EVALUATION REPORT

Danida/UNIDO Ecotoxicology Research Centre

Pakistan
I BASIC PROJECT DATA

Title of Project: Ecotoxicology Research Centre

Recipient Country: Pakistan

Project Area: Pakistan

Sector: Agriculture/Environment

Responsible Authority: Ministry of Food, Agriculture and Livestock

Executing Agency: UNIDO

Development Objectives:
Minimize the immediate and long term human health hazards and environmental effects caused by the steadily increasing production and use of pesticides in Pakistan and to encourage the introduction of newer and safer products conducive to man and his environment.

Provide technical expertise, advice and know-how in this area to member countries of the Regional Network on Pesticides for Asia and the Pacific (RENPAP) and thereby assisting them to provide similar benefits to their own countries under the Technical Cooperation among Developing Countries (TCDC) arrangement.

Project Period: July 1992 - December 1996

Funding by Danida: 791,000 USD (whereof 91,000 to UNIDO)

Government contribution: Counterpart staff, laboratory space and running expenses

Currency Equivalents: 1 USD = 35 PKR
II LIST OF CONTENTS

I BASIC PROJECT DATA ............................................................................................................. I

III GLOSSARY AND ABBREVIATIONS ............................................................................. V

IV MAP OF THE PROJECT AREA ..................................................................................... VI

1. INTRODUCTION ................................................................................................................. 1

2. EXECUTIVE SUMMARY ...................................................................................................... 2
   2.1. Background .................................................................................................................... 2
   2.2. The Project and its Setting ............................................................................................ 3
   2.3. Findings and Conclusions ............................................................................................ 3
       2.3.1. Project Preparation and Planning ........................................................................... 3
       2.3.2. Project Implementation ......................................................................................... 4
       2.3.3. Achievement of Objectives ................................................................................. 5
       2.3.4. Project Organisation and Management .................................................................. 5
       2.3.5. Future Operation and Development of the Project ............................................... 5
   2.4. Recommendations ......................................................................................................... 6
   2.5. Lessons Learnt ............................................................................................................... 7
       2.5.1. UNIDO ................................................................................................................ 7
       2.5.2. Danida .................................................................................................................. 7

3. THE SETTING OF THE PROJECT ....................................................................................... 7
   3.1. Use of Pesticides in Pakistan ......................................................................................... 7
   3.2. Pesticide Legislation, Administration and Control ....................................................... 8
   3.3. Pesticides Import, Sales and Distribution ................................................................... 9
   3.4. Education of the Extension Staff and the Farmers ....................................................... 9
   3.5. Institutional Aspects ..................................................................................................... 9

4. PROJECT DESCRIPTION ....................................................................................................... 10
   4.1. Development Objectives .............................................................................................. 11
   4.2. Immediate Objectives .................................................................................................. 11
   4.3. Outputs ......................................................................................................................... 12
   4.4. Activities ..................................................................................................................... 13
   4.5. Assumptions ................................................................................................................ 13
   4.6. Target Beneficiaries ..................................................................................................... 13
   4.7. Project Organisation ..................................................................................................... 14
   4.8. Financing ...................................................................................................................... 14
   4.9. Project Reviews and Modifications ............................................................................. 14

5. PROJECT PREPARATION AND PLANNING ..................................................................... 15
   5.1. Project relevance and identification ............................................................................. 15
   5.2. Project design ............................................................................................................... 16
   5.3. Project Appraisal ......................................................................................................... 17
   5.4. Conclusions .................................................................................................................. 17
5.5. Recommendations ........................................................................................................ 18

6. PROJECT IMPLEMENTATION AND PERFORMANCE .................................................. 18
   6.1. International Consultancies ...................................................................................... 18
   6.2. Training Programme ............................................................................................... 19
   6.3. Equipment and Laboratory Space ........................................................................... 21
   6.4. Staff ........................................................................................................................ 22
   6.5. Funds ....................................................................................................................... 22
   6.6. Commitments and Obligations ............................................................................... 24
   6.7. Conclusions ............................................................................................................. 24
   6.8. Recommendations .................................................................................................. 25

7. ACHIEVEMENT OF OBJECTIVES, EFFECTS AND IMPACT .................................. 25
   7.1. Immediate Objective 1 ........................................................................................... 25
   7.2. Immediate Objective 2 ........................................................................................... 26
   7.3. Immediate Objective 3 ........................................................................................... 27
   7.4. Modifications ......................................................................................................... 27
   7.5. Effects ..................................................................................................................... 28
   7.6. Conclusions ............................................................................................................ 28
   7.7. Recommendations .................................................................................................. 30

8. PROJECT ORGANISATION AND MANAGEMENT, ADMINISTRATIVE ISSUES ....... 30
   8.1. Organisation and Management ............................................................................... 30
   8.2. Conclusions ............................................................................................................ 32
   8.3. Recommendations .................................................................................................. 32

9. FUTURE OPERATION AND DEVELOPMENT OF THE PROJECT .............................. 32
   9.1. The Future Operation ............................................................................................. 32
   9.2. Sustainability .......................................................................................................... 33
   9.3. Replicability ............................................................................................................ 34
   9.4. Conclusions ............................................................................................................ 34
   9.5. Recommendations .................................................................................................. 35

10. LESSONS LEARNT ..................................................................................................... 36
    10.1. UNIDO .................................................................................................................. 36
    10.2. Danida .................................................................................................................. 36

ANNEXES
Annex 1: Terms of Reference
Annex 2: Programme of the Team.
Annex 3: List of Persons met
III  GLOSSARY AND ABBREVIATIONS

AARI  Ayub Agricultural Research Institute
Agenda 21  Action Plan approved at the UN Conference on Environment and Development in Rio 1992
Beneficiaries  Useful Insects or Worms
BSO  Backstopping Officer (of UNIDO)
CAP  Crop Protection Association of Pakistan
CTA  Chief Technical Adviser
Danida  Danish International Development Assistance
FAO  Food and Agriculture Organization of the United Nations
GLP  Good Laboratory Practice
GOP  Government of Pakistan
IIBC  International Institute for Biological Control
IPM  Integrated Pest Management
NARC  National Agricultural Research Centre
Natural Enemies  Predators or parasites of the pests
NIAB  Nuclear Institute for Agriculture and Biology
NIBGE  National Institute for Biotechnology and Genetic Engineering
NMR  Nuclear Magnetic Resonance
NPD  National Project Director
NWFP  North West Frontier Province
PAPA  Pakistan Agricultural Pesticides Association
PARC  Pakistan Agricultural Research Council
PC-1  Project Concept-1 (GOP Project Document)
PD  UNIDO Project Document
PKR  Pakistan Rupees  1 PKR = 0.03 USD
PPER  Project Performance Evaluation Report
RENPAP  Regional Network on Pesticides for Asia and the Pacific
SDPI  Sustainable Development Policy Institute
TARI  Tropical Agricultural Research Institute
TCDC  Technical Cooperation among Developing Countries
UNIDO  United Nations Industrial Development Organization
USD  US Dollar  1 USD = 35 PKR
WWF  World Wide Fund for Nature
IVMAP OF THE PROJECT AREA
1. INTRODUCTION

In Pakistan agriculture accounts for the highest sectoral share of the GDP. Proper use of pesticides is important to reduce the losses of food and cash crops attributable to in particular pests and diseases. The Ministry of Food, Agriculture and Livestock administers regulations governing the import, formulation, sale, distribution and use of pesticides. However, surveillance and enforcement of these regulations have been minimal, largely due to institutional deficiencies.

With support from the Government of Denmark (Danida), UNIDO assists the Government of Pakistan in establishing an Ecotoxicology Centre in Islamabad to be capable of doing environmental research on pesticides.

Ecotoxicology can be defined as the science devoted to the study of the toxic effects of physical and chemical agents on living organisms especially on populations and communities within defined ecosystems. It combines the transfer pathways of such substances and their interactions with the environment. Ecotoxicology is a new discipline, combining chemistry, ecology and toxicology.

The Project has a hard currency budget of USD 700,000. In addition a Government contribution in cash (2.5 million PKR) and in kind (21.98 million PKR) approximately a total of USD 705,000.

The Government of Pakistan provides laboratory facilities and staff, and UNIDO has with Danish assistance through its Industrial Development Fund supported the recruitment of consultants, fellowships, and the purchase of essential equipment.

Project implementation began in July 1992 and completion is now scheduled for the end of 1996. Two Bipartite (the Government of Pakistan-UNIDO) Review Meetings have taken place, the most recent in July 1995, and in 1995 Danida suggested a tripartite evaluation of the Project. The Government of Pakistan and UNIDO agreed to this, and an Evaluation Team consisting of one member from the Government of Pakistan, one from UNIDO and two from Danida was fielded in July 1996.

At the Bipartite Review Meeting in 1995 it was decided to change the name of the institution from Ecotoxicology Research Centre to Ecotoxicology Institute, which name has been applied throughout the present report.

The Evaluation Team Members were

Mr. Mogens Brix Haupt, Management Expert and Team Leader
Mr. Jørgen Jakobsen, Technical Expert
Mr. Albertus van Burik, Quality Assurance Officer, UNIDO, Vienna
Dr. G.A. Miana, Vice Chairman, University Grant Commission, Islamabad

The Team worked according to the Terms of Reference enclosed as Annex 1, the programme of
the Team is in Annex 2 and a list of people met is in Annex 3.

The Team has studied the Project files, both in Copenhagen, Vienna and Islamabad, and visited a number of relevant institutions and organisations in Islamabad, Peshawar, Lahore, Faisalabad and Karachi.

Before leaving Pakistan the Team submitted a brief of its findings and conclusions at a debriefing meeting. At the same time the Team members from Pakistan and UNIDO submitted their report contribution, and the Danish Team members completed the report after their return to Denmark.

The Terms of Reference, prepared by Danida in Collaboration with UNIDO, did not include any debriefing with UNIDO in Vienna.

The Evaluation Team would like to express its thanks to all officials and individuals met for the kind support and valuable information which the Team received during its work in Pakistan and which highly facilitated the work of the Team.

This report contains the views of the Evaluation Team which do not necessarily correspond to the views of the Danish Ministry of Foreign Affairs, the Government of Pakistan or UNIDO. All proposals are subject to approval by the two governments.

2. EXECUTIVE SUMMARY

2.1. Background

In Pakistan agriculture accounts for the highest sectoral share of the Gross Domestic Product. Proper use of pesticides is important to reduce the losses of food and cash crops attributable to in particular pests and diseases. The Ministry of Food, Agriculture and Livestock administers regulations governing the import, formulation, sale, distribution and use of pesticides. However, surveillance and enforcement of these regulations have been minimal, largely due to institutional deficiencies.

With support from the Government of Denmark (Danida), UNIDO assists the Government of Pakistan (GOP) in establishing an Ecotoxicology Institute in Islamabad to be capable of doing environmental research on pesticides.

Ecotoxicology can be defined as the science devoted to the study of the toxic effects of physical and chemical agents on living organisms, especially on populations and communities within defined ecosystems. It combines the transfer pathways of such substances and their interactions with the environment. Ecotoxicology is a new discipline, combining chemistry, ecology and toxicology.

Project implementation began in July 1992 and completion is now scheduled for the end of 1996. In 1995 Danida suggested a tripartite evaluation of the Project. The Government of
Pakistan and UNIDO agreed to this, and an Evaluation Team consisting of one member from the Government of Pakistan, one from UNIDO and two from Danida, was fielded in July 1996.

2.2. The Project and its Setting

The consumption of pesticides in Pakistan is not alarmingly high for the size of the country, but the problem is, that it is concentrated on relatively few crops (primarily cotton, fruit, vegetables), so that the consumption for the areas where these crops are grown is high. This entails a risk for health hazards for farm workers and a risk for pesticide residues in the crops, such as in cotton seed oil and cakes and in fruit and vegetables.

There is a large number (more than 2800) of pesticide dealers, and their knowledge of how to handle and use pesticides in a safe and efficient way is very limited, so they are not able to provide proper guidance to the farmers, who know even less. Consequently there is much improper use of pesticides, although the agricultural research institutes at federal and provincial level (and some larger importers/dealers) have developed training programmes for farmers and the provincial extension service.

There is very little knowledge of the effect and fate of the pesticides and how fast they degrade and in the context of the Regional Network on Pesticides for Asia and the Pacific (RENPAP) an initiative was taken, ending in a decision by Pakistan to strengthen the pesticide research and data collection and within the Regional Network on Pesticides for Asia and the Pacific to specialise in ecotoxicology through the establishment of the Ecotoxicology Institute.

