

**Study tour &
attendance at the
international
symposium on edible
Alliaceae, Beijing,
April 2004**

Daniel Weddell
Magnus Kahl Seeds Pty Ltd

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**STUDY TOUR AND ATTENDANCE AT THE INTERNATIONAL
SYMPOSIUM ON EDIBLE ALLIACEAE, BEIJING, APRIL 2004.**

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PURPOSE OF REPORT

This report is aimed at supplying the Australian allium industry with current, relevant information supplied by industry leaders and specialists. It provides a snapshot of an industry and the developments taking place in it. The report also looks to offer some insight into the emerging market presence of China and a greater understanding of their processes.

ACKNOWLEDGMENTS

In order for this study tour to commence and be completed with such pleasing results was due to the support of Horticulture Australia Limited. Through financial support, the group was able to attend the symposium on edible alliaceae and bring back much knowledge and insight into the world allium industry.

Appreciation must also go to all the study tour members who also offered funding to attend the symposium. These kind of events are extremely beneficial to industry and future success depends on contributions from both levy funds and separate entities.

DISCLAIMER

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TABLE OF CONTENTS.

PAGE 1 - 1.0 TABLE OF CONTENTS

PAGE 2 – 2.0 LIST OF AUSTRALIAN INDUSTRY ATTENDEES.

3.0 MEDIA SUMMARY

4.0 EXPECTED OUTCOMES AND HOW THEY WERE ACHIEVED.

PAGE 3 – 4.0 EXPECTED OUTCOMES AND HOW THEY WERE ACHIEVED.

PAGE 4 - 5.0 RESULTS OF DISCUSSIONS

5.1 FIELD PRODUCTION

PAGE 5 - 5.2 MILD ONION TESTING

5.3 MEDICINAL PROPERTIES

PAGE 6 - 5.4 BIO-TECHNOLOGY – ONION GMO (GENETICALLY MODIFIED ORGANISM).

5.5 DOWNY MILDEW MONITORING.

6.0 FIELD TRIPS

6.1 SHANDONG PROVINCE.

2.0 Australian Industry Attendees.

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3.0 Media Summary

The International symposium on edible alliaceae in april of 2004 in Beijing, China was a fantastic opportunity for Australian industry specialists to liase with worldwide leaders in alliums. Providing a platform for information dissemination and collation, the symposium offered much in the way of technical developments within the world allium industry. Covering issues related to pest and disease control, genetically modified organisms, food issues and current research findings of various specialists around the globe.

The Australian allium industry has seen much change over the last five year period in relation to the size and direction of the industry. Reduction in onion grower numbers, but generally stable production levels, have meant that new levels of efficiency and greater knowledge of inputs has been realised. The access of up to date and relevant information is required for growers and industry to be able to keep up with demands placed on them by the market.

To be able to bring something back to the Australian industry, the study tour looks to access information which is applicable to the situation here in Australia. This mainly is concerned with current research and findings on cultural techniques which will assist the growers in increasing productivity and efficiency. Another outcome which is a major part of the study tour, is the connection with overseas industry specialists. By having Australian industry players interact with overseas entities, we can further develop relationships which will better the industry.

From the tour it was clear that China is looking for control of large segments of the world allium industry. With a firm grasp of the garlic market, China also looks to increase exports of onion to various world trade arenas. With a limited technology base, but a huge labour force, China are looking to access as much industry information to assist their entrance into these markets. Lacking information and quality input products has reduced China's ability to compete internationally in the past. This is set to change with their pursuit of information.

4.0 Expected outcomes and how they were achieved

Throughout the process of organising the conference several outcomes were established as points of interest which would need reporting on. These outcomes indicated information which would be applicable to industry leaders in Australia. The specific outcomes were as follows:

→ *An increased information base of industry technology and its application within given fields.*

From the seminar presentations, much information was gained on technology developments in the world allium industry. This was mainly centred around the development of onion

varieties and work done on resistances, genetically modified organisms (GMO's) and disease control.

→ *Grower awareness of differing production techniques in order to refine and enhance current practises.*

Although most of the information was based on scientific research, much of the presentations looked to supply the growers with relevant information on production activities. This was especially evident when looking at topics such as:

- Irrigation techniques relative to single centres and yields.
- Nematode control via garlic oil application
- Cultural activities affecting pungency levels in onions.
- Techniques to reduce chemical usage.
- Downy mildew forecasting.

