapsack,and failure of operator to wash it after spraying;headache & chest-pain,running eyes and watery nose;mild poisoning by organophosphate; two cases of 'eye-burns and minor skin irritations; poisoning but no details given.	YES	6	NO	4
21.	Have you, or anyone for whom you are responsible, ever required professional medical attention for pesticide poisoning? If YES, give details: self-treated for methyl parathion poisoning; treated for dermal absorption of paraquat - was not fatal; no details given.	YES	3	NO	29

APPENDIX E

RENPAF.86 QUESTIONNAIRE

On 20 September 1986, the questionnaire was forwarded to all persons listed in Table 1. By 27 November the following countries had responded:

PAPUA NEW GUINEA	(PN)	13/ 9/86 (response for PNG is for situation under new regulations)
SOLOMON ISLANDS	(SI)	13/10/86
GUAM	(GU)	13/10/86
VANUATU	(VA)	14/10/86 (no established registration system)
NEW CALEDONIA	(NC)	16/10/86 (legislation does not require registration of pesticides; NC relies on the French registration system, hence questionnaire not filled in).
WESTERN SAMOA	(WS)	27/10/86 (no pesticide legislation at present)
TTPI	(TT)	27/10/86 (TTEPB ceases to be on 31.12.86; henceforth Marshall Islands EPA, FSM EPB, Palau EQPB; see Table 1)
COOK ISLANDS	(CI)	27/11/86

NAME OF COUNTRY:

ORGANIZATION RESPONDING:

DATA REQUIREMENTS FOR REGISTRATION:

CHEMICAL AND PHYSICAL PROPERTIES:

Do you require the data package proposed in the Report of the Regional Consultation in Harmonization of Pesticide Registration Requirements, October 1983?

Yes	PN	No	SI
	GU		VA
	WS		TT
	CI		

PN: if registered in Australia, NZ, USA, UK or other countries with acceptable registration proceedures, not all data package is required.

If NO, please state reasons briefly:

SI: has own requirements.
TT: registration done by USEPA; their registration decisions are accepted/adopted by TTPI governments; presume USEPA information requirements are similar to above data package.

EFFICACY DATA

Do you accept efficacy data from the applicant in support of registration?

YES	NO
PN	VA
SI	
GU	
WS	
TT (US does)	
CI	

Do you require efficacy testing to be done by Government research workers in your country?

YES	NO	SOMETIMES
GU	SI	PNG
WS	VA	
TT (US does)		
CI		

Do you take into account efficacy trials done in other countries on similar crops in similar climates?

YES	NO
PN	VA
SI	
GU	
WS	
TT (US does)	
CI	

If EPPO(European and Mediterranean Plant Protection Organization) or some other group develop test protocols, would you accept the principle of transportability of data developed in accordance with the protocols?

YES	NO
PN	GU
SI	
VA	
WS	
CI	

If NO, why?

GU: All test protocols pertaining to types of registration of pesticides should meet state and national standards (USEPA - FIFRA).
TT: This will be decided by new countries (FSM, Marshalls and Palau, but presume they will rely heavily on USEPA).

TOXICOLOGY:

Do you evaluate toxicology data?

YES	NO
PN	VA
SI	WS
GU	TT
	CI

If YES, who does the evaluation?

PN: Pesticide Working Party
SI: Pesticide Registration Committee
GU: Federal EPA in Wasington, D.C.
TT: rely on US evaluations

Do you seek advice from any international authority or country?

YES	NO
PN	VA
SI	
GU	
WS	
TT	
CI	

If YES, which one(s)?

PN: Australian Pesticide Board, Australian Dept of Health, New Zealand Pesticide Board, IRPTC, FAO, WHO.
SI: SPC Plant Protection Office
GU: National Enforcement Investigation Centre, Denver, Colorado.
WS: FAO, SPC, chemical companies
TT: USA, SPREP
CI: New Zealand (Pesticide Board)

Do you refer to toxicological reviews of international organizations or other countries?

YES	NO
PN	GU
SI	VA
TT	
CI	

If YES, which one(s)

PN: IRPTC, IPCS, FAO, WHO, Australia, N.Z.
SI: FAO/UNDP, WHO - if none available then applicant must supply proof of registration in Australia, N.Z., Hawaii, U.K. , Fiji or Japan.
TT: USA, WHO.
CI: New Zealand (Pesticide Board)

RESIDUES:

Do you require residue data when considering applications for registration?

YES	NO
PN	SI
GU	VA
WS	
TT (US does)	
CI	

If YES, do you require (all), (some), (no), trials done in your country?

ALL	SOME	NO
(GU)	WS	PN
CI		SI
		TT

Would you accept residue data generated in other countries on similar crops?

YES	NO
PN	
SI	
GU	
VA	
WS	
TT	
CI	

TT: Common problem is that EPA registration emphases mainland crop uses, not uses in Pacific islands.

Does your country have system of MRL's?

YES	NO
GU	PN
TT (US does)	SI
	VA
	WS
	CI

Does your country have facilities for monitoring residue levels both pre and post-registration?

YES	NO
GU	PN (inadequate!)
	SI
	VA
	WS
	TT
	CI

ENVIRONMENTAL ASPECTS

Do you consider environmental effects

VERY IMPORTANT		IMPORTANT?	
	PN		SI
	GU		
	VA		
	WS		
	TT		
	CI		

Do you require any specific tests on environmental effects of pesticides pre-registration?

YES		NO	
	PN		SI
	GU		VA
	CI		TT

If YES, what tests?

- PN: evaluate general toxicological reviews; not do tests ourselves
- SI: but considers data applicant furnishes as environmental tests carried out elsewhere.
- TT: US publications used
- CI: to determine quantities filtering into lagoons, streams and swamps.

If YES, do you follow the tests suggested in the FAO guidelines?

YES	NO	
		PN (do not do own tests)
		SI
		GU
		CI

PROCEDURES

PROPRIETARY RIGHTS:

Do you recognize the Proprietary nature of registration data?

YES		NO	
	PN		SI
	GU		VA
			CI

If YES, how do you do this?

- PN: data is confidential excepting small sections on human and environmental hazards. Each importer when applying for information must provide own information, or approval from original source of information for its use.
- GU: Through formal registration process conducted by Federal EPA.

Do you have a time period during which the second registrant must supply complete data unless an agreement has been reached with the first registrant?

YES		NO	
	GU		PN
			SI
			VA
			WS
			CI

If YES, what is the time period?

GU: 30 days for comments

How was this time period estimated?

GU: Based on review process and completeness of substantiating information for registration of pesticide product(s).

PHASED REGISTRATION:

Do you operate a phased registration scheme?

YES	NO	
		PN
		SI
		GU
		VA
		WS
		CI

If YES, describe briefly the type and major limitations placed at each stage:

AVAILABILITY OF PESTICIDES:

Do you have controls on the availability of pesticides depending on their 'hazard rating', ie toxicity and their potential to cause both environmental/ and or residue problems?

YES		NO	
	PN		VA
	SI		CI
	GU		
	WS		
	TT		

If YES, how do you operate these controls?

PN: can specify restrictions on sale and use
SI: chemical may be registered for restricted use or subject to other conditions of use
GU: through classification process established by Federal EPA
WS: Agriculture Store in collaboration with Agriculture Dept's Crop Protection section operates controls.
TT: US system of restricting use (both general restriction and restriction of specific uses). Also certain chemicals are banned for all uses.

SPECIFICATIONS:

Do you require detailed information on chemical and physical properties of formulations?

YES	NO
PN	VA
SI	
GU	
WS	
TT (US does)	
CI	

Are their data confidential?

YES	NO
PN	SI
GU	VA
	WS
	CI

If these are confidential, how long is confidentiality maintained?

PN: indefinitely
GU: until product (?)

Are local analyses required to authenticate specificants before registration?

YES	NO
	PN
	SI
	GU
	VA
	WS
	CI

If YES, which laboratory does this:

LABELLING

Do you follow the general recommendations for the layout of labels as recommended in the 1983 Report?

YES	NO
PN	SI
	GU
	VA
	TT
	CI

If NO, how do your labelling requirements differ from the recommendations in the 1983 Report?

PN: if labelled accepted in Australia, N.Z. then ok.
PN/SI: sample label but be supplied at time of application
GU: must conform to labelling requirements of FIFRA Pesticides Inspection Manual (Section 3, June 1975)
VA: since have no legislation, accept what is on label of imported product, usually of Australian and N.Z. standards.
TT: follow US requirements

Do you use the WHO Classification to indicate hazard of the product for labelling purposes?

YES	NO
PN	GU
SI	VA
	TT
	CI

Do you use colour coding on labels?

