

<b>Project Title</b>	<b>Field control of pest fruit flies in Vietnam</b>
<b>Code: 2.1</b>	
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<b>Australian Institution</b>	Australian School of Environmental Studies, Griffith University
<b>Vietnam Institution</b>	NIPP, SOFRI, CCPP
<b>Project Duration</b>	July 2001 to June 2003

## **Project Description**

The project is designed to complement an ACIAR project on Fruit Flies in Vietnam. Whereas the ACIAR project will investigate the pest fruit fly species, the crops they attack and levels of damage inflicted, this proposed project under CARD is designed to equip laboratories and staff at three centres under MARD, provide an experimental foundation for production of protein for fruit fly control and animal food and instruct farmers in fruit fly pest management.

The project will build on existing collaboration that has been established by Professor R. Drew (Griffith University) while acting as a consultant to a 1-year FAO-TCP project that was set up to obtain information on the fruit fly problem in Vietnam. This collaboration has brought together staff from Griffith University, the National Institute of Plant Protection (NIPP) and the Southern Fruits Research Institute (SOFRI).

## **Objectives**

The objectives of this proposed project are designed to interlock with, and support the components of, the ACIAR and Crawford Fund project activities. Specifically, under this CARD proposal, the objectives are as follows –

- (a) Conduct a project coordination meeting in Hanoi to plan the project activities with officers from NIPP, CCPP, SOFRI, ACIAR, AusAID, Foster's Brewery and Aventis
- (b) Equip laboratories at NIPP, CCPP and SOFRI to carry out studies on fruit fly species attraction to protein, training of trainers and farmer training exercises
- (c) Supervise quality control of protein manufacture at Foster's Brewery, My Tho, through the use of laboratory and field fruit fly attractancy tests
- (d) Conduct one training program for trainers. This will involve staff from Griffith University training staff from NIPP, CCPP, SOFRI and some PPPD staff in central Provinces around Quang Ngai, in a 10 day workshop in Hanoi
- (e) Conduct three farmer field schools, one in each of three provinces i.e., Moc Chau, Quang Ngai and Tien Giang. Each school will require 1 day per month for 6 months, during the fruiting season of the main fruit crops. The schools will be conducted by the trainers trained in (d) above. These farmer field schools will be

conducted in each year of the project and will provide experience for extending the training in fruit fly pest management and IPM to farmers across Vietnam in future years. In particular, the schools in year 2 will be used to obtain feedback information from farmers on the acceptance and efficacy of the new fruit fly control strategies.

## Outputs and Performance indicators

Outputs	Performance Indicators
(a) Conduct project coordination meeting in Hanoi	(a) Coordination of work programs to be carried out under ACIAR, Crawford Fund and CARD projects. <u>Performance Indicator:</u> A report documenting the integrated work programs on 3-monthly cycles, including listing of personnel responsible for all duties.
(b) Equip laboratories at NIPP, CCPP and SOFRI for work programs to be carried out	(b) Equipment, general supplies and staff delivered to each laboratory for the future project work. <u>Performance Indicators:</u> New staff appointed, equipment and supplies in place
(c) Laboratory and field protein attractancy experiments for maintenance of protein manufacture quality control	(c) Laboratory cage and field ground sheet attractancy tests completed. These tests will use fruit flies cultured under the ACIAR project and measure the responses of the flies to the new protein produced at Foster's Brewery, My Tho. <u>Performance Indicators:</u> 6-monthly reports presenting results of attractancy tests
(d) Training program for trainers i.e. for staff from NIPP, CCPP, SOFRI and Central Province PPPD	(d) Professor Drew and GU staff to travel to Hanoi and conduct a training workshop to equip trainers for Farmer Field Schools. This will be a 10-day program and include teaching sessions, field exercises and planning of extension literature for farmer training. <u>Performance Indicators:</u> Trained staff at the project centres; lists of equipment needed and extension literature planned for Farmer Field Schools; Farmer Field Schools organised; Extension literature printed.
(e) Farmer Field Schools conducted, one in each of three provinces i.e. Moc Chau, Quang Ngai and Tien Giang	(e) Farmer Field Schools completed over a 6-month period in each year of the project, one in each of Moc Chau, Quang Ngai and Tien Giang. Schools to be conducted by trainers trained in (d) above. <u>Performance Indicators:</u> Extension literature provided to farmers and farmers in each province, where training was conducted, applying protein bait for fruit fly control.