→ *A greater insight into the range of products and services available to the grower within the industry.*

As mentioned previously, the main focus was scientific, yet we did see some work on products and services available to the grower. For example, some work and information has been done on forecast work for Downy Mildew. This is covered in greater depth later in this report.

→ *An overview of a differing distribution chain, which may enhance the Australian system.*

Information of this nature has not been included in the report due to much of the Chinese distribution process being largely outdated in comparison to Australian methods. Although the industry can not gain much from the information supplied. It is important to realise what is happening in other industries, developed or not.

→ *Knowledge of packaging and dispatch systems which may increase growers/packers efficiency.*

Once again, as in the above outcome, the methods used in the Chinese industry were not relevant to the Australian scenario. Very intensive labour requirements opposed industry basics in Australia.

→ *Awareness of differing marketing techniques involved in getting the product to desired markets.*

The basis of the symposium was of a technical nature and very little was covered on the marketing front. Some issues addressed held special significance in relation to future marketing efforts which growers and marketers could take. For example, a lot of work has been recently done on the connection of health issues with many of the beneficial elements found in Alliums. Also, it was noted that comprehensive work has been done on analysis of sweet or mild onions for the world market. Previously this 'Mild' label has been unmeasurable. With benefits like these being presented, it is easier for marketers to promote their allium products to the public. Coupled with these ideas is the work done on medicinal advantages of alliums. This falls into line with current issues relating to peoples health and what they eat.

→ *Added elements of cultural practices will enable farmers to further refine growing methods.*

Once again, this trip did not provide advanced cultural methods for our growers in Australia, but did provide much insight into the Chinese methods which will supply industry people with much greater knowledge of this future competitor.

→ *Establish avenues of contact in which the industry can explore and utilise in future trade.*

This outcome was an especially important one for the tour group. Due to geographic restrictions, Australia's scope to liaise with world industry leaders is limited. This provided the perfect opportunity to not only communicate with existing contacts in Western countries, it also offered the chance to meet with Chinese business people and establish ties in this rapidly evolving country.

5.0 Results of discussions

Much of the information gathered at the conference was of a very technical nature, not easily understandable to general industry bodies. Due to the extensive nature of the information, this report focuses on the topics which are current and relevant to the Australian Allium industry. Although the symposium looked at all facets of the Allium industry, a clear focus was given to Allium Cepa (Onions). Due to the Australian participants involved in the study tour being from onion industry based backgrounds, this report is centred around onions more than the other members of the Alliums group. The relevant topics have been broken down into the following paragraphs.

5.1 Field Production:

1. Irrigation effects on single centers and yield

Information about the influence of irrigation on single centers and yield in bulb onions in the US was presented in a poster by Gary Pelter.

“A study to evaluate effects of irrigation stress upon bulb yield and single centers was conducted with long day onions over three years under drip irrigation (in the US). Irrigation was withheld at four onion growth stages or not at all in the control. When soil-water tension reached ... 40 to 50% depletion of available moisture ... at a 0.15m depth, irrigation was restored to normal levels for the duration of the growing season. Irrigation stress applied at the three & seven (two stresses), three and five leaf stages reduced the percentage of single centers by 40%, 30% and 18% respectively compared to the control. Total yield was generally reduced by irrigation stress at any growth stage but the greatest effect was at the five, seven and three & seven leaf stages. Irrigation stress applied at the three & seven leaf stages reduced yield by 32.7t/ha. Only the control, seven leaf and nine leaf treatments met the industry standards for single centered bulbs ... a minimum of 70% single centers.”

It is interesting that early water stress can have such a large influence on single centers and that the crop was not able to recover despite normal irrigation being applied for the remainder of the season. It would be interesting to know if the same effect occurs on both open pollinated and hybrid varieties under Australian conditions, in locations where bulbs are being grown for export markets such as Japan, that also require a high level of single centers in the bulbs. The impact of water stress, especially early, would be worthy of study in Australia, or if the results are already established for current varieties and growing regions, then extending the information to Growers and seed companies could help improve outcomes in the field.

