

Project Title Code: 2.3	An Integrated Approach to Strengthening Institutional Infrastructure for Environmental Risk Assessment, Monitoring & Remedial Action for Pesticide Residues
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Vietnam Institution	Post-Harvest Technology Institute in Ho Chi Minh City
Project Duration	July 2001 to June 2003

Project Description

Pesticides are used to protect crops from insects, weeds and diseases both in dryland and irrigated crop production in Viet Nam. However, reliance on pesticides in crop production system has the potential to cause environmental problems due to contamination of waterways and of produce, adversely affecting the Vietnamese environment and human health. The challenge for the education, research and extension for Government is to cope with the public demand for clean and safer agricultural practices by reducing the environmental impact resulting from the excessive use of pesticides, while maintaining profitability in agriculture.

Aim

As a targeted outcome of an integrated field research project conducted at two sites in Viet Nam in the Red River and Me Kong deltas, this project aims to strengthen the scientific expertise of scientists, university teachers, policy makers and the Vietnamese rural community and the capacity for more informed decision making

Objectives

1. To establish baseline information on the extent of contamination of produce and waterways by pesticides in intensive agriculture area in both North and South Viet Nam. This will require transfer of ELISA technology and other means of integrated monitoring environmental contamination developed in Australia to Viet Nam
2. To train and strengthen Vietnamese scientists' existing knowledge on the methodology for the development and application of immunoassays and related simple cost-effective tests for monitoring the pesticide residues (in link with ACIAR project PHT/1996/004), emphasising the need for effective validation of all simple tests by established laboratory methods.
3. To develop improved risk assessment protocols, monitoring procedures and risk management strategies to minimise the impact of pesticides in produce and the environment. These will be documented in Manuals and Training Guides.
4. To develop an integrated system to assess the risk of chemicals used in crop production, introducing the use of GIS technology. Results from risk models will provide managers with tools for guiding future land-use development, assessing

potential environmental risks associated with pesticides, and designing cost-effective monitoring programs

Outputs and Performance indicators

Major outputs	Description	Objectives met (as per 2.1)	Quantity
1. Identification and quantitative information on problem pesticide residues	Baseline information using ELISA on selected produce on pesticide contamination and of the environment	1	250 samples (100 water, 100 soil and 50 produce samples) from 50km ² of two catchments in north and south Viet Nam
2. Training and strengthening of Vietnamese scientists existing knowledge on monitoring protocols	Modern methods of pesticide analysis in the environment, including the use of ELISA for monitoring pesticide residues in soil, water and agricultural produce	2	40 personnel trained: 2 x (10 scientists, 5 postgraduate students and 5 field extension staff)
3. Minimise the impact of pesticides in produce and the environment	Prediction of the environmental concentration of pesticides, based on the outputs of the surveys (1). These outputs will be subsequently used to assess the risk of pesticides in larger catchment areas, and finally to design risk management strategies in order to minimise their impact on the environment .	3	2 x 500 km ² of the catchment in north and south Viet Nam
4. Develop an integrated system to assess the risk of chemicals used in crop production	Analysis of pesticide residue data and input information into GIS technology to produce risk assessment mapping	4	2 x 500 km ² catchments. Multiple copies of risk assessment report for catchment managers (say 500 or so)
5. Development of a pesticide education tool “Pesticides in Viet Nam’s agriculture: environmental chemistry, toxicology and risk assessment guide”	A pesticide database guide incorporating physico-chemical properties, toxicological, ecological and environmental fate information on registered pesticide use in crop production in Vietnam	3 & 4	Multiple copies possibly produced by ACIAR and distributed in Viet Nam. Also placed on their Websites for public access.

