

Project Title	Increasing the capacity of the Food Crops Research Institute to enhance the Production and Management of Potatoes in the Red River Delta
Code: 1.7	
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Australian Institution	Agriculture Western Australia / Curtin University
Vietnam Institution	Food Crops Research Institute
Project Duration	July 2000 to June 2002

Project Description

This project aims to increase the productivity and profitability of potato production in the Red River Delta (RRD) through an integrated crop production and marketing program. The project is a co-operative research and extension program between the Food Crops Research Institute (FCRI), Agriculture Western Australia and Curtin University. Improvements in productivity and net returns will be achieved by training Vietnamese agronomists and extension agents in the methodologies used by the potato industry in Western Australia (WA).

Objectives

- a) The overall objective is to increase the productivity and profitability of potato production through an integrated crop production and marketing program. The project is a co-operative research and extension program. Improvements in productivity and net returns will be achieved by training Vietnamese agronomists in the methodologies used by the potato industry in WA.
- b) Integrated crop management involves developing an understanding of the most important factors that effect the performance of a crop. It also involves the development of an understanding of the interactions between these factors. Crop improvement will occur through advances in agronomy, post harvest storage of product, improved seed production and genetic improvements. To achieve the major objective, the following objectives must be met:
 - ◆ To train FCRI staff to identify the major factors limiting production
 - ◆ To train FCRI staff to identify improved agronomic inputs that will increase marketable yields.
 - ◆ To train FRCI staff to identify improved storage techniques that will increase profits to growers.
 - ◆ To demonstrate potato growers in the RRD an improved seed supply scheme of improved varieties.
 - ◆ To improve profits to growers through adoption of improved varieties (genetic improvement).
 - ◆ To improve farmers and FCRI staff understanding of the dynamics of both domestic and export markets and the various means farmers have of collectively manipulating the supply of potatoes (and prices) to the market.

Outputs and Performance indicators

Outputs	Performance Indicators
<ul style="list-style-type: none"> ◆ Survey of crops in the first year will achieve the objective of training FCRI staff to identify the major factors limiting production 	<ul style="list-style-type: none"> i) Publication of survey results of crops in the RRD
<ul style="list-style-type: none"> ◆ Experiments will be conducted in the second year to develop improved agronomic inputs that will overcome the limiting factors identified in the crop survey. This will achieve the objective of training FCRI staff how to identify improved agronomic inputs that will increase marketable yields. 	<ul style="list-style-type: none"> i) Publication of recommendations developed from the agronomy trials.
<ul style="list-style-type: none"> ◆ The quality of tubers for seed and for sale will be improved through post harvest work. This will achieve the objective of training FCRI staff to investigate improved storage techniques to increase profits to farmers. 	<ul style="list-style-type: none"> i) The completion of storage trials that will increase the storage period of marketable tubers and reduce the concomitant storage losses.
<ul style="list-style-type: none"> ◆ An improved method of supplying seed tubers to the RRD will be demonstrated. This will involve the importation of high quality seed in the RRD and the final bulking by ordinary growers. This will achieve the objective of demonstrating an improved seed scheme that offers farmers healthy seed of vegetatively propagated potato varieties. 	<ul style="list-style-type: none"> i) The increased yield of crops planted in the first field generation.
<ul style="list-style-type: none"> ◆ Improved varieties developed by the FCRI will be tested on a commercial scale for the first time. High quality seed of these new varieties will be supplied from WA seed specialists. This will achieve the objective of improving profits to growers through the adoption of improved varieties. 	<ul style="list-style-type: none"> ii) The performance indicator will be the amount of new varieties ordered in March 2002
<ul style="list-style-type: none"> ◆ The understanding of agricultural marketing systems by both potato growers and FCRI staff will improve the various means growers have of collectively manipulating the supply of potatoes (and prices). This will improve profits to growers, ensuring that the increased production is marketed effectively, rather leading to an oversupply and commensurate price reduction. 	<ul style="list-style-type: none"> iii) Development of business plans by local groups incorporating a marketing strategy and possible development of export markets.