2. Garlic oil as a nematicide

Garlic oil coated pellets have been shown to provide a level of bird repellent activity in laboratory based feeding studies in the US. The researcher, E Block, also suggested that garlic oil treated pellets are likely to have activity against soil-borne nematodes; however the oil only remains stable for 2-4 weeks from coating. A more stable garlic formulation to control insects has been developed in the UK called ECOguard™. In Australia, the nematicide Namacur is scheduled to be withdrawn from the market on or before 31st May 2007. It would be valuable to the Australian onion industry to evaluate the effectiveness of garlic based products to control nematodes, especially a formulation that is applied either as a coating on the seed or is applied in the furrow with the seed.

3. Field factors influencing pungency

A study in the US by Bill Randle found that high soil sulfur levels did not always result in high levels of pungency. "Calcium chloride was found to decrease sulfur accumulation in the bulb, lower bulb pungency, and affect the cysteine sulfoxide flavor precursors. Additionally, calcium chloride improved post-harvest shelf life and bulb weight. Results indicate calcium chloride may be a new and exciting tool to assist growers of mild onions in mitigating high sulfur environments." In this US environment, chloride was considered the 4th most important nutrient for onions after nitrogen, potassium and phosphorous. It is unclear whether the positive response reported may have reflected a chloride deficiency in the soils used in the studies. Excessive chloride did result in an increase in storage rots.

4. Reduction in Chemical use – Netherlands

In the 1980's chemical use by Dutch onion growers was 10kg/ha. The aim to reduce this by 50% by 2000 was achieved. The current aim is to reduce 1998 use by 95% by 2010. These aims have been formulated within European targets to increase organic production to 10% of total vegetable production by 2010. These policies form the background to the development of the EUREPGAP environmental management system by European supermarkets and producers which in turn is impacting on Australian exporters.

The probability of this program being seen as 'world's best practice' and being adopted by Australian supermarkets is high. In which case Australian producers will need to adapt to EMS requirements higher than those required by statute.

5.2 Mild Onion Testing:

A study in the UK by M Jones has substantially advanced the definition of mild onions. "We have tested two measures of onion pungency, namely pyruvate and flavour precursor levels, in parallel with flavour testing by taste panels. Comparison of the two chemical analytical methods indicated a direct relationship between the total level of flavour precursors and pyruvate. Statistical analysis of the responses of the taste panels, using a standardized protocol and record sheet, showed a reproducible reaction to both commercial and breeding lines. Production of mild sweet onions within the UK requires both appropriate genetic material and also agricultural practices." Despite the reference in the text to "mild sweet", the study concluded that "mild" and "sweet" should be separated and that a "mild" onion can be defined by the level of pyruvate, whereas a "sweet" onion would require further research on definition owing to the range of sugars involved and the interaction with pungency. For Australia, a "mild" onion industry could be progressed rapidly by repeating the UK study to determine the level of pyruvate that an Australian taste panel equates with "mild" flavor.

Bill Randle from the US discussed a feature of the testing procedure that needs to be taken into account. It has been determined that the way onion juice is extracted can have an influence on the pungency test result. The US and UK method is to use a press to extract juice. Other methods involve a more vigorous process such as a blender. Unfortunately this process generates heat which deactivates the pungency flavor compounds and results in a misleading low test result. To overcome this, the US has published the plans to make the press on the web or an assembled press can be purchased from the US. It is highly recommended that Australia take note of these developments in the UK and the US in order to fast track the development of a "mild" onion industry. Standardizing with these already developed protocols is also likely to assist exporters gain acceptance for onions claimed to be "mild".

5.3 Medicinal Properties:

Alicin has been established as the key medicinal component of Alliums, and trials have demonstrated positive effects for the prevention of some types of cancer and cardio-vascular disease, the two biggest medical problems in western countries such as Australia. Alicin is very unstable and the most readily available source is in fresh garlic cloves. Onions do contain Alicin but at lower concentrations. Cooking denatures the compound, so to obtain the

maximum benefit, the garlic or onion needs to be consumed raw. There are tablet formulations of garlic powder that do contain Alicin, however the concentration is variable. Alicin is associated with the same compounds that determine pungency and it is likely that more pungent onions contain more Alicin.

Aliin, which is related to Alicin, was found to increase in onions when sulphur (CaSO_4 – Gypsum) was added to soils low in sulphur, however the effect did not occur in all varieties.