PROJECT COMPLETION REPORT

Executive Summary

The project has met all its objectives and the project design, although initially involving risks, has fully succeeded in its implementation. The risks involved the effectiveness of cooperation of four different institutions in northern and southern Viet Nam, and the effectiveness of application of the analytical technology used itself. Rapid ELISA tests for pesticide residues, produced by the Post-Harvest Technology Institute, Ho Chi Minh City, have been successfully transferred to research teams in two universities (Hanoi University of Science and University of Agriculture and Forestry, Ho Chi Minh City), and to a national analytical institute (Center for Analytical and Scientific Experimentation, HCM City), the latter also validating their use. These tests have been successfully applied to the analysis of field samples of soils, water and agricultural produce, at three field sites in the north, south and central zone of Vietnam, exceeding project specifications in both the number of personnel trained and the numbers of field sites and samples analysed. Methods for risk assessment of different pesticides in use in Vietnamese agriculture were also developed during the project at the two universities and successfully applied to the three field sites, where the data obtained has been employed as part of the risk assessment and management process.

The Report also describes the extension of the project network from the four original Institutes to include interaction with the Plant Protection Departments (PPDs, MARD) in Ho Chi Minh City and Hanoi, as well as the Post Harvest Technology Institute in Hanoi. The PPDs have legal responsibility for pesticide monitoring and for remedial action in Vietnam. All four Vietnamese Institutes involved have cooperated effectively and all acquitted themselves well, as illustrated in the Final Workshop Manual and in the CARD Project Manual (attachments A and B). The latter document provides a concise summary of project outcomes and it includes, as appendices, research publications generated by the participating institutions during the CARD project. As a result of the CARD project, it is highly probable that application of ELISA technology will play an increasing role in improving the quality of Vietnamese agricultural produce and a cleaner environment. The Vietnamese participants in the CARD project are to be commended on the obvious high quality of their work in this project; in particular the young project managers of the research groups responsible for the day-to-day project activities. These personnel and others trained during the project represent a national resource that, with adequate support, can play an essential role in finding solutions to the problem of contamination in Viet Nam.

1.0 Project Description

Background and preparation

Pesticides are used to protect crops from insects, weeds and diseases both in dryland and irrigated crop production in Viet Nam. However, reliance on pesticides in crop production system has the potential to cause environmental problems due to

contamination of waterways and of produce, adversely affecting the Vietnamese environment and human health. The challenge for the education, research and extension for Government is to cope with the public demand for clean and safer agricultural practices by reducing the environmental impact resulting from the excessive use of pesticides, while maintaining profitability in agriculture.

As a targeted outcome of an integrated field research project conducted at two sites in Viet Nam in the Red River and near Ho Chi Minh City, this project aimed to strengthen the scientific expertise of scientists, university teachers, and policy makers, the main stakeholders for the project, regarding monitoring, and their capacity to carry out risk assessment, allowing more informed decision making to help reduce risk from pesticides. This was to be achieved in the project by providing simple tests based on ELISA (enzyme-linked immunosorbent assay) for monitoring of pesticides, as well as by the application of quantitative methods being developed in Australia for risk assessment of the impact of pesticides on produce and on the environment. The beneficiaries of the project would be the Vietnamese rural community and Vietnamese consumers of agricultural produce grown using pesticides. The former would benefit from improved quality and market value of their produce and the latter would benefit from improved food safety and health.

The project would achieve its results using existing personnel at the seven institutions involved in Australia and Vietnam. Preparations for the project were required in terms of the availability of ELISA technology including immunoreagents from Vietnamese sources and the initial training of expert teams for both the application of ELISA and in methods of risk assessment. These were needed early in the project so that they could be applied in pilot studies at the field sites in the north and the south of Vietnam. Workshops were scheduled for both initial training (Workshop 1) and validation of the effectiveness of this training (Workshop 2) in the first year of operation.

1.2 Context and rationale

This project has been supported by technology developed in a continuing large ACIAR project (PHT/1996/004) *Monitoring mycotoxins and pesticides in grain and food production systems for risk management in Viet Nam and Australia* (July 1999 – June 2004) using ELISA tests developed by the Vietnamese as part of the ACIAR project. However, the rationale used was to significantly extend the range of institutions involved by “training the trainers” and to promote the sustainability of the technology transferred to the Vietnamese by ensuring that as much as possible of the technology could be delivered from resources already located within Vietnam. It was considered that this approach building on existing relationships but also bringing in new participants was the preferred option, so as not to overextend resources. As far as possible, a spontaneous route for project development was chosen, using motives such as keenness to be involved by Vietnamese partners as a criterion for involvement. The actual institutions chosen for the project represent about half those that were interviewed in the period leading up to the initiation of the proposal. This approach was facilitated by the previous ACIAR project,