YES	NO
PN	SI
	GU
	VA
	TT
	CI

If YES, is this based on WHO Classification?

YES PN

If NO, on what system is the colour coding based?
CI: uncertain

Please specify colour coding used in your country.

PN: either Australia, or N.Z. acceptable; PNG label as per WHO recommendations.
SI: provided the label is accepted for use in country of manufacture it will be accepted in the Solomons; ie will accept labels from Australia, N.Z., UK etc but the label must be approved at registration.

PACKAGES

Are you required to approve packages as part of the registration requirements?

YES	PN SI	NO	GU CI	N/A	VA

If YES, what are the main criteria you use for acceptance.

PN: as long as safe.

APPENDIX F JOINT FAO/WHO CODEX ALIMENTARIUS COMMISSION CODEX COMMITTEE ON PESTICIDE RESIDUES

QUESTIONNAIRE TO COUNTRIES IN THE SOUTH-WEST PACIFIC REGION CONCERNING PESTICIDES AND PESTICIDE RESIDUES IN FOOD

circulated by Mr Robert MacFarlane, the Plant Protection Officer of the South Pacific Commission for Mr G.N. Hooper , the Pesticides Co-ordinator, Department of Primary Industry , Australia in October 1986.

1. Does your government require that before a pesticide may be used on an agricultural commodity (either before or after harvest) a maximum residue limit (MRL) or tolerance must be established for toxicologically significant residues of the pesticides resulting in or on the commodity?

2. Do MRLs established for approved or registered agricultural uses of pesticides in your country also apply to food commodities imported into your country?

3. Does your government routinely sample and analyse shipments of food for pesticide residues?

4. What are the major food commodities imported into your country?

5 What are the major food commodities exported from your country?

6. What are the most commonly available pesticides in you country?

7. Is there any monitoring of the quality of pesticide products?

8. Please describe briefly the structure of the Registration system in your country and give the names and addresses of the government departments involved.

9. Which foreign country(ies) registration regulations does your country follow most closely?

10. Are ther official or unofficial published notes for guidance and where can these be obtained?

11. Are new laws or regulations of major significance expected in the near future? If so, when are they likely to become effective?

12. What categories of pesticides are subject to the registration procedure?

13. Does the registration of a pesticide require the provision of toxicology? If so, to what extent.

14. Does the registration of a pesticide require the provision of residue data in edible crops, food or feeding stuffs? If so, must residue trials be carried out under local conditions?

15. Is it a requirement that methods of residue analysis be provided?

16. Please provide your comments on:

    - the relevance of the work of the CCPR to your countries needs.

    - the likelihood that your country could participate in future meetings of the CCPR.

    - the needs of countries in the South-West Pacific region insofar as pesticides and pesticide residues are concerned

17. Is your country involved with any other international organization involved with food safety? If so, please describe the program and its objectives.

18. Please provide the name and address for a contact officer for future correspondance concerning pesticides, pesticide residues in food and the activities of the Codex Committee on Pesticide Residues.

ACKNOWLEDGEMENTS

This report has been compiled through the contributions, assistance and co-operation of many people, organisations and government agencies; to whom I am most grateful.

The Bibliography has been compiled with the assistance of my wife Bligh Mowbray.

For the first draft published in January 1984, I would like to thank Barbara Frawley and Charles Vassel of the Environment Centre (in Sydney) , Brian Mowbray and Ruth Denison of E.B. Mowbray and Associates, Sydney, and my wife Bligh for the typing and printing.

For this updated report, I would like to thank the following people: Nora Dai and Bligh Mowbray assisted in the compilation of information; Vagi Raula and Vagoli Bouauka did the drawings and maps; Ali Vele, Mary George, Hilda Petrus, Elizabeth Panau and Bligh Mowbray helped type the script onto the word processor. Mohammad Choudry, Francis Sakala and Nelson Sariman assisted greatly with the word processing and printing; Cyril Nogah and Baua Koivaku and staff of the University Printery printed this edition.

If any reader should find factual errors in this report, please inform me immediately so that the necessary corrections can be made.

Please forward comments and corrections to:

Dr David Mowbray,
Principal Investigator,
Pesticide Project,
South Pacific Regional Environment Program,
Biology Department,
University of Papua New Guinea,
P. O. Box 320,
University P.O., Waigani,
PAPUA NEW GUINEA.

NOTES ON DAVID MOWBRAY

David Mowbray has been a lecturer in Biology at the University of Papua New Guinea since 1977.

He completed his Ph.D. from Sydney University in 1978 for which he did an intensive environmental impact assessment of the effects of pesticides used in cotton on the wildlife in a cotton growing area in Australia. His studies involved toxicity tests, residue analyses and ecological field studies, including studies on eggshell thinning in birds.

In PNG, he has continued his studies with pesticides doing further toxicity and residue work involving larvicides and paraquat; and a survey of organochlorine residues in people in PNG.

Since 1977 David has assisted and provided technical advice on pesticides to various PNG Government departments. He represented the PNG Government at a Regional Meeting of IRPTC in Bangkok (Thailand) in 1979. Through 1985 and 1986 he has helped frame the pesticide regulations and guidelines which are shortly to be gazetted in PNG. He will be a member of the Pesticide Working Party which will oversee the legislation.

In 1983, David was appointed the Principal Investigator of the Pesticide Project of the South Pacific Regional Environment Programme (SPREP). As such, he represented SPREP at two UNIDO Regional Consultations in the Philippines. The first was on the harmonisation of pesticide registration requirements in November 1983. The second was on toxicological requirements in April 1985. In December 1986 he will again represent SPREP at a follow-up UNIDO consultation on harmonization of pesticide registration requirements in the Philippines.

He travelled throughout the South Pacific in November 1983 to complete this detailed report on 'Pesticide use in the South Pacific' for SPREP. Since then he has kept a continuing correspondence with many persons in the Pacific on this study.

With associates at UPNG, he has commenced a project on organochlorine and heavy metal residues in bivalves from PNG in conjunction with SPREP and UNEP's Regional Seas Progarmme.

In early 1986, David completed studies for the PNG Government to determine the toxicity of various heavy metals, cyanide and tailings from the large Ok Tedi gold and copper mine on freshwater animals, and in mid 1986 submitted a report to the PNG Government on the biological impact of mine tailings on the Ok Tedi and Fly River freshwater system.

David Mowbray can be contacted at the following address:

Dr David L. Mowbray,
Principal Investigator,
Pesticide Project,
South Pacific Regional Environment Programme,
Biology Department,
University of Papua New Guinea,
P.O. Box 320,
University P.O., Waigani,
PAPUA NEW GUINEA.

1. AGRICULTURAL AND ECONOMIC APPLICATION OF PESTICIDES

E. QUARANTINE

428. HYDE, Neil H. 1978
Recommendations on improvements necessary to achieve an internationally acceptable standard of plant and animal quarantine. Report to Solomon Islands, Plant and Animal Quarantine Service. Auckland, N.Z. Ministry of Agriculture and Fisheries.

429. SOLOMON ISLANDS. 1971
Agriculture and livestock ordinance.
Honiara, Government Storekeeper.

430. SOLOMON ISLANDS. MINISTRY OF AGRICULTURE AND LANDS. 1979
Plant and animal quarantine: a guide to importers.
Honiara, the Ministry.

4. PUBLIC HEALTH

431. AVERY, J.C. 1975
The malaria eradication programme in the British Solomon Islands.
Papua New Guinea Medical Journal, 18(2): 124-125.

432. AVERY, J.G. 1978
Malaria in the Solomon Islands.
Practitioner, 220(1320): 942-949.

433. AVERY, J.G. 1973/74
Review of the Malaria Eradication Programme in the British Solomon Islands, 1970-72.
Papua New Guinea Medical Journal, 16/17(4/1): 50-60.

434. KIETH-REID, R. 1983
Malaria plague boom.
Island Business, June 1983: 29-30.

435. MAFFI, M. 1973
The mosquitoes (Diptera: Culicidae) of Rennell and Bellona.
Natural History of Rennel Island, British Solomon Island, 1973, 7: 41-60.

436. PAIK, Y.H. and AVERY, J.G. 1973/74
Problem areas in the Malaria Eradication Programme in the British Solomon Islands.
Papua New Guinea Medical Journal, 16/17(4/1): 61-67.

4. PUBLIC HEALTH

437. SAINT-YVES, I.F.M. ?
The Malaria burden and population growth in the Solomon Islands.
Papua New Guinea Medical Journal, 21(2): 162-174.

438. SLOOFF, R. and BELKIN, J.N. 1972
Mosquitoes collected in the British Solomon Island Protectorate between March 1964 and October, 1968, (Diptèra: Culicidae).
Entomologische Berichten, 32(9): 171-181.