PROJECT COMPLETION REPORT

Executive summary

The project is a collaborative research and development project focusing on improving the potato production system in the Red River Delta in Vietnam. The Department of Agriculture, Western Australia (DAWA), Curtin University and the Food Crops Research Institute (FCRI) in Vietnam worked to develop the capacity of the FCRI in a number of key areas: crop management, variety evaluation, agronomy profiling, post harvest and marketing. The project has demonstrated the benefits of using high quality seed of Vietnamese varieties and has shown how this can form the basis of an improved seed scheme from which growers in the Red River Delta (RRD) can improve their yields, profits and livelihoods. Adoption of BMP resulted in a 20 to 40 per cent increase in marketable yield of local varieties TK51.6 and KT3 compared with the normal practices of growers. Adoption of BMP resulted big increases in gross margins for the farmers in the Red River Delta. For example for the variety TK51.6 gross margins were on average 140 per cent (ie \$880 v \$1753 /ha) higher and 80 per cent higher for variety KT3 (\$2030 v \$3444/ha) compared with normal grower practice. This highlights the importance of growers using best management practices to maximise returns when investing in high quality seed.

1. Project description

1.1 Background and preparation

It is widely recognised that the absence of a high quality, pathogen free seed of the desired physiological age is the major constraint limiting the expansion of the potato industry in South East Asia. For many years the International Potato Centre (CIP) has been breeding potato varieties that are more suited to the tropics. However, these new varieties have not been adopted because of the lack of sufficient quantities of high quality seed.

In 1995, WA hosted representatives of the National Potato Programs from Vietnam and the Philippines, the CIP and SAPPAD to further investigate opportunities to develop relationships with the potato industries of South East Asia.

In 1996 the WA Potato Marketing Corporation submitted a proposal to AusAID under the AAACP Linkages III program. This proposal was to test the performance of CIP varieties by first importing pathogen free foundation material into Australia, for subsequent multiplication and re export to Vietnam. The results of this work were encouraging with Vietnamese developed varieties performing very well. The Project team then developed the current CARD project to build upon this work, further trialing Vietnamese varieties, demonstrating the potential of this new seed system and providing technical support in the form of crop management, post harvest and marketing to optimise the output of the proposed system.

1.2 Context and rationale

Potatoes have been classified a priority crop in the RRD by the Government of Vietnam: they provide an alternative to rice and are capable of feeding an expanding population. Potato production in Vietnam is centred around the Red River Delta where 32,000 ha are cultivated. In the early 1980s approx. 100,000 ha of potatoes were cultivated in the RRD, this figure has since fallen, due to the poor quality of seed and the lack of an integrated crop management system leading to low yields of 10-12 tonnes/ha. The FCRI estimated there is the potential to grow 400,000 ha of potatoes in the RRD should yields prove economical. Ultimately the profitability of growing

potatoes will be determined by the farmers' ability to produce and store the product and control the volumes of tubers despatched to the market.

Most (approx. 10,000 tonnes) of the seed used in the Red River Delta comes from China, the seed being small tubers graded out of the ware crop. The seed from China tends to be a mixture of varieties and suffers with various bacterial, fungal and viral diseases including powdery scab. It is used because it is cheap and has been recently harvested, whereas Vietnamese seed is often stored for 9 months between seasons prior to use.

The Vietnamese potato industry needs high quality seed of varieties that are most suited to their growing conditions. Accordingly this project has aimed to introduce an alternative source of seed, developed specifically for the RRD's tropical conditions by the FCRI plant breeding team, and bulked up to commercial quantities in Western Australia.

1.3 Project objectives and scope at design

The overall objective of the project has been to increase the productivity and profitability of potato production through an integrated crop production and marketing program.