allowing a dossier of information regarding possible participants to be built up over two years. The three new institutions were chosen using the criteria of (i) appropriate personnel with adequate training in pesticide analysis and other issues involved, (ii) appropriate facilities to carry out the project work, and (iii) access to appropriate field sites and agricultural produce and motivation. Other possible participants were ruled out using these criteria, particularly those of motivation and experience.

1.3 Project objectives and scope at design

The project design has (i) sought to extend the range of the impact of the ACIAR project by fostering expertise in pesticide monitoring tests within Viet Nam, thus increasing its extent of application, as well as (ii) developing expertise in the risk assessment of pesticides used in agricultural production in Viet Nam. There is already significant Vietnamese expertise in pesticide analysis using costly instruments, but only in a limited number of laboratories; this expertise has been accessed by this project in both Hanoi and in Ho Chi Minh City. The application of ELISA technology is extending this expertise, by allowing more screening analyses of produce and environmental samples, conducted more cheaply in a more sustainable fashion. This project has the overall objective of enhancing the research infrastructure and monitoring capability needed for protecting the environment, agricultural produce and human health from negative impacts of pesticides in both Viet Nam and Australia. The purpose of environmental quality monitoring, risk assessment and risk management of pesticides in Viet Nam is to implement the overall goal of CARD program. The CARD program emphasises the need *'to enhance Vietnam's capacity for teaching and research in agriculture and rural development, through the development of productive partnerships between education, research and training institutions in Viet Nam and in Australia'*

This could be achieved by assessing the extent of contamination of pesticides in produce and the environment, classification and prioritisation of pesticides according to their relative level of risk (low, medium or high) from contamination at two riverine sites in North and South Vietnam. This classification requires three important components: research, teaching and extension. The three components are built into this project specifically designed to meet the CARD program goals. The project aimed to help provide necessary infrastructure to raise the productivity of the rural sector by raising product quality and to improve food safety. All of these goals are consistent with Vietnamese objectives, including those stated by the Ministry for Agriculture and Rural Development (MARD), the agency with overall responsibility for the safe application of pesticides in Viet Nam.

1.4 Implementation arrangements

The project was to be managed using facilities located at the University of Sydney, directly communicating with the four Vietnamese institutions involved. Funds would be disbursed to these institutions on an agreed schedule after their receipt from AusAID's agent in Australia, to facilitate the project activities. Other Australian participants would

need permission of their employers to participate and contribute to the project, which was duly obtained. In the case of the Vietnamese institutions, the effectiveness of the project was facilitated by the fact that the Director of each institution or Centre was the Project Leader. Each institution also appointed a Project Manager, a junior staff member charged with responsibility for day-to-day activities in the project. This was deemed an ideal arrangement in terms of the likelihood of effective participation and for full achievement of the objectives of the project.

2.0 Appropriateness of Project Design and Objectives

2.1 Appropriateness of Objectives

Objective No./Ref.	Objective Description	Appropriateness Rating
1.	To train and strengthen the Vietnamese scientists' existing knowledge on the application of simple cost-effective analytical tests (ELISA) for monitoring pesticide residues, with proper validation by routine analysis using GLC and HPLC.	5
2.	In a workshop setting, to establish protocols for risk assessment using baseline monitoring data on the extent of environmental contamination by key pesticides at two contrasting sites in the northern and the southern areas of Viet Nam.	4
3.	To develop an integrated system to assess the risk of agrochemicals used in crop production (choice of pesticide, application mode, topography and meteorology, crop factors and land and water use). Results from risk models will provide Vietnamese planning authorities with tools for guiding future land-use development, assessing potential environmental risks associated with farm chemicals, and designing cost-effective monitoring programs.	5

The design features listed emphasised joint interactive activities between Institutes in the north and south of Vietnam. Although this was initially a risk, the performance of the four Institutes involved is fully vindicated in the successful outcomes described in this Completion Report.