439. TAYLOR, B. 1975
Changes in the feeding behaviour of a malaria vector, Anopheles ferauti Lav., following use of DDT as a residual spray in houses in the British Solomon Islands Protectorate.
Royal Entomological Society of London, Transactions, 127(3): 277-292.

440. TAYLOR, B. 1975
Observations on malaria vectors of the Anopheles punctulatus complex in the British Solomon Islands Protectorate.
Journal of Medical Entomology, 11(6): 677-687.

441. TURNER, D.A. 1979
A review of the malaria eradication programme in the Solomon Islands, 1975-76.
Papua New Guinea Medical Journal, 1977 (recd 1979) 20(4): 188-197.

442. TURNER, D.A. 1977
ULtra-low-volume ground aerosol as a supplementary anti-vector measure in the Solomon Islands malaria eradication programme.
Mosquito Notes, 37(4): 624-628.

443. WEBBER, R.H. and SOTHGATE, B.A. 1981
The maximum density of anopheline mosquitoes that can be permitted in the absence of continuing transmission of filariasis.
Royal Society of Tropical Medicine and Hygiene. Transactions, 75(4): 499-506.

4. PUBLIC HEALTH

444. WEBBER, R.H. 1977
The natural decline of Wuchereria bancrofti infection in a vector control situation in the Solomon Islands.
Royal Society for Tropical Medicine and Hygiene. Transactions, 71(5): 396-400.

445. WEBBER, R.H. 1975
Vector control of filariasis in the Solomon Islands
Southeast Asian Journal of Tropical Medicine and Public Health, 6(3): 430-434.

446. WORLD HEALTH ORGANISATION. 1976
Dengue fever surveillance in some countries of Asia and the Southwest Pacific.
WHO, Weekly Epidemiological Record, 51(5): 113-116.

5. RECOMMENDATIONS/ADVICE ON HANDLING AND USAGE OF PESTICIDES

447. MACFARLANE, R. ?
Solomon Island weeds and their control.
Honiara, Ministry of Agriculture and Lands, Information Book.
General book on weeds, and recommendations for their control.

15. TOKELAU

1. AGRICULTURAL AND ECONOMIC APPLICATIONS OF PESTICIDES

D. OTHER ANIMAL PEST CONTROL

448. GILBERT AND ELLICE ISLAND COLONY. 1968
Agricultural Annual Report. Tarawa.
(mentions rat problems and use of zinc phosphide an warfarin)

449. VILI, S. 1980
Agricultural development in Tokelau.
Alafua Agricultural Bulletin, 5(4): 23-25.

TOKELAU - continuing

1. AGRICULTURAL AND ECONOMIC APPLICATIONS

D. OTHER ANIMAL PEST CONTROL

450. YALDWYN, J.C. and WODZICKI, K. 1979
Systematics and ecology of the land crabs Decapoda coenobitidae, Grapsidae and Gecarcinidae of the Tokelau Islands, Central Pacific.
Atoll Res. Bull., (235): 1-58.
Includes mention of rat control.

2. ENVIRONMENT

451. MARSCHALL, K.J. 1976
Critical marine habitats and insect control in the South Pacific.
SPC and UICN Second Regional Symposium on Concservation of Nature, Apia, Western Samoa. Proceedings.

452. YALDWYN, J.C. and WODZICKI, K. 1979
Systematics and ecology of the land crabs Decapoda, Coenobitidae, Grapsidae and Gecarcinidae of the Tokelau Islands, Central Pacific.
Atoll Res. Bull., (235): 1-58.

16. **TONGA**

1. AGRICULTURAL AND ECONOMIC APPLICATIONS OF PESTICIDES

A. INSECT CONTROL AND GENERAL PEST CONTROL

453. CROCKER, P. 1979
A home produced insecticide Derris malaccensis
Alafua Agricultural Bulletin, 4(3): 8-10.

454. CROCKER, P. 1979
Plant insecticide investigations.
Nuku'alofa, Tonga. Ministry of Agriculture, Fisheries and Forests. Roneoed publication.

455. FAKALATA, O. 1981
Weevil pest on Kava stems in Vava'u (Tonga).
Alafua Agricultural Bulletin, 6(1): 38-39.

1. AGRICULTURAL AND ECONOMIC APPLICATIONS OF PESTICIDES

A. INSECT CONTROL AND GENERAL PEST CONTROL

456. SHANOWER, T.G. and VON KEYSERLINGK, N. 1984
The coconut spike moth in Tonga. Paper presented to the Fourth Regional Technical Meeting of Plant Protection, 13-17 February, 1984, Noumea.
SPC/Plant Protection 4/WP.18

457. VON KEYSERLINGK, N. 1981
Pests of coconut palms in Tonga.

B. PLANT DISEASE (FUNGI) CONTROL

458. STOVER, R.H. ?
Some diseases and cultivation problems in Tongan bananas.
Nuku'alofa, Tonga. Ministry of Agriculture, Fisheries and Forests. Roneoed publication.

D. OTHER ANIMAL PEST CONTROL (RATS, ETC.)

459. WILLIAMS, J.M. 1982
Rat damage, ecology and control in the South Pacific
Tonga, Ministry of Agriculture, Forests and Fisheries.
In TONGA, MAFF: pp 75-99 (see 424).

460. VON KEYSERLINGK, N., HILDEBRANDT, A.V. and SCHULZ, E. 1983
Assessment of rat damage to cocconuts in Tonga and the viability of control. Paper presented to the 15th Congress of the Pacific Science Association, Dunedin, New Zealand, 1-11 February, 1983.

E. QUARANTINE

461. STOUT, Oliver O. 1978
Review of plant quarantine law of Tonga: an act to provide for the prevention and eradication of diseases affecting vegetation, 23 September, 1916.
Suva, FAO. Survey of Agricultural Pests and Diseases in the South Pacific.

3. LEGAL ASPECTS

462. FIRMAN, I.D. and BOTTRELL, D.G. 1982
Pesticide legislation; rationale and status.
In TONGA, MAFF: pp 260-262 (see 424)

463. FRYAUFF, D.J. 197?
Pesticide regulation and registration in the Kingdom of Tonga.
Nuku'alofa, Tonga. Ministry of Agriculture, Fisheries and Forests. Roneoed publication.

464. FRYAUFF, D.J. 1980
Pesticide regulation and registration in the Kingdom of Tonga.
Nuku'alofa, Tonga. Ministry of Health. Public Health Division. Newsletter, May-June, 4(3): 17-30.

4. PUBLIC HEALTH

465. WORLD HEALTH ORGANISATION. 1976
Dengue fever surveillance in some countries of Asia and the South West Pacific.
WHO, Weekly Epidemiological Record, 51(5): 113-116.

5. RECOMMENDATIONS/ADVICE ON HANDLING AND USAGE OF PESTICIDES

466. *CROCKER, P. and FAKALATA, O. 1982
Inisekite mo hono malu'i Tonga.
Puletini Saka-tekinikale Fika 3.
(Insects and their control in Tonga.
Technical Bulletin (3).)
Nuku'alofa, Ministry of Agriculture, Fisheries and Forests.
(in Tongan).

467. *CROCKER, P. 1979
Insecticide recommendations for crops in Tonga.
(December, 1978)
Nuku'alofa, Tonga. Ministry of Agriculture, Fisheries and Forests. Roneoed leaflet.

468. ENGLBERGER, K. 1983
Vegetable home gardening. A training manual.
Nuku'alofa, Ministry of Agriculture, Fisheries and Forests
Roneoed edition.

5. RECOMMENDATIONS/ADVICE ON SAFE HANDLING AND USAGE OF PESTICIDES

469. *FRYAUFF, D.J. 1981
Recommendations for chemical pest control and plant protection in the Kingdom of TONGA.
Nuku'alofa, Tonga. Ministry of Agriculture, Fisheries and Forests. Technical Bulletin (2): 81pp.
General book on recommendations for pest control.

470. FRYAUFF, D.J. and ENGLBERGER, K. 1984
Pesticide recommendations for Tonga.
Nuku'alofa, Ministry for Agriculture, Fisheries and Forests. Technical Bulletin (2).

471. RATHEY, R. 1983
Chemicals for agricultural use.
In AGRICULTURAL INPUT SURVEY, 1982-83.
Nuku'alofa, Tonga. Ministry of Agriculture, Fisheries and Forests.

472. TONGA. MINISTRY OF AGRICULTURE, FISHERIES AND FORESTS. 1982
Sub-regional training course on methods of controlling diseases, insects and other pests of plants in the South Pacific, October 4-20, 1982, Vaini, Kingdom of Tonga..
Tonga/GTZ/USAID/CICP.