5.4 Bio-technology – onion GMO (Genetically Modified Organism):

The main tool still being used to develop new varieties is the traditional method of crossing two varieties. There is considerable research activity in the area of biotechnology, but to date there are no commercially available GMO onions. The types of GMO being studied include engineering resistance to the herbicide Roundup, engineering resistance to armyworm by transferring the BT gene, engineering resistance to Botrytis leaf blight by transferring a gene from a related Allium species, engineering resistance to Downy Mildew by transferring a gene from a related Allium species and production of milder onions by introducing a protein that deactivates the pungency components. Associated research is investigating the development of markers so that desired attributes can be easily tracked. An example of this is a fluorescence marker gene that is joined to the target gene, so that plants successfully transformed with the desired gene will fluoresce under UV light. This provides a rapid method to evaluate the success and heritability of introducing new genes. Safety issues regarding the possible introduction of allergens or toxins and environmental issues have not been resolved. It is unlikely that Australia will see any GMO onions grown in the foreseeable future.

5.5 Downy mildew monitoring

French researchers reported on a project to verify Downy Mildew monitoring systems. The results confirmed that monitoring systems can highlight local occurrence of disease outbreak conditions, with resultant savings in chemicals. However, it also confirmed that extrapolation of local measurements to regional warning systems was unreliable.

6.0 FIELD TRIPS

6.1 Shandong Province.

To assist in the symposium delegates overview of the Chinese allium production systems, they were taken down to a major garlic and onion growing region. The area was the Jinxiang county, which is situated in the South West of the Shandong province of China. This major agricultural hub supports 330,000 hectares of garlic fields and 6,300 hectares of onions. To give some idea of the change in production over an eleven year period, the following figures provide a good guide.

Onions

1990	59,000 hectares	→	1.6 million tonnes
2001	152,000 hectares	→	4.4 million tonnes

Garlic

1990	258,000 hectares	→	4.4 million tonnes
2001	680,000 hectares	→	13.0 million tonnes

The overnight train trip from Beijing to Jinxiang took eight hours and the delegates arrived at six in the morning. The group was welcomed by a brass band before having breakfast and refreshing at the local motel.

The delegates were then taken to see a garlic packing house in the area. Here, they were able to see the final packed garlic goods on display before they were exported. The array of garlic products was vast and the presentation of the goods was excellent. Some of the products were:

- Fresh Garlic
- Pickled Garlic
- Garlic Paste
- Crushed Garlic
- Dehydrated Garlic Powder
- Dehydrated Garlic
- Diced Garlic

PHOTO – AUSTRALIAN EXPORT GARLIC.

All the products on display were pre packaged and marked with their destinations and company names. It was very interesting that all products were destined for many export markets including Australia. Much of this produce was allocated for Australia with five different companies importing the Chinese garlic.

It was clear that all the people involved in the company were very proud of their product and what they were doing with it. It is important to note that although many production inputs are lacking in technology and capital support, the end product is of a very high grade.

After visiting the packing house and viewing the end products, the delegates were then shown a fresh garlic packing house in operation.

The warehouse style building housed the workers who packed all the garlic by hand.

PHOTO - GARLIC PACK HOUSE WORKERS

All workers were female and aged roughly between 15 and 25 years of age. They would work in groups of three or four at low tables, seated on small stools. In the packing house visited, there were 20 individual tables where sorting could take place. The women employed by the processors were paid 400–500 Yuan (about \$A70 – 80) per month – including bonuses if they packed 30 cartons per day.

Each of the workers would be equipped with a pair of secateurs and some scales. The garlic would be packed into nets and would range from packs of 3, 8 and 16 in different sized packages. Each garlic was inspected by hand and clipped before being placed into the nets. Each table would have a 30kg bag of garlic to sort at a time. The girls were extremely thorough and operated very efficiently. After packing, all produce is moved manually around the packing house. Only when distributing the goods, would motorised transport be used. After seeing the packing facility, the group was taken to see a factory used to pickle garlic. Once again the products were on display and also the delegates were able to taste the garlic. The area used to pack the pickled garlic looked to be hygienic and well sorted. It was a simple process, once again all done by hand.

PHOTO – PICKLING GARLIC

The finished product was of a very high grade and once again the quality of packaging a presentation was high. It was evident that much of production costs in this type of industry are consumed in high grade end product image expenses. Obviously servicing western markets,

the Chinese must package appropriately. Other than this element, the process is done on a very cost conscious level.

