

Project Title Code: 1.1	Postharvest Education in Vietnam: Improving Safety and Quality Standards of Fresh Horticultural Products for Domestic and Export Markets
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Australian Institution	University of Sydney, Faculty of Agriculture
Vietnam Institution	Can Tho University; Hanoi Agri.Univ
Project Duration	July 2000 – June 2002

Project Description

Fresh fruit and vegetables have become a major part of Vietnam's crop production, and have the potential to provide major export revenue. To enable Vietnam to exploit these markets and meet the stringent quality standards required, much greater attention needs to be placed on better postharvest handling, safety and packaging of fresh produce.

The purpose of the postharvest education program is to support the development of university based courses, for both in house and distance learning, enhance the technical and research skills of university and research scientists to enable them to become self sufficient in solving postharvest problems, and to promote inter-university and institute collaboration. To facilitate this process, staff will visit the University of Sydney to observe and participate in postharvest training, develop relevant research skills and contribute to short course development. This will be followed by short course presentations in Vietnam and collaborative development of distance learning packages for rural outposts of the universities. This program of activities will result in an increased capacity for the major universities to engage in postharvest training and research as well as provide courses for students located in rural communities. Many graduates from the participating universities join the extension service and will pass on to the growers and wholesalers the knowledge and practices learnt at university.

Aim

To support development of appropriate university-based courses for both in-house and distance learning, to enhance the technical and research skills of university scientists and to promote inter-university and institute collaboration.

Objectives

- a. develop a postharvest curriculum that can be utilised by major Universities and also a distance education equivalent for satellite institution teaching
- b. facilitate development of research skills in university and institute scientists to enable them to conduct meaningful research on local postharvest issues
- c. upgrade knowledge base and technical skills of university personnel to allow flow through of the technology to students and ultimately, the end users – farmers and wholesalers
- d. utilise collaborative research projects that have the capacity to demonstrate that accessing markets requires an integrated approach to production, postharvest handling and marketing

Outputs and Performance indicators

Outputs	Performance Indicators
1. Curriculum and teaching resource material for use in Universities: distance learning booklets and resource material for rural teaching	i. Implementation of postharvest training curriculum at the end of year 1. Student and staff evaluation of courses will be conducted at the end of year 2. ii. Access by rural communities to postharvest education offered through distance learning, participation to be monitored in years 3 and 4
2. Vietnamese counterparts trained in Sydney for 14 weeks in advanced postharvest research techniques	i. A research report will be prepared in year 1 outlining key information and research skills developed on one crop. ii. In the longer term increased output of research on postharvest handling of produce in Vietnam and the transfer of results in refereed journals.
3. Short courses in postharvest training for University staff at Hanoi Agricultural University and CTU	Evaluation sheets completed by participants at the conclusion of each course. Assessment of understanding gained and skills developed. Follow up evaluation of the usefulness of the short course 6 months after course completion.
4. Improved communication and joint research projects between research institutes and the universities	Establishment of a collaborative working group (via e-mail) that will share and encourage Co-operation in teaching and research between the participants in such areas as postharvest information, research methods and problem solving. The group will be chaired by a different host each year and participation and outcomes will be monitored.

PROJECT COMPLETION REPORT

Executive Summary

Task 1 – Curriculum Development and Research Training.

Three researchers from three Institutes in Vietnam came to Australia. During that time they carried out a research project, learnt new techniques and inter-acted with other researchers.

They attended the postharvest course run at the University of Sydney and they also had access to libraries that allowed them to collect material for the development of a postharvest teaching course they could use in Vietnam.

Task 2 – Introductory Postharvest Training Course

Dr Robyn McConchie and Dr Jenny Jobling ran a postharvest training course in Hanoi (4th to the 8th December 2000). There were 16 participants from 5 different research Institutes. The participants learnt new information and research techniques. The course lecture notes and practical outlines could be easily translated for use in ostarvest training courses at their Universities. The practicals used equipment and produce readily available in Vietnam to demonstrate important postharvest principles lead and partner institutions.

Task 3 - Distance learning package development

A CD ROM on postharvest training and research techniques has been has been completed for use by the participating institutions and extension personnel. The CD was trialed by the participants at the last short course held in December 2001 and was very favourably received. Minor adjustments to the CD will be made during the next month before final release. The CD duly acknowledges financial support by AusAID.