473. VON KEYSERLINGK, N. 1982.
Chemical Control - Principles and Techniques.
in TONGA,MAFF p308 (see 424)

17. TRUST TERRITORIES OF THE PACIFIC ISLANDS (TTPI)

GENERAL

1. AGRICULTURAL AND ECONOMIC APPLICATIONS OF PESTICIDES

E. QUARANTINE

474. TRUST TERRITORY OF THE PACIFIC ISLANDS. CHIEF OF AGRICULTURE. 1976
Animals and plants quarantine controls: plant and animal quarantine administration and enforcement of emergency measures (25: I and II).

475. Trust Territory of the Pacific Islands. Territorial Register: 2(1): 426-435.

476. TRUST TERRITORY OF THE PACIFIC ISLANDS. CHIEF OF AGRICULTURE. 1973
Plant and animal quarantine and regulations. Revised, September, 1972. Saipan, Trust Territory of the Pacific Islands. 12,4pp.

3. LEGAL ASPECTS

477. TRUST TERRITORY OF THE PACIFIC ISLANDS. ENVIRONMENTAL
Trust Territory pesticides regulations (63: 13: IV). Saipan, the Board.

4. PUBLIC HEALTH

478. NOWELL, W.R. 1980
Comparative mosquito collection data from the Southern Mariana Islands in the West Pacific, Diptera culicidae . 48th Meeting, Anaheim, Calif., USA, Jan. 20-30, 1980. Proc. Pap. Ann. Conf. Calif. Mosq. Vector Control Assoc. Inc., (52): 1-13.

5. RECOMMENDATIONS/ADVICE ON SAFE HANDLING AND USE OF PESTICIDES

479. TRUJILLO, E.E. 1971
Advisory leaflets nos. 1-35.
Saipan, Mariana Islands. Division of Agriculture.
Series of one page advisory leaflets on pest control.

TRUST TERRITORIES OF THE PACIFIC ISLANDS (TTPI) - GENERAL - continuing

5. RECOMMENDATIONS/ADVICE ON SAFE HANDLING AND USAGE OF PESTICIDES

480. TRUST TERRITORY OF THE PACIFIC ISLANDS. DEPARTMENT OF AGRICULTURE. n.d
(Pesticide usage, TTPI)
(Saipan, the Department)

FEDERATED STATES OF MICRONESIA

2. ENVIRONMENT

481. FALANRUW, M.V.C. 1980
Marine environmental impacts of land-based activities in the Trust Territory of the Pacific Islands.
Paper presented to the UNESCO Conference, 1980, Papua New Guinea.

MARSHALL ISLANDS

2. ENVIRONMENT

482. ATLAS, E. and GIAM, C.S. 1981
Global transport of organic pollutants: ambient concentrations in the remote marine atmoshphere.
Science, 211(4478): 163-165. (Enewetok)

18. TUVALU

1. AGRICULTURAL AND ECONOMIC APPLICATIONS OF PESTICIDES

A. INSECT CONTROL AND GENERAL PEST CONTROL

483. FOOD AND ARGICULTURE ORGANISATION. 1974
Report to the government of the Gilbert and Ellice Islands Colony on a survey of insect pests of crops.
FAO (based on the work of Peter D. Manser). Rome, FAO. v, 35pp. UNDP Report (TA3246)

TUVALU - continuing

1. AGRICULTUIRAL AND ECONOMIC APPLICATIONS OF PESTICIDES

D. OTHER ANIMAL PEST CONTROL

484. GILBERT AND ELLICE ISLAND COLONY. 1968
Agricultural Annual Report. Tarawa.
(mentions rat problems and use of zinc phosphide and warfarin)

E. QUARANTINE

485. CHOCK, A.K. 1977
Current quarantine procedure and facilities: Tuvalu. Suva, FAO. Survey of Agricultural Pests and Diseases in the South Pacific.
(Confidential)

486. TUVALU. 1976
Plants ordinance 1976.
Tuvalu Gazette (4): 1-11.

487. TUVALU. MINISTRY OF COMMERCE AND NATURAL RESOURCES. n.d.
Guidelines for importers, exporters and quarantine officers to the plant and animal quarantine regulations and laws...
Funafuti, the Ministry.

4. PUBLIC HEALTH

488. LAIRD M. AND MOKRY J, 1983
Larval Aedes-aegypti from Tuvalu South Pacific Papaya Trees.
Mosq. News 43(1) : 81-82.

489. LERD [LAIRD], M. 1984
[Integrated methods of vector control and the threat of dengue haemorrhagic fever in the tropical zone of the Pacific Ocean.] (in Russian)
Parazitologiya, 18(2): 99-105

19. VANUATU

1. AGRICULTURAL AND ECONOMIC APPLICATIONS OF PESTICIDES

E. QUARANTINE

490. NEW HEBRIDES. DEPARTMENT OF AGRICULTURE. 1977
Guidance notes for importers in the New Hebrides: plants, animals, plant and animal products.
Vila, the Department.

491. WELLER, R. and KANAS, E. 1984
Country paper on plant protection: Vanuatu.
Paper presented to the Fourth Regional Technical Meeting on Plant Protection: Vanuatu 1317 February, 1984, Noumea.
SPC/Plant Protection 4/WP.8.
[Noumea, SPC].

4. PUBLIC HEALTH

492. GUILLO, J.Y. 1984
[Pathology of the Republic of Vanuatu.]
La pathologie en Republique de Vanuatu.
Bulletin de la Societe de Pathologie Exotique et ses Filiales, 77(2): 222-226.

493. HAZBUN, J. A. 1986
Control of Importation of Pesticides
Mimeo WHO, Vanuatu
(article on three deaths by poisoning by parathion).

494. MAFFI, M. and RATARD, R.C. 1974
Malaria on the Banks and Torres Islands - New Hebrides Archipelago.
Parasitologia (Rome), 16(2-3): 151-197.

495. WORLD HEALTH ORGANISATION. 1976
Dengue fever surveillance in some countries of Asia and the Southwest Pacific.
WHO Weekly Epidemiological Record, 51(5): 113-116.

20. WALLIS ET FUTUNA

NO REFERENCES

21. WESTERN SAMOA

1. AGRICULTURAL AND ECONOMIC APPLICATIONS OF PESTICIDES

A. INSECT CONTROL AND GENERAL PEST CONTROL

496. ANON 1984
Country Report - Western Samoa.
Presented to the Fourth Regional Technical Meeting in Plant Protection, 13-17 February, 1984, Noumea
SPC/Plant Protection 4/2P.22
[Noumea, SPC]

497. AUKUSO, O. and DHARMARAJU, E. 1980
Banana scab moth control.
Alafua Agricultural Bulletin, 5(1): 17.

498. DALE, P.S. and HERRIING, J.L. 1956
Pest control in Samoa.
Western Samoa, Department of Agriculture, Forest and Fisheries. 15pp.

499. DHARMARAJU, E. 1977
Trunk injections with systemic insecticides for the control of the coconut stick insect, Graeffea crouanii (Le Guillou).
Alafua Agricultural Bulletin, 2(2): 6-7.

500. DHARMARAJU, E.; BERGER, A.: ULUPAGO, M. and AUPAAII, E. 1979
The sugar cane weevil on coconuts in Western Samoa.
Alafua Agricultural Bulletin, 4(2): 8-9.

501. FAU, S.S. 1980
Agricultural Store Corporation of Western Samoa.
Alafua Agricultural Bulletin, 5(4): 33.

502. FITZPATRICK, B. 1980
Aerial spraying in Western Samoa.
Alafua Agricultural Bulletin, 5(2): ? pp.

503. HEKA, A.T. 1972
Crop protection manual.
Alafua, Western Samoa. South Pacific Regional College of Tropical Agriculture. Research Paper Series. 62pp.

504. HEKA, A.T. 1980
"Ripcord" in the control of pests of cabbages.
Alafua Agricultural Bulletin, 5(1): ? pp.

WESTERN SAMOA - continuing

1. AGRICULTURAL AND ECONOMIC APPLICATIONS OF PESTICIDES

A. INSECT CONTROL AND GENERAL PEST CONTROL

505. LAITI, Tu'ulima and DHARMARAJU, E. 1980
Chemical control of the taro leafhopper.
Alafua Agricultural Bulletin, 5(1): 17.

506. STECHMANN, D.H. and SEMISI , S.T. 1984
[Insect control in Western Samoa with particular reference to the present state of biological and integrated control.]
Insektenbekampfung in West-Samoa unter besonderer Berucksichtigung des Standes biologischer und integrierter Verfahren.
Anzeiger fur Schadlingskunde, Pflanzenschutz, Umweltschutz, 57(4), 65-70.