The final part of the tour consisted of viewing a production field of garlic and onions in the area. This gave all of the delegates a much greater insight into the way that the Chinese are producing.

PHOTO – ONION/GARLIC FIELD

Many delegates were very surprised by the quality of the crops. The onions and garlic were very healthy plants, with strong structures and little sign of nutrient deficiencies. Disease issues were not evident in the crop that was shown and weed management was excellent. This was due to plastic being laid down over the surface of the soil to stop any weed seedlings from germinating. Both the onion and garlic seedlings are planted through the plastic after it is put down.

The overall state of the crops was very good, in considering that the level of technology and capital available is greatly limited.

All activities, like in the packing house, are done by hand. From planting to maintaining a weed free crop. The labour required for this type of intensive farming is unimaginable in Australia.

Apart from the health of the crop, it was also very interesting that the Chinese are not just single plant cropping. In the field which was visited, it was evident that dual cropping is common place in China. Both the onions and garlic crops were inter planted with another crop. Most noticeably was the planting of cotton seedlings amongst the onions. The onion plants were spaced about 150mm apart and were at the 5-6 leaf stage. In between the onions there were cotton seedlings planted. These were about 5cm high.

The onion crop will be harvested in October.

Many farmers are also 'overcropping' with trees – with garlic and onions underneath. These trees are to provide carbon credits which are being traded - with European countries mainly under the Kyoto agreement.

It was suggested that this large space between the onion plants was responsible for the limited incidence of disease, through the increase in air movement around the plant.

To assist in the efficiency of the operation and accommodate the lack of mechanical support, the Chinese ensure that all their field configurations are easily accessible to workers and close to the packing houses. Little measures of efficiency are seen in many forms. For example, within the field of onions and garlic, they have tiny hot house structures of 2m X 1m, which are used to grow the cotton seedlings directly next to the field in which they will be planted into. When it comes time to plant out the field, they already have the seedlings ready to plant on the site.

It was also noted that within the field crop of onions, an onion seed crop was growing at the same time. Although only small, the crop would supply the farmer with enough seed for the next seasons crop. The seed would be fresh every year and over selection work, would become the best suited for that area and even that particular field.

Each farmer is allocated 3ha on which to produce crops. In the past this had been done on an annual basis, but has recently changed to a 30 year allocation so that there is an incentive to improve soil fertility and raise yields.

The farms are also growing winter wheat (now in head). All of the crops looked particularly healthy and weed free. The wheat is harvested with small [2m wide] self propelled headers.

**INSTITUTE OF VEGETABLES AND FLOWERS,
CHINESE ACADEMY OF AGRICULTURAL SCIENCES.**

A visit to the Beijing facilities of the Institute highlighted their recent upgrading of analysis equipment to underpin a comprehensive residue testing system. This program is seen as important in securing horticultural exports.

BEIJING WHOLESALE MARKET

This market covers 50ha – mostly open aired. Most of the ‘stands’ are occupied by growers. Covered areas are provided for meat, seafood and spice sellers. The bustling market was quite a surprise in its size, activity, range of produce and ‘orderliness’ – watched over by many guards (Red Army) and a comprehensive closed circuit television surveillance system. Regulations regarding Weights and Measures and Food Residues are closely monitored [by members of the Red Guard] – however Food Safety standards would appear to be less stringent than Australian standards.

5.0 Implications for Australian horticulture

This symposium on Alliums provided great access not only to technical and current industry information, but also into the Chinese market and their current situation. Initially the study tour aimed at sourcing worldwide Allium industry knowledge, but was also supplied with a snapshot of what China is looking to achieve and how they will go about it.

By viewing the Chinese elements of production and cultural methods, the Australian industry can have a much greater understanding of the scope with which China have to operate in the world marketplace. With the information gained by this study tour, the Australian industry can better prepare itself for future competition with China.

On a more technically based front, the information gathered here will offer the Australian industry players with an insight into works done by specialists in given fields. Information supplied here is very important for the industry in relation to having up to date information which many other countries are privy to.

6.0 How the information gathered will be disseminated

To fully utilise the information obtained on this study tour, a comprehensive array of literature will be supplied to industry information bases. The varying pieces of articles and reports will be submitted to the following industry avenues:

- Horticulture Australia via a full report.
- Onions Australia Magazine via an article covering relevant issues to the industry.
- Good Fruit & Vegetable Magazine via an article covering an industry overview of the Chinese market and relevant information on issues covered.
- A report issued to each of Magnus Kahl Seeds clients, looking at issues relevant to growers.

