REPORT ON
THE TRIP TO CHINA
BY MEMBERS OF THE
AUSTRALIAN WALNUT
INDUSTRY ASSOCIATION

18-29th July 2013
Contents

Media Summary 3
Introduction 4
A Collaborative Report 5
Acknowledgements 5
Expected Outcomes 6
Report on the 7th International Walnut Symposium 7
Observations of the walnut industry in China 9
Information gathered from Observation and Discussion 11
Implications for the Australian Walnut Industry 24
Recommendations 25
How information gathered will be disseminated 26
Appendices 27
MEDIA SUMMARY

The recent highly successful attendance of AWIA members at the 7th International Walnut Symposium and study tour of the walnut industry in China achieved numerous important outcomes for the Australian walnut industry. Considerable benefits will also be provided as the new knowledge, technical information and contacts gained are disseminated to the wider Australian walnut industry.

A number of the papers presented at the Symposium, including four Australian-authored papers, provided valuable practical technical information of immediate application to Australian walnut growers. An example of this is the paper on Improved Management of Walnut Quality Factors Under Grower Control authored by Prof. David McNeil and Dr Kathy Evans from the Tasmanian Institute of Agriculture.

The post symposium walnut industry study tour provided considerable insight into R&D, marketing, processing, packaging, walnut machinery manufacturing and all aspects of the Chinese walnut industry in Shanxi and Hebe Provinces.

Throughout the symposium and during the study tour all delegates had the opportunity to re-new acquaintances with Chinese walnut industry personnel they had previously met at the 6th International Symposium in Melbourne as well as make many new industry contacts. A number of delegates have been invited back to China to consult or undertake marketing or other business arrangements.

With three New Zealand walnut growing visitors who were members of the New Zealand Walnut Growers Group (NZWIG) travelling with the AWIA team excellent ongoing industry contacts were also made.

The knowledge, technical information, and marketing opportunities gained will be disseminated widely to the Australian walnut industry through AWIA workshops, the AWIA AGM and other AWIA forums. Articles will be published in the Australian Nutgrower, The Land, The Weekly Times, Stock and Land, The Kernel (AWIA’s monthly newsletter to growers) and other appropriate media outlets. A formal report to Horticulture Australia Ltd. will also be presented.

This attendance at the Chinese Symposium and the post symposium study was considered by all AWIA and NZWIG members in the study as being extremely valuable to them and their industry.
INTRODUCTION
Sixteen members of the Australian Walnut Industry Association (AWIA) recently travelled to Fenyang City, Shanxi province in North-Central China, as delegates to the 7th International Walnut Symposium (IWS). The group also visited nearby Chinese orchards, nurseries and processing units. Group members, who were supported by a grant from Horticulture Australia Ltd (HAL), were required to liaise with Chinese and other International walnut industry researchers, gather new and relevant information about walnut production and processing to bring back and disseminate to the broader Australian walnut industry and renew relationships with delegates who had attended the 6th IWS in Australia in 2009. Delegations from Walnuts Australia Ltd. and on behalf of the Australia-China Agricultural Co-operative Agreement also attended the 7th IWS.

At the 7th IWS, the HAL group heard about international and Chinese work, particularly on new cultivars. The Chinese are keen to develop varieties with thin shells, frost resistance and early harvest capabilities. Severe frosts have decimated the majority of the crops in Shanxi province over the last two years. Other Symposium topics included propagation and irrigation techniques and nutritional components of walnuts. One AWIA member presented data on a trial of blight management and another chaired a session of the Symposium.

At the local Trade Exhibition, the group was shown examples of processing machinery available in China, but was unable to easily buy these for use in Australia. They were impressed with the variety of value-added walnut products in China, a country which sees walnuts as health-giving. Walnut oil, bottled and in capsules, also salted, milk-dusted, sesame coated and roasted kernels were marketed in luxurious packaging, while in-shell walnuts were sold in gift boxes like chocolates. Walnut milk, a by-product of oil extraction, is widely sold.