507. UNIVERSITY OF THE SOUTH PACIFIC, ALAFUA CAMPUS, SCHOOL OF AGRICULTURE. 1980
Research and development 1979.
Alafua Campus, School of Agriculture, Univ. of the

B. PLANT DISEASE (FUNGI) CONTROL

508. FITZPATRICK, B. 1980
Aerial spraying in Western Samoa.
Alafua Agricultural Bulletin, 5(2): 32-34.

509. FOOD AND AGRICULTURE ORGANISATION 1976
Outbreaks of pests and diseases.
FAO, Plan Protection Committee for the SE. Asian and Pacific Region, Quarterly Newsletter, 19(2): 3-5.

510. GERLACH, W.P. WOLFGANG 1980
Thread blight of passionfruit and its control in Western Samoa.
Alafua Agricultural Bulletin, 5(2): ? pp.

511. GERLACH, W. and AMITUANAI, A. 1981
Late leafspot of peanut and its control in Western Samoa.
Alafua Agricultural Bulletin, 6(1): 34-37.

512. LONG, P.G. 1973
Control of banana Black leaf streak disease in Western Samoa.
Trop. Agric., 50(1): 75-84.

1. AGRICULTURAL AND ECONOMIC APPLICATIONS OF PESTICIDES

D. OTHER ANIMAL PEST CONTROL

513. PEREZ, V. Roger 1980
Tests on bait preferences of field rats in cocoa plantations in Western Samoa.
Alafua Agricultural Bulletin, 5(2): ? pp.

514. THOMSEN TAIMALELAGI, E.J. 1980
Giant African Snail.
Alafua Agricultural Bulletin, 5(2): ? pp.

E. QUARANTINE

515. STOUT, Oliver O. 1978
Review of proposed plant quarantine act of Western Samoa.
Suva, FAO. Survey of Agricultural Pests and diseases in the South Pacific.

516. WESTERN SAMOA. 1950
Plant and soil importation (Disease control) ordinance, 1950.
Apia, Western Samoa.

2. ENVIRONMENT

517. LAMBERTS, A.E. 1977
The effects of some pesticides on reef corals.
Mar. Res. Indones., (17): 69.

3. LEGAL ASPECTS

518. FRYAUFF, D.J. 1982?
Pesticide use and regulation in Western Samoa.
Apia, Western Samoa, Samoan German Crop Protection Project.

519. PEREIRA, A.J. 1981
Legal aspects in regard to the importation, distribution and use of poisonous chemicals in Western Samoa.
Alafua Agricultural Bulletin, 6(3): 63-76.

4. PUBLIC HEALTH

520. BOWLES, J. 1982
Suicide in Samoa.
Apia. Mimeographed.

521. BOWLES, J. 1983
Suicide and attempted suicide.
Apia.. Mimeographed.

522. BRYAN, J.H. and SOUTHGATE, B.A. 1976
Some observations of filariasis in Western Samoa after mass administration of diethylcarbamazine.
R. Soc. Trop. Med. Hyg., Transactions, 70(1): 39-48.

523. GALUVAO, M. and BOURKE, T.V. 1981
Report on Delsene/mancozeb vs skin reaction.
(no publication details)

524. IMO, A. and GRIGOP, R.R. 1974
Poisonings from Paraquat in Western Samoa.
Fiji Medical Journal, 11(6): 165-169.

525. KEITH -REID, R. 1983
The horror of the death wish.
Islands Business, May 1983: 12-14.

526. OLIVER, D. 1982
Coming to grips with the problems of youth suicide in Western Samoa.
Pacific Islands Monthly, November 1982: 55-57.

5. RECOMMENDATIONS/ADVICE ON HANDLING AND USAGE OF PESTICIDES

527. CONSORTIUM FOR INTERNATIONAL CROP PROTECTION 1982.
Plant Protection Course for Peace Corps Volunteers in the South Pacific, Held in Tonga, October 25-29, 1982.

528. DALE, P.S. and HERRING, J.L. 1957
Pest control in Samoa.
Apia, Department of Agriculture, Forests and Fishing.
Outdated publication.

529. DALE, P.S. n.d.
Pest control in Samoa.
Apia, Department of Agriculture, Forests and Fisheries.
15pp.

5. RECOMMENDATIONS/ADVICE ON SAFE HANDLING USAGE OF PESTICIDES

530. FIELD TRAINING IN PLANT PATHOLOGY - manual.
Apia, Western Samoa, May 15 - 30, 1965.
(s.l.) Institute for Technical Interchange, East-West Centre. [1965?]

531. LABORIUS, A. and BURGSTALLER, H. 1980
Recommendations on storage techniques and protection of stored products.
Apia, Western Samoa, GTZ Post Harvest Project, Samoan German Crop Protection Project.

532. LOVANG, T. 1976
Weed control recommendations for some pasture weeds in Western Samoa: based mainly on spraying trials carried out May-September, 1976.
Apia, Department of Agriculture.
Western samoa. Department of Agriculture. Livestock and Pasture Agronomy Report Series. Report (5). 14pp.

22. SOUTH PACIFIC REGION

1. AGRICULTURAL AND ECONOMIC APPLICATIONS OF PESTICIDES

A. INSECT CONTROL AND GENERAL PEST CONTROL

533. BATEMAN, M.A., DALE, P.S. and MADDISON, P.A. 1983
Fruit flies in South Pacific Islands, an escalating problem,
Pac. Sci. Congr. Proc., 15(1-2): 15.

534. BUTCHER, C.F. 1981
Green vegetable bug.
South Pacific Commission, Advisory Leaflet (13): 4pp.

535. DHARMARAJU, E. 1980
Crop protection. (at The University of the South Pacific)
Alafua Agricultural Bulletin, 7(2): 47-49.

536. DREW, R.A., HOOPER, G.H. and BATEMAN, M.A. 1978
Economic fruit flies of the South Pacific region. (Monograph).
Entomology Branch. vi, 137¬p.

SOUTH PACIFIC - continuing

1. AGRICULTURAL AND ECONOMIC APPLICATIONS OF PESTICIDES

A. INSECT CONTROL AND GENERAL PEST CONTROL

537. DREW, R.A. and HOOPER, G.H. 1981
The responses of fruit fly species Diptera tephritidae in Australia to various attractants.
J. Aust, Entomol. Soc., 20(3): 201-205.

538. FOOD AND AGRICULTURE ORGANISATION. REGIONAL OFFICE FOR ASIA AND THE PACIFIC. 1981
Pest, disease, and weed complexes in high yielding varieties in Asia and the Pacific: an overview.
Bangkok, the Office. 17pp.

539. FOOD AND AGRICULTURE ORGANIZATION 1985
Report of the Fourteenth Session of the Asia and Pacific Plant Protection Commission, Jakarta, Indonesia 5-10 August 1985. FAO Regional Office for Asia and the Pacific (RAPA) Bangkok, Thailand.

540. MADDISON, P.A. 1983
Coconut hispine beetle.
South Pacific Commission, Advisory Leaflet (17).

541. REDDY, D. Bap 1980
Plant Protection Committee for the Southeast Asia and Pacific Region: 25 years of service, 1956-1980. Plant protection in Asia and Pacific, an overview.
Bangkok, FAO. Regional Office for Asia and the Pacific. 123pp.

542. ROSEN, L., ROZEBOOM, L.E., REEVES, W.C., SAUGAIN, J. and GUBLER, D.J. 1976
A field trial of competitive displacement of Aedes polynesiensis by Aedes albopictus on a Pacific atoll.
Am. J. Trop. Med. Hyg., Nov., 26(6): 906-913.

543. STAPLEY, J.H. 1973
Insect pests of coconuts in the Pacific region.
Outlook of Agriculture 7(5) : 211-217

544. SOUTH PACIFIC COMMISSION. 1983
Advisory Leaflet (15):
Cottony cushion scale, Seychelles scale and Egyptian fluted scale.
Noumea, SPC.

1. AGRICULTURAL AND ECONOMIC APPLICATIONS OF PESTICIDES

C. WEED CONTROL

560. SOUTH PACIFIC COMMISSION. 1974
Sub-regional training course on weed control in tropical pastures, Tonga, February, 1974.
Report.
Noumea, SPC. 32, 2, 2pp.

561. SOUTH PACIFIC COMMISSION. 1977
Sub-regional training course on weed control in vegetables, Guam, 16-27 May, 1977.
Agana, SPC. 40pp.