Task 4 - Advanced Postharvest Training Course

Dr Robyn McConchie and Dr Jenny Jobling ran a second postharvest training course in Ho Chi Minh City (3rd to the 7th December 2001). There were 19 participants from 6 different educational or research institutes. This advanced research-based course built on the fundamental concepts presented at the previous shout course by presenting a methodology framework for research. Scientists were able to initiate, conduct and report on a set of experiments. A set of course notes and work book was prepared. The course will improve their own capacity for research and also training of postgraduate students. A key feature was that again, the practicals used equipment and produce readily available in Vietnam to demonstrate important postharvest principles.

1. Project Description

1.1 Background and preparation

The purpose of the postharvest education program was to

- a) support development of university-based courses, for both in-house and distance learning,
- b) enhance the technical and research skills of university and research scientists to enable them to become self sufficient in solving postharvest problems,

c) to promote inter-university and institute collaboration.

To facilitate this process, staff visited the University of Sydney to observe and participate in postharvest training, develop relevant research skills and contribute to short course development. This was followed by short course presentations in Vietnam and collaborative development of distance learning packages for rural outposts of the universities.

Task	Preparation Steps	Date of Task	Stakeholders	Beneficiaries
1. Curriculum Development and Research Training	1. Organising attendance at PH coursework, 2. Preparing research projects as vehicles to improve research skills	Sydney, August 2000 – October 2000	Dr Le Van Hoa (CanTho University, Mr Nguyen Manh Khai (Hanoi Ag Univ), Mr Do Minh Hien (SOFRI)	The participants and all of the participating Institutions in Vietnam
2. Postharvest Short Course	1. Preparation of manual 2. Purchase of workshop materials and equipment	Hanoi , 4 th - 8 th December 2000	1. Can Tho University, Faculty of Agriculture 2. Southern Fruit Research Institute (SOFRI), Long Dinh 3. University of Agriculture and Forestry, Department of Food Science, HCMC. 4. Postharvest Institute, Ho Chi Minh City 5. Hanoi Agricultural University 6. Research Institute for fruit and Vegetables (Hanoi)	Staff from the participating institutions plus students enrolled at their respective institutions.
3. Distance Learning packages	Write a CD ROM and manual of the new curriculum	January 2001- June 2002	As above	As above
4. Advanced Postharvest Short Course	1. Prepare Manual 2. Purchase Materials and equipment	Ho Chi Minh City 3 rd - 7 th December 2001	As above plus Wei Agricultural University	As above plus Wei Agricultural University

1.2 Context and rationale

Vietnam has a rapidly growing horticultural industry providing fresh produce for both domestic consumption and export to local south east Asian countries. Few producers or wholesalers can afford refrigeration or packaging for their product (although the infrastructure to provide this is growing rapidly) and consequently, the postharvest losses of fresh produce are high. The development of appropriate storage and transport system is crucial to the expansion of Vietnam's export of fresh horticultural produce. Vietnam will only be able to compete in the open market by improving the quality and safety of its products. Research and training in postharvest physiology is an essential component of these developments, particularly in the areas of food safety and quality.

This educational program provided a low-cost approach to understanding the basic concepts in postharvest physiology of horticultural crops and has allowed participants to become actively involved in research and training to ensure effective storage, packaging and handling systems to be developed to maintain quality of produce.

The project involved participant from across the country from 6 institutions. From each institution 2-3 participants attended workshops. A major outcome has been the improved collaboration between participants in the development of curricula and research resources.

1.3 Project objectives and scope at design

Aim:

The aim of this postharvest education program is to support development of appropriate university-based courses for both in-house and distance learning, to enhance the technical and research skills of university scientists and to promote inter-university and institute collaboration.

Objectives:

- a. In conjunction with Vietnamese counterparts, develop a postharvest curriculum that can be utilised by major Universities and also a distance education equivalent for satellite institution teaching.
- b. Facilitate development of research skills in university and institute scientists to enable them to conduct meaningful research on local postharvest issues.
- c. Upgrade knowledge base and technical skills of university personnel to allow flow through of the technology to students and ultimately, the end users - farmers and wholesalers.
- d. Utilise collaborative research projects that have the capacity to demonstrate that accessing markets requires an integrated approach to production, postharvest handling and marketing.

1.4 Implementation arrangements

The University of Sydney was the coordinating institution and had overall responsibility for management and implementation of the project. The following institutions were participants in the project: Can Tho University, Faculty of Agriculture, Southern Fruit Research Institute (SOFRI), Long Dinh , University of Agriculture and Forestry, Department of Food Science, Ho Chi Minh City, Postharvest Institute, Ho Chi Minh City, Hanoi Agricultural University, Research Institute for fruit and Vegetables (Hanoi), Wei Agricultural University.

