

Australia-Pakistan Agriculture Sector Linkages Program

FINAL REPORT

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**ASLP Citrus Familiarisation Tour for Pakistan delegates
(10-20 May, 06)**

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ASLP Citrus Familiarisation Tour for Pakistan delegates

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This report describes the details for the citrus familiarisation tour arranged for the Pakistani delegates. The report consists of the tour activities, venues and facilities visited by the delegates. Report also outlines the outcome of the ACIAR workshop held in Sydney. Impressions and recommendations of Pakistani delegates at the conclusion of the tour and a program for the Citrus scoping study in Pakistan are included in this report.

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Executive Summary:

Citrus is an important crop for Australia and for Pakistan. The Australian citrus industry is mainly based on export and domestic market, while Pakistan citrus production is mainly consumed for domestic markets and a small proportion for the overseas markets. A formal agreement for an Agricultural Sector Linkages Program (ASLP) was developed and signed between the governments of Australia and Pakistan. The main objective of this agreement is to build linkages between the horticulture sectors for the mutual benefits of both countries. In subsequent bilateral discussions regarding implementation of the ASLP, citrus (along with mangoes and dairying) was selected as a major sector of focus for research, development and capacity building activities.

A citrus industry delegation from Pakistan visited Australia in May 2006 to familiarise themselves with Australian citrus industry, its structure, skills and expertise. This tour was funded through the ASLP and hosted by the Department of Primary Industries and Fisheries, Queensland. This study tour by Pakistani delegates was one of the three activities identified previously to establish linkages between Australia and Pakistan to strengthen their relations in horticulture sector for the mutual benefits of both countries in Research, Development and Extension (RD&E).

A comprehensive study tour of 10 days was designed to expose the group to Australian citrus industry in different growing regions across various states. The group started their tour at Bundaberg Research station where they were exposed to the Queensland and national scion breeding programs and tree management and fruit size and climatic issues. The day was followed by a citrus orchard tour in Central Burnett (Gayndah and Mundubbera), the major mandarin growing region in Queensland. This group was also shown the major insectaries and packing sheds in Queensland. In southern Australia the group visited major research stations, citrus orchards, packing shed/juice facilities, CSIRO, marketing boards and Australian Citrus Growers (ACG), Australian Budwood Scheme in Mildura. The group also visited one of the modern citrus growing systems called open hydroponics system in Yandilla Park, Mildura. They also attended presentation on citrus greening disease by Professor Andrew Beattie from University of Western Sydney.

The group took a keen interest in the entire tour and the delegates were quite impressed with the structure of the citrus industry in Australia, its citrus expertise and advanced techniques of managing citrus crop. A successful 'wrap up' workshop was held on 19 May, facilitated by Les Baxter (ACIAR). This workshop included Pakistani delegates, proposed Australian team for the scoping study, AQIS, HAL and program managers from NSW DPI and DPI&F Queensland.

The discussions and meeting with the Pakistani delegates suggested that, in Pakistan, there is a poor linkage between researchers and growers, researchers and extension workers and also there is either no or poor co-ordination across the research institutes. Pakistani growers are small land owners and they do not have knowledge or resources to maintain and manage their citrus crops. Growers do not have crop management protocols for basic cultural practices such as irrigation, fertilisation, pruning and disease management. Due to lack of crop management, poor fruit quality and storage facilities 30-35% of the crop is unsuitable for marketing.

Poor yields are also due to lower tree density compared to Australia. Citrus trees in Pakistan take up to 9 years to reach commercial bearing. There is almost no concept of fruit thinning and flower manipulation to improve fruit quality and fruit size. Pruning is the main issues due to the late maturing nature of Pakistani “Kinnow” cultivar. In addition to that there is no reliable source of budwood. This is due to lack of certified citrus nurseries and therefore, there is no disease control via virus free budwood. No monitoring of pest is practiced like in Australia. Water use is not efficient as intercropping is carried out without the knowledge of the water requirements for the major and minor crops.

The Pakistani delegates were very impressed with the way Australian citrus is structured and the integration between growers, researchers, extension workers and marketers. Therefore, any ASLP project should have a grower-focussed research component. Pakistani delegates also emphasised the need of public and private partnerships rather than projects concentrating only on government institutes.

The Australian citrus team is due to arrive in Islamabad in mid July 06 to carry out a citrus scoping study in order to identify and familiarise themselves with problems of crop and nursery management, irrigation and disease management. This team will also evaluate the research and extension capabilities of the Pakistani citrus industry. The recommendations from the scoping study will assist in designing the longer term research and extension program for the citrus industry in Pakistan.

General Introduction:

In late 2005 a formal agreement for an Agriculture Sector Linkages Program (ASLP) was developed and signed between the governments of Australia and Pakistan. The aim of this four-year ASLP is to build linkages between the agricultural sectors in both countries. Initially dairying, mangoes and citrus were selected as the primary focal sectors for this program.

During detailed consultation between Australian and Pakistan counterparts, it was decided that the citrus component of the ASLP would be comprised of a range of R&D, technology transfer and capacity building activities. A citrus familiarisation study tour to Australia by key technical, agribusiness, grower and government representatives of the Pakistan citrus industry was one of the identified activities.

The objectives of the citrus familiarisation study tour were to:

- provide key representatives of the Pakistan citrus industry with an opportunity to experience citrus production, processing and R&D in Australia;
- provide an opportunity for Pakistan citrus industry representatives to meet and interact with their counterparts in Australia;
- discuss production constraints, R&D priorities and other issues of mutual interest to Pakistan and Australian industries;
- provide an initial forum for the identification of R&D issues to be considered in other ASLP activities.