The Project was to establish an Ecotoxicology Institute in Islamabad and organise a cooperation between this Institute and laboratories in 2 provinces, and it has 3 components:

- International consultancies within various disciplines related to pesticide research
- Training of staff in Pakistan and abroad in laboratory and research work
- Upgrading of laboratories through installation of new equipment

2.3. Findings and Conclusions

2.3.1. Project Preparation and Planning

The Project is relevant, because it addresses a real need for an institution capable of providing data illustrating the ecotoxicological situation in the soil and water in Pakistan and conducting research on how to maintain a high agricultural production using pesticides in a sustainable way. And the Project has a relatively high priority in Pakistan, because the actual and potential problems related to pesticides are widely recognised.

The Project is placed within the federal institution National Agricultural Research Centre in Islamabad, which implies many advantages, although conflicts of interest might arise between the aim at a high agricultural production level and a restrained application of chemicals.
The project preparation was not quite adequate, because the result was a project described in 2 papers, the UNIDO Project Document and the Government of Pakistan Project Description called PC-1 (Project Concept-1), which are somewhat different. The Project Document, which was ambitious and not quite realistic, was the basis for the UNIDO and Danida approval and the UNIDO implementation, while the PC-1 was the basis for the Government of Pakistan approval and implementation. This has created some communication problems, but by virtue of sound daily project management no serious problems occurred.

The PC-1 was more realistic than the Project Document, which did not recognise the existence of some laboratory capacity related to pesticides, and the budget for equipment was not in accordance with the high level of ambition of the Project Document.

What has been implemented is not surprisingly much closer to the PC-1 than to the Project Document. However, both documents are lacking specific immediate objectives and indication of well-defined target groups. The result is, that it is not clear what kind of research and data collection the Institute shall undertake or what services shall be developed.

2.3.2. Project Implementation

The inputs in the form of international consultancies were largely adequate, although a mistake in the appointment of the first Chief Technical Adviser caused a delay in the selection of equipment, which could not take place without expert input.

The training, which has taken place both in Pakistan, other Asian countries and Europe, was also adequate.

The installation of equipment was delayed, partly due to delays in selection of the equipment, partly due to slow acquisition procedures. Although prices obtained by UNIDO were favourable, the equipment required more funds than budgeted, partly because the budget was optimistic, partly because consultants recommended additional equipment and consumables.

Laboratory space and staff were allocated largely in accordance with the requirements of the Project.

The budget for funds from UNIDO/Danida was the same in the Project Document as in the PC-1, while the budget for the Government contribution was much larger in the Project Document than in the PC-1, first of all because the Project Document anticipated a staff of 57 and the PC-1 a staff of 21.

As for the UNIDO/Danida budget there is as per the end of June 1996 an uncommitted balance of about 100,000 USD, which could be spent on keeping the Project ongoing until a possible new phase has been formulated, approved and funded.

The Government of Pakistan, Danida and the UNIDO office in Islamabad have lived up to their commitments. The UNIDO Headquarters in Vienna could have provided a better project preparation and a better project management follow-up.
Since UNIDO has been through a thorough reform process in 1995-96 these shortcomings may be history.

2.3.3. Achievement of Objectives

The Project has given the Ecotoxicology Institute facilities and expertise to analyse pesticide residues at ppm level in samples from plants, soil and water for the most common pesticides used in Pakistan and to conduct research on the effect of pesticides on beneficials - natural enemies and earthworms.

The staff has been introduced to the principles of Good Laboratory Practice (GLP) and intercalibration has been organised between the Institute and the Good Laboratory Practice-accredited laboratory of the Chief Technical Adviser in Denmark. The first set of test samples have recently been analysed in Islamabad, and the results were encouraging.

The Project has overall been very cost-effective, mainly due to an efficient daily Project Management. The above-mentioned facilities staffed with well-trained scientists have been established at a cost of 600,000 USD, whereof 415,000 USD for equipment.

Due to the delay in project implementation the Project has so far not been able to provide a specific service to industry, extension service, farmers, consumers and the public, and it has only to a limited extent been able to disseminate knowledge to other member countries of the Regional Network on Pesticides for Asia and the Pacific.

The Project is perfectly in harmony with chapter 19 of Agenda 21 concerning environmentally sound management of toxic chemicals (pesticides) by strengthening national capabilities and capacities.

2.3.4. Project Organisation and Management

The National Project Director has functioned well with support from the UNIDO office in Islamabad and the Chief Technical Adviser.

The higher level of project management has been more casual with only two Project Management Committee meetings in 4 years and little follow-up on decisions. The result is, that decisions have not been implemented, major issues have not been discussed, and no preparations have been made for a possible next phase for the Project, which is needed for consolidation and further development.

Project progress reporting has been insufficient, and the Project could have benefited more from the Project Performance Evaluations.

The recommended Steering Committee has been appointed in July 1995 but has not held any meetings during its first year. And in July 1996 the recommended Scientific Committee has not yet been appointed although its establishment was decided in July 1995.
2.3.5. Future Operation and Development of the Project

Use of pesticides in Pakistan is essential for the production of cotton, fruit and vegetables. Also crop protection is important for production of wheat (fungicides), rice (insecticides) and sugar cane (insecticides).

Consequently there will be a further need for improving crop yields - and this will only be possible by more intensive production methods including more use of pesticides.

Therefore it is very important in the present situation and for the further development that there are facilities and expertise to do research and monitoring of adverse effects related to the use of pesticides and to find ways of minimising these effects.

Because of the lack of specific immediate objectives and well-defined target groups and the weak higher level project management it is not clear what kind of research the Ecotoxicology Institute should undertake and how sustainability can be ensured. Ecotoxicology is a very comprehensive subject, and under this label working with a very wide variety of topics is possible, but the limited resources available do not permit widespread efforts. The Chief Technical Adviser has made suggestions for work plans but received no feed back.

It is very important that further support is based on the activities of interest to key customers. Among these should be emphasised the political decision makers, extension service, farmers and the agrochemical industries. Also, FAO should be involved in the Project with UNIDO.

It is necessary to decide how to ensure sustainability for the Ecotoxicology Institute. This may be obtained by a Government of Pakistan decision to maintain the Institute as a regular part of the National Agricultural Research Centre with its share of the total budget. Or it may be obtained by developing (perhaps after consultation with the target groups) services for the pesticide industry or others, which are so useful to the target groups that these are willing to pay for them.

2.4. Recommendations

1. For a possible next phase UNIDO/the Government of Pakistan should ensure, that the Project Document and the PC-1 describe the same project, and that objectives and target groups are sufficiently specific. A consistent application of the Logical Framework Approach would be appropriate, if they aim at Danida funding.

2. In order to keep the Project ongoing in the best way until the start of a possible next phase, the National Project Director in consultation with the Chief Technical Adviser should as soon as possible prepare a proposal for the utilisation of the uncommitted balance of the Project budget.

3. Progress reports should be prepared regularly and semiannually by the daily project management.
4. The Steering Committee and the Scientific Committee should be properly implemented.

5. The Evaluation Team can recommend support for a next phase of the Project, provided that:

   - Clear objectives are set and a long term strategy developed for the future operation and development of the Ecotoxicology Institute including the network of other laboratories in Pakistan
   - Work programmes are elaborated specifying the need for support in terms of consultancies and funds
   - A better overall project organisation set-up is implemented

2.5. Lessons Learnt

2.5.1. UNIDO

It is possible that the shortcomings concerning project preparation and project management are history, because UNIDO during the ongoing reform process more or less is changing all procedures. However, to make sure that possible weaknesses from the past are not carried on, UNIDO should consider the following:

The Project document should be taken more seriously, both during its preparation and during project implementation.

It may be useful to define more clearly the role of the Backstopping Officer, both overall and more specifically vis à vis the Chief Technical Adviser.

More attention should be paid to the project progress reporting. A format should be defined, and the reports should be prepared semiannually by the daily project management, e.g. the National Project Director.

More attention should also be paid to the higher level of project management and the follow-up on decisions. This includes the Project Performance Evaluation Report procedure, or what may replace it.

2.5.2. Danida

Since Danida in all its own project preparation places great emphasis on the Logical Framework Approach it is recommended to demand the preparation of a proper Logical Framework Matrix for all Danida funded projects executed by other agencies.

3. THE SETTING OF THE PROJECT
3.1. Use of Pesticides in Pakistan

The present use of pesticides in Pakistan is concentrated on cotton, the most important cash crop, and the most important export commodity. The production of cotton is concentrated in the Punjab and in Sindh provinces, but is also found in Baluchistan. The pesticides applied in cotton are mostly insecticides against a number of very serious pest species, e.g. white fly, jassid, aphid and bollworms. White fly is important, both as a direct pest species and as a transmitter of the cotton leaf curl virus. This virus is the most important disease in cotton.

There are also pest problems in other crops, and pesticides are being used mostly in cash crops such as vegetables and fruit. Insecticides account for about 80 per cent of the consumption.

Some figures for import and use of pesticides in Pakistan illustrate the development:

<table>
<thead>
<tr>
<th>Year</th>
<th>1983</th>
<th>1988</th>
<th>1993</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>1,800 metric tonnes of active ingredients</td>
<td>4,900 &quot; &quot; &quot; &quot;</td>
<td>6,100 &quot; &quot; &quot; &quot;</td>
</tr>
</tbody>
</table>

The total amount of pesticides used in Pakistan is not very high compared to the area of arable land, but the pesticide use in Pakistan is concentrated on relatively few crops, with cotton, fruit and vegetables as the most important.

This means a rather intensive use of pesticides in these crops. The total cotton area is about 2.5 mio. ha and 80 per cent of the total use of pesticides is used in cotton. About three to six applications in the crop are normal, so the figures correspond to an average use of two kg per ha per year. The use of pesticides in fruit and vegetables can be even more intensive.

The intensive use of pesticides in cotton involves a special risk for the harvest workers, the boll pickers, and of an unacceptable residue concentration in cotton seed oil and cakes.

The intensive use of pesticides in fruit and vegetables also involves the risk of pesticide contamination in marketable products, which may threaten the export income, which is important, in particular for fruit, where the export figures are as follows:

<table>
<thead>
<tr>
<th></th>
<th></th>
<th></th>
<th></th>
<th></th>
</tr>
</thead>
<tbody>
<tr>
<td>Quantity</td>
<td>124.6</td>
<td>121</td>
<td>127.5</td>
<td>139</td>
</tr>
<tr>
<td>(1,000 tonnes)</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Value</td>
<td>965.5</td>
<td>1,179</td>
<td>1,324</td>
<td>1,256</td>
</tr>
<tr>
<td>(Million PKR)</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

3.2. Pesticide Legislation, Administration and Control

Legislation concerning marketing, control and use of pesticides is administered by The Plant Protection Department, Ministry of Food, Agriculture and Livestock. This department is responsible for the registration of pesticides for marketing in Pakistan. Before registration,
companies have to present data about physical and chemical characteristics of the pesticides, and the pesticides have to be tested for efficacy - normally in field tests over two years in Pakistan in addition to efficacy tests carried out in other countries and under other conditions than in Pakistan.

The registration procedure also comprises quality tests of samples from the batches used for sales in Pakistan.

A number of pesticides are banned in Pakistan. The banned pesticides include mostly chlorinated hydrocarbons as DDT, Aldrin, Dieldrin.

The Pesticide Research Laboratory of the Tropical Agricultural Research Institute in Karachi carries out the quality control of the batch samples, and they charge the companies for this quality control - presently the fee is 10,000 PKR per sample.

The FAO has recently provided the Department of Plant Protection with equipment so that also this department can perform quality control when the equipment has been installed.

The provincial research institutes do the field efficacy tests and the quality control of pesticides for sale is also the responsibility of the provincial authorities. The results from these analyses are submitted to the department of Plant Protection.

3.3. Pesticides Import, Sales and Distribution

Many companies are dealing with import, formulation and sales of pesticides in Pakistan. About 80 of the most important companies are organised in the Pakistan Agricultural Pesticides Association (PAPA). During the recent years the pesticide trade has been liberalised with the consequence that the price has been declining and is now at the same level as in the neighbouring countries. Therefore it has become less profitable to import and sell pesticides in Pakistan and some multinational companies have left the market. Many small companies are operating in the pesticide market in Pakistan. There are more than 2,800 dealers, who should have a certificate to sell pesticide, but knowledge about pesticides among the dealers is stated to be insufficient, so they cannot inform the farmers how to handle the pesticides in a safe and efficient way.