To support this objective a series of activities were undertaken focusing on developing the capacity of FCRI and growers to effectively manage crop production, storage and marketing. The project design included the following activities:

- Training FCRI staff to identify the major factors limiting production.
- Training FCRI staff to identify improved agronomic inputs that will increase marketable yields.
- Training FCRI staff to identify improved storage techniques that will increase profits to growers.
- Demonstration to potato growers in the RRD of an improved seed supply scheme of improved varieties.
- Improve profits to growers through adoption of improved varieties (genetic improvement).
- Improve farmers and FCRI staff understanding of the dynamics of both domestic and export markets and the various means farmers have of collectively manipulating the supply of potatoes (and prices) to the market.

The hands-on nature of most the research and development work has been very successful in ensuring that FCRI staff and potato growers have developed new skills. The 'learning by doing' style of the project ensuring that skills demonstrated by the WADA and Curtin University staff are evaluated, customised and incorporated into FCRI and grower practices.

The project has addressed a number of key issues for both AusAID and the Vietnamese government assisting in developing R & D capacity in a crop which provides valuable nutrition, employment and income for the poor farmers of the RRD.

1.4 Implementation arrangements

The project has been managed by the WADA, with the Dept and Curtin University providing short term inputs to develop the capacity of the Vietnamese counterpart – the

FCRI. The project partners had worked together previously on a AAACP project and have continued to develop a good working relationship. The management of the project has been assisted greatly by having 2 Youth Ambassadors seconded from the WADA, Joanna Embry and Ashe Briscoe, who spent a total of 21 months working in Hai Duong with the FCRI.

2. Appropriateness of project design and objectives

2.1 Appropriateness of objectives

Objective No./Ref.	Objective description	Appropriateness rating
2.2.1	Crop Survey to train FCRI staff in identifying the major factors limiting production.	5
2.2.2	Training FCRI staff to identify improved agronomic inputs that will improve yields.	5
2.2.3.0	To train FCRI staff to identify improved storage techniques for both seed and ware potatoes that will increase profits to growers.	5
2.2.3.1	To assist staff to develop a survey instrument which will identify the importance of problems experienced in postharvest handling of seed and ware potatoes on the Red River Delta.	4
2.2.3.2	To identifying the training needs of FCRI staff and personnel in co-operatives collaborating with the FCRI in postharvest technology of seed and ware potatoes.	5
2.2.3.3	To identify possible research projects on alternative methods of extending the shelf life of seed and ware potatoes in storage.	5
2.2.4	To demonstrate to potato growers in the RRD an improved seed supply scheme of improved varieties	5
2.2.5	To commercially test improved potato varieties developed by the FCRI.	5
2.2.6	To develop FCRI staff and grower understanding of marketing to capture the benefits of increased production.	4

2.2 Appropriateness of design

Description of design features	Appropriateness rating
2.2.1 Survey of grower practices with stratified cluster sampling and multiple regression analysis of relationships	5
2.2.2 Planning, implementation and analysis of the agronomy trials based on the results of survey.	5
2.2.3 With FCRI staff visit Ministry of Agriculture personnel, research institutes scientists, co-operatives and farmers in the target area to discuss their experience with the storage of seed and ware potatoes.	5
2.2.3 Inspect storage facilities in the provinces under study	5

2.2.3	Inspect seed about to be planted to identify storage problems experienced by farmers and co-operatives	5
2.2.3	Finalise a survey instrument with FCRI staff, which will assist in defining the problem, experienced in seed storage by farmers and establish research priorities.	4
2.2.3	Use the above information to develop training and research activities	4
2.2.4	Improved techniques for seed production. - Mother seed produced for Vietnam in WA - Specialist Vietnamese growers to bulk seed in Vietnam - Positive plant selection.	5 4 1
2.2.5	Genetic Improvements - Supply the improved FCRI developed varieties KT3 & VC51.6 using high quality WA seed.	5
2.2.6	Marketing - Explore existing supply chain relationships for the various market segments and identifying possible improvements. The findings of this research were then incorporated into developing appropriate training workshops.	4