A group of 11 Pakistani delegates arrived in Australia on 10 May 2006 (refer Attachment 1). The group consisted of a range of citrus industry officials including scientists, exporters, processors, marketers and growers.

This group was funded by ACIAR through the Agriculture Sector Linkages Program (ASLP) and hosted by Dr Tahir Khurshid (Principal Research Scientist - Citrus), Department of Primary Industries and Fisheries, Queensland.

A comprehensive study tour of 10 days was designed to expose the group to Australian citrus industry in different growing regions across various states (refer Attachment 2). The familiarisation tour culminated in a wrap-up workshop designed to provide a forum for tour participants to discuss their impressions and learning from the study tour, to allow the discussion of issues and constraints associated with the Pakistan citrus industry and to provide an overview for an R&D project scoping study to be carried out in Pakistan in July 2006.

The group started their tour at Bundaberg Research station where they were exposed to the Queensland and national scion breeding programs by Malcolm Smith. Tahir Khurshid presented his research in terms of tree management and fruit size and climatic issues. The day was followed by a citrus orchard tour in Central Burnett (Gayndah and Mundubbera), the major mandarin growing region in Queensland. This group was also shown the major insectaries and packing sheds in Queensland.

In southern Australia the group visited major research stations, citrus orchards, packing shed/juice facilities, CSIRO, marketing boards and Australian Citrus Growers (ACG),

Australian Budwood Scheme in Mildura. The group also visited one of the modern citrus growing systems called open hydroponics system in Yandilla Park, Mildura. This group also attended presentation on citrus greening disease by Professor Andrew Beattie from the University of Western Sydney.

This group took a keen interest in the entire tour and the delegates was quite impressed with the structure of the citrus industry in Australia, its citrus expertise and advanced techniques of managing citrus crop. A successful 'wrap up' workshop was held on 19 May, facilitated by Les Baxter (ACIAR). This workshop included Pakistani delegates, proposed Australian team for the scoping study, AQIS, HAL and program managers from NSW DPI and DPI&F Queensland.

Day one – 11 May 2006

Bundaberg Research Station, Bundaberg

Dr Tahir Khurshid chaired the first session of the citrus familiarisation program. Malcolm Smith (Senior Scientist) made a presentation on delivering improved genetics for the commercial citrus production. In his presentation Malcolm Smith emphasised on improving the existing available cultivars in Australia rather than developing more cultivars. There is also an interest in juicy, sweet and seedless mandarin. Radiation treatment is generally used in Australia to reduce the seed number. The mandarin cultivar 'Imperial' is much liked in Australia due to its palatability; however, it does not travel very well. 'Troyer' is the most used rootstock for mandarins in Central Burnett for its early fruiting qualities, however, fruit grown on 'Troyer' is most prone to granulation similar to 'Volkameriana' (Khatti) used in Pakistan. Malcolm believes that 'Benton' citrange has promise to overcome problems faced by the other rootstocks. Malcolm Smith also presented data from the rootstock evaluation program.

Tahir Khurshid talked about his research in pre harvest physiology in the form of 3 short presentations. Tahir highlighted the importance of flower suppression for early crop load management with the use of plant growth regulator called Ralex[®]. Ralex[®] is previously registered for mandarins. Ralex[®] is also now been registered for it flower suppression use of 'Navel' oranges after the completion of a successful project carried out by Tahir Khurshid in NSW DPI. There are other techniques such as chemical thinning, hand thinning, and pruning can also be use to control crop load. However, each technique is carried out at different phenological stages. Tahir also presented the data from his fruit size management project and heat unit mapping project. Some data for rootstock evaluation program was presented and the group was later taken to the experimental plot to give them a visual perception of the rootstock work. Delegates have been given copies of the poster on citrus phonological cycle recently published by Tahir Khurshid. The group interacted with a range of research and extension officer at the station.

Citrus Orchard Visit, Gayndah

In the afternoon the group visited a grower's orchard in Ban Ban Spring. This orchard has trees grown on various rootstock including 'Troyer' citrange and 'Cleopatra'. A range of different cultivars like 'Imperial' mandarins, 'Ellendale', 'Honey Murcott', 'Freemonts', 'Hicksons' and 'Sunbursts' are grown in this area. At this time of the year mandarin harvest was underway so delegates had the opportunity to observe the fruit picking, transporting and degreening techniques. The farm manager spent time with the delegates and demonstrated

hands-on pruning, skirting and hedging techniques in the field. Delegates were also impressed with tree density as in Pakistan they grow 80-90 trees/acre, a very low density on Australian standards. The farm manager also answered questions raised by the delegates. Delegates also took the opportunity to view the irrigation/fertigation units on the property.

In Pakistan mandarin trees are fairly large as seen in the video presentation. Once again trees needed to be brought down to a manageable size to grow large yields of quality fruit. In Gayndah and Mundubbera an average age of citrus tree is 12-15 year.

Day Two – 12 May 06

Bugs for Bugs Insectary, Mundubbera

The group started their day with visiting one of the most important insectaries called 'Bugs for Bugs'. 'Bugs for Bugs' is the trading name for that part of the operation which specialises in the production of beneficial insects. Integrated pest management aims to maximise the use of biological control. Other control measures, especially chemicals, must play a supportive rather than a disruptive role. Chemicals should not be used on a 'calendar' basis but strictly when needed as defined by systematic pest monitoring. Selective rather than broad-spectrum chemicals should take preference. The aim is to produce high-quality marketable produce at minimal cost by intelligently using the various control options to manage pests.