2.2 Appropriateness of Design

Description of Design Features	Appropriateness Rating
1. Workshop training by US and PHTI in ELISA analysis	5
2. ELISA technology transfer from the PHTI to three other Vietnamese institutions, UAF, HUS, CASE	4
3. Field monitoring, conducted by two teams from HUS and UAF	4

4. Validation of analyses performed by UAF, HUS, PHTI by CASE (see attachment from CASE)	4
5. Risk assessment methods transferred to UAF and HUS and employed by them in the project, to be reported to a broader audience in final workshops	5

5: Best Practice; 4: Fully Satisfactory; 3: Satisfactory Overall; 2: Marginally Satisfactory; 1: Weak.

3.0 Implementation Performance

3.1 Project Components and Outputs

All three main workshops held were successful, very well attended by both project participants and many others, all achieving their respective aims. These were: (i) Workshop 1 (March 2002): training in ELISA and risk assessment (ii). Workshop 2 (July 2002): demonstration of capacity to apply ELISA technology in field projects at two field sites conducted by UAF and HUS and to perform elementary risk assessment for pesticides. (iii) Workshop 3 (October 2003) Final Reports and delivery of Project Outputs as Manuals. Arrangements were made, at the suggestion of Vietnamese project leaders, to undertake final training in risk assessment for two Vietnamese participants (Miss Ha from HUS and Miss Trang from UAF), in a working group operating at the University of Sydney. Material generated by this working party was successfully presented at the Final Workshop to be held in Hanoi in October 2003 (see attachments). All tasks and activities listed in the table below have been completed at October 31, 2003.

Component No./Ref.	Component Description	Performance Rating
1.	<p>Task: Collection of quantitative information on problem pesticides in the Red River and Ho Chi Minh City areas</p> <p>Activity/Output:</p> <p>1.A survey of existing field data on pesticide residue contamination for cyclodiene and DDT residues will be prepared as a background information.</p> <p>2.Establishing a network in Viet Nam for monitoring selected pesticide levels in selected agricultural products, water and soil in the region as a baseline study.</p> <p>3. Conduct field and market surveys of pesticide contamination, including risk assessments</p>	5
2.	<p>Task: Training of Vietnamese researchers in techniques of ELISA application for pesticide residue testing under field condition in Australia & Vietnam,</p>	4/5

	<p>with effective validation; sampling and generation of catchment data.</p> <p>Activity/Output: In linkage with ACIAR project PHT/1996/004, Training Workshops will be conducted in (i) the technologies for detection of pesticide residues (ii) design of field monitoring (iii) ELISA test validation (iv) environmental risk assessment at</p> <ul style="list-style-type: none"> (1) PHTI July 2002 ELISA technology, risk & site selection (2) UAF July 2002 GC/HPLC validation and risk assessment (3) HUS October 2003 Integrated system 	
3.	<p>Task: Develop risk assessment protocols and risk management strategies to minimise the impact of pesticides in produce and the environment</p> <p>Activity/Output:</p> <ul style="list-style-type: none"> (1) Identification of source of the hazard-pesticides and the impact they are expected to have in the environment. (2) Collection of baseline information on selected pesticide usage, land use pattern, soil profile information (physico-chemical properties). (3) Collection of selected pesticide data (physico-chemical properties, toxicology and environmental fate) to model the fate and transport of chemicals in a particular environment. (4) Use of models, such as fugacity approach, to predict the environmental concentration of pesticides in the environment in a particular catchment or region. (5) Estimation of spatial distribution of pesticides in the environment under study, their persistence, exposure routes for off-target impacts and toxicity information (6) Quantify the risk posed by that hazard using the above information gathered. 	5
4.	<p>Task: Develop an integrated system and pesticide database to assess the risk and risk management of pesticides</p> <p>Activity/Output:</p> <ul style="list-style-type: none"> (1) Complete analysis of data gathered on risk assessment, to produce integrated risk assessment for the catchment. (2) Development of a pesticide database 	5