3.4. Education of the Extension Staff and the Farmers

There have been and are ongoing training programmes financed and organised by the research institutes, both at the federal and the provincial level. Some big pesticide companies run their own education and training programme and also international organisations like FAO are involved in training programmes for a more appropriate use of pesticides based on the Integrated Pest Management concept.

Important ingredients in these programmes are
- Better knowledge about efficacy, side effects and the transport and degradation of the used
pesticide
- The hazards in connection with formulation, transport, storage and application of pesticides, and
- Concentration of pesticides in the plant products after treatment with pesticides.

There is very little knowledge about how fast the various pesticides degrade under the conditions occurring in Pakistan.

3.5 Institutional Aspects

An important part of the agricultural research in Pakistan is funded through the Pakistan Agricultural Research Council (PARC) in Islamabad, where also the federal research institution, the National Agricultural Research Centre (NARC) is situated. There are several agricultural universities in Pakistan, but few laboratories have been dealing with pesticides. Some provincial laboratories have carried out quality control activities by analysing pesticides being marketed, but residue analyses have only been done on an ad hoc basis as a part of various projects.

The Nuclear Institute for Agriculture and Biology (NIAB) has been involved in research concerning degradation of pesticides in soil in connection with the International Atomic Energy Commission in Vienna. This agency has organised and financed world wide research on degradation of pesticides in soil based on use of radioisotope labelled pesticides. This work has been concentrated on pesticides with very long degradation time, e.g. DDT and other chlorinated pesticides. The Nuclear Institute for Agriculture and Biology has equipment to work with isotopes.

The Pesticide Research Laboratory at the Tropical Agricultural Research Institute (TARI) in Karachi has been working with quality control of pesticides and has therefore obtained experience in chemical analyses of pesticides. This laboratory also does residue analyses in samples from plant products, milk samples from women and other residue analyses, but not on a large scale due to limited capacity and funds.

The Agricultural Research Institute, Peshawar Agricultural University has recently been equipped with instruments for chemical analyses of pesticides. This equipment has been funded by the Pakistan Agricultural Research Council. The Department for Plant Protection is very active in research concerning Integrated Pest Management for fruit, cereals and other crops especially important for this province.

The AYUB Agricultural Research Institute (AARI) in Faisalabad also has a laboratory for pesticide analyses, which is reasonably well equipped for this purpose.

The International Institute for Biological Control (IIBC) in Rawalpindi has been working with research in biological control of pests. This expertise and experience is important for the future research on implementing Integrated Pest Management-based plant protection strategies in Pakistan.

The National Institute for Biotechnology and Genetic Engineering (NIBGE) in Faisalabad is involved in the study of the degradation of biochemicals in soil and water based on microbial
activities, which research could be relevant also for biological degradation of pesticides. This institute is new and has been developed after the preparation of the Project document for the present Project.

4. PROJECT DESCRIPTION

There is no unequivocal description of the Project, because it is described both in the Project Document, which was the basis for the UNIDO and Danida approval and the UNIDO implementation, and in the PC-1 (Project Concept-1), which was the basis for the Government of Pakistan approval and implementation, and these two descriptions are somewhat different.

The Project Document was prepared first, and what probably happened was, that those preparing the PC-1 appreciated the unrealistic ambitions of the Project Document and made some changes in the project formulation. Usually there are differences between the Project Document and the PC-1, but in this case the two documents nearly describe two different projects.

The UNIDO Backstopping Officer should have appreciated these differences before project inception and initiated a discussion with the Government of Pakistan on how to achieve a common basis for the implementation.

In the following the documents are compared to illustrate the differences.

In the Project Document the project title is "An Ecotoxicology Research Centre in Pakistan" while in the final issue of the PC-1 the title is "Strengthening of the Ecotoxicology Research in Pakistan".

4.1. Development Objectives

In the Project Document the development objectives are:

1. Minimise the immediate and long term human health hazards and environmental effects caused by the steadily increasing production and use of pesticides in Pakistan and to encourage the introduction of newer and safer products conducive to man and his environment.

2. Provide technical expertise, advice and know-how in this area to the member countries of the Regional Network on Pesticides for Asia and the Pacific and thereby assisting them to provide similar benefits to their own countries under the Technical Cooperation among Developing Countries (TCDC) arrangement.

In the PC-1 the first and the last of the development objectives are the same as in the Project Document, except that in the last one expertise, advice and know-how should also be provided to the provinces. In between there is the following additional development objective:
3. Measure and minimise the effects of accidental emissions, discharges, leakages etc. of bulk pesticides during manufacture, formulation, storage and transport.

4.2. Immediate Objectives

In the Project Document the immediate objectives are the following:

1. Establish an ecotoxicology laboratory at the National Agricultural Research Centre (NARC), in Islamabad, to study the fate and effects of pesticides in the environment.

2. Establish laboratories at suitable locations in two of the provinces capable of supporting the central facility by carrying out local ecological trials and analysing samples.

3. Make the Ecotoxicology Institute a focal point for carrying out ecotoxicity of selected pesticides for the country. At the final year of the project implementation, the Institute will, based on actual possibility, provide support to the member countries of the Regional Network on Pesticides for Asia and the Pacific and in the process become self-supportive as much as possible.

In the PC-1 there are 4 immediate objectives as follows:

1. Strengthen ecotoxicology laboratories at the National Agricultural Research Centre to study the fate and effects of pesticides on the environment.

2. Strengthen Pesticide Laboratories at Karachi capable of supporting the central facility by carrying out ecological trials and analysing environmental samples.

3. Establish a nucleus of national scientific staff having the necessary technical skill, by rearranging priorities in Entomological Research Laboratories research portfolios, so that necessary manpower can be diverted to this Project.

4. Develop an ecotoxicology facility in Pakistan capable of carrying out the functions described which will continue to operate beyond the period of UNDP/UNIDO support and be able to provide technical support in ecotoxicology to the provinces and to the member countries of the Regional Network on Pesticides for Asia and the Pacific.

The difference between the two sets of objectives is, that the Project Document anticipates the establishment of new laboratories at Islamabad and 2 unidentified locations in the provinces, while the PC-1 recognises, that some laboratory facilities are already there in Islamabad and Karachi. The objective is to upgrade and strengthen these, and the manpower should be found at the Entomological Laboratory of the National Agricultural Research Centre in Islamabad and at the Tropical Agricultural Research Institute in Karachi.

4.3. Outputs
In the Project Document there is one output for the first immediate objective:

1. A central laboratory at the National Agricultural Research Centre, Islamabad, established with trained staff and equipment and capable of doing environmental research on pesticides for industries, government agencies and other institutions.

for the second immediate objective there are 2 outputs:

2.1 Two laboratories, each in a different province. The exact locations will need to be decided on a variety of factors. From an initial survey convenient locations seem to be the North Western Frontier Province Agricultural University, Peshawar, and the Agricultural University at Faisalabad, Punjab.

2.2 A total of 14 trained personnel established in the laboratories providing support service to the National Ecotoxicology Institute.

and for the third immediate objective there is one output:

3. The Ecotoxicology Institute providing assistance to pesticide industry, agricultural institutions during the final year of the Project in solving problems related to ecological aspects (both existing and anticipatory) associated with pesticides.

In the PC-1 no outputs are formulated. The main emphasis is placed on specification of the staff to be seconded to ecotoxicology activities, the training to be conducted and the equipment to be installed in the laboratories.

Apart from the differences in the objectives the main difference between the Project Document and the PC-1 is the number of technical staff members to be seconded, which is 47 in the Project Document and 18 in the PC-1.

4.4. Activities

The Project Document lists a total of 11 activities required for achieving the 4 outputs, and it contains a tentative work plan, which is not directly related to the activities.

The PC-1 does not specify the activities or the work plan.

4.5. Assumptions

Neither the Project Document nor the PC-1 specifies any assumptions. The Project Document lists a number of risks, which may cause delays or prevent achievement of project outputs and objectives. These risks are mainly related to the Government of Pakistan support and the availability of well qualified staff.

Both papers indicate the prerequisite that the necessary laboratory space and staff are made available by the Government of Pakistan before the inception of the Project.
4.6. Target Beneficiaries

The Project Document states: The target beneficiaries are the Pakistan Agricultural Research Council of the Ministry of Agriculture and the Project will ultimately benefit the producers, users and the public by providing a better knowledge of the extent of possible risks to their health and how to avoid them. The Asia region will also benefit through the Regional Network on Pesticides for Asia and the Pacific by making use of the Ecotoxicology Institute for training and conducting workshops for the benefit of the Asian countries.

The PC-1 does not specify any beneficiaries

4.7. Project Organisation

According to the Project Document the project organisation consists of:

- The National Project Director, who runs the Project assisted by the Chief Technical Adviser. They will report to

- The Project Management Committee (consisting of representatives from the Government of Pakistan and UNIDO, the National Project Director and the Chief Technical Adviser), which will coordinate all aspects of the Project

The PC-1 does not describe the project organisation.

4.8. Financing

Both the Project Document and the PC-1 contains a detailed budget for the Project, specifying the inputs to be provided from the Government of Pakistan and from UNIDO

The inputs to be provided by UNIDO are the same, but the inputs in the form of staff and cash to be provided by the Government of Pakistan are much smaller in the PC-1 than in the Project Document.

4.9. Project Reviews and Modifications

Two bipartite (the Government of Pakistan and UNIDO) reviews (Project Performance Evaluations) were carried out, one in September 1993 and one in December 1994, and the corresponding bipartite meetings were held in October 1993 and July 1995, respectively. These reviews were based on the Project Document only.

In 1993 delays in implementation were recognised and the expected project completion was changed from June 1995 to December 1995.
As for the immediate objective 2 (regional laboratories) nothing had happened in 1993 ("negoti-
ations were ongoing").

In 1994/95 further delays were recognised and the expected completion changed to June 1996
and in connection with a budget revision in March 1995 it was changed to end 1996.

In connection with the 1994/95 review the immediate objective 2 (establishment of 2 regional
laboratories) was changed to cooperation arrangements with laboratories in Karachi (the
Tropical Agricultural Research Institute) and Faisalabad (the Nuclear Institute for Agriculture
and Biology).

Furthermore, recognising that the level of ambition was too high, it was decided that the
laboratory in Islamabad should not work with isotopes, microbiology, vertebrate and aquatoxici-
ology. Instead work related to these subjects should be carried out in affiliated laboratories.

5. PROJECT PREPARATION AND PLANNING

5.1. Project relevance and identification

The Project has been initiated in the context of the Regional Network on Pesticides for Asia and
the Pacific, which network has the objective of promoting safety in production and use of pesti-
cides with emphasis on user and environment friendly pesticides in support of Integrated Pest
Management (IPM).

The Regional Network on Pesticides for Asia and the Pacific supports various core topics such
as: Pesticides data collection, industrial safety and waste management, industrial hygiene and
occupational safety, ecotoxicology, new material prospection, impurities in technical materials
and application technology.

The various member countries of the Regional Network on Pesticides for Asia and the Pacific
build up an expertise within certain topics, and Pakistan has agreed to specialise in pesticide
ecotoxicology, which topic is very important for further development of more safe and efficient
crop protection.

Furthermore there is a great lack of knowledge and understanding among the farmers in Pakistan
of the correct use of pesticide and the consequences of inappropriate application.

Therefore there is a great need for an institution capable of providing data illustrating the
ecotoxicological situation in the soil and water in Pakistan and conducting research on how to
maintain a high agricultural production using pesticides in a sustainable way. So the Project
must be considered relevant, because it addresses a real need.

The problems related to pesticides are widely recognised, and the priority given to the Project in
Pakistan is high, which has been confirmed by the persons interviewed. This is also demon-
strated by the fact, that the Government of Pakistan inputs to the Project largely have been provided according to the project requirements.

The Pakistan Agricultural Research Council (PARC) is supporting many research programmes aiming at increasing the agricultural production and reducing the losses due to pests. Many of these programmes are implemented at the National Agricultural Research Centre (NARC) in Islamabad. The Pakistan Agricultural Research Council realises that production increase and loss reduction must be achieved on a sustainable basis (including use of pesticides), so data are needed on the effects and fate of chemicals applied for these purposes.

Projects dealing with pesticide problems have been implemented in Pakistan on an ad hoc basis, which means that the efforts have been scattered and incoherent. Therefore when the Regional Network on Pesticides for Asia and the Pacific recommended the establishment of a national institution in Pakistan it was evident that there would be many advantages connected with establishing it within the National Agricultural Research Centre, where a specific knowledge of plant protection and a general scientist research environment is already present, and where they could share many support facilities with other institutions.