Dan Papacek (Director) made a video presentation for nearly 30 minutes on integrated pest management and answered a range of questions. The tour was given an opportunity to visit the laboratories and insect rearing facilities. Delegates were quite amazed to see the facilities and expressed interest in the possibility of similar types of operation in Pakistan. Delegates have been given copies of the video and other written materials.

Tour of the Bugs factory was followed by an orchard visit in Mundubbera. Dan Papacek and Phil Jackson demonstrated the pest monitoring techniques and identification of diseases in the orchard. Delegates took a keen interest in hand-on orchard visits.

GayPak Packing House, Gayndah

In the afternoon delegates travelled to Gayndah to see the packing operation in 'GayPak'. 'Gaypak' are the Australia's largest mandarin growers. 'Gaypak' export mandarins all over Australia and right around the world. Some of their major international markets include Japan, Hong Kong, Singapore, Indonesia, Canada, and Europe. Currently 'Gaypak' does not export fruit to United States and New Zealand due to the problems of black spot and Queensland fruit fly. Gayndah Packers produce several different types of mandarins and other citrus such as lemons, grapefruit and navel oranges. Each mandarin has its own unique qualities and each one reaches maturity at a slightly different time of the year. This diversity means that Gayndah Packs' mandarins can be enjoyed for at least 6 months of the year. The Queensland mandarin industry is focussed on capturing the early Australian markets due to early maturity compared to Southern parts of Australia.

The company's General Manager Berry received the visitors and made a presentation about the co-operative structure of 'Gaypak'. Pakistani delegates are very interested in forming a growers' co-operative in Pakistan with the assistance of 'Gaypak'. Delegates did a detailed tour of the packing house to packing the facilities. Delegates were also shown the cold

storage and degreening room facilities in the packing shed. Later on delegates visited hardware shops to buy tools for mandarin harvest and mechanical pruning.

Day Three & Four – 13 & 14 May 06

Delegates spent the weekend in Brisbane and spent time exploring Brisbane and sightseeing. The citrus group spent a weekend in Brisbane and took the opportunity to visit Southbank and local shopping areas.

Day Five – 15 May 06

Rocklea Fruit and Vegetable Markets, Brisbane

Delegates had a very early start and were taken to the Rocklea Fruit and Vegetable Markets, Brisbane. Brisbane Markets Limited (BML) is the owner of the markets and is responsible for the ongoing development and management of the markets. BML operates on a commercial basis as an unlisted public company with 158 shareholders. BML's shareholders are predominantly industry-based and include growers, wholesalers, secondary wholesalers, retailers and the industry organisation.

BML strives to provide international-standard facilities and services at the Brisbane Markets. These include facilities and services for fruit and vegetable wholesalers, retailers, provedores, secondary wholesalers, food processors, transporters, exporters, industry organisations and market support businesses.

This market tour was led by Tony Cooke and Judie Campbell from DPI&F. The group took a keen interest in the practical hands-on visit to the Brisbane Markets. Some of the Pakistani delegates got involved with discussions with the local importers and exporters and exchanged useful ideas to improve the market systems. Some of the delegates are certain to keep in touch with some key importers in near future.

Entomology & Pathology Laboratories, Brisbane

After the return from Brisbane Markets the citrus delegates spent a very busy day at the entomology and pathology laboratories at DPI&F at Meiers Road, Indooroopilly in Brisbane. The group was introduced to John Chapman, General Manager Horticulture and Forestry Science followed by a brief presentation by the General Manager about the role of Horticulture and Forestry in DPI&F. Dr Annice Lloyd (Principal Research Scientist) chaired the session which was consist of a range of presentations organised by the entomology and pathology staff. Mr Freebain gave an overview of the citrus entomology in Queensland. The group attended presentations on Queensland fruit fly, black spot, area wide management and market access issues by Pauline Wyatt and Martin Shivas. They were also exposed to the insect collection laboratories and visited the pathology building.

In the afternoon the group left the Indooroopilly Laboratories for Brisbane airport to fly to Melbourne. The group spent a night in Melbourne.

Day Six – 16 May 2006

Agricultural Research Station, Dareton

The group arrived in Mildura in the morning time and then visited the main citrus research station in Australia, the Agricultural Research & Advisory Station, Dareton, New South Wales. The Dareton Agricultural Research and Advisory Station is the centre for NSW Agriculture's service to primary producers and their industries in the Lower Murray area of the state. The Station is in the Coomealla irrigation area, 3 km from Dareton and 10 km from Wentworth (the town situated at the junction of Australia's largest rivers — the Murray and the Darling rivers). The Dareton Research Station is 243 ha in area, and about one-third of this area has soils suitable for horticulture.

A range of presentations were made by the research scientists at Dareton. Mr Jeremy Giddings highlighted the importance and significance of irrigation of Sunraysia district in general and also about the use of different irrigation systems used in Victoria and New South Wales. Mr Jeremy Giddings is one of the team members of the Australian group who are leaving to conduct a scoping study for citrus in Pakistan in mid July. Later Mr Graeme Sanderson, a senior researcher gave an orchard tour of the national cultivar program of navel oranges. Graeme also exposed the group to a range of mandarin cultivars in his past and recent research work.

Later in the day Dr Ken Bevington a senior scientist of more than 30 years experience in citrus research interacted with the group and got involved in very productive discussions. Dr Bevington also showed the group on his research work on a large national rootstock evaluation program at Dareton. The program runs with a range of Chinese and local cultivars being assessed for their performance under Australian conditions.