D. OTHER ANIMAL PEST CONTROL

562. LAMBERT. M. 1977
The giant African snail.
South Pacific Commission, Advisory Leaflet (6)
Noumea, SPC.

563. WILLIAMS, J.M. 1982
Rat damage, ecology and control in the South Pacific.
In Tonga. Ministry of Agriculture, Fisheries and Forests.
Sub-regional training course on methods of controlling diseases, insects and other pests of plants in the South Pacific, October 4-20, 1982, Vaini, Kingdom of Tonga.
Proceedings: 75-99.
Tonga/GTZ/USAID/CICP.

564. WILLIAMS, J.M. 1979
Rat damage to agricultural crops.
South Pacific Commission, Advisory Leaflet (11).
Noumea, SPC.

565. WILSON, E.J. 1971
Rat destruction in Pacific Islands.
Noumea, SPC. SPC Information Document (26) (1971).

1. AGRICULTURAL AND ECONOMIC APPLICATIONS OF PESTICIDES

E. QUARANTINE

566. BAIRD, Jaimie D. 198?
Survey of plant quarantine facilities, procedures and staffing in Cook Islands, Fiji, Kiribati, Niue, Tonga, Tuvalu, Western Samoa.
UNDP/FAO-SPC Project for Strengthening Plant Quarantine and Plant Protection Services in the South Pacific. Project Report (2): 117pp.

567. CHOCK, A.K. 1980
Survey of agricultural pests and diseases in the South Pacific: report of the Plant Quarantine Consultant.
Suva, FAO, the Survey.

568. FIRMAN, Ivor D. 1982
Quarantine, insect pests and diseases. Paper presented at SPEC Regional Meeting of Coconut Industry Interests, 1982, Suva.
(S.l., s.n.) 10pp.

569. FOOD AND AGRICULTURE ORGANISATION. 1967
Plant protection agreement for the Southeast Asia and Pacific Region.
Rome, FAO. Basic Texts, vol. III, fascicle 6.

570. FOOD AND AGRICULTURE ORGANISATION. PLANT PROTECTION COMMITTEE FOR THE SOUTHEAST ASIA AND PACIFIC REGION. 1971
Digest of plant quarantine regulations: supplement III, Southeast Asia and Pacific Region.
(based on the work of T.H. Harrison)
Bangkok, FAO.

571. FOOD AND AGRICULTURE ORGANISATION. PLANT PROTECTION COMMITTEE FOR THE SOUTHEAST ASIA AND PACIFIC REGION. 1971
Guidelines for preparing a plant quarantine law.
(based on the work of T.H. Harrison).
Bangkok, FAO.

1. AGRICULTURAL AND ECONOMIC APPLICATIONS OF PESTICIDES

E. QUARANTINE

572. FOOD AND AGRICULTURE ORGANISATION. SURVEY OF AGRICULTURAL PESTS AND DISEASES IN THE SOUTH PACIFIC. n.d.
(Model quarantine act).
Suva, the Survey.

573. IKIN, B. 1984
Aircraft disinfection procedures for agricultural quarantine.
Paper presented to Fourth Regional Technical Meeting of Plant Protection, 13-17 February, 1984, Noumea.
Noumea, SPC.

574. O'CONNOR, B.A. 1961
Plant quarantine in the South Pacific Commission's area.
Noumea, SPC.

575. STOUT, Oliver O. 1978
Plant quarantine procedural manual for island countries of the South Pacific.
Suva, SPEC. FAO, Survey of Agricultural Pests and Diseases in the South Pacific. 1 vol. (looseleaf)

576. STOUT, Oliver O. 1978
Plant quarantine treatment manual for island countries of the South Pacific.
Suva, SPEC. FAO. Survey of Agricultural Pests and Diseases in the South Pacific. 2 vols.

577. STOUT, Oliver O. 1984
Plant quarantine treatment manual for island countries of the South Pacific, Vol II. Suva, SPEC. FAO.

578. SOUTH PACIFIC COMMISSION, 1984
Report of Sub-regional workshop on Plant Quarantine Guidelines, Fiji, 1984.

579. ** A former FAO project, RAS/71/427, Survey of Agricultural Pest and Diseases in the South Pacific, which worked in seven countries of the region (Cook Islands, Fiji, Kiribati, Niue, Tonga, Tuvalu and Western Samoa) and was co-ordinated by the South Pacific Bureau for Economic Co-operation (SPEC), also produced a plant quarantine procedural and treatment manual for Island countries of the South Pacific (3 volumes) and a volume of Plant Quarantine Guidelines which concerned intra-regional trade.
(Exact citations of these are not known to author).

SOUTH PACIFIC - continuing

2. ENVIRONMENT

580. ANON. 1984
Study slams chemicals.
Islands Business, May 1984: 26-29.

581. BRODIE, J.E. and MORRISON, R.J. 1984
Coastal and inland water quality in the South Pacific.
A review of existing information, monitoring programmes, monitoring facilities and legislation.
SPREP. Topic Review, (16 December, 1984).

582. DAHL, A.L. and BAUMGART, I.L. 1983
The state of the environment in the South Pacific.
UNEP Regional Seas Reports and Studies (31).

583. DEUBERT, Karl H. 1972
Organochlorines in the seastar Acanthaster planci.
N.Y. , Bulletin of Environmental Contamination and Toxicology, 8(4): 251-256.

584. DEVANEY, D.M. and RANDALL, J.E. 1973
Investigations of Acanthaster planci in southeastern Polynesia during 1970-1971.
Atoll Res. Bull., (169): 1-23.

585. FOOD AND AGRICULTURE ORGANISATION. 1985
Fourteenth session of the Asia and Pacific Plant Protection Commission, Jakarta, Indonesia, 5-10 August, 1985. Report.
Bangkok, Thailand, FAO. Regional Office for Asia and the Pacific (RAPA).

586. GOLOB, Richard and EGAN, Richard 1983
Review of hazardous waste storage and disposal in the South Pacific Region. Cambridge, Mass., World Information Systems for SPREP, B.P. D5, Noumea, New Caledonia. December, 1982 (revised September, 1983)

587. MORRISON, R.J. and BRODIE, J.E. 1983
Pollution problems in the South Pacific with particular reference to fertilisers, biocides, water supplies and urban wastes. Paper presented at UNEP Symposium on Regional Co-operation on the protection of the environment 15 th Pacific Science Congress, Dunedin, New Zealand, 1-11th February, 1983.

SOUTH PACIFIC - continuing

2. ENVIRONMENT

588. MOWBRAY, D.L. AND BARIA A. (ed) 1986
Manual compiled for SPREP/COSEA/IOC Workshop on Analysis of Organochlorines in Marine Animals held at the University of Papua New Guinea, from 23 June to July 4, 1986, Port Moresby, Papua New Guinea.

589. SOUTH PACIFIC REGIONAL ENVIRONMENT PROGRAMME. 1981
Country reports 1980 - 1981
Noumea, New Caledonia, SPC.
Eighteen reports, by country, various pagination.

590. SOUTH PACIFIC REGIONAL ENVIRONMENTAL PROGRAMME, 1983
Report of the First Consultative Meeting of Research and Training Institutions in the South Pacific Region. April, Suva Fiji. Noumea, New Caledonia, SPC

591. SOUTH PACIFIC REGIONAL ENVIRONMENT PROGRAMME, 1984
Report of the Second Consultative meeting of Research and Training Institutions in the South Pacific Region. Port Moresby, Papua New Guinea, 23-27 January 1984, Noumea. New Caledonia, SPC.

592. SOUTH PACIFIC REGIONAL ENVIRONMENT PROGRAMME 1986.
Report of the Third Consultative meeting of Research and Training Institution in the South Pacific Region. Guam, 16-20 June 1986, Noumea, New Caledonia, SPC.

593. SPC/SPEC/ESCAP/UNEP. 1983
Action plan for managing the natural resources and environment of the South Pacific Region.
UNEP Regional Seas Reports and Studies, (29).
SPC/SPEC/ESCAP/UNEP. 1984
Hazardous waste storage and disposal in the South Pacific.
UNEP Regional Seas Reports and Studies, (48). [Appendices]

594. THAMAN, R.R. 1984a
Pesticides in the Pacific Islands: panacea or peril.
Paper presented to Fiji Institute of Agricultural Science, Public Seminar on "Pesticides", Girmit Cultural Centre, Lautoka, Fiji, 3 March, 1984. 12pp.

595. THAMAN, R.R. 1984b
The poisoning of Paradise: Pesticides, people, environmental pollution and increasing dependency in the Pacific Islands.
South Pacific Forum, 1(2): 165-200.