Project workshops were held at Hanoi Agricultural University and the University of Agriculture and Forestry, HCM City.

2. Appropriateness of Project Design and Objectives

2.1 Appropriateness of Objectives

Objectives

- a. In conjunction with Vietnamese counterparts, develop a postharvest curriculum that can be utilised by collaborating Universities (and others) and also a distance education equivalent for satellite institution teaching.
- b. Facilitate development of research skills in university and institute scientists to enable them to conduct meaningful research on local postharvest issues.
- c. Upgrade knowledge base and technical skills of university personnel to allow flow through of the technology to students and ultimately, the end users - farmers and wholesalers.

- d. Utilise collaborative research projects that have the capacity to demonstrate that accessing markets requires an integrated approach to production, postharvest handling and marketing.

Objective No (1, 2, 3, etc)	Objective description	Appropriateness Rating
a	In conjunction with Vietnamese counterparts, develop a postharvest curriculum that can be utilised by major Universities and also a distance education equivalent for satellite institution teaching.	5
b	Facilitate development of research skills in university and institute scientists to enable them to conduct meaningful research on local postharvest issues.	5
c	Upgrade knowledge base and technical skills of university personnel to allow flow through of the technology to students and ultimately, the end users - farmers and wholesalers	5
d	Utilise collaborative research projects that have the capacity to demonstrate that accessing markets requires an integrated approach to production, postharvest handling and marketing	5

2.2 Appropriateness of Design

Description of design feature	Appropriateness	Rating
<p>Task 1 Visit to Australia: Three academics from each institute visited the University of Sydney to participate in the final year degree postharvest course. The aim was to give them an opportunity to participate in a postharvest course first-hand and provide the experience on which to base their own curriculum development.</p> <p>In curriculum development workshops they learnt about course structure, modes of presentation, practical laboratories to support the lectures and assessment and feedback.</p> <p>The visitors conducted a small 12-week research project at Sydney Postharvest Laboratory. The objective of this activity was to develop research skills related to their own projects in Vietnam to enable fast tracking of their in-country research careers. (See Appendix 1 for program)</p>	Well worthwhile exercise – cemented cooperation between parties, saw how the curriculum operated in Australia, opportunity to operate new research equipment. Drawback was that the 3 participants required intensive input from Dr Jobling and Dr McConchie	4
<p>Task 2 Short course: A 5 day short course on postharvest handling was conducted at Hanoi Agricultural University. The course was supported by the help of Mr Nguyen Manh Khai and Mr Do Minh Hien. They had both travelled to</p>	Excellent outcome as shown in feedback (Appendix X)	5

<p>Australia earlier in the year. The course program can be seen in Appendix 2 and a course manual is available on request (Course outcomes summary Appendix 5). Demonstration of the key concepts was primarily through practical hand-on sessions followed by group discussion.</p> <p>A total of 16 participants attended from Can Tho University, National Agriculture and Forestry University HCM City, The Postharvest Institutes at HCM City, Research Institute for Fruit and Vegetables Hanoi (RIFAV) and Hanoi University (Appendix 4). Travelling scholarships were provided for in the budget to facilitate travel for long distance participants.</p> <p>A summary of the feedback by participants can be seen in Appendix 3.</p>		
<p>Task 3 Distance learning package development :A CD ROM on postharvest training and research techniques has been completed for use by the participating institutions and extension personnel. The CD was trialed by the participants at the last short course held in December 2001 and was very favourably received. Minor adjustments to the CD will be made during the next month before final release. The CD duly acknowledges financial support by AusAID.</p>	<p>Excellent tool for the participant to use in own teaching and for workshops they run with extension personnel.</p>	<p>5</p>
<p>Task 4 Advanced Postharvest Training Course: A second postharvest training course in Ho Chi Minh City (3rd to the 7th December 2001) was presented. There were 19 participants from 6 different educational or research institutes. This advanced research-based course built on the fundamental concepts presented at the previous short course by presenting a methodology framework for research. Scientists were able to initiate, conduct and report on a set of experiments. A set of course notes and work book was prepared. The course will improve their own capacity for research and also training of postgraduate students. A key feature was that again, the practicals used equipment and produce readily available in Vietnam to demonstrate important postharvest principles</p>	<p>Excellent outcome as shown by feedback. (Appendix X)</p>	<p>5</p>