3. Implementation performance

3.1 Project components and outputs

Component No.	Component description	Outputs	Performance indicators	Performance rating
2.2.1	Identification of major factors limiting marketable yield.	Crop Survey to train FCRI staff in identifying the major factors limiting production.	Publication of survey results of crops in the RRD	5
2.2.2	Recommendations for improved crop production.	Training FCRI staff to identify improved agronomic inputs that will improve yields.	Publication of recommendations developed from the agronomy trials	5
2.2.3.0	Post harvest technology to extend storage and to reduce losses	Train FCRI staff to identify improved storage techniques for both seed and ware potatoes that will increase profits to growers.	The completion of storage trials that will increase the storage period for marketable tubers and reduce concomitant storage losses.	5
2.2.3.1	Post harvest technology to extend storage and to reduce losses	Assist staff to develop a survey instrument that will identify the importance of problems experienced in postharvest handling of seed and ware potatoes on the Red River Delta.	Publication of options for survey instruments to identify post harvest problems	4
2.2.3.2	Post harvest technology to extend storage and	Identify the training needs of FCRI staff and personnel in co-	Development of training plan	5

	to reduce losses	operatives collaborating with the FCRI in postharvest technology of seed and ware potatoes.		
2.2.3.3	Post harvest technology to extend storage and to reduce losses	Identify possible research projects on alternative methods of extending the shelf life of seed and ware potatoes in storage.	If research results are positive then proposals for research projects will be developed	4
2.2.4	Improved techniques for seed production	Demonstrate to potato growers in the RRD an improved seed supply scheme of improved varieties.	The performance indicator will be the amount of new varieties in use.	5
2.2.5	Genetic improvements	Commercially test improved potato varieties developed by the FCRI	Publication of test results comparing improved and traditional potato varieties	5
2.2.6	Potato Marketing	Develop FCRI staff and grower understanding of marketing to capture the benefits of increased production.	Development of business plans by local groups incorporating a marketing strategy and possible development of export markets	4

A number of changes were approved through the course of the project, these are detailed in Annexes 2, 3 and 4. The main changes being:

Study tour by Vietnamese researchers and growers to Western Australia. The aim of the tour was to demonstrate specialist seed potato growers operating within a functioning seed certification scheme. In this way growers and researchers could see the potential for to develop a seed certification scheme appropriate for Vietnam. In addition the Vietnamese team gained an insight into marketing of ware, processed and seed potatoes as well as best management practices and the co-ordination achieved between industry and government.

Focus on marketing and economics - further work was carried out in the area of economics and marketing. As production is predominantly around the Tet Holiday (Lunar New Year) there is the possibility of over-supply leading to reduced grower prices. To overcome this further work was undertaken by Peter Batt looking at the supply chain to measure the elasticity of supply and demand. In addition workshops were conducted to improve researcher and grower understanding of market dynamics. This work has also been supported by inputs from Western Australian exporters, Youth Ambassadors and the recent study tour visit to Western Australia.

Integration of research results into the wider potato program - To ensure that the results of the R&D work are effectively communicated through MARD, Terry Hill, Program Manager from the WADA, visited Vietnam. His work focusing on ensuring

that systems are in place to capture, retain and disseminate project information throughout MARD.

Best Practice trials - The project was extended into a third year, the main aim being to ensure that the findings of the project, particularly those related to crop management, were demonstrated to growers and other researchers. The work indicating the problems caused by low levels of potassium and the benefits of using cut seed, cool stored and treated with cement or mancozeb was very important to the Vietnamese potato industry.

3.2 Project outcomes

The project has been successful in delivery training to FCRI staff and growers in a number of key areas:

Crop survey (2.2.1) and the surveys undertaken with Joanna Embry (Farm financial performance), Peter Batt (Marketing) and John Janes (Postharvest) provided counterparts with key skills in survey design, implementation (interviews and data collection) and analysis. These skills will prove extremely useful in future research and extension work.