7.0 Itinerary

April 20 (Tues.)

8:00 — 23:00 Registration

April 21 (Wed..)

8:00 — 19:00 Registration

9:00 — 10:00 Opening ceremony

10:00 — 10:30 Picture taken and coffee break

10:30 — 12:00 Plenary session

13:30 — 15:30 Plenary session

15:30 — 15:45 Coffee break

15:45 — 18:00 Plenary session
18:30 — 20:30 Reception party

April 22 (Thu.)

7:00 — 17:00 The Great Wall and Ming Tombs

April 23 (Fri.)

8:00 — 10:00 Plenary session
10:00 — 10:15 Coffee break
10:15 — 12:00 Plenary session
13:30 — 15:30 Plenary session
15:30 — 15:45 Coffee break
15:45 — 16:00 Plenary session
16:00 — 18:00 Poster presentation
19:15 — 21:00 Recreation

April 24 (Sat.)

8:00 — 9:30 Institute of Vegetables and Flowers, Chinese Academy of Agricultural Sciences
10:00 — 11:30 Beijing Vegetable Research Center, Beijing Municipal Academy of Agricultural and Forest Sciences
13:30 — 16:00 Forbidden City
17:00 — 18:00 Poster presentation
17:00 — 18:00 ISHS meeting

April 25 (Sun.)

8:00 — 10:00 Plenary session
10:00 — 10:15 Coffee break
10:15 — 12:00 Plenary session
13:30 — 15:30 Plenary session
15:30 — 15:45 Coffee break
15:45 — 18:00 Plenary session
22:20 - Leave Beijing for Jinxiang County by train K51.

April 26 (Mon.)

6:18 - Arrival at Yanzhou
7:00 - Leave for Jinxiang by bus
8:30 — 9:00 Opening Ceremony of China Garlic Festival
9:20 — 10:30 Onion and garlic production field tour, processing factory etc.
10:40 — 12:00 Leave for Yanzhou
12:00 — 1 3:00 Lunch
14:00 — 17:00 Qufu (birthplace of Confucius)
17:30 — 19:30 Farewell banquet
21:51 - Leave Yanzhou for Beijing by train K52, sleeping compartments are available

April 27 (Tues.)

5:50am - Arrival in Beijing.

April 28 (Wed)

Return flight to Melbourne.

8.0 Recommendations

This study tour to China has been a great success, both on a research level and on an industry awareness level. Although some of the outcomes have not been realised, it is important to

realise that the information gained about China and its future intentions in the world allium markets, is crucial to the success and longevity of the Australian industry.

The value gained from this will greatly benefit Australian industry players and offer much insight. All members of the group were excited by the experience and were pleased by the information supplied. It is of utmost importance that these kind of industry exercises continue, in order to advance the future of the Australian allium industry. The next symposium of this nature will be held in the Netherlands and it is recommended that a group be organised and present at this event.

9.0 Acknowledgments

It must be noted that if it were not for the funding support provided by Horticulture Australia, the study tour would not have been possible, due to extensive costs involved in such a venture.

With this funding, the group was able to make the most of the tour and could access all the required resources in order to make it a worthwhile and successful exercise.

It should also be noted that much effort has been given by individuals within the group. Each of the following members were very helpful throughout the entire project.

Jason Dennis – Greatly assisted in the collation and reporting of information from the trip. His knowledge and insight was greatly appreciated throughout the exercise.

Trevor Twigden – Was instrumental in the collation and interpretation of information gained at the conference. His knowledge of the Australian industry and current issues, meant that his reports were relevant and timely to the Australian industry.

Andrew Doran – Was responsible for photography of much of the trip. His photos greatly support reporting measures and add much to the relay of information.

Peter Delahunty – Has written reports in his local area paper and has given presentations to local community groups about his time in China. This dissemination of information has been beneficial to this project.

Thanks to all the other members of the group who made the trip successful and enjoyable.

10.0 Contact List

Through the symposium the group met many world allium industry members. Varying from technical specialists to marketing leaders, the group had the chance to communicate on all levels.

The list of delegates is attached as an appendix to this document