The group had useful dialogue on orchard management with growers and scientists from countries including Turkey, Iran, the US, France and Chile. A connection made at the 2009 IWS with Dr Gui Wang, Director, Pomology Institute, Shanxi Academy of Agricultural Sciences, enabled the HAL group to visit Chinese scion and rootstock nurseries and view a demonstration of grafting techniques with a Chinese grafting expert. Because labour is plentiful and cheap in China, cultivation, harvesting and cracking are done by hand. Continuing dialogue has begun between the group and interested Chinese parties.

A state-of-the-art processing unit, Fenzhou Yuyuan Native produce Co., impressed our group. It boasted a huge kernel sorting, cleaning and packaging clean room utilising laser, x-ray and UV technologies. A large industrial kitchen handled the roasting and value-adding processes. The company is run on modern business principles and has a comprehensive showroom displaying its history, products and ISO, HACCP and organic certification from several countries which are export customers.

Although there are differences between China and Australia in climate, socio-economic structures and labour costs, it was felt much will be gained from maintaining collaboration between us. A report on the visit was presented to AWIA members at a seminar on 23rd August 2013.
A COLLABORATIVE REPORT
Production of this report has been a collaborative effort by members of the AWIA group that visited China. Sub-groups of three or four members were responsible for reporting on different sections, namely Research and Development, Orchard Management, Processing, Marketing and Information Dissemination. The reports produced by the first four sub-groups were forwarded to the Information Dissemination sub-group for compiling into this full report.

Contributors:
- Orchard management (P Fitzgerald, C Marsh, M Fitzgerald, H Bell)
- Processing (P Elphick, N Pantou, C Bell)
- Marketing (R Smith, M Burston, P McNamara)
- Research and development (H Adem, N Wilkinson, P McNamara, J Feint)
- Networking (J Wilkinson, Julie Adem, Sally Smith.)

ACKNOWLEDGEMENTS
Dr Gui Wang (Director, Pomology Institute, Shanxi Academy of Agricultural Sciences), organised many of the visits to the walnut nurseries, orchards and processing centres for the delegation.

Ms Yu Cuiping, Chair, Fenzhou Yuyuan Native Produce Co., Ltd. hosted two visits to her large processing plant and product showroom.

HAL The AWIA members who took part in this trip to China would like to acknowledge the valuable funding support of Horticulture Australia Ltd.
EXPECTED OUTCOMES

The Australian Walnut Industry Association (AWIA) organised this trip to China which was supported by a grant from HAL for AWIA voluntary contributors. Sixteen delegates from Victoria, NSW and WA formed the Australian group, with three visitors from New Zealand. After attending the IWS and its trade exhibition, the group spent three days visiting walnut nurseries, orchards and processing plants in the Fenyang district of Shanxi Province, China.

The objectives of the trip were to build on the information gathered at the 6th International Walnut Symposium (IWS) held in Australia in 2009 and to bring Australian growers up to date on new research being undertaken in China and internationally, specifically to-

1. Attend the 7th IWS in Fenyang district, China,
2. Visit Chinese walnut growers and processors,
3. Liaise with Chinese and other international walnut industry researchers,
4. Gather new and relevant information on walnut production and processing to bring back and disseminate to the broader Australian walnut industry,
5. Renew relationships with the Chinese researchers and/or growers who attended the International Walnut Symposium in Melbourne in 2009.
REPORT ON THE 7TH INTERNATIONAL WALNUT SYMPOSIUM

A number of papers relevant to Australian production were presented at the four-day Symposium. Much information was unfortunately lost in the verbal presentation of some papers due to language and accent problems. This should be solved with the publishing of the Symposium Proceedings which will fill in a great deal of missed information. Following publication of the Symposium proceedings, discussion of these papers with AWIA members will be a worthwhile exercise.