## **PROJECT COMPLETION REPORT**

### **Executive Summary**

To combat the problems of stagnant incomes for staple food (rice) growers rural, poverty and household food security, Vietnam has embarked on a major program to rehabilitate the horticultural and expand the area under cultivation of improved varieties of fruits and vegetables. Based on extensive experience in Australia and from other countries in South East Asia in horticulture pest management, damage by fruit flies is the main obstacle to the successful establishment of horticultural industries in Vietnam. To address this problem, the Ministry of Agriculture and Rural Development in Vietnam (MARD), in collaboration with from Griffith University, conducted a two-year AusAID-CARD project entitled “Field control of pest fruit flies in Vietnam” from June 2001 – July 2003. This CARD project was designed to complement ACIAR and Crawford Fund projects on “Managing pest fruit flies to increase production of fruit and vegetable crops in Vietnam.” Whereas the ACIAR project will investigate the pest fruit fly species, the crops they attack and levels of damage inflicted, and the Crawford Fund financed the construction of a plant at Foster’s Brewery in Tien Giang province in Vietnam to convert waste brewery yeast into protein for fruit fly control and animal food, the objectives of the CARD project were to equip laboratories and staff at partner institutions under MARD, to provide an experimental foundation for production of protein from beer waste, and to train Vietnamese staff and farmers in fruit fly pest management.

The CARD project has fully achieved all its objectives. The laboratories at the National Institute of Plant Protection (NIPP) and the Southern Fruits Research Institute (SOFRI) have been provided with the full set of equipment to conduct host fruit surveys and trap collections of fruit flies across Vietnam, as well as equipment for rearing major pest species in the laboratory. The required staff have also been permanently appointed to the project. The protein production plant at Foster’s Brewery in Tien Giang province has been commissioned and protein being produced at this plant is being evaluated as a bait for fruit fly control in Vietnam. The training program for trainers and farmers exceeded initial targets. The first training program was conducted in June 2002 by Griffith University project staff for 27 Vietnamese participants from six different national agencies. These core trainers then conducted a second round of training for 176 Plant Protection and Sub-department staff. Finally, a series of one-day training courses was conducted from September 2002 to March 2003, for batches of 25 farmers each from 16 provinces across Vietnam. This has resulted in over 1600 farmers receiving training in fruit fly identification, biology and pest management across Vietnam so far. This exercise was accompanied by the distribution of over 3000 illustrated brochures in the Vietnamese language on the biology and field pest management of pest fruit flies, incorporating the new bait spray technology.

The primary beneficiaries of the AusAID-CARD project are NIPP, SOFRI, PPPD staff and through these institutions, Vietnamese farmers in several provinces, all of whom have been be trained in fruit fly identification and field management techniques, in particular the environmentally friendly spot spray method of controlling fruit flies using

the protein bait produced from local beer yeast waste. Farmers and their workers, many of whom are women and children will also benefit from reduced application of toxic pesticides and consumers in Vietnam will benefit from pesticide-free fruits. Because 85% of the population of Vietnam resides in rural communities and depends on agriculture for survival, this project will make a direct contribution to the majority of the nation's people. Through increased availability of food and larger quantities of better quality fruits and vegetables for marketing, the project will make significant socio-economic contributions across the community and gender sectors.

## **1. Project Description**

### **1.1 Background and preparation**

To combat the problems of stagnant incomes for staple food (rice) growers (World Bank 1997), rural poverty and household food security, Vietnam has embarked on a plan of crop diversification and expanded plantings of a range of agricultural crops. Specifically, government agricultural production targets were set at 10 million tonnes of fruits and vegetables in the year 2000, up from an average of 4 million tonnes/year in the years 1993-1995. The government has also embarked on major rehabilitation and expansion of the horticultural sector with the assistance of the Asian Development Bank to introduce new high yielding varieties of tropical and subtropical fruits in south and north Vietnam respectively.