Australian Budwood Scheme, Dareton

The citrus group also inspected the Australian Budwood Scheme. 'Auscitrus' is the trading name of the Australian Citrus Propagation Association Incorporated (ACP), a national "not for profit" industry organisation comprising citrus growers and nurserymen from each state. 'Auscitrus' is responsible for the supply of citrus budwood and seed in Australia, and operates under a Deed of Licence with the NSW Department of Primary Industries at research institutes at Dareton, Camden and Gosford. Close links are maintained with state based seed supply schemes in Queensland and South Australia.

'Auscitrus' is responsible for the budwood and rootstock seed production and distribution. It also does pathogen indexing and elimination. Virus-free and pre-immunised foundation trees are maintained in insect proof screen houses. 'Auscitrus' imports new citrus varieties from overseas countries and screen the new varieties.

Mr Tim Herrmann, Manager 'Auscitrus' did a briefing on the process involved in the scheme. Delegates were very impressed by the Agricultural Research & Advisory Station, Dareton.

EJT Packers & Processors, Curlwaa

The group also had the opportunity to visit a juice making facility, EJT Packers Owned and operated by Mr John Bailey (Director). Pakistani processors from Roshan Enterprises and Iftikhar & Company appreciated the visit and claimed to gain a significant amount of knowledge from the juice factory tour. Delegates finished their day with tasting and admiring the fresh orange juice from EJT Packers.

Day 7 – 17 May 06

Citrus Marketing Board, Mildura

The delegates were received by Mr John Tesoriero (CEO), Murray Valley Citrus Marketing Board and Ms Judith Damiani (Executive Director), Australian Citrus Growers (ACG).

The Murray Valley Citrus Marketing Board (MVCB) is a grower-funded statutory authority, established under Victorian legislation. The MVCB provides services to approximately 468 citrus producers on both the New South Wales and Victorian sides of the Murray River from the South Australian border to Echuca/Moama and areas around Kyabram and Wangaratta. The Murray Valley region is one of Australia's largest producers of 'Navel' oranges. Farmers in this region have always known that their sunny, clean climate produces some of the best quality fruit in the world and are proud of their reputation for quality. There are 45 packing houses, and nine processors in the region with the total export value of \$70 million.

Australian Citrus Growers Inc., Mildura

Australian Citrus Growers (ACG) was established in 1948 as the national peak body of the Australian citrus growing industry. ACG membership includes nine grower organisations and three State Statutory Citrus Authorities, which in turn represent approximately 2,500 commercial citrus growers. ACG's main functions are to monitor, investigate and/or promote areas including exports and imports of citrus fruits and juices, export market access and development, quality management, research, development and extension, and promotion both domestically and overseas. The citrus growing industry also contributes to a significant research, development and marketing program through Horticulture Australia Limited (HAL).

The group was shown a video about the citrus industry in Australia followed by a presentation. Mr Tesoriero elaborated on the citrus industry work and the structure of the organisation. Ms Judith Damiani made a PowerPoint presentation about the ACG in Australia. This session had a significant impact on the CEO and Chairman of the Pakistan Horticulture Development and Export Board. They would like assistance in establishing a grower based system such as a marketing board and ACG to coordinate and integrate research, extension, growers and funding bodies in Pakistan.

CSIRO Plant Industries Merbein, Mildura

Citrus delegates visited CSIRO Merbein and inspected the facilities and laboratories. Dr Steve Sykes (Principal Research Scientist) made a presentation about the National Citrus Scion Breeding Program (NCSBP). Dr Sykes does collaborative research with NSW DPI on

the NCSPB. Dr Michael Treeby (Principal Research Scientist) addressed the issues of post harvest physiology and citrus rind breakdown.

Mildura Fruit Company (MFC), Mildura

MFC is Australia's largest citrus packer, packing and marketing the full range of citrus fruits; 'Navel' and 'Valencia' oranges, lemons, easy peelers, ('Imperial' mandarins, tangelos, 'Ellendales', 'Honey Murcotts'), grapefruit and sweetie. MFC packs mainly for export markets. In 2001 greater than 90% of MFC's 2 million carton production was shipped overseas. MFC packs out of a single, very large packing house, located in Mildura in North West Victoria and employs 45 permanent staff and 170 casual staff. Mildura Fruit Company was one of Australia's first fruit packing companies to obtain ISO 9002 accreditation for its Quality Management System. MFC produces a detailed "Orchard Protocol" which all MFC growers are required to adhere to, in producing safe quality fruit for the Australian and world markets. The "Orchard Protocol" is MFC's "Approved Supplier Program" and is a key component of their SQF 2000 quality management system.

The Citrus group spent a very busy afternoon in one of the biggest packing sheds (Mildura Fruit Company) in the southern hemisphere. Mr Danny Thornton (Grower's Services Representative) took the group for the packing shed tour. Delegates visited different departments that included fruit washing, sanitising, grading, packing and despatch facilities. Visitors were also shown the degreening and cold rooms.

Citrus Marketing Board, South Australia

The Board promotes the citrus industry and its products. It plans, funds and facilitates research relevant to the citrus industry. The Board disseminates technical, scientific, economic and marketing information and collects and analyses data relating to the citrus industry. It also provides advice to the Minister as appropriate and advises on relevant Acts and Regulations.

The citrus group attended a sessions on the Citrus Marketing Board of South Australia. Mr Andrew Green (CEO) presented on the citrus industry of South Australia and also statistics of different citrus species for domestic and export markets.