The 7th International Walnut Symposium (IWS) in China represented a good opportunity for the Australians and New Zealanders to network with some 67 delegates from a number of countries including the USA, Chile, France, Spain, Italy, Iran, Turkey, Argentina, Romania, Pakistan, Kyrgyzstan, Georgia, Slovenia, Nigeria, Switzerland and South Africa. The largest groups of international visitors were from Australia/New Zealand (23), Turkey (12), Chile (10) and USA (7). Our Chinese hosts numbered some 200 delegates, making the symposium possibly the biggest attendance on record.

The IWS format was an official welcome, formal sessions with oral presentations, poster displays, a field trip and a gala dinner. Lunchtime, morning and afternoon coffee breaks offered opportunity for renewing acquaintances or new introductions, as did the field trips and other free time. The official dinner was low key with mainly visitors present and there was little designated time here for viewing the poster papers and meeting their authors.

Of the 40 international oral papers four were presented by scientists from Australia. There was a large number of papers from Chinese researchers describing development of different cultivars for each region in China.

The 2 keynote speeches were on Establishing Walnuts in Cold Areas and Walnut Timber Production in Southern Europe.

The 40 oral papers were separated into sections

- Germplasm, genetics and biotechnology
- Variety, rootstock and propagation
- Water, soil, nutrition and plant pathology
- Control of pests and diseases

Topics within these sections included development of breeding stock, rootstock shortage, cold and frost damage, management of walnut blight and diseases such as codling moth, walnut husk fly, crown gall, anthracnose, cherry-leaf-roll virus, brown apical necrosis, and brown soft scale. Many of these pathologies are still not seen in Australia.

The 66 poster presentations covered a broad range of topics. Presentations of particular interest were on

- Irrigation management research to prevent or reduce kernel shrivel in France.
- Straw pit irrigation in China.
- Tolerance to abiotic stress in walnut trees in Iran
- Studies on control of Brown Apical Necrosis in Turkey
- Planning of harvest operations to improve nut quality in Iran (not presented but listed)
- The fate of $^{15}$N-labelled nitrogen applied to walnuts in China.
- Control of walnut anthracnose by biological means in China.
- Exploration of wild walnut trees in Yunnan Province for varieties with potential benefits for walnut orchards, such as frost resistance, tolerance of calcareous soils, kernel flavour, water use efficiency and smooth crack-out.
- Biochemical analysis of tocopherols and other substances of interest in walnuts.
The content of the papers and discussions from the main walnut producing countries in the world suggested that by and large all countries and regions were facing the same or similar basic problems. However there were very few papers on the important issues of irrigation management, pruning and tree training, soil management and walnut physiology and blight control. One paper from Spain did highlight the importance of growing walnut trees for their value in the production of high quality timber for furniture making. Another presentation described how in Chile, poplars are used to protect orchards, making sure not to block the egress of cold air flow.

Our group was able to liaise with growers and academics from France, Turkey, Switzerland, Slovenia, Iran, Chile, California and Spain on topics including walnut nurseries, tree spacing and hedging, control of blight and pests, and tree nutrition. A member of the Australian group, Harold Adem, chaired a session of the symposium.

Although the language barrier limited some networking with Chinese delegates, there was significant dialogue with key players in both research and development and commercial fields. The 300 volunteer students did an excellent job as interpreters, guides and hosts. The strong presence of Australia and New Zealand had considerable impact in conveying the message that although our walnut industry is small by world standards we have a southern hemisphere advantage, minimal pest and disease issues and we have modern orchards employing advanced technology.

Networking with China and other countries was at times intense with examples of collaboration with researchers, machinery manufacturers, walnut importers, processors and consultants.

The 7th IWS address book provides a useful reference and networking database as do the many business cards that were handed out to us. Already numerous emails have been exchanged between us and the contacts made in China. Some delegates have been invited back to China to continue the collaboration. Our hosts built their conference centre in three months for the IWS and presented two splendid cultural shows for us involving hundreds of singers, dancers and musicians.