Based on extensive experience in Australia and from other countries in South East Asia in horticulture pest management, damage by fruit flies is bound to rapidly emerge as the major obstacle to the successful establishment of horticultural industries in Vietnam. Thus Vietnam will need, and benefit significantly from, an Integrated Pest Management approach, based first and foremost on successful control of fruit flies using spot sprays of protein baits. Realising this problem, the Food and Agriculture Organisation (FAO) appointed Professor R. Drew on a one-year consultancy from March 1999 to April 2000 to assess the fruit fly problem in Vietnam. The Griffith University (GU) Fruit Fly Research Group led by Professor R.A.I. Drew, worked on the FAO-TCP funded fruit fly project in Vietnam from March 1999 to April 2000. This 1-year project has given GU specific, strong linkages with the Vietnamese Ministry of Agriculture and Rural Development (MARD) and two of its key institutions, the National Institute of Plant Protection (NIPP) in Hanoi, and the Southern Fruits Research Institute (SOFRI) in My Tho province, south Vietnam, as well as with staff at State Farms and Provincial Plant Protection Departments (PPPD). The PPPD serves as the key extension agency in Vietnam and operates through an extensive network of extension staff that regularly visit and assist Vietnamese farmers.

Following on from this initial effort, Griffith University then began a four-year project supported by ACIAR entitled "Managing pest fruit flies to increase production of fruit and vegetable crops in Vietnam." This project will run from June 2001 – July 2005. In conjunction with this ACIAR project, a two-year AusAID-CARD project was also conducted from June 2001 – July 2003. The construction of a plant at Foster's Brewery in

the province of Tien Giang (south Vietnam) to convert waste brewery yeast into protein bait was financed by the Crawford Fund and its industry partner AVENTIS.

The primary beneficiaries of the AusAID-CARD project are NIPP, SOFRI, PPPD staff and through these institutions, Vietnamese farmers in several provinces, all of whom have been trained in fruit fly identification and field management techniques, in particular the environmentally friendly spot spray method of controlling fruit flies using the protein bait produced from local beer yeast waste. Farmers and their workers, many of whom are women and children will also benefit from reduced application of toxic pesticides and consumers in Vietnam will benefit from pesticide-free fruits. Because 85% of the population of Vietnam resides in rural communities and depends on agriculture for survival, this project will make a direct contribution to the majority of the nation's people. Through increased availability of food and larger quantities of better quality fruits and vegetables for marketing, the project will make significant socio-economic contributions across the community and gender sectors.

## **1.2 Context and rationale**

The CARD project was designed to complement an ACIAR project entitled "Managing pest fruit flies to increase production of fruit and vegetable crops in Vietnam." Whereas the ACIAR project will investigate the pest fruit fly species, the crops they attack and levels of damage inflicted, the project under CARD is designed to equip laboratories and staff at three centres under MARD, provide an experimental foundation for conversion of brewery yeast waste production of protein for fruit fly control and animal food, and instruct Vietnamese farmers in fruit fly pest management.

The project built on existing collaboration that had been established by Professor R. Drew (Griffith University) while acting as a consultant to a 1-year FAO-TCP project that was set up to obtain information on the fruit fly problem in Vietnam.

## **1.3 Project objectives and scope at design**

The CARD project was designed to interlock with, and support the components of, the ACIAR and Crawford Fund project activities. Specifically, under this CARD project, the objectives are as follows:

- a) Conduct a project coordination meeting in Hanoi to plan the project activities with officers from NIPP, SOFRI, CCPP, ACIAR, AusAID, Foster's Brewery and Aventis.
- b) Equip laboratories at NIPP, SOFRI and CCPP to carry out studies on fruit fly species, attraction to protein, training of trainers, and farmer training exercises.
- c) Supervise quality control of protein manufacture at Foster's Brewery, My Tho, through the use of laboratory and field fruit fly attractancy tests.
- d) Conduct one training program for trainers. This will involve staff from Griffith University training staff from NIPP, SOFRI, CCPP and some PPPD staff in central provinces around Quang Ngai, in a 10-day workshop in Hanoi.

e) Conduct three farmer field schools, one each in each of three provinces. Each school will require 1 day per month for 6 months, during the fruiting season of the main fruit crops. The schools will be conducted by the trainers trained in (d) above.

#### 1.4 Implementation arrangements

Griffith University as the project leader will manage and conduct the project in collaboration with the Ministry of Agriculture and Rural Development in Vietnam, which is represented by the National Plant Protection Centre (NIPP) in Hanoi and The Southern Fruits Research Institute (SOFRI) in My Tho. Vietnam is geographically spread over a wide latitude, and was thus divided into a northern and southern zone for ease of implementation of the project. NIPP handled all aspects of the project north of the city of Danang in central Vietnam, while SOFRI was in charge of the project south of Danang and into the Mekong delta.