Cut seed - The benefits of using cut seed were effectively demonstrated to the growing community through agronomic trials, best practice trials, hands-on workshop training provided by Western Australian farmer, Tom Fox and the recent WA study tour. Using cool stored cut seed will reduce input costs whilst maintaining yields, so reducing the financial exposure faced by growers buying in high quality seed.

Post harvest - Surveys undertaken by the Post harvest specialist indicate that field and storage hygiene are inadequate to control diseases being spread by seed produced and stored by farmers. A major training program supported by legislation to set up a clean seed certification system is required. The seed certification system needs cool stores to function effectively and cool stores will replace diffuse light storage in houses as a means of storing seed tubers.

Marketing - A comprehensive study of the supply chain was undertaken and this provided the impetus for further work in this area funded by a German aid project (GTZ). In addition to workshops, growers and researchers have learnt more on the marketing of ware, processed and seed potatoes through visits by WA exporters and through the study tour to WA. Here growers saw seed potatoes specifically grown and marketed through a regulated system.

Variety evaluation - Vietnamese varieties had initially been evaluated under the AAACP project. During the CARD Project further varieties were evaluated. Of those TK51.6, Eben and KT3 in particular performed well. These varieties having good yield potential, yield stability over locations and seasons, and dry matter content. Therefore, they are recommended for rapid multiplication for production. These clones may also be suitable for processing as they further have low concentration of reducing sugars. TK51.6 has a short dormancy period, thus low storability under the ambient hot and humid conditions of the diffused light storage that is the most popular seed storage method used by the farmers in Vietnam. That said, all clones will only reach their potential if they are stored in cool rooms between seasons.

3.3 Sectoral impact

Potato production in the RRD relies heavily on women carrying out much of the work, often as a result of male rural-urban drift. The project has effectively targeted women with new techniques and ideas in the areas of crop management, storage and cutting of

large tubers for seed. A number of female researchers at the FCRI have received training including Ms Nguyen Thi Hue, Mrs Nguyen Thi Que and Ms Hoai. In addition the project has benefited greatly from the presence of 2 female Youth Ambassadors who have developed a good working relationship with the staff at FCRI and the growing community.

3.4 Costs and financing

Revisions to the project budget has enabled the project to be extended to 3 seasons. Annexes 2, 3 and 4 detail these changes. The project was carried out with considerable savings being made from the use of soil and plant analysis facilities in Vietnam. These facilities enabled the funds to be used to enhance those activities described in 3.1 and affording the project an extra season in Vietnam to consolidate the work already undertaken and extend its findings to the wider growing community.

The FCRI spent more than was originally envisaged (\$47,270 as opposed to \$35,150). This in part reflected the higher priority placed on the project by the Vietnamese counterparts as the results of the trials and training became evident.

3.5 Monitoring of project

In the initial design of the project, monitoring was to be carried out by team members during visits to Vietnam, ensuring that R&D work was being undertaken by FCRI staff. This proved adequate, however monitoring improved as a result of the inputs provided by Joanna Embry and Ashe Briscoe. The presence of two AYAs in Hai Duong ensured that project activities were regularly monitored and evaluated, with reports being made to the WADA project manager and actions carried out accordingly.

3.6 Technical assistance, training and capacity building

The bulk of training provided by the project was through collaborative research. Researchers from the WADA and Curtin University, acting as mentors for counterparts from the FCRI. FCRI staff have been involved in prioritising work and designing trials and extension mechanisms, fostering ownership of the process.

A number of surveys have been carried out in conjunction with the FCRI team. This has provided the opportunity for team members from FCRI to be involved in designing, implementing and analysing surveys as well as acting as interpreter between Australian team members and Vietnamese growers and marketing agents.