SOUTH PACIFIC - continuing

3. LEGAL ASPECTS

596. FIRMAN, I.D. and BOTTRELL, D.G. 1982
Pesticide legislation: rationale and status.
In Tonga. Ministry of Agriculture, Fisheries and Forests. Sub-regional training course on methods of controlling diseases, insects and other pests of plants in the South Pacific, October 4-20, 1982, Vaini, Kingdom of Tonga. Proceedings: 260-262.
Tonga/GTZ/USAID/CICP.

597. HARROW, K.M. 1981
Comments on pest and pesticide control.
Noumea, New Caledonia, SPC, SPREP Topic Review No 10.

598. LENG, MARGUERITE L. AND McCollister, Donald D. - 1983
Product registration and notifications - pesticides
Dow Chemical Company. Technical Report.
Presented at Chemical Mfrs. Assn/Synthetic Organic Chem. Mfrs. Assn. Compliance with Intl. Chem. Regulations Sym., DC, April 29-30, 1981, (83).

599. MOTOOKA, P.S. (ed) 1976
Conference on the impact of pesticide laws, December 6-10, 1976, East-West Centre.
Proceedings.
Honolulu, East-West Centre, Food Institute. 128pp.
(Includes as follows from the table of contents:
FIRMAN, I.D. - Oceania : 45
MUNIAPPIN, R. - GUAM : 58-62
OTOBED, D.O. - TTPI : 63-64)

600. MOWBRAY, D.L. 1984c
Pesticide legislation in South Pacific. Paper presented to Fourth Regional Meeting on plant protection sponsored by South Pacific Commission, Noumea, New Caledonia, February, 1984. 11pp.

601. MOWBRAY, D.L. 1985a
Situation in Papua New Guinea and South Pacific. Brief review of legislative situation and assessment of toxicological data for registration in Papua New Guinea and countries of the South Pacific. UNIDO Regional Forum on pesticide toxicology of Regional Network for the production, marketing and control of pesticides in Asia and the Far East, Baguio and Manila, Philippines, 22-26 April, 1985.

SOUTH PACIFIC - continuing

3. LEGAL ASPECTS

602. VENKATESH, S., VA'AI, S. and PULEA, Mere 1983
An overview of environmental protection legislation in the South Pacific countries.
Noumea, New Caledonia, SPREP Topic Review (13).
(Revised and updated)

603. CHOW, C.Y. 1974
Aedes aegypti surveillance in the South Pacific.
Papua New Guinea Medical Journal, 17(3): 309-315.

604. MOUCHET, J. 1972
[The resistance of Aedes to insecticides in regions of Southeastern Asia and the Pacific.]
La resistance aux insecticides des Aedes dans les regions d'Asie du Sud-Est et du Pacifique.
Cah. ORSTOM Ser. Entomol. Med. et Parasitol., 10(4): 301-308.

605. MOWBRAY, D.L. 1985
The poisoning of the Pacific. Pesticides in the South Pacific.
The Siren, (29): 13-19.

606. MOWBRAYDL, D.L. 1986
Pesticide Poisoning in Papua New Guinea and the South Pacific.
Papua New Guinea Med J 29 : 131-141.

607. REED, D.: ROSEN, L and KUBERSKI, T. 1976
Dengue hemorrhagic fever in the South Pacific.
Am. J. Epidemiol., 104(3): 309.

5. RECOMMENDATIONS/ADVICE ON HANDLING AND USAGE OF PESTICIDES

608. AGRICULTURAL REQUISITES SCHEME FOR ASIA AND THE PACIFIC (ARSAP). 1984
Safe-handling and application of agro-pesticides. A safety guide for pesticide retail distributors and shopkeepers.
Bangkok, Thailand, ARSAP, ESCAP.

609. CONSORTIUM FOR INTERNATIONAL CROP PROTECTION. 1982
Plant protection course for Peace Corps volunteers in the South Pacific, held in Tonga, October 25-29, 1982.

5. RECOMMENDATIONS/ADVICE ON SAFE HANDLING AND USAGE OF PESTICIDES

610. DAVIES, R.E. 1981
Storage and distribution of chemicals.
Alafua Agricultural Bulletin, 6(3): 29-32.

611. DAVIES, R.E. 1981
Toxic risks and safe handling of pesticides.
Alafua Agricultural Bulletin, 6(3): 11-15.

612. FIJI. MINISTRY OF AGRICULTURE AND FISHERIES. 1983a
Lesson Plan. Training course for agro-pesticides distributors on safe and efficient use of agro-pesticides. South Pacific.
Fiji, Ministry of Agriculture and Fisheries, Plant Protection Section, in co-operation with Agricultural Requisites Scheme for Asia and the Pacific, Bangkok.

613. FIJI. MINISTRY OF AGRICULTURE AND FISHERIES. 1983
Training manual. Training course for agro-pesticide distributors on safe handling and efficient use of agro-pesticides. South Pacific.
Fiji, Ministry of Agriculture and Fisheries, Plant Protection Section, in co-operation with Agricultural Requisites Scheme for Asia and the Pacific Region, Bangkok.

614. FIRMAN, I.D. 1976
Pesticides handbook.
Noumea, SPC. iv, 72pp.

615. FIRMAN, I.D. 1981
Pesticide handbook: a guide to the safe and efficient use of crop protection chemicals available in the South Pacific Islands served by the South Pacific Commission. Revised edition.
Noumea, SPC 102pp.
Publication giving information on 162 pesticides available in the region with general recommendations.

616. FIRMAN, I.D. 1976
Plant protection and the South Pacific Commission.
South Pacific Bulletin, 26(1): 29-32, 34.

5. RECOMMENDATIONS/ADCICE ON SAFE HANDLING AND USAGE OF PESTICIDES

617. FIRMAN, I.D. 1979
South Pacific Commission training in pesticide application.
South Pac. Bull., 29(4): 40-44.

618. FOOD AND AGRICULTURE ORGANIZATION OF THE UNITED NATIONS, REGIONAL OFFICE FOR ASIA AND THE PACIFIC (RAPA) 1985
Fourteenth session of the Asia and Pacific Plant Protection Commission Jakarta, Indonesia : 5-10 August 1985.
Report, Bangkok, Thialand.

619. FULLERTON, R.A. 1979
Report of a visit to Rarotonga to participate in the SPC pesticide application course and for discussions with the MFA Totokoitu Evaluation Team: 19 April-10 May, 1979.
[Noumea, SPC]. 22pp.

620. IMPERIAL CHEMICALS INDUSTRIES, Sydney. 1968
ICI Pacific Islands planters handbook.
Sydney, ICIANZ. 243pp.

621. *JACKSON, G.V.H. 1980
Diseases and pests of taro.
Noumea, SPC.

622. LAMBERT, M. 1970
SPC Subregional training course in weed control and the use of pesticides. Manual.
[Noumea, SPC]

623. *LAMBERT, M. 1973
Weed control in the South Pacific.
Noumea, SPC, SPC Handbook (10).

624. LEFORT, E.J.E. 1955
[Aspects practiques de la destruction chimique des plantes nuisible aux cultures tropicales.]
Practical aspects of weedkilling by chemicals in tropical crops.
Noumea, SPC.

5. RECOMMENDATIONS/ADVICE ON SFAE HANDLING AND USAGE OF PESTICIDES

624. MOWBRAY, D.L. 1983
Country statement: South Pacific countries. Paper presented to UNIDO Regional Consultation on harmonization of pesticide registration requirements of Regional Network for the production, marketing and control of pesticides in Asia and the Far East, Baguio, Philippines, October 1983. 2pp.

625. MOWBRAY, D.L. 1984a
Pesticide project. A review of pesticide use in the South Pacific, with a proposal to establish a pesticide monitoring and evaluation network in the South Pacific Region. Prepared for the Second Consultative Meeting of Research and Training Institutions in the South Pacific held by the South Pacific Regional Environment Programme at University of Papua New Guinea, January, 1984. 191pp.

626. MOWBRAY, D.L. 1984b.
Pesticide Use in South Pacific.
Paper presented to Fourth Regional Meeting on Plant Protection sponsored by South Pacific Commission, Noumea, New Caledonia, February 1984, 16p.

627. MOWBRAY, D.L. 1985
The poisoning of the Pacific.
The Siren 29: 13-19.

628. MOWBRAY, D.L. 1986a
Pesticide use in the South Pacific.
Ambio, 15(1): 22-29.

629. OUDEJANS, Jan H. 1982
Agro-pesticides: their management and application.
A manual for instructors of pesticide distributors, storekeepers and professional applicators.
Bangkok, ESCAP. Agricultural Requisites Scheme for Asia and the Pacific. v, 205pp.