It has been considered that there might occur conflicts of interest between the main goals inside the National Agricultural Research Centre to increase the agricultural output, and the aims of the Ecotoxicology Institute dealing with the adverse effects of using pesticides, but it was concluded, that the advantages of a placement within the National Agricultural Research Centre predominate the disadvantages.

5.2. Project design

It is difficult to assess the project strategy, because the one described in the Project Document is different from the one described in the PC-1.

The Project Document does not recognise that within the National Agricultural Research Centre, the Nuclear Institute for Agriculture and Biology and the Tropical Agricultural Research Institute there is some pesticide knowledge, and the strategy is to establish new laboratories, both in Islamabad and in the provinces, and it is not obvious where the provincial laboratories should be located.

The PC-1 strategy is to strengthen the pesticide research, based on an upgrading/transformation (both staff and equipment, but without changing the institutional set-up) of the Entomology Laboratory of the National Agricultural Research Centre in Islamabad and the Analytical Laboratory of the Tropical Agricultural Research Institute in Karachi.

The strategy actually followed has been closer to the PC-1 than to the Project Document, which is natural, since the institutional set-up outlined in the Project Document was not properly elaborated, and it was not functionally realistic, because it did not recognise the factual situation.

The formulation of the objectives in the Project Document is not quite adequate.
The first part of the development objective is relevant and to the point, but the rest of the objectives are outputs rather than true objectives, which is demonstrated by the fact, that the formulation of each immediate objective and the corresponding output is nearly identical.

The same is true for in particular the last 2 objectives of the PC-1.

The latest parts of the immediate objectives, indicating that the laboratories should 'study the fate and effects of pesticides in the environment' and 'carry out local ecological trials and analyse samples' are too general to provide clarification.

Proper immediate objectives are missing, and consequently it is not sufficiently clear what the specific purpose of the Project really is. In the background chapter of the Project Document several options are mentioned, and it gives the impression, that the purpose is to service the industry, but this is not really indicated anywhere. The target beneficiaries are defined as primarily the Pakistan Agricultural Research Centre and the Ministry of Agriculture, and ultimately the producers, users and the public.

The PC-1 realistically defines the objectives to be strengthening of the laboratories in Islamabad and Karachi, although it is not more specific than the Project Document on the research topics.

The level of ambition for the capability of the laboratory in Islamabad, expressed in the activities leading to output No. 1 of the Project Document, was too high. The National Project Director, the Chief Technical Adviser and the UNIDO Backstopping Officer later appreciated this, and activities such as the ones related to implementation in the Islamabad laboratory of facilities for use of isotopes, soil microbiology, vertebrate and aquatic toxicology were left out from the Project. Instead work related to these subjects should be carried out in affiliated laboratories.

The immediate objective No. 2 of the Project Document must also be considered not quite realistic. Instead of establishing laboratories belonging to the Ecotoxicology Institute the objective has in fact become the establishment of a cooperation network with other laboratories, which already have an expertise somehow related to ecotoxicology. This is in accordance with the PC-1, which never anticipated the establishment of proper subsidiaries of the Islamabad laboratory in the provinces.

5.3. Project Appraisal

The Project was first formulated by the UNIDO consultant A. Calderbank during a visit to Pakistan in June/July 1988. During another visit in September/October 1989 he prepared the draft Project Document, which then went through the normal UNIDO appraisal procedure.

The above-mentioned problems connected with project design may be caused by the fact, that it was dubious, whether the Project was really within UNIDO's mandate. If the Project Document had had the same content as the PC-1 it may not have been approved by UNIDO.

The UNIDO project preparation seems to have been insufficient. The unrealistically high level of ambition should have been revealed, and the differences between the Project Document and
the PC-1 should have been corrected before project start.

On the face of it the Project seems designed through application of the Logical Framework Approach, but in fact it has not been applied consistently, resulting in a Logical Framework Matrix. Otherwise the design shortcomings would probably have been uncovered.

Danida did a very short desk appraisal of the Project and suggested a reappraisal in Pakistan by Mr. Calderbank and a Danida representative. However, although this was accepted by UNIDO, after UNIDO had answered some questions, Danida gave up the suggestion, relying on the UNIDO appraisal.

5.4. Conclusions:

The Project is relevant, because it addresses a real need for an institution capable of providing data illustrating the ecotoxicological situation in the soil and water in Pakistan and conducting research on how to maintain a high agricultural production using pesticides in a sustainable way. And the Project has a relatively high priority in Pakistan, because the actual and potential problems related to pesticides are widely recognised.

The Project is placed within the federal institution National Agricultural Research Centre in Islamabad, which implies many advantages, although conflicts of interest might arise between the aim at a high agricultural production level and a restrained application of chemicals.

The project preparation was not quite adequate, because the result was a project described in 2 papers, the Project Document and the PC-1, which are different. The Project Document, which was ambitious and not quite realistic, was the basis for the approval by UNIDO and Danida and the UNIDO implementation, while the PC-1 was the basis for the Government of Pakistan approval and implementation, and this has created some communication problems, but by virtue of sound daily project management no serious problems occurred.

The PC-1 was more realistic than the Project Document, which did not recognise the existence of some laboratory capacity related to pesticides, and the budget for equipment was not in accordance with the high level of ambition of the Project Document.

What has been implemented is not surprisingly much closer to the PC-1 than to the Project Document. But both documents are lacking specific immediate objectives and indication of well-defined target groups. The result is, that it is not clear what kind of research and data collection the Institute shall undertake or what services shall be developed.

5.5. Recommendations:

For a possible next phase UNIDO and the Government of Pakistan should ensure, that the Project Document and the PC-1 describe the same project, and that objectives and target groups are sufficiently specific. A consistent application of the Logical Framework Approach may be appropriate, if the aim is Danida funding.
6. PROJECT IMPLEMENTATION AND PERFORMANCE

Detailed work plans have not been prepared, so a comparison between such plans and the realisation is not possible.

6.1. International Consultancies

The visits by the international consultants have been as follows:

<table>
<thead>
<tr>
<th>Consultant/ Country</th>
<th>Expertise</th>
<th>Time of Visit</th>
<th>Remarks</th>
</tr>
</thead>
<tbody>
<tr>
<td>K. Fletcher, UK</td>
<td>Designated Chief Technical Adviser</td>
<td>9.7.-26.7.1992</td>
<td></td>
</tr>
<tr>
<td>B. Crozier, UK</td>
<td>Analytical Chemist</td>
<td>28.7.-22.8.1992</td>
<td></td>
</tr>
<tr>
<td>L. Vollner, Germany</td>
<td>Radio labelled pesticides</td>
<td>21.3.-17.4.1994</td>
<td></td>
</tr>
<tr>
<td>M.L. Richardson, UK</td>
<td>Ecotoxicology</td>
<td>25.3.-2.4.1994</td>
<td>Participation in the Ecotoxicology Workshop</td>
</tr>
<tr>
<td>S.A. Hassan, Germany</td>
<td>Biological Control</td>
<td>27.11.-6.12.1995</td>
<td>The Project paid only for the travel expenses.</td>
</tr>
</tbody>
</table>

Mr. E. Kirknel will have his last visit in Pakistan in the last part of 1996. The visit has not yet been scheduled.

The number and duties of the experts have been adjusted in view of the modifications of the Project (see the budget table below), and the Chief Technical Adviser was to cover several disciplines. The overall delivery of the international expertise was satisfactory, although the appropriateness and performance of these experts varied. Problems were reported on the synchronization of some visits with the arrival and availability of necessary instruments/equipment.
The appointment of Mr. Fletcher was a mistake, because he was not able to provide technical guidance on equipment, which was his first important task. UNIDO is hardly to blame, because this was not evident from his CV. However, this caused a delay in the selection of equipment and thus the Project.

Also the visit of Mr. Vollner was not appropriate, because expertise within the field of isotopes was already available at the Nuclear Institute for Agriculture and Biology in Faisalabad.

6.2. Training Programme

The training programme was not detailed in the Project document, and training has been conducted when felt relevant by the international consultants, the National Project Director and the project staff.

The following table has been compiled from information provided in the Project Performance Evaluation Reports and the project files.

<table>
<thead>
<tr>
<th>Field of Training</th>
<th>Name of Person, Sex</th>
<th>Institution/Country</th>
<th>Duration, Dates</th>
</tr>
</thead>
<tbody>
<tr>
<td>Analytical techniques</td>
<td>Dr. M.A. Matin (M)</td>
<td>Pesticide Lab., the Tropical Agricultural Research Institute, Karachi</td>
<td>2 weeks; March 1993</td>
</tr>
<tr>
<td></td>
<td>Dr. Yousaf Hayat (M)</td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td>Mr. Moh. Mumtaz (M)</td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td>Mr. Tahir Anwar (M)</td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td>Mr. Athar Rafi (M)</td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td>Ms. Sima Tahir (F)</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Use of Nuclear Techniques with special reference to</td>
<td>Mr. Tahir Anwar (M)</td>
<td>The Nuclear Institute for Agriculture and Biology, Faisalabad</td>
<td>6 weeks; 10.7-18.8.94</td>
</tr>
<tr>
<td>radio labelled pesticides in Ecotoxicology research</td>
<td>Mr. Ashiq Muhammad (M)</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Study tour in Ecotoxicology</td>
<td>Dr. Umar K. Baloch (M)</td>
<td>Denmark, U.K.</td>
<td>3 weeks; May 1993</td>
</tr>
<tr>
<td>Pesticide use and analysis</td>
<td>Ms. Sima Tahir (F)</td>
<td>Natural Resource Institute, U.K.</td>
<td>1.5 month; Sept-Oct. 1993</td>
</tr>
<tr>
<td></td>
<td>Ms. Shahida Akhtar (F)</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Study tour regarding research strategies adopted for</td>
<td>Dr. Yousaf Hayat (M)</td>
<td>U.K.</td>
<td>3 weeks; 10.7-31.7.94</td>
</tr>
<tr>
<td>bio-remediation/bio-degradation of pollutants and their</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>adverse effect on beneficial microbes in agro ecosystems</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Study tour for review of Ecotoxicology research;</td>
<td>Dr. M.A. Matin (M)</td>
<td>U.K., Germany</td>
<td>3 weeks; 2.-23.7.94</td>
</tr>
<tr>
<td>IOBC test methods for beneficial organisms.</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Field of Training</td>
<td>Name of Person, Sex</td>
<td>Institution/ Country</td>
<td>Duration, Dates</td>
</tr>
<tr>
<td>-------------------</td>
<td>---------------------</td>
<td>-----------------------</td>
<td>-----------------</td>
</tr>
<tr>
<td>Study tour to visit and study Environm. Labs. At different Universities</td>
<td>Mr. Mohammad Mumtaz (M)</td>
<td>U.K.</td>
<td>1 week; 22.10.-6.11.94</td>
</tr>
<tr>
<td>Pesticide residue analysis</td>
<td>Mr. Tahir Anwar (M) Mr. Moh. Ashiq (M)</td>
<td>Denmark</td>
<td>16.10.-10.12.94</td>
</tr>
<tr>
<td>Participation in 5th SETAC Congress</td>
<td>Dr. Syed Z. Masud (M)</td>
<td>Denmark</td>
<td>2 weeks; 24.6-7.7.95</td>
</tr>
<tr>
<td>Study tour and Congress Participation</td>
<td>Mr. Umar K. Baloch (M)</td>
<td>Germany, Netherlands, Malaysia</td>
<td>3 weeks; 2.-24.4.95</td>
</tr>
<tr>
<td>Evaluation of Pesticide effects on natural enemies and its implication for pesticide registration</td>
<td>Mr. Haseeb (M)</td>
<td>Malaysia</td>
<td>13.-26.3.95</td>
</tr>
<tr>
<td>Terrestrial Ecotoxicology</td>
<td>Mr. Muh. Amjad (M) Mr. Muh. Haseeb (M)</td>
<td>Germany</td>
<td>2 weeks; 8.-21.11.95 6 weeks; 13.11-23.12.95</td>
</tr>
</tbody>
</table>

As far as the training and study tours component is concerned, substantive changes from the initial plans were observed with respect to duration and number of people trained. A considerable reduction in the budget allocation for fellowships and a steep increase in the allocation for study tours was due partly to the fact that training below 6 weeks was considered study tours, partly to an increased appreciation of the value of study tours and international contacts.