Day Eight – 18 May 06

Open Hydroponic Systems, Yandilla Park

Citrus delegates visited the Yandilla Park Open Hydroponics Facility in Colignan, Mildura. Open hydroponics system for citrus is one of the new technologies of citrus growing in Australia. This tour was facilitated by Mr Arthur Edwards (Senior Horticulturist). Yandilla Park Ltd is the exclusive agent for the Martínez Open Hydroponics Technology (MOHT) in Australia, previously known as Open Hydroponics System (OHS). This technology was developed by Professor Rafael Martínez Valero, a plant physiologist from the University Miguel Hernández in Alicante, Spain and introduced into Australia by Yandilla Park Ltd in 1999. MOHT has the potential to substantially increase horticultural returns by improving fruit size, quality and yields as well as controlling many crop problems. MOHT is currently

being successfully used in the production of peaches, almonds, grapes, citrus, avocados and vegetable crops in Spain, South Africa, Chile, Argentina, Morocco, California and Australia.

Some of the most noticeable benefits observed with this technology include reduced biennial bearing and albedo breakdown in citrus, *Phytophthora* control and increased yields in avocados and increased yields and fruit size in stone fruits. The emphasis is on achieving a small rooting system that provides the ability to manipulate and control plants through all stages of the productive cycle. Because trees and vines are supplied with a complete and balanced nutrient solution, soil fertility is of no importance. The soil is regarded as a medium to anchor the plant and accommodate the root system. The only requirement is that the soil be well drained. Even calcareous and saline soils can be utilised for citrus production.

Day Nine – 19 May 06

ACIAR Workshop in Sydney

ACIAR conducted a ‘wrap up’ workshop on the last day of the citrus familiarisation tour in Sydney. Expertise from DPI&F, NSW DPI management, AQIS and Horticulture Australia participated in the workshop along side of 11 Pakistani delegates (refer Attachment 3). The workshop was chaired by Les Baxter (Research Program Manager – Horticulture, ACIAR). This informal workshop created a lot of interest and discussions. A range of people exchanged very useful ideas about the citrus industry of Australia. Pakistani delegates were very impressed by the citrus industry and would like to see the Pakistani citrus industry develop in the same directions. Professor Andrew Beattie and Dr Paul Holford presented the data on citrus greening disease. AQIS presented on the quarantine system of Australia and showed a video. A Pakistani delegate showed a video and presented data on citrus industry of Pakistan.

Some of the useful points were noted and should be considered by the Australian citrus team which is due to arrive in Islamabad in mid July.

Impressions/learning from the Familiarisation Tour (Pakistan delegates):

Participants were of the view that the tour was a ‘real eye opener’. They listed the following impressions/learning from the citrus industry familiarisation tour and presentations:

1. Importance of linkages between researchers and growers, researchers and extension workers and between research agencies. In Pakistan there are no linkages between researcher and growers and also no linkage between the research institutes.
2. Australia has proactive research and different institutes have different R&D and extension programs.
3. In Pakistan tree management is poor even in basics such as pruning, irrigation and pest/disease management. The group saw well-managed trees in Australian orchards.
4. Pakistan only exports fruit to non-compliant countries, Russia and Egypt etc. and to other countries. Pakistan loses 30-35% of the crop due to poor quality standards, lack of storage facilities and poor crop management.
5. Growers in Pakistan do not have any crop management protocols for irrigation, fertilisation, and use of plant growth regulators. However, Australian growers follow

- strict protocol for export markets. Also in Australia, growers have access to tools which assist them with crop management (eg., tensiometers, salt testing kits).
6. There is certainly no tree management for smaller growers in Pakistan as they sell their fruit at flowering.
 7. Pakistani growers still need technology and need to integrate with the industry people like in Australia.
 8. They were impressed by the linkages between growers and packers and exporters in Australia.
 9. Pakistanis learnt about that how citrus industry is structured in Australia (including research and extension). They were impressed by what they saw and are keen to pursue more commercial models in Pakistan.
 10. The ASLP project should have a grower-focussed research component.
 11. Pakistan Horticulture Development and Export Board representatives also raised the issues that processors in Pakistan buy the fruit directly from the growers and sometime even from the wholesalers. This needs to be changed.
 12. Public and private partnerships should be emphasised in this project rather than project concentrating only on government institutes.
 13. In future they are keen to ensure that R&D and extension has a grower focus and grower involvement.

Recommendations (by Pakistani delegates):

The participants highlighted the following issues for consideration in other activities associated with the ASLP program:

1. Tree management such as pruning, fruit thinning and irrigation management is poorly understood in Pakistan. No pruning is carried out due the nature of 'Kinnow' mandarin as it is a late cultivar. The introduction of early mandarin cultivars will be a possibility.
2. Citrus tree takes longer (8-9 years) in Pakistan to be bear fruit commercially. In Australia trees produce commercial yield at year 6. The Pakistan industry needs some early maturing cultivars/rootstocks to expedite the fruit production.
3. Interest in heat unit mapping. Currently Dr Tahir Khurshid provides consultancy for the feasibility of growing different crops in different regions based on climatic modelling.
4. Intercropping in Pakistan is a problem as the water requirement for both crops varies at different phenological stages but under the current system each crop is receiving water at the same time and amount. No monitoring is in place. Water quality is also an issue. The Australian scoping team will be addressing this issue in July study tour.
5. No certified nurseries in Pakistan. Clean high quality planting material needs to be a focus of the ASLP.
6. The group was impressed with 'Bugs for Bugs' insectaries in Mundubbera and would like to see something like that happening in Pakistan.
7. Delegates were not sure about the greening disease and there were conflicting ideas about that. Australian scoping team in July will sort this one out.
8. The group is also interested to form a grower co-operative such as GayPak (Gayndah), however they need some assistance in this regard.
9. The group also wants to dedicate a person to learn open hydroponics systems in Yandilla Park, however, this is a very new and costly system in Australia and may be