	<p>incorporating physico-chemical properties, toxicological, ecological and environmental fate information on registered pesticide use in crop production in Vietnam</p> <p>(3) Conduct concluding Workshop or Conference in collaboration with other participants in the process of risk reduction, including government agencies.</p> <p>(4) Provide information to assist State and regional resource managers on risk management options to minimise the impact of pesticides in produce and the environment.</p>	
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5: Exceeding time and quality targets, 4: Achieving time and quality targets and on budget; 3: Moderate progress towards targets, some issues about quality, budgets or costs but these are being adequately addressed; 2: Some progress towards targets, but slippage in schedule and cost overruns; & 1: Significant problems in achieving targets, quality outputs unlikely to be achieved and substantial cost increases affecting overall budget.

The one change approved by AusAID during the implementation related to the extension of the project to allow the Final Workshop to be held at a more appropriate time, allowing more analysis of the project results and monitoring and also more participation by others. In general terms, the project design catered well for the actual conditions and factors applying. These were largely as expected and no major variations in implementation, neither positive or negative, were necessary. Field site data was collected for case studies (see CARD Project Manual, Section 5) at three sites near Hanoi, Ho Chi Minh City and in Central Vietnam, exceeding project targets and the numbers of samples analysed.

3.2 Project Outcomes

All three project objectives listed in section 2 have clearly been achieved. The outcomes involved technology transfer between Vietnamese institutions, training by the providers of the technology in these new methods of applying this technology and their actual application in several case studies conducted by the University project teams. These processes were also validated by quality assurance methods built into the project design and reported in the three Workshop Manuals (see Attachment B for Workshop Manual 3). The main project outcomes concerned regarding risk assessment methods are documented in the CARD Project Manual (Attachment A); this attachment also include three manuscripts of research papers, soon to be submitted to a journal. The quality of all these outcomes is assessed as highly satisfactory, and exceeding expectations when the project was designed. These outcomes are very relevant to the purpose of the project, since they demonstrate that the project design was a good one and that it has been successfully implemented.

This approach using case studies for risk assessment involved a careful examination of resources available, supplementing them with new sustainable technology followed by in-project validation of their use. Monitoring with feedback of the project outcomes to further optimise the process during the course of the project also proved highly effective. This is recommended as a general procedure that can potentially improve the performance of similar AusAID projects.

3.3 Sectoral Impact

Agriculture in Viet Nam involves strong participation by women. The majority of farmers are female and they are more directly exposed to negative effects on health by pesticides. Minority communities are also heavily engaged in primary industry, often involving the use of pesticides. To the extent that the infrastructure established and other project outcomes will eventually impact on the safer use of pesticides, these group will eventually be assisted by this CARD project. More directly, the project research teams involved comprise both males and females, but with a majority of women participants. For example, all the Project Managers at HUS, UAF and the PHTI are women and all three undertook intensive training in Australia in September 2003 (the latter from the PHTI, funded by ACIAR). It is anticipated that these experiences will prove beneficial, improving their professional expertise, skills in research management and their capacity to be involved in future work that can help consolidate the project's achievements.

3.4 Costs and Financing

There are no major discrepancies between cost estimates and actual costs incurred since the project needs for equipment and activities adhered quite closely to the project design. Expenditure associated with the Final Workshop is still being acquitted in the University of Sydney's financial system, but the estimated small overexpenditure has been calculated accurately from actual travel claims now being processed. There were some variations in the percentages of funds required for different areas of expenditure, particularly for travel, as a result of increases in travel costs and a fall in the relative value of the Australian dollar during 2001-2002.