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

3. Implementation Performance

3.1 Project Components and Outputs

Comp. No.	Component Description	Outputs	Performance Indicators	Performance Rating
Task 1	Visit by 3 Vietnamese Scientists to Australia	The 3 major participating Institutes had a person trained in postharvest who can train others and help develop curricula.	Long term, increased output of research on postharvest handling of fresh fruit and vegetables grown in Vietnam and subsequent transfer of results in grower publications and via the rural extension network. Development of postharvest curriculum for undergrad teaching and teaching of colleagues.	4
Task 2	Short course 1	Participants were trained in basic principles of postharvest handling which were then introduced into their respective teaching and research programs.	At the completion of each course each participant will have completed an evaluation sheet on the course, and will have been broadly assessed as to the extent of their understanding of the concepts and skills learnt in the workshops. A follow-up evaluation of the workshop indicates that the program has been very useful in their teaching programs.	5
Task 3	CD ROM development	The distance education resources will consist of course notes study guides, self-evaluation quizzes, a CD-ROM. The CD ROM is used as a teaching resource in conjunction with the distance education study guides.	Implementation of the postharvest training curriculum at the major universities developed in Year 1 of this project. Access by rural communities at rural campuses to postharvest education through distance learning modules offered from Hanoi Ag and CTU.	4 Behind in time producing booklet for distance education
Task 4	Short course 2	Participants were trained in advanced principles of postharvest handling and introduced into their teaching research and extension programs.	At the completion of each course each participant will have completed an evaluation sheet on the course, and will have been broadly assessed as to the extent of their understanding of the concepts and skills learnt in the workshops.	5

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

1. A postharvest curriculum has been developed and detailed teaching material has provided that can be utilised by the Universities in undergraduate and postgraduate teaching. The material will be useful for many years to come and can be used to train others scientists and teachers.
2. A CD ROM of postharvest training material has been developed for use in the classroom and training of extension and research personnel. The CD will not only be useful for Vietnam but also other developing countries.
3. The research skills of 16 people have been enhanced and this will allow these university and institute scientists to conduct meaningful research on local postharvest issues. In addition the knowledge base and technical skills of university personnel has been improved and this knowledge will extend to students and ultimately, the end users - farmers and wholesalers.

3.3 Sectoral Impact

There was good female participation rate in the courses that we ran. This particular project was conducted by 2 females from Australia. Around 50% of the participants of the short courses were female.

The course will enable these women to develop and maintain their own research equipment and resources and be responsible for their own research projects. They will also develop the capacity to teach and train others at their respective institutes. We will give priority to supporting participation by women.

Indirectly there will be impact on colleagues and students interested in postharvest in each institution. In particular students and extension personnel will be trained in the principles of postharvest handling which will flow through to the rural communities. Benefits will flow through to rural communities, particularly fruit and vegetable growers who will have access to more relevant information, and consequently will produce a better product which translates into better prices. This will increase the standard of living of poor farmers and will improve the national economy as export markets are developed.

3.4 Costs and Financing

The full acquittal will be available on 30th Septemebr with final submission. There is no budget overrun in this project.

3.5 Monitoring of project

The management and funding for this project was coordinated by the University of Sydney accounts department and Dr Robyn McConchie, Project Leader. Funds have been spent according to budget allocation and were used appropriately.

3.6 Technical Assistance, Training and Capacity Building

Capacity building has been achieved primarily in the area of curriculum development for University institutions (where none existed before), improved research skills in scientists and teachers and developement of a network for ongoing communication and support between all the participants. For example equipping postharvest laboratories for teaching and research have become priorities for nearly all institutions and communication has allowed for active exchange of information.

The relationship between all participating institutions is extremely positive and constructive. The training programs were the cornerstone of this project and had the best outcome in terms of meeting objectives and meeting performance measures.

3.7 Management of Constraints, Issues, Risks and Change

There were no major issues or constraints to hinder the successful operation of this project.

3.8 Project Management

Institution	Comments
University of Sydney	5 The project was well implemented and managed
Hanoi Agricultural University	5 Excellent hosts for workshop1
CanTho University	5 Excellent coordination in Vietnam

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

Objective	Major Output	Expected Performance Indicators	Actual Indicators of Performance
a.	Curriculum and teaching resource material for use in Universities; distance learning booklets and resource material for rural teaching.	(i) Implementation of the postharvest training curriculum at the major universities developed in Year 1 of this project. (ii) Access by rural communities at rural campuses to postharvest education through distance learning modules offered from Hanoi Ag and CTU.	(i) Fully implemented (ii) Yet to be fully evaluated for implementation. Final version of Booklets and CD ROM to be sent this month. There were delays due to illness of the technician hired to develop these packages.
b.	Three Vietnam counterparts trained in Sydney for 14 weeks in advanced postharvest research techniques based on relevant in-country issues.	Long term, increased output of research on postharvest handling of fresh fruit and vegetables grown in Vietnam and subsequent transfer of results in refereed journals, grower publications and via the rural extension network.	Evidence of improved postharvest research capability has been shown at all participating institutions. This in part has been shown through setting up research and teaching labs in postharvest.
c.	Two short courses in postharvest training for University staff at	At the completion of each course each participant will have completed an	All evaluations of the short courses and teaching material indicate