- inappropriate for Pakistan at this time. It would certainly not benefit small growers. However, advanced irrigation and fertigation would be a beneficial alternative.
10. The participants were keen to explore ways in which they could interface with Australian commercial organisations such as 'Bugs for Bugs'.
 11. The tree size of mandarin in Pakistan is too tall and rootstocks are needed to control the tree height.
 12. A grower from NWFP (North West Frontier Province) (Mardan and other regions) emphasised that a portion of the project should also be spent in NWFP. NWFP is the only region famous for its sweet oranges and blood oranges. It was felt that the possibility of improving the citrus crop in NWFP needs to be explored. There should be an equally replicated research program for oranges along side with mandarins

Follow Up Issues:

The participants highlighted three areas identified during the tour/workshop where they would like the Australian team to follow up with more information:

1. Production Information – the tour participants requested additional information on some of the production techniques that they had seen. Tahir will follow up on this.
2. Scholarships – A number of participants requested that the ASLP project team consider the possibility of providing short-term scholarships for growers and packers to come to Australia and spend time (say several months) working alongside their counterparts in Australia. This will be considered in the project design.
3. AQIS Training – The participants were impressed by the AQIS presentation of the Australian quarantine system and by a brief introduction to the training provided by AQIS to Australian industry. Several participants enquired as to how we could provide this training to growers and other industry staff in Pakistan. It was agreed that this would be further discussed with AQIS.

Feedback of the Familiarisation Tour/ Suggestion for Improvements to Format:

The participants were asked to provide verbal feedback on the industry familiarisation tour and ways in which it could be improved. In general, the participants were very impressed by the organisation of the tour and the program of visitations. A number of participants suggested additional citrus industry sectors/activities which may be considered for inclusion in future visits. These were:

- Value adding operations
- Fruit drying/dehydration
- Machinery manufacturers
- Logistics/trucking
- Cold storage/CA

Participants Views on Issues/Constraints Associated with Citrus Production in Pakistan:

1. Issues Across the Value Chain
 - Lack of policy/regulation framework
 - Weak institutional linkages/capacity
 - No standardisation eg., quality standards and hygiene protocols

- Lack of information dissemination mechanisms
- Poor logistics/distribution system
- Lack of infrastructure such as cool chain systems, storage and processing
- Lack of appropriate technology/know-how

2. Constraints for Growers

- Poor agronomic practices leading to low yields and poor quality
- Unreliable supply of pest and disease-free, high quality planting material
- Current marketing systems which relies upon harvest contractors and middlemen buying the crop in advance
- Weak linkages, support and capacity of research organisations
- Weak linkages between research and extension
- Lack of technical information
- Small scale of farms
- Lack of investment in production technology (eg mechanisation)
- Lack of skilled labour
- Expensive production inputs
- Lack of credit facilities
- Lack of available high quality water/salinity
- Soil structure

3. Constraints for Exporters

- Poor quality fruit
- Advanced sales to middlemen
- Access to market information
- Information on international trade, compliances, quarantine requirements etc
- Lengthy documentation procedures
- Limited logistics and transportation
- Lack of cold storage and CA facilities
- Price undercutting in limited markets
- Lack of credit for export financing
- Small exporters
- Lack of support for international marketing
- Poor international awareness of local brands
- Fruit flies and other phytosanitary pests
- Market access protocols

Tentative Itinerary for Pakistan Scoping Study:

An Australian team consisting of scientists, technical specialists and industry representatives will visit Pakistan for a two week citrus scoping study to identify the major technical and socio-economic constraints to commercial citrus production in Pakistan. Australian and Pakistani citrus expertise will identify and prioritise the research and development issues to develop an integrated crop management project.

The proposed membership of the Australian Scoping Study Team is as follows:

Dr Greg Johnson (Team Leader) – Consultant

Dr Tahir Khurshid – Principal Research Scientist (Citrus), DPI&F, Queensland
Professor Andrew Beattie – University of Western Sydney, Sydney
Mr Jeremy Giddings – Irrigation Officer, NSW DPI, Dareton
Mr Andrew Green – CEO, Citrus Board of SA, Adelaide
Mr Peter Walker – Citrus Grower, Exporter and Board member HAL, Adelaide

Date	Location	Activity
15/07/06	Arrive in Islamabad	Group meeting in Hotel
16/07/06	Islamabad	Project planning
17/07/06	Meet with PARC, NARC, Horticulture protection	Meetings
18/07/06	Visit blood orange orchards in Mardan District	Field studies
19/07/06	Fly to Faisalabad, Visit University, AARI	Mini workshop
20/07/06	Orchard visits /citrus research station, Sargodha	Field studies & Meetings
21/07/06	Fruit markets/juice processor/irradiation institute, Bhalwal Dist. Sargodha	Market study/Field study
22/07/06	Return to Islamabad	Continue Field studies
23/07/06	Workshop preparation, Islamabad	Group Meeting/strategy
24/07/06	Workshop, Islamabad	Presentations
25/07/06	Workshop, Islamabad	Presentation
26/07/06	Depart for Australia	Last day (Scoping study)

Acknowledgements:

The QDPI&F take this opportunity to thank the ASLP for providing the financial assistance for this project. I am personally thankful to the individuals listed below who arranged and made power point presentations, participated in orchard and packing shed visits, hosted and organised lunches/refreshments. Mr Sosheel Solomon's (ASLP Officer, Australian High Commission, Pakistan) help is highly appreciated. Participation of Pakistani delegation in delivering presentations about Pakistan's citrus industry and citrus research and development is greatly appreciated.