As far as the usefulness of the training provided is concerned, the Evaluation Team believes that the subjects, duration and methodology of the training programme have been largely adequate. The only exception seems to be the training of Islamabad scientists in the use of isotopes.

### 6.3. Equipment and Laboratory Space

The delivery and installation of the equipment faced several delays, partly due to problems concerning selection of equipment and availability of laboratory space, partly due to slow UNIDO procedures. The equipment also required more funds than originally foreseen, although the prices obtained by UNIDO were favourable. In addition to the original budget being too optimistic this was caused partly by recommendations made by the visiting consultants for additional instruments and/or consumables, partly by problems due to an unstable electricity supply.

The allocation of all the planned laboratory space should have been effected before project start, but it has only been allocated when and to the extent required by the Project. The reason for this was, that the National Project Director found it inappropriate to have other laboratories vacate space, which the Project was unable to use.

The total laboratory space allocated in Islamabad is now a little less than 3,000 sq.ft., equal to
about 2/3 of the ground floor in the building where it is placed. At the Bipartite Review Meeting in 1995 it was decided to allocate the whole ground floor to the Ecotoxicology Institute.

The Project Document estimates the necessary laboratory space to be 12,000 sq.ft. at Islamabad and 5,000 sq.ft. in each province, while the PC-1 estimates the need to be a total of 22,000 sq.ft. in Islamabad and Karachi.

6.4. Staff

Staff members have also been allocated to the extent the Project has been able to absorb them. The National Project Director was appointed in February 1992, and 6 scientific officers were appointed in September 1992. 1 more was appointed in February 1994 and 3 trainee scientists were appointed in April 1994, later 2 persons left and 3 others were taken on, so at the end of 1995 the scientific staff in Islamabad was:

1. Dr. Umar Khan Baloch, Deputy Director General (the National Agricultural Research Centre) and National Project Director.
2. Mr. Muhammad Mumtaz, Principal Scientific Officer
3. Dr. Muhammad A. Matin, Senior Scientific Officer
4. Dr. M. Yousaf Hayat Khan, Senior Scientific Officer
5. Mr. Muhammad Haseeb, Scientific Officer
6. Mr. Tahir Anwar, Scientific Officer
7. Dr. Seema Tahir, Scientific Officer
8. Mr. Ashiq Muhammad, Scientific Officer
9. Mr. Karam Ahad, Scientific Officer
10. Mr. Abdul Rauf Ahmad, Scientific Officer
11. Miss Shagufta Aziz, Trainee Scientist
12. Mr. Shahid Majeed, Research Fellow

The Project Document estimated the total staff at project completion to be as follows:

<table>
<thead>
<tr>
<th></th>
<th>Islamabad</th>
<th>The Provinces</th>
</tr>
</thead>
<tbody>
<tr>
<td>27 scientific</td>
<td></td>
<td>10 scientific</td>
</tr>
<tr>
<td>assistants</td>
<td></td>
<td>4 lab. assistants</td>
</tr>
<tr>
<td>6 other support staff</td>
<td></td>
<td>4 other support staff</td>
</tr>
</tbody>
</table>

while the PC-1 anticipated the following:

<table>
<thead>
<tr>
<th></th>
<th>Islamabad</th>
<th>Karachi</th>
</tr>
</thead>
<tbody>
<tr>
<td>9 scientists</td>
<td></td>
<td>6 scientists</td>
</tr>
<tr>
<td>1 stenotypist</td>
<td></td>
<td>5 support staff</td>
</tr>
</tbody>
</table>

and a total of 4 scientific officers and 10 lab. assistants involved in ecotoxicology research.
6.5. Funds

The main items of the project budget as per the Project Document of 14 November 1991 and those of the latest budget revision “F” (dd. 26 June 1996), and the uncommitted balance as per the end of June 1996, were:

<table>
<thead>
<tr>
<th>Budget Line</th>
<th>Original/revised title</th>
<th>Initial Budget</th>
<th>Latest Revision</th>
<th>Uncommitted Balance as per 30/6 1996</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td></td>
<td>w/m USD</td>
<td>w/m USD</td>
<td>USD</td>
</tr>
<tr>
<td>11-01</td>
<td>Chief Technical Adviser</td>
<td>5.0 50,000</td>
<td>5.0 65,000</td>
<td>16,193</td>
</tr>
<tr>
<td>11-02</td>
<td>Analytical Chemist</td>
<td>2.0 20,000</td>
<td>0.7 9,451</td>
<td>0</td>
</tr>
<tr>
<td>11-03</td>
<td>Environmental Chemist</td>
<td>2.0 20,000</td>
<td>1.2 13,255</td>
<td>0</td>
</tr>
<tr>
<td>11-04</td>
<td>Soil Science Specialist</td>
<td>2.0 20,000</td>
<td></td>
<td></td>
</tr>
<tr>
<td>11-05</td>
<td>Aquatic Toxicology/Terrestrial Toxicologist</td>
<td>1.0 10,000</td>
<td>1.0 13,000</td>
<td>13,000</td>
</tr>
<tr>
<td>11-06</td>
<td>Quality Assurance</td>
<td>1.0 10,000</td>
<td></td>
<td>0</td>
</tr>
<tr>
<td>11-07</td>
<td>Eco-toxicology/ST consult.</td>
<td>1.0 10,000</td>
<td>0.5 5,000</td>
<td>258</td>
</tr>
<tr>
<td>11-99</td>
<td>Sub-total</td>
<td>14.0 140,000</td>
<td>8.4 105,706</td>
<td>29,451</td>
</tr>
<tr>
<td>13-00</td>
<td>Clerks, secretaries</td>
<td>4,000</td>
<td>4,000</td>
<td>919</td>
</tr>
<tr>
<td>15-00</td>
<td>Project Travel</td>
<td>3,000</td>
<td>3,000</td>
<td>2,826</td>
</tr>
<tr>
<td>16-00</td>
<td>Staff mission</td>
<td>10,000</td>
<td>15,000</td>
<td>5,464</td>
</tr>
<tr>
<td>17-00</td>
<td>National Experts</td>
<td>4.0 8,000</td>
<td>4.0 10,000</td>
<td>7,502</td>
</tr>
<tr>
<td>31-00</td>
<td>Fellowships</td>
<td>41.0 160,000</td>
<td>65,577</td>
<td>20,725</td>
</tr>
<tr>
<td>32-00</td>
<td>Study tours</td>
<td>10,000</td>
<td>70,717</td>
<td>0</td>
</tr>
<tr>
<td>41-00</td>
<td>Expendable equipment</td>
<td>5,000</td>
<td>15,161</td>
<td>1</td>
</tr>
<tr>
<td>42-00</td>
<td>Non-expendable equipment</td>
<td>340,000</td>
<td>401,941</td>
<td>34,443</td>
</tr>
<tr>
<td>51-00</td>
<td>Sundries</td>
<td>20,000</td>
<td>10,000</td>
<td>957</td>
</tr>
<tr>
<td>99-00</td>
<td>Project Total</td>
<td>700,000</td>
<td>700,000</td>
<td>102,288</td>
</tr>
</tbody>
</table>

The Government of Pakistan contribution according to the Project Document was estimated at 20.7 mill. PKR, while according to the PC-1 it was estimated at 5.4 mill. PKR.

As shown in the table there is a considerable uncommitted balance left only 6 months before completion of the Project. These funds could be spent on keeping the Project ongoing until a possible new phase has been formulated, approved and funded.
The balance between the project components has not quite been in accordance with the Project Document and the PC-1, because the laboratory in Islamabad has received nearly all the attention. With two exceptions (Dr. S.Z. Masud and Ms. Shahida Akhtar) all staff trained or on study tours has been from Islamabad, and almost all the new equipment has been installed in Islamabad.

6.6. Commitments and Obligations

Since the basis for the Government of Pakistan project approval was the PC-1, the Government of Pakistan has lived up to the commitments, except for the laboratory space, but it must be admitted, that the Government of Pakistan mostly has allocated the space that the Project has required.

Danida has lived up to its commitments, which were related to the funding only.

The UNIDO office in Islamabad has also lived up to its commitments, providing all possible support within its limits.

The UNIDO Headquarters in Vienna has not quite lived up to its commitments as far as project management and follow-up are concerned. It seems that the higher level project management has been casual (see details in chapter 8), and the Chief Technical Adviser strongly feels, that he received insufficient information and support from Vienna. Some delays are due to slow procedures for acquisition.

Since UNIDO has been through a thorough reform process in 1995-96 these shortcomings may be history.

The Project encountered a major problem in 1993-94. One instrument did not function properly, and the project staff and the Chief Technical Adviser spent much time and effort trying to identify the cause. When after many months they finally sent the motherboard to the manufacturer it was revealed, that the board was defect.

Also the unstable electricity supply in Islamabad created many problems for the work at the analytic laboratory until a generator was installed in 1995.

6.7. Conclusions:

The inputs in the form of international consultancies were largely adequate, although a mistake in the appointment of the first Chief Technical Adviser caused a delay in the selection of equipment and thus the Project.

The training, which has taken place both in Pakistan, other Asian countries and Europe, was adequate.

The installation of equipment was delayed, partly due to delays in selection of the equipment,
partly due to slow acquisition procedures. Although prices obtained by UNIDO were favourable, the equipment required more funds than budgeted, partly because the budget was optimistic, partly because additional equipment and consumables were recommended by consultants.

Laboratory space and staff were allocated largely according to the requirements of the Project.

The budget for funds from UNIDO/Danida was the same for the Project Document and the PC-1, while the budget for the Government contribution was much larger for the Project Document than for the PC-1, first of all because the Project Document anticipated a staff of 57 and the PC-1 a staff of 21.

As for the UNIDO/Danida budget there is as per the end of June 1996 an uncommitted balance of about 100,000 USD, which could be spent on keeping the Project ongoing until a possible new phase has been formulated, approved and funded.

The Government of Pakistan, Danida and the UNIDO office in Islamabad have lived up to their commitments. The UNIDO Headquarters in Vienna could have provided a better project preparation and a better project management follow-up.

Since UNIDO has been through a thorough reform process in 1995-96 these shortcomings may be history.

6.8. Recommendations:

In order to keep the Project ongoing in the best way until the start of a possible next phase, the National Project Director in consultation with the Chief Technical Adviser should as soon as possible prepare a proposal for the use of the uncommitted balance of the Project budget.

7. ACHIEVEMENT OF OBJECTIVES, EFFECTS AND IMPACT

7.1. Immediate Objective 1

As for the immediate objective 1 and output 1 in the Project Document, the Project has given the Ecotoxicology Institute facilities and expertise to analyse pesticide residues at ppm level in samples from plants, soil and water for the most common pesticides used in Pakistan. Two gas chromatographs, two high performance liquid chromatographs and a spectrophotometer have been installed as well as the necessary support equipment including a separate generator for power supply to the analytical instruments.

The staff has been introduced to the principles of Good Laboratory Practice (GLP) and inter calibration has been organised between the Institute and the Good Laboratory Practice-accredited laboratory of the Chief Technical Adviser in Denmark. The first set of test samples have recently been analysed in Islamabad, and the results were encouraging.
With the support of the Chief Technical Adviser tentative work plans have been formulated for analytical research in the years ahead.

Training programmes for the staff members have been implemented. Two staff members have been trained for six weeks in chemical analytical methods at the Natural Resource Institute, UK, and two other staff members have participated in a two months training programme at the Danish Institute of Plant and Soil Science in Denmark - also in the field of analysis for pesticide residues in samples from plant, soil and water, and exposure experiments in occupational health studies in agriculture.

A staff member has been trained to carry out tests of the effects of pesticides on beneficials and natural enemies that can play an important role as predators or parasites in relation to important pest species in agricultural crops.

In addition other staff members have been trained at the Pesticide Laboratory of the Tropical Agricultural Research Institute in Karachi and at the Nuclear Institute for Agriculture and Biology, Faisalabad.

One staff member has been on a six weeks training course in Malaysia, concerning ecotoxicology related to the use of pesticides.

The Project has provided facilities and expertise for monitoring and research concerning fate of pesticide residues in crops, soil and water. This capacity can be of great importance for an environmentally friendly and more safe use of pesticides in Pakistan.

This capacity has not yet been used as a routine tool for monitoring and research because the project implementation has been delayed for many reasons - so this capability has just been established and has not yet status as routine. The equipment was installed in 1994 and the key staff has been trained and essential spare parts and an electrical generator to ensure a stable power supply to the sensitive analytical equipment were delivered and installed in 1995.