To sum up, the symposium was a success, the Chinese were hospitable and went to great lengths to present their walnut industry at its best and for many of the visitors the event exceeded expectations.
OBSERVATIONS OF THE WALNUT INDUSTRY IN CHINA

Background

Walnuts are an important business in China - they have been a significant part of the Chinese diet as a source of high quality nutrition. At present in China, the total area cultivated for walnuts is 2 million hectares currently bearing, with another 1.3 million ha coming ‘online’. Walnuts are grown in China over a vast area of the country, across varying climates and topographies.

The region around Fenyang City where the 7th IWS was held is one of China’s important walnut growing areas and the site of a treasured 600-year old walnut tree. Fenyang City is in Shanxi Province, north-central China, at latitude 37.1N, longitude 111.63E and altitude 970 m, with annual rainfall of 500 mm. The provincial capital is Taiyuan, with a population of over 4 million. The three pillars of its economy are identified by the people as white (spirit distillation), black (coal mining) and green (walnut cultivation). Current issues for the district have been organisation of walnut production in the commune, walnut cultivation in impoverished communities with poor hilly soils, and transition to more efficient cultivation and walnut management.

Climate

Shanxi has a continental monsoon climate, and is rather arid. Average January temperatures are below 0 °C, while average July temperatures are around 21 - 26 °C. Winters are long, dry, and cold, while summer is warm and humid. Spring is extremely dry and prone to dust storms. Shanxi is one of the sunniest parts of China; early summer heat waves are common. Annual precipitation averages around 350–700 mm, with 60% of it concentrated in summer.

Socio-economic structure of walnut farming in Shanxi Province

In the 1970s under the decision-making of the county party committee and county government, the people transformed barren hills in the Taiyuan area into walnut plantations which are maintained by the local villagers. Members of the village co-operative manage about 70 walnut trees each.

Over the past 20 years the area’s walnut industry has undergone rapid development. Seedlings of the best cultivars were sought to establish grafted orchards, and this search continues across the provinces for varieties with desirable qualities such as frost resistance. A brochure for the symposium describes: “The peoples’ struggles over the past 20 years are like a raging fire, capable of evoking praises and tears … [our town’s] tomorrow will surely be brighter.”

The time of the small independent farmer has passed so that processing and marketing of the walnuts and value-added products now occur in large co-operatives, a form of collectivised agriculture. The farmers now live in towns.

Although walnuts are a reliable crop, production can be influenced by weather conditions such as spring frost, drought and excessive rain. This was evident at the time of our visit when the frost in the last two springs destroyed the crop in the farms near Taiyuan. The farmers had planted soya beans and other annual crops between the trees. Such a practice would prevent mechanical harvesting. While these areas were humid, they experienced little rainfall in spring and subsequently had no blight problem, unlike orchards in Australia. Air pollution was very bad but did not seem to affect vegetation growth, which appeared lush.
Field visits

The setting of the 7th IWS was an opportunity for the Chinese industry to demonstrate its strength. Our Chinese hosts were welcoming and happy to show us and discuss many aspects of their walnut production, including scion and rootstock nurseries, their established trees, and an impressive modern processing plant.

A visit to a local trade exhibition was organised for the Australia and New Zealand group to meet manufacturers of walnut processing machinery. Some enthusiastic bartering followed as our group sought to explore the purchase and shipment of machinery. Business cards, brochures and samples of value-added products were freely given out by the stall holders at the exhibition. Some highly ornate carved walnut beds, chairs and wardrobes were on display at the trade exhibition.

Social networking was at a high level with members of our group pressured at every turn for their photograph to be taken with the locals. We never did find out whether it was a measure of Chinese hospitality or that we just looked different to the local people.
INFORMATION GATHERED FROM OBSERVATION AND DISCUSSION

Orchard management

1. Site selection criteria

   Climate. Our host Dr Gui Wang told us that in Shanxi Province spraying for blight is not necessary. Due to almost complete loss of crop to the spring frosts in 2013 we could not verify that blight-free walnuts can be grown in the Shanxi climate. However if true, this is advantageous since blight management represents a significant production cost and can be a barrier to organic certification. Due to the dry spring weather, walnuts in Shanxi Province were free from blight infection.