3.5 Monitoring of project

Project monitoring has been achieved largely by matching performance of tasks and results of activities against a predicted schedule of outputs, and by periodic review by the Steering Committee on several visits to Viet Nam by the Australian project director. The project design was deliberately self-monitoring in nature, since success in the final outcomes was dependent on success in the initial training and technology transfer stages. Failure at these stages would have prevented success in the completion stage of the project. The significance of the final outputs of the project can be verified from inspection of the materials generated in the three Workshop Manuals, as well as the CARD Project Manual. The latter document is included as Attachment A to this Completion Report and the strategies designed in this document together with the descriptions of the three case studies and three manuscripts soon to be presented to scientific journals for publication are strong evidence of the effective completion of this

project. The manual for Workshop 3 is Attachment B. There is no previous project in this area in Viet Nam known to the Australian project leader that has been as effective in its documented outcomes as this one, although there is still the challenge of having the papers accepted by international journals. However, a significant debt must be acknowledged to previous international projects with each of the institutions involved, both from European as well as Australian sources such as ACIAR, that provided the facilities, training and experience necessary for this success. In that sense, the CARD project represents an appropriate stage in the development of Vietnamese expertise in this area.

AusAID also conducted its own Review of this project as one of several selected for this purpose. CON0016 received a rating equal to the highest score for all the projects included in the survey at the stage when two workshops had been conducted. The final stage of the project has been particularly successful, exceeding project targets and would reinforce this assessment.

3.6 Technical Assistance, Training and Capacity Building

The lead institution should provide an assessment of the ways in which their project has assisted in capacity building in the sector in which the project operated. Analyse and assess positive and negative aspects of the recruitment, management and performance of the project team. Discuss the working relationship between the Lead Institution and the Vietnamese partner institution. Analyse and assess the usefulness of training programs/courses under the project.

The project has assisted in capacity building by introducing two practical methodologies for the risk management of pesticides to the Vietnamese system, both of a completely novel character. The Vietnamese participants have shown themselves to be adept at accepting these methodologies. For example, they accepted mathematical aspects of risk assessment with surprising ease, compared to Australians undergoing similar training. In retrospect, this could have been predicted given the strength of their prior mathematical training. The Australian team comprised current or past members of the University of Sydney research group with the relevant experience in risk assessment for pesticides and their monitoring using ELISA. This enabled links to be established between Vietnamese counterparts with the Australian Bureau of Rural Sciences (BRS), Sydney Water and Chiba University, Japan, broadening the range of expertise available. The University of Sydney is clearly the leading institution in Australia for these skills, considering both risk assessment and ELISA monitoring, and including a staff member from the BRS provided a link to the institution responsible for Australia's National Residue Survey. Sydney Water provided expertise related to good laboratory practices and certification for pesticide analysis.

Because there were four Vietnamese institutions involved, a Steering Committee headed by Dr Le Van To of the Post Harvest Technology Institute was instituted. This

Committee functioned to confirm matters such as the best dates for workshops and to establish liaison between the four institutions for supply and appropriate delivery of immunoreagents, installation of equipment and preparation of reports. Most of the project organisation was achieved, however, using email via the Internet. The periodic visits by the Australian project director from the University of Sydney provided an effective means of communication, mainly by circulation of subsequent Trip Reports. This was facilitated by the fact that he also had a related ACIAR project in Viet Nam with the PHTI regarding ELISA technology, enabling three other trips to Viet Nam to be conducted during the term of the CARD project.

The training programs during the project have involved transfer of methods of pesticide monitoring and risk assessment. Methods for both of these areas are still under development and the range of analyses possible and a feature of the project has been useful feedback regarding these methods and the most appropriate to be applied for pilot training purposes. The participants in the training program have included the immediate project teams from each of the four Vietnamese institutions (about 16 personnel in total) as well as about 3-4 times that number drawn from these institutions and several others. The CARD project has also assisted the extension of ELISA technology developed in the prior ACIAR project. For example, in the week before the final Workshop 3 in Hanoi, 27 trainees in ELISA monitoring received certificates in Danang in a course conducted by the PHTI at the Food Research Institute. This workshop was able to be conducted in a more self-assured fashion by PHTI staff, partly as a result of the extra experience generated through the CARD project's program.

As Australian Project Director, I must complement the Vietnamese participants in this project. Their keen participation, acceptance of responsibility for the project activities and level of performance has left nothing to be desired.

3.7 Management of Constraints, Issues, Risks and Change

The project was ambitious, involving four Vietnamese institutions that all needed to perform for the project design to prove effective. This involved calculated risks, given that three new project teams would be involved. To their credit, all project teams succeeded in their tasks. It did not prove feasible to employ GIS (geographical information systems) analysis of pesticide distribution in this project, because of a lack of suitable expertise with current staff at the University of Sydney although there was interest in this aspect, particularly by HUS. This remains an activity that could be employed in future work regarding risk management.