Ecotoxicology research - originally planned to cover both aquatic, terrestrial and soil living organisms has been reduced so that the activity in this field within the Institute will be concentrated on effect of pesticides on beneficials - predators, parasites and earthworms. Staff members have been on training courses in this discipline and a laboratory for that purpose is under establishment - in close collaboration with the International Institute for Biological Control in Rawalpindi.

The quality of the established laboratory for chemical analysis is high - which means that there is a considerable capacity for handling monitoring and research programmes concerning pesticide residues in plant products, soil and water in relation to application of pesticides under varying conditions in Pakistan.

The capacity to test pesticide effects on selected species of beneficials has to be elaborated but the training programme and the building facilities dedicated to this have a considerable potential for development of a well functioning unit in this area within a few years - it will not
be possible within the current Project, however.

7.2. **Immediate Objective 2**

As for the immediate objective 2 and outputs 2.1 and 2.2, collaboration and coordination with analytical laboratories in the Nuclear Institute for Agriculture and Biology in Faisalabad and the Tropical Agricultural Research Institute in Karachi have been established. Further collaboration with the National Institute for Biotechnology and Genetic Engineering in Faisalabad (soil living micro-organisms) and the Agricultural University in Peshawar is anticipated, and one staff member from the Tropical Agricultural Research Institute has been trained in pesticide use and analysis.

7.3. **Immediate Objective 3**

As for the immediate objective 3 and the output 3, an achievement related to the Regional Network on Pesticides for Asia and the Pacific was the Ecotoxicology Workshop held in Islamabad in March 1994 at the time of the inception of the first analytic laboratory work. And a scientist from Thailand has been trained at the Ecotoxicology Institute in Islamabad.

The cost-effectiveness of the Project has been good. The above-mentioned facilities staffed with well-trained scientists have been established at a cost of 600,000 USD, whereof 415,000 for equipment.

7.4. **Modifications**

Building up facilities and expertise in the area of chemical residue analysis was only one element among others of the anticipated activities of the Project. Because of an insufficient budget for the Project, and because of difficulties in recruitment of qualified staff, other anticipated activities of the Project have not been established or have been changed.

These are:
(1) Environmental chemistry and the use of radiochemical techniques
(2) Aquatic ecology
(3) Soil science, isolation of macro- and micro-organisms from soil
(4) Mass spectrometry and Nuclear Magnetic Resonance techniques

These changes have had some consequences so that (1) will be left to the Nuclear Institute for Agriculture and Biology where this technique has already been used to monitor the degradation of selected pesticides under Pakistan conditions. This research was part of the working programme organised by the International Atomic Energy Commission, Vienna - so the relocation of this activity from Islamabad to Faisalabad is fully supported by the Evaluation Team.

(2) Aquatic ecology will not be implemented. Instead a close collaboration with other
laboratories in the region will be established in this area - e.g. in South Korea and Malaysia. The Evaluation Team also supports this decision.

(3) Soil science - ecotoxicology in relation to macro- and micro-organisms in soil. Some research has been organised to test the effects of pesticides on earthworms, but these activities have until now been rather marginal and it is the impression of the Evaluation Team that this aspect related to the use of pesticides in Pakistan is not the most urgent problem.

The same applies to tests of the pesticide effect on soil living micro-organisms. This activity will be left to the National Institute for Biotechnology and Genetic Engineering, where the staff already has an expertise concerning the role of micro-organisms on degradation of xenobiotic substances in soil. The Evaluation Team fully supports this decision.

(4) Mass spectrometry and Nuclear Magnetic Resonance techniques. This activity has been postponed because there has been no possibility of establishing this facility within the budget for the Project. Also, the establishment of these facilities should be further discussed in relation to the work plan for the Institute in the future. Mass spectrometry and Nuclear Magnetic Resonance techniques are not essential for the presently planned activities.

7.5. Effects

The Project has so far not been able to provide a specific service to industry, extension service, farmers, consumers and the public. This is partly because of the delay in implementation of the Project, but also because of difficulties in defining and giving priorities to selected research programmes.

The Project has only to a limited extent been able to disseminate knowledge to other member countries of the Regional Network on Pesticides for Asia and the Pacific due to the delay in the project implementation. However, the experience gained via the implementation of the Project will be to the benefit of the member countries wanting to build up capacity for chemical analysis of pesticide residues and side effects on beneficials.

The established capacity to analyse residues and side effects on beneficials is most important for the growers and for the industry but also the consumers and the environment can profit from the Project.

The Project has been concentrated on hazards and environmental consequences from using pesticides, but in principle the set-up can also be used for research and monitoring the adverse effects of other xenobiotic compounds.

The Project has not been seriously affected by external factors.

The Project is perfectly in harmony with chapter 19 of Agenda 21 concerning environmentally sound management of toxic chemicals (pesticides) by strengthening national capabilities and capacities for management of chemicals - and by promoting the establishment and strengthening of national laboratories to ensure availability of adequate national control
regarding the import, manufacture and use of chemicals.

7.6. Conclusions:

The Project has given the Ecotoxicology Institute facilities and expertise to analyse pesticide residues at ppm level in samples from plants, soil and water for the most common pesticides used in Pakistan.

The quality of the established laboratory for chemical analysis is high, but the capacity has not yet been used as a routine tool for monitoring and research.

Ecotoxicology research - originally planned to cover both aquatic, terrestrial and soil living organisms has been reduced so that the activity in this field within the Institute will be concentrated on effect of pesticides on beneficials - predators, parasites and earthworms.

The Project has overall been cost-effective, mainly due to an efficient daily project management. The above-mentioned facilities staffed with well-trained scientists have been established at a cost of 600,000 USD, whereof 415,000 USD for equipment.

Because of an insufficient budget for the Project, and because of difficulties in recruitment of qualified staff, other anticipated activities of the Project have not been established - or have been changed.

These are:
(1) Environmental chemistry and the use of radio chemical techniques
(2) Aquatic ecology
(3) Soil science, isolation of macro- and micro-organisms from soil
(4) Mass spectrometry and Nuclear Magnetic Resonance techniques

(1) will be left to the Nuclear Institute for Agriculture and Biology where this technique has already been used to monitor the degradation of selected pesticides under Pakistan conditions.

(2) Aquatic ecology will not be implemented. Instead a close collaboration with other laboratories in the region will be established in this area - e.g. in South Korea and Malaysia.

(3) Soil science - the pesticide effect on micro-organisms in soil will be left to the National Institute for Biotechnology and Genetic Engineering, where the staff already has an expertise concerning the role of micro-organisms on degradation of xenobiotic substances in soil.

(4) Mass spectrometry and Nuclear Magnetic Resonance techniques. This activity has been postponed because there has been no possibility of establishing this facility within the budget for the Project.

These changes are supported by the Evaluation Team.

The Project has so far not been able to provide a specific service to industry, extension service, farmers, consumers and the public. This is partly because of the delay in implemen-
tation of the Project, but also because of difficulties in defining and giving priorities to selected research programmes.

The Project has only to a limited extent been able to disseminate knowledge to other member countries of the Regional Network on Pesticides for Asia and the Pacific due to the delay in the project implementation.

The Project is perfectly in harmony with chapter 19 of Agenda 21 concerning environmentally sound management of toxic chemicals (pesticides) by strengthening national capabilities and capacities.

The establishment of the Ecotoxicology Institute in Islamabad has given Pakistan a potential to do research and monitoring of adverse effects of pesticides - but the Institute will not be sustainable without further support.

7.7. Recommendations:

None.

8. PROJECT ORGANISATION AND MANAGEMENT, ADMINISTRATIVE ISSUES

8.1. Organisation and Management

According to the Project Document the project organisation consists of

- the National Project Director, who runs the Project assisted by the Chief Technical Adviser. They will report to

- The Project Management Committee (consisting of representatives from the Government of Pakistan and UNIDO, the National Project Director and the Chief Technical Adviser), which will coordinate all aspects of the Project

The first of these two levels, the daily project management, seems to have functioned very well. With support from first of all the UNIDO office in Islamabad and the Chief Technical Adviser the National Project Director has managed to promote the activities leading to output No. 1 in particular. The only important task, which has not been carried out by the National Project Director is the semiannual project progress reporting stipulated in the Project Document, and the reason for this was, that the Backstopping Officer in Vienna took this upon himself.

The support from the Chief Technical Adviser has been good, considering the circumstances: He has paid 5 visits to the Project with a total stay in Pakistan of only 14 weeks during more than 3 years, and between the visits he has only to a very limited extent been updated on progress achieved and problems encountered.
The support from the local UNIDO office has also been good within its limited possibilities. All decisions concerning the Project had to be made in Vienna.

The higher level of project management seems to have been rather casual. The Project Management Committee has only held meetings in connection with the Project Performance Evaluations, resulting in 2 meetings during 4 years, so in reality the management has been left to the National Project Director, supported by the Chief Technical Adviser and the UNIDO Backstopping Officer.

It is difficult to assess the involvement of the Backstopping Officer, because the communication was to a large extent based on telephone and meetings. However, project files reveal very few follow-up initiatives from the Backstopping Officer, especially on recommendations from the Chief Technical Adviser and other consultants and decisions from the Bipartite Review Meetings. The support seems to have been insufficient, in particular in connection with the acquisition of equipment and laboratory consumables.

Major issues, such as the weaknesses of the Project Document, the differences between the Project Document and the PC-1, the most important recommendations from the consultants, and the sustainability of the Project, have not been discussed in a forum, where conclusions could be reached and decisions made, and decisions and recommendations from Bipartite Review Meetings have only to a very limited extent been implemented.

Weaknesses in the Project Document (e.g. lack of proper immediate objectives and success criteria and doubts concerning the sustainability) were pointed out already in October 1993 by the evaluation officer in Vienna, who scrutinised the Project Performance Evaluation Report, but it seems that these comments were never even discussed in the Project Management Committee. At the time of the Meeting in 1993 the comments of the evaluation officer had not reached Islamabad, and in 1995 they may have been forgotten. And the recommendations from the Chief Technical Adviser are also not mentioned in the minutes from the Bipartite Review Meeting in October 1993.

In 1993 it was decided, that the Government of Pakistan would in the near future provide a double cab pick-up for the Project. The commitment was repeated at the Meeting in 1995.

In July 1995 it was decided to establish a Scientific Committee to deal with research planning, which had repeatedly been recommended by the Chief Technical Adviser, but in July 1996 it had not yet been appointed.

In July 1995 a Steering Committee for the Project was appointed, but in July 1996 it had not yet held any meeting, so it was not implemented.

Danida has not been involved in project implementation. The only involvement has been approval of a total of 5 Project Budget Line Revisions, suggested by UNIDO (the total amount remained unchanged).

The administration of the Project has been a bit cumbersome, because all communication on
all details had to go from the National Project Director to the UNIDO Country Office and on to Vienna, and perhaps to the Chief Technical Adviser, and vice versa, although there has been some direct communication between the Chief Technical Adviser and the National Project Director through the UNIDO Country Office.

The quality of the project progress reporting and monitoring is not convincing. 4 progress reports were made, in November 1992, July 1993, February 1994 and in April 1995, and it is evident, that as these reports were made by someone not involved in the day-to-day management of the Project, they contained generalities and gave an unclear picture of the situation. And the explanations accompanying the Budget Revision Requests are not very informative.

The self-evaluation (Project Performance Evaluation) is detailed and it may be useful, if the quality is assured and it is scrutinised by someone not directly involved in the Project.

For example, the output 2.2 concerns the provincial laboratories, but in the 1994 Project Performance Evaluation Report the status indicated is for the Islamabad laboratory, which is meaningless. This would have been revealed through some kind of quality assurance for the Project Performance Evaluation Report. And the observations on the Project Document made in the 1993 Project Performance Evaluation Report by the UNIDO Evaluation Officer in Vienna could have been useful if discussed in an appropriate forum.

8.2. Conclusions:

The daily project manager has functioned well with support from the UNIDO office in Islamabad and the Chief Technical Adviser.

The higher level of project management has been more casual with only two PMC meetings in 4 years and little follow-up on decisions. The result is, that decisions have not been implemented and major issues have not been discussed.

Therefore it is not clear what research and data collection the Ecotoxicology Institute shall engage in, so that Pakistan can benefit as much as possible from what has been achieved so far, and it is not clear, how sustainability can be ensured for the Ecotoxicology Institute. And no preparations have been made for a next phase for the Project, which is needed for consolidation and further development.