   Walnuts are cultivated in more than 20 provinces in China. Yunnan is the top walnut producing province and accounts for around 20% of total yield. Other main walnut producing provinces are Shaanxi, Shanxi, Shandong and Hebei with production from each exceeding 10,000 tonnes. Total yield of the top 10 producing provinces is 90% of the whole country. The Liaoning. Other species of walnut are also cultivated.

   Soil: The orchards we visited appeared to have very deep topsoil-sometimes >10 m. Some areas had experienced severe wind erosion. The soil is loess, naturally blown from the West by spring winds.

   Water availability: In some areas we visited we noticed flood irrigation, others had drippers and some, especially on steep hills, had none, relying on rainfall only.

   Geography/topography: Many orchard blocks were on very steep terrain and utilised every piece of available area; others were on flat land.

   Energy sources: a plentiful human work force supplied most of the energy for management tasks and harvesting. Electricity was readily available.
**Pests and diseases:** All the tree trunks had been painted with a lime-sulphur wash. No blight was evident.

**Harvesting:** We were told that all was done by hand, regardless of terrain, but because our visit was in summer (and there was no crop), we were unable to see harvesting in action.

**Transport:** Truck transport is readily available on good government constructed roads-provided specifically for the orchards by government.

**Business/markets/walnut wood production:** There seemed to be a high demand for in-shell and kernel for local consumption at prices comparable with Australia. There also appears to be a good export market to Europe. The walnut industry is heavily subsidised by the Chinese government.

2. **Site preparation**

**Soil mounding** was not seen but topsoil was very deep. Ploughing and tilling was done by hand.

**Row spacing:** Ranged from 6 x 4 to 5 x 3 m or denser in plant nursery areas, all with inter-row crops, e.g. soy beans. In France, we heard 7 x 3.5 m, 300-400 trees/ha.

**Wind breaks:** Not seen in China, except along the roadsides to protect against spring dust storms.

**Fertilising before planting** in China was not discussed.

**Understorey** Inter row crops were usual- no space was wasted to maximise income.

**Erosion:** Historical deep ravines were evident and are now being stabilized by intense tree and shrub plantings.

**Irrigation:** Flood and drippers were seen and in some steep, terraced hillsides, no irrigation was apparent. Bishuan Walnuts Research Company used recycled water from the local coal mine.
3. **Tree Selection**

**Root stock development:** in China, there are many varieties of *Juglans regia*, also *Juglans sigillata, manshurica, cathayensis, hopeiensis* and hybrids.

**Cultivars:** many locally bred varieties of *J. regia* exist in China - Liaoning 1, Liping 1, Liping 2, Luguang, Jinlong 1, Jinlong 2, Jinboxiang 1, Luguo 1, etc. They grow in a wide variety of climates. Most of the cultivars are lateral bearing. Frost resistance is a priority in Chinese cultivar research.

**Disease resistance:** Shanxi Province orchards had no blight problems because of little spring rainfall. By comparison, blight management in Southern Australia includes copper treatments in a timely fashion from bud burst, as in California where research shows decreasing disease load in buds decreases blight damage in wet springs and summers.

**Frost/flowering issues: because** widespread severe frosts can occur in the Shanxi area, the Chinese focus on developing cultivars with late leafing, lateral fruit bearing and early harvest dates.

**Shell thickness and kernel yield:** The Chinese consumers prefer walnuts with a thin shell, easily cracked by hand without mechanical aid and with a full kernel. (A common belief is that if the shell is thick, much of the goodness of the kernel has been lost). It was found, though, that high kernel yield was obtained at the expense of shell thickness. Thinner shells lead to the risk of darker kernels and ease of fracture. In California, 1-1.5 mm thickness is seen as desirable. Chinese varieties from Xinjiang had a shell < 1mm thick with > 60% crack-out. Easy fracturing is less of a harvesting problem in China, where there is no mechanical harvesting, but storage remains problematic with thin shell – kernel is less protected by thin shells.
4. **Tree numbers**

*Spacing* was designed in Shanxi Province to maximise yield and because all harvest and maintenance was by hand, close plantings were common. One 66 ha orchard we visited used 4 x 6 m planting, another had 3 x 5 m.