Workshops have also been conducted demonstrating cut seed technology and marketing concepts. The workshops, facilitated by FCRI staff, enabled three-way communication between FCRI staff, DAWA/Curtin and growers.

A study tour was undertaken to Western Australia in March 2003. The 10 day tour providing an opportunity for researchers and growers to see first hand seed certification systems, best practice crop management and how the research partners work with the WA potato industry in prioritising and implementing R&D.

The project collaborators had all worked together previously on the AusAID funded AAECF III Project (1996-99). All members of the research team were involved in developing the proposal and in monitoring and evaluating project progress. The working relationship between team members has undoubtedly benefited from the two youth ambassadors' input and the recent visit to WA of the study tour group.

3.7 Management of constraints, issues, risks and change

Initially the project was constrained by the lack of agreement between the WADA and ITC/AusAID as to the format of the client contract. This issue was resolved in March 2001. To assist the FCRI in the initial stages of the project the WADA advanced FCRI \$10,000 to ensure that the project received support in Vietnam.

FCRI lack capital equipment and their operating budget is limited. This caused problems during the crop survey with transport to and from sites and a contract addendum was developed to provide transport in the form of a moped.

There has been a delay in the input of Terry Hill who was due to visit Vietnam in early 2003. Mr Hill's input was initially delayed as a result of work commitments in Western Australia and subsequently as a result of the SAR outbreak. Mr Hill will be visiting Vietnam, funded by the Western Australian Agriculture Department in August 2003.

3.8 Project management

The project was administered by Paul Mattingley (WADA) who visited Vietnam in December 2000 and August 2001. The WADA and Curtin University have had regular project meetings in Western Australia. All team personnel were thoroughly briefed prior to departure and provide a full debrief on return. The financial aspect of the project was managed through WADA's Smartstream accountancy package. Procurement of equipment has been at a low level but has run according to schedule.

The job of managing the project was made considerably easier by the existing relationship between the research partners and the input of two youth ambassadors. In addition savings in the budget allowed additional trips to Vietnam to be made further improving communication.

The FCRI is staffed by well trained, motivated individuals, who are committed to improving potato production in the RRD. Trials have been well managed at the FCRI facility in Hai Duong as have on-farm trials and best practice demonstrations, highlighting the FCRI's close link to the farming community. In addition the FCRI successfully hosted 2 AYAs seconded to work on the project.

Rating - 5.

4. Performance and outcomes

4.1 Assessment of performance against objectives and design

The project team has sought to be flexible in their attitude to the problems facing potato production in the RRD. Whilst opinions had been formed during the AAECPLinkages project the team were keen to avoid too many pre conceived ideas swaying the project design and implementation.

The project covered potato production from variety evaluation/genetic material through to marketing. The post harvest component of the project was finished early due to the non performance of essential oils as a sprout and disease inhibitor. The Marketing component was ambitious in its aim of developing business plans with potato growing co-operatives, however that component is now being implemented.

Variety evaluation work demonstrated that Vietnamese varieties were suited to RRD conditions. However the survey undertaken by Joanna Embry (AYA) demonstrated that other non Vietnamese varieties such as Mariella were also well suited. This

demonstrated that seed is not the only issue and that crop management and a regulated seed certification scheme are also required.

Crop management work initially focused on a survey to link grower practices to yield. There was a strong correlation between potassium levels and yield and a trial was conducted in year 2 to test this. The results of the trial have been inconclusive and further work in this area is needed.

4.2 Sustainability

Developing potato production in the RRD is a priority for MARD, with domestic and external funds provided for R&D and extension activities. The CARD project has augmented the work undertaken by the FCRI on a GTZ funded project looking at variety evaluation in the RRD. This CARD funded project is therefore part of an ongoing program of activities and the FCRI is not financially dependent on this project funding.

The project was designed and implemented cooperatively with FCRI and no line management roles were taken on by Australian counterparts ensuring that the projects aim of capacity building was fulfilled and the program's continuing sustainability.