## 2. Appropriateness of Project Design and Objectives

### 2.1 Appropriateness of Objectives

Objective	Objective Description	Appropriateness Rating
(a) Project Coordination Meeting	To conduct a planning workshop in Vietnam to coordinate the activities to be performed by all project participants	5
(b) Equip laboratories in Vietnam	To ensure that the laboratories at NIPP and SOFRI have the necessary equipment and supplies to conduct the project	5
(c) Attractancy tests for maintenance of protein manufacture quality control	To test the attractancy of fruit flies to new protein formulations produced at the Fosters Brewery, My Tho, under the Crawford Fund support	5
(d) Training program for trainers	Training of Vietnam staff in fruit fly identification, biology and field pest management, including the new bait spray technology.	5
(e) Farmer field schools	To train farmers in three provinces in fruit fly pest management	5

5- Best Practice; 4- Fully Satisfactory; 3- Satisfactory overall; 2- Marginally Satisfactory; 1- Weak

## 2.2 Appropriateness of Design

Outline the key features of the selected project design and discuss the appropriateness of these, provide a rating of the appropriateness of each design feature using the scale listed below.

Description of design feature	Appropriateness Rating
(a) Construction of a processing plant to convert waste brewery yeast into protein bait for fruit fly control and/or animal feed supplement at Foster's Brewery in Tien Giang province. Successfully completed and now able to supply protein to formers.	5
(b) Training of trainers - Completion of training conducted from 3-7 June 2002 for a core group of 27 trainers from 6 national agencies in Vietnam. These trainers then conducted further training of other staff and farmers across the country.	5
(c) Farmer field schools – a total of 176 PPPD staff and 1600 farmers from 16 provinces across Vietnam have been trained by the core group of Vietnamese trainers.	5
(d) Farmer leaflet – over 3000 illustrated brochures in the Vietnamese language explaining fruit fly biology and management, incorporating the new protein bait spray technology have been printed and distributed to farmers.	5

5- Best Practice; 4- Fully Satisfactory; 3- Satisfactory overall; 2- Marginally Satisfactory; 1- Weak

## 3. Implementation Performance

### 3.1 Project Components and Outputs

Provide details on project components including outputs and performance indicators.

Provide a rating of performance against each component using the scale given below.

Component No.	Component Description	Outputs	Performance Indicators	Performance Rating
1.	Research Coordination Workshop	Coordination of work programs carried out under ACIAR, Crawford Fund and CARD projects. This workshop brought together staff from six participating organisations in Vietnam (SOFRI, NIPP, Aventis, Foster's Brewery, AusAID and ACIAR) and developed a detailed work program for implementation.	Completed and report submitted in 2001	4
2.	Equip	The laboratories at NIPP and SOFRI were	Completed	4

	laboratories at NIPP and SOFRI in Vietnam	provided with the full set of equipment to conduct host fruit surveys and trap collections of fruit flies across Vietnam, as well as equipment for rearing major pest species in the laboratory. Staff were also permanently appointed to the project.	and report submitted in 2001	
3	Quality control of protein manufacture	The plant at Foster's Tien Giang Brewery to convert brewery yeast waste into a protein bait has been fully commissioned. The protein bait produced by this plant has been tested both in the laboratory and the field and found to be highly attractive to pest fruit flies in Vietnam. Large-scale field control trails on a number of important fruit crops are in progress.	Completed and report submitted in 2002	4
4	Training of trainers	The first training program was conducted from 3-7 June 2002 by Griffith University project staff for 27 senior Vietnamese participants from SOFRI, NIPP, Quarantine and Plant Protection Departments, three Universities and Bayer Crop Sciences – Vietnam. These core trainers then conducted a second round of training for 90 Sub-Plant Protection Department staff in south Vietnam and another 86 Sub-PPD and Sub-Plant Quarantine Department staff in north Vietnam from August to December 2002.	Completed and report submitted in 2002	5
5	Farmer field schools	The program for training farmers was modified. The initial plan was to conduct farmer field schools for 60 farmers from 3 provinces. However, Vietnamese project partners felt that it was important for the new bait spray technology to be introduced to farmers across Vietnam instead of a small group. It was also felt that another vital need at this stage of the project was to create nationwide awareness amongst farmers regarding the fruit fly problem, and to lay the groundwork for farmer field schools, which ideally need to be conducted over a period of 6-12 months to ensure adoption and integration of the new bait spray technology. Thus a series of one-day training courses was conducted from September 2002 to March 2003, for batches		5

		of 25 farmers each from 16 provinces across Vietnam. This has resulted in over 1600 farmers receiving training in fruit fly identification, biology and pest management across Vietnam so far. This exercise was accompanied by the distribution of over 3000 illustrated brochures in the Vietnamese language on the biology and field pest management of pest fruit flies, incorporating the new bait spray technology.		
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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.