Project progress reporting has been insufficient, and the Project could have benefitted more from the Project Performance Evaluations.

The recommended Steering Committee has been appointed but has not held any meetings during its first year. And the recommended Scientific Committee has not been appointed although it was decided in July 1995.

8.3. Recommendations:
Progress reports should be prepared regularly and semiannually by the daily project management.

The Steering Committee and the Scientific Committee should be properly implemented.

9. FUTURE OPERATION AND DEVELOPMENT OF THE PROJECT

9.1. The Future Operation

The Ecotoxicology Institute is now in a situation, where it is operational, but has a very limited working routine, and objectives and plans of operation for the future activities have not been settled. Another and more serious matter is, that it is not clear, how the sustainability of the Project can be ensured.

The National Project Director handed over to the Evaluation Team a set of objectives with a high level of ambition. The Evaluation Team would rather regard these objectives as a vision for the future, because what is needed now is a set of very down-to-earth short-term objectives, which can give a clear guidance for the work during the next 2-3 years.

The Government of Pakistan should decide how sustainability may be achieved for the Ecotoxicology Institute and a corresponding long term strategy should be formulated. And a research and data collection programme should be formulated, which will ensure that the analytical laboratory gains routine in doing pesticide analyses correctly, and that useful research is conducted at the same time as the Institute develops further within specific areas of ecotoxicology. The Chief Technical Adviser has made proposals for work plans, but they have not been discussed or approved.

The most obvious potential for service at the Ecotoxicology Institute will be research in and monitoring of the level of residues in plant products, depending on the amounts and types of pesticides used and the conditions under which the pesticides have been applied.

It is very important to provide the farmers with information about the circumstances under which they can apply pesticides without any risk for people who go into the treated crops - especially for cotton pickers - and also to avoid pesticide residues above a critical concentration in plant products - again especially cotton (seed - oil) and fruit and vegetables.

This kind of information will also be valuable for the chemical companies because they are interested in giving more precise information to the farmers about how to use pesticides without hazards.

The terrestrial unit will have an important potential for providing information about the side effects of different pesticides on natural enemies. This information will be of interest both for the industry and for the farmers.
Residue analysis of samples from fruit and vegetables can be of interest to monitor the occurrence of pesticide residues, but the preventive effect of such analyses is considered very limited because only a negligible fraction of consignments can be checked - and there will be little effect for farmers who consciously misuse pesticides.

Analysis of water samples from rivers for content of pesticides can be a kind of service but it is very difficult to draw any conclusions from such analyses because of the limited capacity to analyse samples from the very big and complicated river systems in Pakistan.

9.2. Sustainability

In the opinion of the Evaluation Team the Ecotoxicology Institute is not capable of continuing on its own without external support during a consolidation and further development phase, if Pakistan is to benefit fully from what has been achieved so far.

The Ecotoxicology Institute is part of the National Agricultural Research Centre as one of a series of institutes. This means, that as an institution it will be sustainable as long as it is a meaningful part of the whole National Agricultural Research Centre set-up, producing important research results and valuable ecotoxicology data. And it will remain a meaningful part as long as ecotoxicology is an important issue in Pakistan. Considering Pakistan's urgent need for high agricultural productivity and thus the use of agrochemicals, ecotoxicology will in all probability remain an important issue.

Being a part of the National Agricultural Research Centre the Institute will be financially sustainable, as long as it receives its share of the National Agricultural Research Centre budget allocations. There is also a possibility that the Ecotoxicology Institute will be financially sustainable by generating income of its own. This may be the case if the pesticide industry or other outside agencies would be interested in buying then services of the Institute, either because they were forced to by Government regulations (which seems to be a general expectation) or because they would need the services for other reasons. However, these issues seem not to have been discussed, although all persons interviewed by the Evaluation Team have confirmed, that the Ecotoxicology Institute has a high priority. This is also supported by the fact, that the President of Pakistan attended the opening of the Ecotoxicology Workshop in March 1994 and held a long and committed speech.

Technically the Ecotoxicology Institute will be sustainable, if it manages to establish good equipment maintenance. The present set-up is state of the art for the present analyses and research, but breakdowns of instruments will create serious problems, because maintenance is not yet well established. This should be an important issue in a possible next phase of the Project.

As for the sustainability of the trained staff, there is only a limited risk that the scientists will leave the Institute. Generally the mobility within the scientific institutes in Pakistan is low, and since there are no other laboratories in Pakistan doing this kind of work the chances for a scientist of getting a similar job elsewhere are very limited. The risk that a scientist would leave for another job is also limited, because the work is interesting and the possibilities of
participating in international cooperation are relatively good.

9.3 Replicability

Since the Ecotoxicology Institute is more or less going to serve the whole of Asia through the cooperation within the Regional Network on Pesticides for Asia and the Pacific, where Pakistan has taken upon itself to specialise in ecotoxicology, there would hardly be a need for an exactly similar institute in Asia, so the full concept is hardly replicable. And the particular conditions in Pakistan influence the selection of equipment, so even a part of the Project may only be replicable in a country with the same conditions as Pakistan.

9.4 Conclusions:

Use of pesticides in Pakistan is essential for the production of cotton, fruit and vegetables. Also crop protection is important for production of wheat (fungicides), rice (insecticides) and sugar cane (insecticides).

Therefore there will be a further need for improving crop yields - and this will only be possible by more intensive production methods including more use of pesticides.

Facilities and expertise to do research and monitoring of adverse effects related to the use of pesticides and to find ways of minimising these effects are very important in the present situation and for the further development.

Because of the lack of specific immediate objectives and well-defined target groups and the weak higher level project management it is not clear what kind of research the Ecotoxicology Institute should undertake and how sustainability can be ensured.

Ecotoxicology is a very comprehensive subject, and under this label working with a very wide variety of topics is possible, but the limited resources available do not permit widespread efforts. The Chief Technical Adviser has made suggestions but received no feedback.

It is important that further support is based on the activities of interest to key customers. Among these the political decision makers, the extension service, the farmers and the agrochemical industries should be emphasised.

Therefore the second phase of the Project should be connected with direct links to agricultural projects concerning integrated pest management and other crop protection strategies and FAO should be involved in the Project with UNIDO.

It will be important to implement the Steering Committee, which can support the Institute in decisions concerning priority setting for the research programme, and the scientific committee, which should support the group with scientific and technical guidance. As for the latter involving correspondent members from abroad may be considered.
In addition it is also necessary to decide how to ensure sustainability for the Ecotoxicology Institute. This may be obtained by a Government of Pakistan decision to maintain the Institute as a regular part of the National Agricultural Research Centre with its share of the total budget. Or it may be obtained by developing (perhaps after consultation with the target groups) services for the pesticide industry or others, which are so useful to the target groups that these are willing to pay for them.

9.5. Recommendations:

The Evaluation Team can recommend support for a next phase of the Project, provided that:

- Clear objectives are set and a long term strategy developed for the future operation and development of the Ecotoxicology Institute including the network of other laboratories in Pakistan
- Work programmes are elaborated specifying the need for support in terms of consultancies and funds
- A better overall project organisation set-up is implemented

10. LESSONS LEARNT

10.1. UNIDO

It is possible that the shortcomings concerning project preparation and project management are history, because UNIDO during the ongoing reform process more or less is changing all procedures.

However, looking back at the present Project in order to make sure that possible weaknesses from the past are not carried on may be useful.

The lessons, that the Evaluation Team feels may be learned, are the following:

The project document should be taken more seriously, both during its preparation and during project implementation.

Defining more clearly the role of the Backstopping Officer may be useful, both overall and more specifically vis à vis the Chief Technical Adviser.

More attention should be paid to the project progress reporting. A format should be defined, and the reports should be prepared semiannually by the daily project management, e.g. the National Project Director.

More attention should also be paid to the higher level of project management and the follow-up on decisions. This includes the Project Performance Evaluation procedure, or what may replace it.
10.2. Danida

It is fully understandable that Danida prefers not to be involved in project implementation, when the project is implemented by UNIDO.

And it would be reasonable to expect, that the UNIDO project preparation is adequate and sufficient.

However, Danida should fully understand what the funding is intended for and for this purpose a good project description is needed.

Since Danida in all its own project preparation places great emphasis on the Logical Framework Approach it is recommended to demand the preparation of a proper Logical Framework Matrix for all Danida-funded projects.
ANNEX 1  Terms of Reference
104.UNIDO.11,

Terms of Reference

Tri-partite Evaluation of Ecotoxicology Centre in Pakistan

1. Background

In Pakistan agriculture accounts for the highest sectoral share of GDP. Proper use of pesticides is important to reduce the losses of food and cash crops attributable to pests, diseases and weeds. A number of local firms engage in pesticides formulation. There are many possible sources of health risks associated with the operation of formulation plants and the subsequent distribution and use of pesticides. Such risks include inhalation, exposure, incorrect effluent disposal. Further, health risks are related to the transport of pesticides in the presence of foodstuffs, etc. Regulations governing the import, formulation, sale, distribution and use of pesticides are administrated by the Ministry of Food, Agriculture and Cooperatives. These regulations aim primarily to safeguard the health of all persons affected by the production, distribution and application of pesticides. However, surveillance and enforcement of these regulations has been minimal, largely due to institutional deficiencies.

With the support, in the period 1992 to 1994, from the Government of Denmark (Danida), UNIDO assists the Government of Pakistan in establishing an Ecotoxicology Centre in Islamabad to be capable of performing environmental research on pesticides. When the project was initiated there was no systems or facilities in Pakistan for assessment and monitoring of the environmental presence and effects of pesticides.

The project has a hard currency budget of USD 700,000. Plus a local currency contribution in cash (Rs 2,5 million) and in kind (Rs 21,98 million) approximately a total of USD 705,000.

The project is aimed at building the capability of Pakistan scientists to conduct research on monitoring the environmental impact of pesticides on the ecosystem and on humans. According to the Project Document the overall objectives of the project are to:

- "minimize the immediate and long term human health hazards and environmental effects caused by the steadily increasing production and use of pesticides in Pakistan and to encourage the introduction of newer and safer products conducive to man and his environment." and,

- "provide technical expertise, advice and know-how in this area to RENPAP member countries and thereby assisting them to provide similar benefits to their own countries under the TCDC arrangement."

1. The Regional Network on Production, Marketing and Control of Pesticides in Asia and the Pacific (RENPAP) was established in 1982
The immediate objectives are to:

- "establish an ecotoxicology laboratory at the national Agricultural Research Centre (NARC), in Islamabad, to study the fate and effects of pesticides in the environment."

"establish laboratories at suitable locations in two of the provinces capable of supporting the central facility by carrying out local ecological trials and analyzing samples."

"make the Ecotoxicology Centre a focal point for carrying out ecotoxicity of selected pesticides for the country. At the final year of the project implementation, the Centre will, based on actual possibility, provide support to the RENPAP member countries and in the process become self-supportive as much as possible."

The Government of Pakistan provides laboratory facilities and staff, and UNIDO has with Danish assistance through its Industrial Development Fund supported the recruitment of consultants, fellowships, and the purchase of essential equipments.

Project implementation began in July 1992 and completion is scheduled for June 1996, although a number of delays may postpone this date. Three bipartite review meetings have taken place, the most recent in July 1995.

2. Objectives

The main objectives of the evaluation are as follows:

2.1. To assess the relevance, effectiveness, efficiency, impact and sustainability of the project.

2.2. To formulate recommendations on possible improvements affecting the sustainable operation of the Ecotoxicology Research Centre.

2.3. To formulate experience of a general nature to be gained from the project in relation to future preparation and implementation of similar projects and of aid delivery in general.

3. Scope of Work

The evaluation shall be carried out in accordance with the Danida Guidelines for Evaluation, and shall, thus, comprise but not necessarily be limited to the following aspects.

3.1. Project description

and has 10 member countries. A number of specialized agencies provide support to the Network in their areas of expertise. These include FAO, WHO, ESCAP, the World Bank and UNIDO.
The evaluation shall provide a brief description of the project, incl. assumptions, objectives, target groups, components, project organization, activities, financing and main findings from previous reviews/evaluations.

3.2. The setting of the project

The evaluation shall describe:

- the economic and social setting of the project, and in particular the industries, agrobusiness, social groups and the environment, especially the terrestrial ecosystem likely to be affected by the project, and

- the institutional framework of the project, that is, the institutions dealing with various environmental and health-related aspects of pesticide use and those institutions which host and interact with the Ecotoxicology Research Centre.