There were challenges regarding the following issues:

- (i) the stability of ELISA kits (solved by employing freeze-dried plates)
- (ii) selection of ELISA kits for the pilot studies, based on sensitivity and appropriateness for pesticides actually encountered in field work (endosulfan was eventually collectively chosen as the most appropriate model choice)

- (iii) selection of the best method(s) of risk assessment to be employed in the field studies.

However, none of these challenges threatened the success of the project and all were solved in a satisfactory process of trial and error with feedback of results, allowing optimisation of the overall process. In fact, successfully meeting these challenges was an important part of the training itself.

3.8 Project Management

The Australian Lead Institution met all its obligations fully during this project, providing satisfactory services by the appropriate staff, as well as by other nominated participants in providing in-kind contributions for the various activities. The University of Sydney has provided other management resources as an in-kind contribution, including accounting facilities, purchasing and travel arrangements and travel insurance for its staff.

A rating of Fully Satisfactory (4) for the performance of the Australian agency is considered appropriate.

The chief executive officer of each of the Vietnamese institutions was directly involved in the project, in their area of expertise. As a result, the project has run well, with strong institutional support and a high profile in Viet Nam. A Vietnamese Steering Committee, with Dr Le Van To in Ho Chi Minh City as chairman, was established to foster coordination within the project and the first meeting was held in Ho Chi Minh City in November, 2001. The Steering Committee was also effective in helping to arrange the Workshops and cooperation between the four Vietnamese institutions has been remarkably good. The standard of management in Viet Nam is rated at Level 5. As anticipated, the two universities are more broadly focussed than the two professional Institutes but this diversity of approach has strengthened the project. There has also been a high level of good will engendered in this project and this materially assisted it to reach its objectives. As noted elsewhere, this project also received a top rating during AusAID's CARD Program Review in Viet Nam in 2002, including assessment of its management.

A rating of Fully Satisfactory (4) for the four Vietnamese partner agencies is considered as appropriate.

5: Best Practice; 4: Fully Satisfactory; 3: Satisfactory Overall; 2: Marginally Satisfactory; 1: Weak.

4.0 Performance and Outcomes

4.1 Assessment of Performance Against Objectives and Design

As indicated elsewhere in this report (section 3), nearly every outcome anticipated for this project has been achieved. The project has added significant value to previous

development work in this area of pesticide safety in Vietnam. The project objectives regarding technology transfer, training and the development of an integrated framework for risk assessment, monitoring and validation of these processes have all been achieved as anticipated in the project design. This confirms the effectiveness of this design but did require acceptance that this was appropriate design by all participants. The Vietnamese deserve commendation for their enthusiastic and fully effective participation. In providing more competent infrastructure, there are plainly benefits still to be realised from this project. It is likely to require an additional aid project to integrate these outcomes more effectively into the official framework in the near future, such as the government agency MARD. But the project has made clearer the necessary requirements for this to be achieved. Indeed, the expected entry of Viet Nam into the World Trade Organization (WTO) in 2005 will probably require this further stage of development to occur sooner rather than later.

4.2 Sustainability

Given that each of the Vietnamese institutions already had some expertise and technical infrastructure for pesticide analysis, and an incentive to acquire more, it is anticipated that the benefits of this project should be sustainable and will have a continuing impact. The actual ELISA technology transfer and the training of a significant number of Vietnamese in the application of ELISA all contribute towards its sustainability. The project design and performance in the project recognises that the Post-Harvest Technology Institute in Ho Chi Minh City has the demonstrated capacity and the responsibility to continue to provide immunodiagnostic reagents and technical backup regarding ELISA analysis. It is anticipated that this pilot project will have continued benefits as a result of improvements in technical infrastructure and that the project itself will stimulate the kind of cooperative activity essential for the benefits to be realised. Workshop 2 (July 2003) already involved participation by personnel of the Plant Protection Departments (PPDs) of both Hanoi and Ho Chi Minh City. Subsequently, the PHTI in Ho Chi Minh City has cooperated with the HCMCity PPD to involve supply and their use of pesticide ELISA tests, produced by the PHTI and this was reported at the final Hanoi workshop in October 2003. This is an excellent sign regarding sustainability, because simple tests must be accepted by authorities such as the PPDs.