	Hanoi Agricultural University and CTU	evaluation sheet on the course, and will have been broadly assessed as to the extent of their understanding of the concepts and skills learnt in the workshops. A follow-up evaluation of the workshop will be conducted 6 months later to gauge usefulness of workshop in their teaching programs.	it has been extremely useful and incorporated into their teaching and research programs. We could not hope for a better uptake of our work.
d.	Better communication and joint research projects between research institutes and the universities will result from the collaboration and team effort required for this project - bringing together CTU, HAU and SOFRI personnel.	Through email, set up a collaborative working group that will share and encourage co-operation in teaching and research between the participants in such areas as postharvest information, research methods, and problem solving.	The participants did not know each other before this project. This particular objective has been one of the most useful for ensuring ongoing benefits of the project. The email network continues to operate and communication between the groups remains high. The participants have links with us and importantly with each other to help solve problems and issues.

4.2 Sustainability

Financial and Institutional: The funds have provided tangible outcomes such as written and CD material which will be useful for at least the next 5 years. The CD can easily be updated to incorporate new material. In addition, on the strength of our curriculum, each institution has now acquired funding to purchase postharvest teaching and research equipment. Each institution now has a postharvest curriculum in place ensuring proper training of graduates going out into the workplace.

Technical: This project has focused on knowledge and skills transfer in the field of postharvest technology. This aspect has been very successful. In the future updating of skill and knowledge will be achieved through the network participants have developed as well as exposure to the data base of postharvest information conveyed to them.

Environmental: Improved postharvest handling will reduce wastage and reduce the problem of the disposal of large quantities of rotting fresh produce, particularly in the cities. It will also reduce pesticide use by increasing awareness of quality regulations and improving general hygiene on farm. For the consumer it will ensure safer food products by training growers to respect the with holding periods after spraying. Vietnam must be able to ensure the safety of its products if export markets are to be developed.

Social/Community: Fresh, good quality products have a higher nutritional value, taste better and will therefore be more appealing to consumers. Access to good quality fresh produce, particularly in poor rural areas, is important for improving health and diet.

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

4.3 Development Impact

Food processing has been part of university based education in many institutions but handling of fresh, unprocessed horticultural produce has not been part of the curriculum. The primary reason for this is that the university scientists and teachers were not trained in postharvest physiology and technology. Thus, to enhance Vietnam's ability to improve quality and safety of fresh produce the university educators needed to be trained. This project has put postharvest education on the map for the major agricultural universities in Vietnam. A postharvest curriculum has been developed that can be utilised by major Universities and also a distance education equivalent for satellite institution teaching in Vietnam. The research skills of 16 people have been enhanced and this will allow these university and institute scientists to conduct meaningful research on local postharvest issues. The knowledge base and technical skills of university personnel has been improved and this knowledge will to students and ultimately, the end users - farmers and wholesalers.

5. Conclusions

5.1. Overall assessment

Food processing has been part of university based education in many institutions but handling of fresh, unprocessed horticultural produce has not been part of the curriculum. The primary reason for this is that the university scientists and teachers were not trained in postharvest physiology and technology. Thus, to enhance Vietnam's ability to improve quality and safety of fresh produce the university educators needed to be trained. This project has put postharvest education on the map for the major agricultural universities in Vietnam. A postharvest curriculum has been developed that can be utilised by major Universities and also a distance education equivalent for satellite institution teaching in Vietnam. The research skills of 16 people have been enhanced and this will allow these university and institute scientists to conduct meaningful research on local postharvest issues. The knowledge base and technical skills of university personnel has been improved and this knowledge will to students and ultimately, the end users - farmers and wholesalers.

5.2. Lessons Learned

1. We learnt how to prepare a learning package for CD Rom. This has been trialed successfully at Sydney University and as a result other international and local courses will be prepared using the same format.
2. We developed a low technology postharvest training package that we can take and present in many developing countries.
3. We became more aware of the lack of resources and training in Vietnam and we have ideas for projects that could be developed in the future - both research and training.
4. We became more aware of the background of students coming from Vietnam and the resources and assistance they need when studying in Australia.