### 3.2 Project Outcomes

The key outcomes of the CARD project are:

1. Coordination of the activities and inputs of the various participating agencies has been excellent and has led to the achievement of all planned outcomes on time and within the budget provided.
2. All equipment, supplies and project funds were transferred to NIPP and SOFRI on time, and has enabled these participating agencies to meet with project milestones and targets.
3. Construction of the protein manufacturing plant at Foster's Brewery at Tien Giang was delayed in the first year of the CARD project because of design and purchasing problems. However, this problem was resolved in the second year of the project and the plant has now been completed and is fully commissioned. Attractancy tests on the protein produced have also been successfully completed. The initial delay in construction of the protein production plant has not affected the progress of the CARD project.
4. The initial plan under the CARD project was to conduct farmer field schools for only 60 farmers from 3 provinces in Vietnam. In consultation with Vietnamese project workers, this training program was modified to benefit a much larger number of farmers because Vietnamese project partners felt that it was important for the new bait spray technology to be introduced to farmers across Vietnam instead of a small group. It was also felt that another vital need at this stage of the project was to create nationwide awareness amongst farmers regarding the fruit fly problem, and to lay the groundwork for farmer field schools, which ideally need to be conducted over a period of 6-12 months to ensure adoption and integration of the new bait spray technology. Thus a series of one-day training courses was conducted from September 2002 to March 2003, for batches of 25 farmers each from 16 provinces across Vietnam. This has resulted in over 1600 farmers receiving training in fruit fly identification, biology and pest management across Vietnam so far. This exercise was accompanied by the distribution of over 3000 illustrated brochures in the Vietnamese language on the biology and field pest management of pest fruit flies, incorporating the new bait spray technology.

### **3.3 Sectoral Impact**

Many farms in rural Vietnam rely on family labour, which often is made up of women and children. As is often seen under the hot humid climates of developing tropical countries, the prescribed safety guidelines and precautions regarding pesticide use are difficult to observe or implement. Thus women and children are likely to be excessively exposed to pesticides traditionally used as cover sprays to control a range of insect pests including fruit flies.

A major contribution of the CARD/ACIAR project in Vietnam (and elsewhere) has been the introduction of the spot spray protein bait technology that does not expose farm labour to toxic pesticides. The new protein bait spot spray technology taught to farmers through the CARD project utilizes a low volume of spray (20 ml per tree) and a minute amount of a relatively safe (very low toxicity) pesticide. Farm workers (women and children) thus benefit by not being exposed to dangerous levels of pesticides.

In north Vietnam in the province of Son La the Vietnamese government has embarked on a major program to introduce the cultivation of peaches to the minority hill tribes in this area as an alternative to the cultivation of poppy. Damage by fruit flies, however, causes extensive losses to yield. Staff at NIPP are currently conducting trials on the application of spot sprays of the new protein bait to control fruit flies infesting peach in this province. The minority hill tribes are expected to gain significantly from this CARD/ACIAR initiative.

### **3.4 Costs and Financing**

The protein production plant at Foster's Tien Giang Brewery was constructed and commissioned at a relatively low cost of about 120,000 dollars. This was achieved through having a large part of the equipment fabricated in Vietnam using local materials and expertise.

The training program was extended to over 1600 farmers instead of the 60 as originally planned. This was achieved primarily through the inputs and efforts of NIPP, SOFRI and PPPD using their own resources and without needing additional funding than what was originally budgeted for.

All other components of the CARD project have met with expenditures as planned. A full acquittal is provided in Appendix 1.

### **3.5 Monitoring of project**

Monitoring of the project was conducted through regular 6 monthly visits by project staff from the lead agency Griffith University to NIPP and SOFRI. Detailed project discussions were conducted with project staff along with visits to field sites and planning for future work. The project leaders at both NIPP and SOFRI communicated regularly by E-mail and submitted performance reports and data for AusAID and ACIAR reports as required. Project staff at Griffith University also communicated with project staff in Vietnam Project leaders in Vietnam by telephone. These telephone communications in between the visits enabled problems to be rapidly sorted out and the necessary adjustments to be made to ensure smooth running of the project.