630. OUDEJANS, Jan H. and STARING, W.D.E. 1984
ARSAP Agro-pesticide index. A directory of common and trade names of agro-pesticides comiled for the Asia-Pacific region.
Bangkok, Thailand, Agricultural Requisites Scheme for Asia and the Pacific.

5. RECOMMENDATIONS/ADVICE ON SAFE HANDLING AND USAGE OF PESTICIDES

631. *ROWE, F.P. 1975
Rat control in the South Pacific.
Noumea, SPC. SPC Handbook (1).

632. SHELL COMPANY (Pacific Islands) LTD n.d.
Shell planters guide to agricultural chemicals in the Pacific Islands region.
Melbourne, Shell. var.pag.

633. SOUTH PACIFIC COMMISSION. 1976-1982
Plant Protection Advisory Leaflets nos. 1-14.
Noumea, SPC.
Series of one page advisory leaflets, on pest control - printed in both English and French.

634. SOUTH PACIFIC COMMISSION. 1984
Fourth Regional Technical Meeting on plant protection, Noumea, New Caledonia, 13-17 February, 1984.
Report, (406/84).
Noumea, [SPC].

635. STARING, W.D.E. 1982
Report on the PPS/ARSAP Training Planning Workshop for Instructors of Agro-chemical Distributors in the South Pacific, Koronivia, Suva, Fiji 31 May - 11 June 1982.

636. STARING, W.D.E.
Pesticides: Data collection systems and supply, distribution and use in selected countries of the Asia-Pacific Region.
Bangkok, Thailand, Agricultural Requisites Scheme for Asia and the Pacific/ESCAP.

637. VON KEYSERLINGK, N. 1982
Chemical control. Principles and techniques.
In Tonga. Ministry of Agriculture, Fisheries and Forests. Sub-regional training course on methods of controlling diseases, insects and other pests of plants in the South Pacific, October 4-20, 1982, Vaini, Kingdom of Tonga.
Proceedings: 308-
Tonga/GTZ/USAID/CICP.

5. RECOMMENDATIONS/ADVICE ON SAFE HANDLING AND USAGE OF PESTICIDES

638. WHISTLER, W.A. 1984
Weed handbook of Western Polynesia.
Nuku'alofa, German Agency for Technical Co-operation (GTZ), Tonga, Ministry of Agriculture, Fisheries and Forests and Western Samoa, Department of Agriculture.

639. WORLD HEALTH ORGANISATION. n.d.
Multilevel course on the safe use of pesticides and on the diagnosis and treatment of pesticide poisoning.
Rome, WHO. 1 vol.

640. SPC/SPEC/ESCAP/UNEP. 1984
Hazardous waste storage and disposal in the South Pacific.
UNEP Regional Seas Reports and Studies No 48. (plus Appendices) UNEP.

23. AUSTRALIA

There are many publications on pesticides published in Australia; far too many to include in this bibliography for the South Pacific. Selected ones are referred to in Chapter 14 (14.2), and a few are mentioned in References (page ...). A few pertinent publications on recommendations for uses of all pesticides registered in Australia are available in microfiche form. These microfiche formats are given on page .....(3.2). Others include:

641. SNELLGROVE, J. 1982
Uses of insecticides in Australia.
Fifth edition.

642. SNELLGROVE, J. 1982
Uses of fungicides in Australia.
First edition.

643. SNELLGROVE, J. 1982
Uses of herbicides in Australia.
First edition.

AUSTRALIA - continuing

These and other publications are all published by Agvic Pest List, and are available from:

Agricultural Standards Section,
State Chemistry Laboratory.
Division of Agricultural Chemistry,
5 MacArthur Street,
PO Box 4041 GPO
Melbourne, 3001
VICTORIA, AUSTRALIA.

Further microfiches are available on pesticide recommendations on fruit crops, vegetable crops, field crops (including stored commodities), pasture and pasture seed crops, home garden products, ornimental and horticultural products, animal treatments (for external use on pets and livestock), turf, weed control in industrial, forestry, non-agricultural and aquatic situations.

'Uses of pesticides in Australia' are updated editions of:

644. AUSTRALIA. DEPARTMENT OF PRIMARY INDUSTRY. 1979
Uses of insecticides in Australia 1979.
Fourth edition.
Canberra, Australian Government Printing Service.

The PESTKEM microfiche on recommendations also referred to on page ... (3.2) can be got from:

The Registrar
(attention Mr Jim Caley
Lecturer in Plant Protection)
Queensland Agricultural College,
Lawes, Gatton, Queensland 4343
QUEENSLAND, AUSTRALIA.

AUSTRALIA - continuing

Other useful publications include:

645. AUSTRALIA. DEPARTMENT OF PRIMARY INDUSTRY. n.d.
Manual of safe practice in the handling and use of pesticide.
Canberra, Department of Agriculture. Pesticides Branch, Document PB 377.

646. AUSTRALIA. DEPARTMENT OF PRIMARY INDUSTRY. 1982
Witholding periods, maximum residue limits and poisons schedules for agricultural and veterinary chemicals, Document PB 431. Fourth edition.
Canberra, [Australian Government Printing Service].

647. AUSTRALIA. DEPARTMENT OF PRIMARY INDUSTRY. 1985
Requirements for clearance of agricultural chemicals, Document PB 310B.
Canberra, [Australian Government Printing Service].

Each State Department of Agriculture also publishes leaflets on pest and disease problems and these incorporate recommendations. Some State Departments publish spray charts and others publish manuals such as weed control manuals.

24. NEW ZEALAND

It is beyond the scope of this bibliography to include publications on pesticides in New Zealand. Again only one selected publication is mentioned. Recommendations for agricultural pesticides are taken from the following publication which lists the accepted label claims and other details about each active ingredient:

648. NEW ZEALAND. AGRICULTURAL CHEMICALS BOARD.
Guide to agricultural pesticides.
Wellington, [the Board].

This publication is available from:

Pesticides Board/
Agricultural Chemicals Board,
P.O. Box 1500,
Wellington,
NEW ZEALAND.

NEW ZEALAND - continuing

The New Zealand Department of Agriculture has also published numerous small advisory publications, and has a computer print out of what pesticides are available for use and gives an update on recommendations.

25. NON-SOUTH PACIFIC

MANUALS ON SAFE AND EFFICIENT USE OF PESTICIDES

This list includes those manuals and publications produced outside the South Pacific but which are widely available and in use in the South Pacific region:

649. DAVIES, J.E., FREED, V.H. WHITTEMORE, F.W. 1982
An agromedical approach to pesticide management. Some health environmental considerations.
Berkley, Calif. United States. Agency for International Development and Consortium for International Crop Protection.

650. MORGAN, D.P. 1982
Recognition and management of pesticide poisonings.
[USA], EPA-540/9-80-005.

651. SELF, L.S. 1981
Guidelines on the safe use of insecticides for vector control personnel.
Manila, Philippines. WHO publication.

652. UNITED STATES OF AMERICA. DEPARTMENT OF AGRICULTURE and UNITED STATES. ENVIRONMENTAL PROTECTION AGENCY. n.d.
Apply pesticides correctly - a guide for commercial applicators. Washington, D.C., USEPA.

ADDENDA

PAPUA NEW GUINEA

653 SUTHERLAND, J.A. 1986
Pests of cucurbits - 1 - Pumpkin beetle.
Entomology Bulletin (40), in Harvest. 11(4) : 154 - 155.

654 SUTHERLAND, J.A. 1986
Pests of cucurbits - 2 - Black leaf-footed bug.
Entomology Bulletin (41), in Harvest, 11(4) : 156 - 158.

655 SUTHERLAND, J.A. 1986
Pests of cucurbits - 3 - Minor pests of cucurbits.
Entomology Bulletin (42), in Harvest, 11(4) : 159 - 163.

656 THOMLINSON, D. 1986
Early and late leafspots of peanut.
Plant Pathology Note (29), in Harvest, 11(4) : 164 - 166.

SOUTH PACIFIC REGION

657 MOWBRAY, D.L., BARIA A. , HAEI P. and KAPUSH, M. (in preparation)
Report on SPREP/EAS/IOC Organochlorine Workshop , held from 23 June to 4 July 1984 at University of Papua New Guinea, Port Moresby. PNG.

658 UTHE, J.F. 1986
Report on SPREP/EAS/IOC Training Workshop on Organochlorines in Marine Animals, held at University of Papua New Guinea, Port Moresby, PNG from 23 june to 4 July 1986.

659 UTHE, J.F., MUSIAL C.J. and MISRA R.K. 1986
Observations on Training Workshops and Manuals Associated with the Implementation of the GIPME Plan for Global Monitoring. Fisheries Research Branch, Department of Fisheries and Oceans Halifax , N.S. Canada.