A special thanks to Ms Diane Kopras, Senior Administrative Officer (DPI&F) who spent a significant amount of time and effort on a range of issues during each stage of this project.

Chris Freebain	Citrus Entomologist, DPI&F, Maroochydore
Mr. Martin Shivas	Research Scientist, DPI&F, Brisbane
Mr. Tony Cooke	Experimental Scientist, DPI&F, Brisbane
Mr Ed Hamacek	DPI&F, Brisbane
Pauline Wyatt	DPI&F, Brisbane
Mr John Chapman	General Manager, DPI&F, Brisbane
Mr Shane Dullahide	Science Leader, DPI&F, Stanthorpe
Mr Bob Williams	Science Leader, DPI&F, South Johnstone
Dr Annice Lloyd	Principal Research Scientist, DPI&F, Brisbane
Mr Tony Cooke	Experimentalist, DPI&F, Brisbane
Mr Malcolm Smith	Senior Scientist, DPI&F, Bundaberg
Ms Jodie Campbell	Horticulturist, DPI&F, Brisbane
Lyn Wakefield	Administrative Officer, DPI&F, Bundaberg
Joanne Gardiner	Administrative Officer, DPI&F, Bundaberg

Dr Christian Roth	Program Manager, ACIAR, Canberra
Ms Betty Robertson	Administrative Assistant, ACIAR, Canberra
Mr John Bailey	Director, EJT Packers, Curlwaa
Mr Dan Papacek	Entomologist, Bugs for Bugs, Mundubbera
Mr Bevan Young	Citrus Grower, Ban Ban Springs
Mr Mark Trought	Citrus Grower, Mundubbera
Mr Tim Ulcoq	Citrus Grower, Gayndah
Mr Nick Ulcoq	President Queensland Citrus Grower, Gayndah
Mr John Tesirero	CEO Citrus Marketing Board, Mildura
Mr. Tony Filippi	IDO, Citrus Marketing Board, Mildura
Mr Robert Mansell	Chairman Citrus Marketing Board, Mildura
Ms Judith Damiani	Executive Director ACG, Mildura
Mr Andrew Green	CEO SA Citrus Board, Adelaide
Dr Ken Bevington	Senior Research Horticulturist, NSW DPI, Dareton
Ms Leane Hegedus	Administrative Assistant, NSW DPI, Dareton
Mr Tim Herrmann	Manager AusCitrus, Dareton
Mr Jeremy Giddings	Irrigation Officer, NSW DPI, Dareton
Mr Graeme Sanderson	Research Horticulturist, NSW DPI, Dareton
Mr. Danny Thornton	Mildura Fruit Company, Mildura
Dr Steve Sykes	Principal Research Scientist, Merbein
Dr Michael Treeby	Principal Research Scientist, Merbein
Mr Barry Scott	Managing Director, GayPak Packing, Gayndah
Ms Gai Connely	Quality Manager, GayPak, Gayndah
Mr Arthur Edwards	Senior Horticulturist, Yandilla Park, Mildura
Professor Andrew Beattie	Agricultural Entomology, UWS, Sydney
Paul Holford	Associate Professor – Pathologist, UWS, Sydney
Mr Peter Walker	Chairman Riversun, Waikerie
Mr Phil Jackson	Entomologist, Bugs for Bugs, Mundubbera
Mr Ross Rickard	Senior Entomologist, AQIS, Sydney
Mr Satya Yataw	Plant Pathologist, AQIS, Sydney

Attachment 1. List of Pakistan Participants

**Names of Pakistani Citrus Industry Familiarization Visit Delegation Members proposed
by MINFAL for Australia- 9th May to 20th May 2006**

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4 Growers

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Attachment 2. Itinerary for Citrus Familiarisation Tour

Pakistani Citrus Delegation Tour to Australia (10-19 May, 06)

Wednesday 10 May **Depart** Brisbane (10.20 am) – **Arrive** Bundaberg (11.15 am QF2326)

Wednesday 10 May

Overnight stay at Kacy's Bargara Beach Motel / Ph: 07-41301100

Thursday 11 May

Bundaberg Station facilities **9-11 am**

Introduction

Dr Tahir Khurshid – Principal Research Scientist (Citrus)

Queensland & national Citrus Breeding program

Mr Malcolm Smith - Senior Research Scientist (Breeding)

Lunch at the Station

12-1 pm

Travel to Gayndah by car

1-3 pm

Orchard visits

Mr Bevan Young - BJ&JA Young Orchards

3-3.30 pm

Mr Tim Ulcoq – Ulcoq Citrus Enterprises

4-5.00 pm

Travel to Mundubbera by car

4.30-5.15 pm

Overnight Stay at Billabong Motor Inn / Ph: 07-41654533

Friday 12 May

Bugs for Bugs, Mundubbera

Mr Dan Papacek – Director/Entomologist

9-11 am

Orchard visit if time allows

Lunch at Mundubbera

12-1 pm

Travel to Gayndah by car

1-2 pm

Gaypak Packers, Gayndah

Ms Gai Connely - Quality Manger

2-3.30 pm

Travel by car to Bundaberg

3.30-5.30 pm

Overnight Stay at Kacy's Bargara Beach Motel / Ph: 07-41301100

Saturday 13 May

Fly from Bundaberg to Brisbane QF2323

10.55 -11.50 am

Overnight Stay at Taringa Garden Apartments / Ph: 07 38785500

Sunday 14 May

Overnight Stay at Taringa Garden Apartments / Ph: 07 38785500

Monday 15 May

Indooroopilly Labs Brisbane

Welcome & Introduction - John Chapman

(General Manager, Horticulture & Forestry Science)