The third year of the project enabled key agronomic management information to be disseminated through best practice demonstrations. This has ensured that the information generated by the project has been extended to the growing community.

Optimisation of inputs such a fertiliser together with the demonstration of the benefits of using cool stored cut seed will ensure that environmental damage incurred in potato production and storage are minimised.

Rating - 4

4.3 Development impact

The project has had two main impacts:

- Increasing the capacity of the FCRI - staff from FCRI are now better equipped to conduct research, development and extension activities as a result of the training that they have received.
- Demonstrating the potential for an improved seed system - the project has demonstrated the yield potential of high quality imported seed if managed correctly. Without the integrated crop management program developed by the project, growers will not be able to harness the potential offered by the high quality seed. The project has also demonstrated that a seed certification system is required so that buyers of second or third generation imported seed can have confidence in the seed performance. It is envisaged that in the next three to five years Vietnam will establish a seed certification scheme, where seed can be 'branded' through the system. In this way the price received for seed will reflect its true yield potential and users of high quality seed can become specialised seed growers.

5. Conclusions

5.1. Overall assessment

The project aimed to demonstrate that a new seed multiplication system is possible in Vietnam based on the importation of high quality seed of the correct varieties. To maximise the potential offered by the seed components focusing on variety evaluation, crop management, post harvest and marketing were conducted.

Variety evaluation work demonstrated the appropriateness of Vietnamese developed varieties to the tropical conditions found in the RRD. A key determinant of variety performance is disease tolerance; varieties that can produce high yields over three seasons provide a financial incentive to growers. Work undertaken by Joanna Embry showed that not only Vietnamese varieties performed well, with German varieties such as Mariella yielding well over a number of seasons.

The **crop management** work demonstrated that without an integrated crop management system high quality seed will not perform. Seed cutting technology was demonstrated to researchers and growers and, when used with cool stored seed, provides cost benefits to growers. The initial survey work pointed to a lack of potassium restricting yields. This was not borne out in follow on trials and further work will be required to test this link.

Disease management - roguing (removal of diseased plants) was not initially successful as growers only saw the downside of a plant being destroyed. Having visited WA the growers and researchers can now see the benefits of removing diseased plants if a seed certification system is to be developed.

The **post harvest** component of the project aimed to analyse current practices and examine the effectiveness of using essential oils to treat seed stored between seasons. The conclusions of the post harvest experimental work was that essential oils only had a minor effect in this circumstance and that cool storage of seed is required to reduce seed degeneration. Survey work showed that field and storage hygiene is poor and so identified further training needs for growers to allow the successful development of an improved seed scheme.

The **marketing** component of the project aimed to assist growers and researchers understand market dynamics for seed and ware marketing. A comprehensive survey was conducted providing an insight into the margins made in the sale of ware potatoes to Ho Chi Minh and the reasoning behind choice of seed. It had been envisaged that business plans would be developed however this has not happened in a formal sense. Instead the study tour to WA in March 2003 enabled growers and researchers to see the potential for marketing potatoes (ware, seed and processed). These ideas are now being developed into business plans by cooperative heads. Further work will be required in this area.

5.2. Lessons learned

The project was ambitious in its objectives covering a number of areas – crop management, variety evaluation, post harvest and marketing. There was little work initially planned in the economics area. It soon became apparent that without financial incentives growers would not adopt new practices. Accordingly a separate project was put to AusAID to fund Joanna Embry (WADA Agricultural Economist) under the Youth Ambassador Program. Ms Embry's input and that of Ashe Briscoe highlighted the risks of buying in high quality imported seed and the need for a seed certification scheme to reward those risks.

The duration of the project (two years) was too short to fully evaluate crop performance and accordingly a contract addendum was developed to enable a third season's work to be undertaken. In this way the findings of two years' crop management work could be demonstrated to the growing community.