3.3. Project preparation

The evaluation shall assess:

- relevance of the project (i.e. whether it addresses real needs, and the priority given to the project in Pakistan),

- project identification, including the choice of counterpart institution,

- project design, including an assessment of the advantages and disadvantages of the project strategy,

- realism of design (i.e. is the project realistically designed with respect to project objectives, inputs, timeframes etc, and are the assumptions realistic), and

- quality of project appraisal.

3.4. Project implementation and performance

The evaluation shall assess:

- adequacy and timing of inputs, including personnel (local, expatriate), consultancies, training, scholarships, buildings, equipment (particularly laboratory and office space and procurement of equipment) and funds,

- fulfilment of commitments (Danida, UNIDO and the Government of Pakistan),

- relevance of, and balance between, project components,

- project support communication,
- the degree to which decisions and recommendations of the Bipartite Review Meetings have been implemented,
- other major factors affecting implementation and performance, and
- project output.

3.5. Achievement of objectives

The evaluation shall assess the degree to which the project's stated development and immediate objectives have been attained with respect to: Research capacity-building, environmental effects and other major effects and impact.

Further the evaluation shall assess:

- quality of facilities provided by the project,
- quality of services to be provided by the Ecotoxicology Research Centre,
- effectiveness and efficiency of the research centre's operational modalities,
- cost-effectiveness of the project,
- the extent to which the project has been able to disseminate know-how to other RENPAP member countries,
- distribution of benefits among stakeholders such as research institutes, industries, agrobusiness and social groups,
- developments which have been, or might be, brought about by the project. These might include, for example, the extent to which other environmental hazards can be assessed and monitored at the Ecotoxicology Research Centre, or the possible activities of the centre in relation to compliance with ISO norms.
- analysis of external factors which may have affected the production of outputs and the achievement of objectives.
- linkages with Chapter 19 of Agenda 21 concerning environmentally sound management of toxic chemicals.
3.6. **Project management**

The evaluation shall assess:

- organization, management and administration both in the field and at UNIDO and Danida headquarters,

- coordination between the parties involved, incl. the donors, and

- quality of reporting, monitoring and (self-)evaluation.

3.7. **Future operation and development of the project**

The evaluation shall assess prospects and conditions for sustainability of project benefits by analyzing:

- social sustainability (distribution of responsibilities and benefits) and involvement of stakeholders in project preparation and implementation,

- technical sustainability (appropriateness of technology chosen, incl. maintenance aspects),

- financial sustainability, and

- institutional sustainability; incl. the relevance and usefulness of training, the number of trained researchers and the degree to which newly acquired skills are employed, availability of local researchers versus brain drain, and the possible involvement of local researchers in international/regional research groups.

Further the evaluation shall assess:

- replicability: Can the project be replicated in other countries, and

- need for further development assistance.

3.8. **Needs for further analysis**

The evaluation may if appropriate identify needs for further analysis.

3.9. **Conclusions and recommendations**

The evaluation may provide conclusions and recommendations in relation to any of the issues mentioned above, but they shall be made with respect to:

- relevance of project objectives,
- realism of design,
- operational effectiveness and efficiency,
- quality and timeliness of project support from the Government and UNIDO headquarters,
- achievement of objectives,
- sustainability, and
- immediate effects and possible long-term impact.

3.10. Lessons learnt

The evaluation shall where possible derive lessons of relevance to similar technical cooperation projects in this or in other sectors of the economy.

4. Reporting

4.1 A brief of the findings of the mission shall be presented to the National Agricultural Research Centre, the Ministry of Industry, the Ministry of Food, Agriculture and Cooperatives and to the UNIDO Resident Representative and the Danish Embassy during the final stage of the team's stay in Pakistan.

4.2 According to the Danida Guidelines for Evaluation, February 1994, the team shall produce a draft report, a final report, an Evaluation Summary and a draft Follow-up Memorandum stating recommendations and actions to be taken - by whom and when.

5. Method of Work

The two Danida team members shall provide 2 days desk work at Danida, Copenhagen. The whole team shall provide 2-3 days desk work in UNIDO headquarters, Vienna, and 14 days desk studies and field work in Pakistan. In Pakistan, the evaluation shall include visits to the research centre in Islamabad, to all project laboratories, including the two satellite laboratories in Faisalabad and Karachi, and to other relevant institutions.

6. Composition of Team

The team shall be composed of a teamleader, Mr. Mogens Brix Haupt, Director of MBH Management Consulting and a technical expert, Mr. Jørgen Jakobsen, Head of Department, Danish Institute of Plant and Soil Science provided by Danida, a UNIDO representative, Mr Albertus van Burik, chemical engineer and quality assurance officer and a representative of the Government of Pakistan, Dr. G.A. Miana, Chairman, Department of Chemistry/ex-Vice Chancellor, Gomal University. The participants will have had no prior involvement in the project. The teamleader has the overall responsibility for the evaluation, incl. the final report.

7. Timing

Desk studies in UNIDO, Vienna, shall be undertaken from the 3rd to the 5th of July 1996 before the team leaves for two weeks fieldwork in Pakistan scheduled for from the 8th to the 22nd of July 1996. The team shall produce a draft report before the 12th of August. Comments from UNIDO and the Government of Pakistan to the draft report shall be forwarded to Danida at latest on the 16th of September. The final report, Evaluation Summary and draft Follow-up Memorandum shall be forwarded to Danida not later than the 10th of October 1996.
8. **Documents Made Available**

All documents and data relevant to the project shall be made available to the evaluation in UNIDO and Danida Headquarters, the project office, the laboratories and at the involved institutions in Pakistan.
ANNEX 2

Programme of the Evaluation Team
**Evaluation of the Ecotoxicology Research Centre, Pakistan.**

Programme of the Evaluation Team, July 1996.

Tuesday, 2nd,         Arrival in Vienna (MBH and JJ).

Wednesday, 3rd -
Friday, 5th,          Study of files and meetings and discussions with UNIDO representatives on UNIDO in general and Pakistan and the Ecotoxicology Project in particular.

Saturday, 6th,       Departure from Vienna (MBH+JJ+BvB).

Sunday, 7th,         Arrival at Islamabad.

Monday, 8th,         Meetings with UNIDO, Pakistan, and with the chairman of Pakistan Agricultural Research Council (PARC).

Tuesday, 9th         Meetings with the Danish Embassy, the Secretary of the Ministry of Food, Agriculture and Livestock, and the Director General of the National Agricultural Research Centre (NARC).

Wednesday, 10th      Meetings with the Ministry of Environment and the Sustainable Development Policy Institute (SDPI).
                      Travel by car to Peshawar.

Thursday, 11th       Meetings with the NWFP (North Western Frontier Province) Agricultural University, the Agricultural Research Institute, Tarnab, and the Crop Protection Association of Pakistan (CAP).

Friday, 12th         Office work.
                      Travel by air to Lahore.

Saturday, 13th       Meeting with WWF (World Wide Fund for Nature).
                      Office work.
                      Travel by car to Faisalabad.
Sunday, 14th  Meetings with the National Institute for Biotechnology and Genetic Engineering (NIBGE), the Nuclear Institute for Agriculture and Biology (NIAB) and the AYUB Agricultural Research Institute (AARI).
Office work.

Monday, 15th  Meetings with the Tropical Agricultural Research Institute (TARI) and the Pakistan Agricultural Pesticide Association (PAPA).
Office work.

Tuesday, 16th  Meeting with the Department of Plant Protection.
Office work.
Travel by air to Islamabad.

Wednesday, 17th  Meeting with FAO.
Office work.

Thursday, 18th-
Saturday, 20th  Office work.

Sunday, 21st  Debriefing meeting.
Office work.

Monday, 22nd  Office work.
Departure (BvB).

Tuesday, 23rd  Departure (JJ + MBH).
ANNEX 3  
List of Persons Met
Evaluation of the Ecotoxicology Research Centre, Pakistan

July 1996.

List of People met.

UNIDO, Vienna
MR. R. Beltran, Director, Office of the Director-General
Mr. W.H. Holaday, Chief, Programme + Project Review Committee Secretariat
Mr. O. Gonzales-Hernandez, Head, Evaluation Branch
Mr. J. Navrátil, Senior Evaluation Officer
Dr. Z. Csizer, Director, Chemical Industries Branch
Mr. M. Rigola, Head, Environment and Energy Branch
Dr. B. Sugavanam, Chief, Agro-Chemical Industries Unit
Dr. Yong-Hwa Kim, Environmental Toxicologist, Industrial Development Officer
Dr. M. Abtahi, Senior Industrial Development Officer

PAKISTAN

UNIDO, Islamabad
Dr. Abd El-Rahim Marei, UNIDO Country Director
Mr. M.J.A. Zuyderduyn, Programme Officer
Mr. A. Sessa, Programme Officer

FAO, Islamabad
Mr. Tsukasa Kimoto, FAO Representative a.i. in Pakistan
Mr. Syed Mohammad Ali, Programme Officer

Ministry of Food, Agriculture and Livestock, Islamabad
Dr. Zafar Altaf, Additional Secretary Incharge

Ministry of Environment, Islamabad
Mr. Mehboob Elahi, Director General
Mr. Rafiq Ahmad, Inspector General, Forest and Wildlife

Pakistan Agricultural Research Council (PARC), Islamabad
Dr. C.M. Anwar Khan, Chairman

National Agricultural Research Centre (NARC), Islamabad
Dr. Muhamad Akbar, Director General
Dr. Umar Khan Baloch, Deputy Director General
Ecotoxicology Institute, NARC, Islamabad
Mr. Muhammad Mumtaz, Principal Scientific Officer
Dr. Muhammad A. Matin, Senior Scientific Officer
Mr. Muhammad Haseeb, Scientific Officer
Mr. Tahir Anwar, Scientific Officer
Dr. Seema Tahir, Scientific Officer
Mr. Ashiq Muhammad, Scientific Officer
Mr. Karam Ahad, Scientific Officer
Mr. Abdul Rauf Ahmad, Scientific Officer
Miss Shagufta Aziz, Trainee Scientist
Mr. Shahid Majeed, Research Fellow

International Institute of Biological Control, Rawalpindi
(PARC -IIBC Station)
Dr. M. Ashraf Poswal, Scientist-in-Charge

Sustainable Development Policy Institute (SDPI), Islamabad
Dr. Chaudry Inayatullah, Senior Research Fellow

NWFP (North Western Frontier Province) Agricultural University, Peshawar
Mr. Jehangir Khan Khattak, Vice Chancellor
Dr. Abdul Rashid, Chairman (Soil Science)

Crop Protection Association of Pakistan (CAP), Peshawar
Dr. Naseer Hussain, Dean
Dr. Said Khan Khalil, Chairman (Plant Protection)
Dr. M. Naeem, Chairman (Entomology)
Dr. Farmanullah, Ass. Prof. (Plant Protection)

Agricultural Research Institute, Tarnab
Dr. Habibur Rehman, General Director
Dr. Abdul Latif, Senior Research Officer (Termite)
Mr. Gul Nawaz, Senior Research Officer (Entomology)
Dr. Izharul Haq, Senior Research Officer (Soil Chemistry)
Mr. Iftikhar-ul-Haq, Senior Research Officer (Horticulture)

WWF (World Wide Fund for Nature), Lahore
Mr. Faisal Qasmi, Environment Officer

National Institute for Biotechnology and Genetic Engineering (NIBGE), Faisalabad
Dr. Kauser Abdullah Malik, Director

Nuclear Institute for Agriculture and Biology, Faisalabad
Dr. Ahmad Saeed Bhatti, Acting Director
Dr. Altaf Hussain, Principal Scientific Officer
AYUB Agricultural Research Institute (AARI), Faisalabad
Dr. Ahmad Saleem Akhtar, Director
Dr. Ghulam Mustafa, Head Entomology Section
Mr. Mohammad Siddique Hamdard, Agricultural Chemist
Mr. Sajjud Ahmad, Entomologist

Department of Plant Protection, Karachi
Dr. Muhammad Shafi, Plant Protection Adviser & Director General

Tropical Agricultural Research Institute (TARI), Karachi
Dr. A.K. Khanzada, Director
Dr. S. Zafar Masud, Project Incharge, Pesticide Research Laboratory
Mrs. Shahida Akhtar, Senior Scientific Officer, Pesticide Research Laboratory

Pakistan Agricultural Pesticides Association (PAPA), Karachi
Mr. Haider Rashid, Chairman

DENMARK

Danish Institute of Plant and Soil Science
E. Kirknel, Chief Technical Adviser