Mr Chris Freebain – Citrus Entomology Queensland	10.15 am
Mr Ed Hamacek – Fruit fly control in Citrus	10.30 am
Dr Annice Lloyd – Area wide Mgmt. & market access	11.15 am
Inspection Entomology lab, entomology collection	11.30
	12 am

Lunch 12.30 – 1.30 pm (Pergola outside Pathology building)

Tony Cooke – Citrus Pathology in Queensland	1.30 pm
Mr Martin Shivas & Pauline Wyatt – Citrus black spot	2 pm
Tony Cooke – Inspection Plant pathology building	2.30 pm
Depart for Airport	3.00 pm

Fly from Brisbane to Melbourne QF631 4.50-7.10 pm
Overnight stay in Melbourne Holiday Inn near airport / Ph: 1800456749

Tuesday 16 May

Fly from Melbourne to Mildura QF2754 8.15- 9.35 am

Citrus Research Station, Dareton

10 am

National varietal program/Irrigation

Mr Jeremy Giddings – Irrigation in Sunraysia	10.30-11 am
Mr Graeme Sanderson – National Cultivars program	11-12 am

Lunch at the Station

12-1 pm

National rootstock program

1-2 pm

Dr Ken Bevington – Senior Research Horticulturist

Australian Budwood Scheme

2-3 pm

Mr Tim Herrmann – Manger AusCitrus

EJT Packers (Juice Company)

3.30-4.30 pm

Mr John Bailey - Director

Overnight Stay in Mildura Grand Hotel / Ph:

Wednesday 17 May

Citrus Marketing Board, Mildura

Mr Tony Filippi – Industry Development Officer 9-9.30 am

Australian Citrus Growers Inc.

Ms Judith Damiani – Executive Director 9.30-10 am

Morning Tea 10-10.20 am

Depart for Merbein 10.45 am

CSIRO Merbein, Breeding

Dr Steve Sykes – Principal Research Scientist 1-12 am

Lunch at the CSIRO 12-1 pm

Mildura Fruit Company

Mr Danny Thornton – Grower's Services Representative 1-3 pm

Citrus Marketing Board South Australia

Mr Andrew Green – CEO 3.30-4 pm

Overnight Stay in Mildura Grand Hotel / Ph:

Thursday 18 May

Yandilla Park- Open Hydroponics

9-12 am

Mr Arthur Edwards – Senior Horticulturist

Lunch in Mildura town

Fly from Mildura to Melbourne QF2759

4.35 - 5.55 pm

Fly from Melbourne to Sydney QF462

7.00 -8.30 pm

Overnight Stay in Sydney (Airport Sydney International Hotel) Ph: 02 95561555

Friday 19 May

ACIAR Workshop

Airport Sydney International Hotel

Professor Andrew Beattie 10–10.30 am

Morning tea 10.30–11 am

ACIAR Workshop 11 am–12.30 am

Lunch 12.30–1.30 pm

ACIAR Workshop 1.30–3.00 pm

Paul Holford – Presentation 3–3.30 pm

ACIAR Workshop 3.30–4.30 pm

Attachment 3. Program for Wrap up Workshop

Running Sheet for Pak Citrus Industry Familiarisation Visit Final Workshop - Airport Sydney International Inn (19th May 2006)

Time	Session	Facilitator
09.00 – 10.00	Informal meeting	
10.00 – 10.05	Program Overview	Les Baxter
10.05 – 10.35	Presentation by Andrew Beattie (UWS) on Citrus Greening work	Andrew Beattie
10.35 – 11.00	Morning Tea	
11.00 – 12.00	Presentation by Australian Quarantine Inspection Service on Australian Quarantine	Ross Rickard (Senior Entom.) Satya Yatav (Plant Path)
12.00 – 12.30	<u>Workshop Session 1</u> 12.00- 12.05 Introduction and welcome 12.05- 12.20 Overview of Tour & Visits 12.20- 12.30 Impressions/learning (1)	Les Baxter Tahir Khurshid Pak team member
12.30 – 13.15	Lunch	
13.15 – 14.00	<u>Workshop Session 1 Contd</u> 13.15 – 13.25 Impressions/learning (2) 13.25 – 13.35 Impressions/learning (3) 13.35 – 14.00 Discussion - other points from group - issues to follow up - actions resulting from tour - feedback (what was good/ needs improvement)	Pak team member Pak team member Les Baxter
14.00 – 15.00	<u>Workshop Session 2</u> 14.00- 14.20 Overview of Pak Citrus Industry 14.20- 15.00 Industry Constraints - supply chain - market info	Les Baxter

	<ul style="list-style-type: none"> - production - extension - infrastructure/policy <p>Which constraints are/are not being addressed</p>	
15.00 – 15.10	Afternoon Tea	
15.10 – 15.40	Presentation by Paul Holfod (UWS) on Citrus Greening work	Paul Holford
15.40 – 16.30	<p><u>Workshop Session 3</u></p> <p>15.40- 15.55 Summary</p> <p>15.55- 16.05 Outline of plans for Australian visit to Pakistan</p> <p>16.05- 16.20 Closing remarks</p>	<p>Les Baxter / Tahir Khurshid</p> <p>Les Baxter</p> <p>All</p>