### 3.6 Technical Assistance, Training and Capacity Building

Training and capacity building in Vietnam has been a key component of the CARD project. The first training workshop for trainers conducted from 3-7 June 2002 by Griffith University project staff for 27 senior Vietnamese participants from SOFRI, NIPP, Quarantine and Plant Protection Departments, three Universities and Bayer Crop Sciences in Vietnam, has greatly strengthened the capacity of Vietnamese to further conduct their own training in Vietnam. These core trainers have then proceeded and successfully completed a second round of training for 90 Sub-Plant Protection Department staff in south Vietnam and another 86 Sub-PPD and Sub-Plant Quarantine Department staff in north Vietnam over the period August to December 2002.

Both NIPP and SOFRI with technical assistance from Griffith University project staff, have produced an illustrated one-page leaflet on fruit fly identification, biology and pest management for Vietnamese farmers. Training has now been extended to over 1600 farmers from 16 provinces across Vietnam. The ability to train such a large number of farmers, has been largely due to the Vietnamese partner institutions working very well with regional plant protection departments to carry out the training for farmers.

This round of training carried out under the CARD project has provided Vietnamese plant protection and quarantine department staff as well as farmers, for the first time, with the ability to identify fruit flies of economic importance in Vietnam, a good understanding of the economic losses they cause, and a sound knowledge of the various control strategies and methods, with particular emphasis on the new protein spot spray technology. This “short-term” training should be supported by a long-term training program that will ensure successful adoption and sustainability of the new technology being introduced to farmers. It is proposed that such long-term training be conducted under a farmer field school training program which is carried out over a 6 – 12 month period in selected locations in Vietnam.

### 3.7 Management of Constraints, Issues, Risks and Change

No major difficulties have been encountered during the project except for an initial delay during the first year of the project in the construction of the protein manufacturing plant at Foster’s Brewery at Tien Giang. The delay was caused by the longer than expected time to purchase materials and have the equipment fabricated locally in Vietnam. However, the plant was completed and commissioned in the second year of the project and the project has proceeded on schedule.

### 3.8 Project Management

Project Component	Performance of lead institution (Griffith University)	Performance and input rating of Vietnamese partner institutions
Research Coordination Workshop	Provided leadership and overall coordination of work programs carried out under ACIAR, Crawford Fund and CARD projects to successfully bring together staff from six participating	4

	organisations in Vietnam (SOFRI, NIPP, Aventis, Foster's Brewery, AusAID and ACIAR) to develop a detailed work program for implementation.	
Equip laboratories at NIPP and SOFRI in Vietnam	Equipped the laboratories at NIPP and SOFRI with the full set of equipment to conduct host fruit surveys and trap collections of fruit flies across Vietnam, as well as equipment for rearing major pest species in the laboratory. Staff were also permanently appointed to the project.	4
Quality control of protein manufacture	The plant at Foster's Tien Giang Brewery to convert brewery yeast waste into a protein bait has been fully commissioned. The protein bait produced by this plant has been tested both in the laboratory and the field and found to be highly attractive to pest fruit flies in Vietnam. Large-scale field control trails on a number of important fruit crops are in progress.	4
Training of trainers	Completed the first training program for 27 senior Vietnamese participants from SOFRI, NIPP, Quarantine and Plant Protection Departments, three Universities and Bayer Crop Sciences – Vietnam. These core trainers then conducted a second round of training for 90 Sub-Plant Protection Department staff in south Vietnam and another 86 Sub-PPD and Sub-Plant Quarantine Department staff in north Vietnam from August to December 2002.	5
Farmer field schools	Based on the knowledge and technology transferred by Griffith university project staff to the Vietnamese partner institutions, over 1600 farmers have received training in fruit fly identification, biology and pest management carried out by Vietnamese project staff. Over 3000 illustrated brochures in the Vietnamese language on the biology and field pest management of pest fruit flies, incorporating the new bait spray technology have been printed and distributed.	5

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

#### **4. Performance and Outcomes**

##### **4.1 Assessment of Performance Against Objectives and Design**

Overall, the project has proceeded smoothly and all the expected outcomes have been achieved on time and on budget. The construction of the protein production plant was delayed in the first year of the project because purchase of materials and fabrication of the plant using local materials and labour took longer than expected. However, the plant was completed and successfully commissioned in the second year of the project. While the protein plant was being constructed in 2002, samples of brewery waste were processed in small batches in the laboratory at SOFRI for evaluation of attractancy to adult fruit flies in Vietnam. Thus the initial delay in the construction of the protein plant did not affect the quality control and field attractancy testing component of the project. With the commissioning of the protein plant in March 2003, large quantities of protein bait are now available for further evaluation and distribution to farmers.