There are also good indications that the tests, whose further development has been supported by the CARD project, can be commercialised under Vietnamese conditions in future. The PHTI recently undertook to provide a large number of cyclodiene test kits for an FAO-sponsored project. Workshop 3 in October 2003 has generated a blue-print for “the way forward”, including a recommendation for establishment of a National Residue Survey for Vietnam, using the cooperative structure developed during this project as a spring-board for this process. Given the importance for quality assurance of produce and the environment, sustainability is rated as fully satisfactory at level 4. The progress of the project has been consistent with this rating. The PHTI is currently extending its range of ELISA tests to include synthetic pyrethroids as well as DDT at improved sensitivity and the highly successful cyclodiene kits already in use are now proceeding to commercialisation.

Sustainability is rated as Fully Satisfactory (4).

5: Best Practice; 4: Fully Satisfactory; 3: Satisfactory Overall; 2: Marginally Satisfactory; 1: Weak.

4.3 Development Impact

As indicated elsewhere in this Completion Report, this project comprises a stage in the development of appropriate skills for risk assessment and management of pesticides. However, it should prove to be a critical stage considering that the methods involved and the monitoring tools are new and will allow more effective decision-making in future. It is expected that the CARD Project Manual will be reproduced in Vietnamese (as well as English as attached) and distributed widely in Viet Nam to all relevant agencies, particularly the various institutes of MARD. Therefore, there is expected to be a continued impact of the technology and an increasing demand for its application. One means of amplifying the impact would be to foster these methods as part of a Vietnamese National Risk Assessment and Residue Survey, as recommended as an outcome of the Final Workshop (see Attachment C); it is suggested that this could be a very suitable topic for a future CARD project proposal, involving official agencies such as MARD. If this proposal is developed, the current project would form a necessary part of this development and its impact would be enhanced.

Such a process is inevitable, if Viet Nam is to be properly prepared to participate in regional and international trade.

5.0 Conclusions

5.1. Overall assessment

It is concluded that the project achieved all the objectives outlined in the project design document. This was possible because the project had highly effective prior preparation in an ACIAR project and the resources of the latter were still fully available during the implementation of the CARD project. The project design was clearly highly appropriate, given the stage of development in Viet Nam. The involvement of institutions in both the south and the north of Viet Nam involved risk, because of distance and the critical need for cooperation. However, it is considered that a mild competitive approach and a strong desire to perform well, based on previous good performance in work with pesticides, all tended to promote the success of the project. It was recognised by the participating universities during the project that there is a need to make ELISA tests available for a broader range of pesticides. This was actually recommended as a result of discussions in the Final Workshop in October, 2003. However, the endosulfan/cyfluthrin ELISA tests provided a highly relevant pilot method, given that this was found frequently as a contaminant in agricultural produce to an extent not realised when the project was designed. Since this proved to be the most robust ELISA test available, this reliability strengthened the project outcomes considerably.

Viet Nam is poised to maintain and perhaps strengthen its position as a major world exporter of safe agricultural produce such as rice, coffee, tea, and fish. However, it is now essential that this country needs to provide quality assurance for all this produce, the

main objective of this project. To achieve this will require coordination and cooperative activities between a number of Vietnamese agencies, drawing on all the available technology and expertise in Viet Nam. This CARD project has provided an excellent example of how such cooperation can be achieved with the assistance of skilled Australian partners, using an adequate project design.

5.2 Lessons Learned

The project has demonstrated how effectively development grants of this type can achieve desirable outcomes as a cooperative effort with good leadership. We argue that the CARD program could now be extended to achieving national goals in this area rather than just the successful achievement of field case studies achieved in this project. If so, this should be attempted in the near future to allow effective participation of the skill base just developed.