The training program for farmers was initially planned for 60 farmers in 3 provinces. However, based on recommendations from Vietnamese partner institutions (NIPP and SOFRI), the training program was modified. The primary aim was the urgent need to create awareness in the wider Vietnamese farming community of fruit flies, the damage they cause, and the control techniques available, in particular the new spot spray protein bait technique introduced by the project. The modified training program has been a tremendous success and has resulted in the training of 176 trainers, who have then gone on to train more than 3000 farmers in 16 provinces across Vietnam. This initial training program provides an ideal platform for a second round of extended training based on the farmer field school technique that is planned for under a follow-on CARD project. This follow-on training will ensure the adoption and sustainability of the new protein bait spot spray technique introduced to Vietnamese farmers through the CARD project.

#### 4.2 Sustainability

Component	Comments on sustainability	Rating
Equipment in Vietnamese partner institutions (NIPP and SOFRI)	Vietnamese partner institutions have been fully equipped through the project to carry on the work after termination of the current CARD project	4
Knowledge and technical capacity of Vietnamese partner and associated institutions	The training program for trainers has provided technical workers in Vietnam the full capacity to conduct training of further personnel and farmers	5
Awareness and knowledge base of farmers	Vietnamese partner institutions are now fully capable of conducting training for farmers to increase their knowledge base of fruit flies	5
Protein manufacture within Vietnam	The project has ensured that a cheap and locally available source of protein is available to farmers in Vietnam without relying on expensive imports.	4

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

### **4.3 Development Impact**

Vietnamese farmers currently experience yield losses ranging from 40 – 100% across a range of fruits and vegetables of major economic importance. Little has been done to avert these losses apart from cover spraying of crops with insecticides - a practice that is undesirable because of its environmental, economic and social costs. The introduction of the new protein bait spot spray technique, together with the availability of a locally produced protein from Foster's brewery, will enable Vietnamese farmers to effectively control fruit flies without the various disadvantages associated with cover sprays of insecticides. Effective fruit fly control through protein bait sprays can increase yield (up to 50% or more based on prior experience in Malaysia) and thereby contribute significantly to increased farm income. Another major impact would be the reduced danger of exposure of farmers and farm labour (women and children) to pesticides.

## **5. Conclusions**

**5.1 Overall assessment:** The objectives at the onset of the CARD project were:

- 1) To conduct a planning workshop in Vietnam to coordinate the activities to be performed by all project participants
- 2) To ensure that the laboratories at NIPP and SOFRI have the necessary equipment and supplies to conduct the project
- 3) To test the attractancy of fruit flies to new protein formulations produced at the Fosters Brewery, My Tho, under the Crawford Fund support
- 4) To train staff of Vietnam partner institutions in fruit fly identification, biology and field pest management, including the new bait spray technology.
- 5) To train farmers in three provinces in fruit fly pest management.

All these objectives have been fully met.

This current CARD project together with the ongoing ACIAR project should provide a firm foundation for expansion of the project work to other major fruit producing provinces. In particular, the training program for farmers needs to be conducted in selected locations using the farmer field school training method over a longer period such as 6 –12 months. The purpose of farmer field school training is to ensure the successful adoption and sustainability of the new protein bait spot spray technology, as well as to assist farmers cope with issues that may arise with the anticipated increase in fruit quality and yield. These aspects could not be covered under the current CARD project and need to be addressed under a follow-on CARD project as soon as possible. Also, the new protein needs to be field tested on more crops in different locations.

### **5.2 Lessons Learned**

Conducting a project of this nature at locations separated by large distances in Vietnam has required excellent collaboration and support from Vietnamese partner institutions. This collaboration and support has been obtained through regular visits to collaborating institutions, regular communication by E-mail and telephone, and cordial interpersonal relationships. Understanding and respecting local customs and being aware of cultural differences and sensitivities is also a very important factor when conducting the project in Vietnam.