**Pruning factors:** trees were limited in height to 3-5 m to facilitate hand harvest using poles.

*Yield long term/tree* early yield was maximised, heading cuts were made in winter, followed by rapid growth. The inter-tree space filled over within 5 years. Yield was 3-5 kg/tree, i.e. 2-3 t/ha at 5 years.

5. **Planting**

*Root stock:* planted by hand, plastic membrane was used over soil to reduce evaporation.

*Inter-row plantings* were usual.

*Patch budding* was done on small seedlings - one year old wood, in summer (June) and we saw 0.5 m growth of the new scion wood over forty days. We also saw patch buds on older trees used to renovate non productive branches on root stock. Other grafting methods were demonstrated such as whip & tongue and bark grafting, which were used on older root stock if the initial patch bud had failed. The Chinese had a 95% success rate for in-field grafting, if not raining, at 500-800 buds per person per day! Soft budwood is used, 1 year old. Cuts are sealed with acrylic paint.

Bud-grafting demonstrated by a Chinese expert.
1. **Tree Training**

   *Central leader or vase* height control seemed to be the most important factor, not shape.

   *Height and diameter:* 3-5 m height; and tree widths were also maintained by hand - no machine hedging was used or possible in many orchards because of inter-row plantings.

2. **Tree growth**

   **Water and fertiliser needs:** In some regions, the Chinese employ leaf analysis to guide the use of mixed fertilisers. The utilisation of nitrogen by the walnut tree was discussed and yield increases of up to 47% were attributed to application of 30g N/tree three times in the growing season.

   **Irrigation:** drip, sprinkler, straw pits, flood irrigation or none. One Symposium paper demonstrated the cost: yield benefit of straw pits in China. World-wide, sprinklers, drippers and subsurface irrigation methods were found to be common. This part of China is well-suited to flood irrigation as the soils are deep and retentive. Plastic sheeting is used in some parts to reduce evapo-transpiration.

3. **Threats to productivity**

   **Climate-frosts, wind:** The breeding of plants that flower later and are more resistant to frost is a research priority in China. Fans are used in many places world-wide but none were seen in China.

   **Disease management:** There was little mention of disease in Chinese walnut orchards.

   **Weed Management:** in China was all by hand weeding, spraying etc.

4. **Harvesting**

   Shaking by hand, using long poles to whack nuts off trees. The most advanced machinery seen in harvesting was a motorised hand-held shaker, similar to a whipper-snipper, with a vibrating grip attachment. Topography is not conducive to large vehicular movement and production is generally from small family/village/community group plantings, where harvesting is a very manual activity, involving the whole community.
Processing

In Shanxi Province, walnuts are harvested before they drop, so they need to be de-husked. This is mostly done by hand on the farms we believe, although mechanical de-huskers were seen. Drying is not mechanised; it is done on roofs and hardstands. To obtain kernel, most cracking is done by hand.

Hand-cracking in China.

Mechanical cracking is apparently done in large co-operatives, but none were inspected.

Processing machinery sighted and inspected at the Trade Exhibition included:

- Grader/sizer, which was for nuts still in hull, so unsuitable for our requirements, but the representative showing the unit was prepared to construct a unit to our specifications, for a reasonable price: approx. 3,600 AUD – before freight.
- De-husker and washer, a copy of a US design
- Cracker (which didn’t include a separator, so required considerable manual input),
- Oil press which was Ukrainian technology and was relatively expensive at approx. 8,000 AUD
- Batch code printer, which was standard technology, quoted at approx. 16,500 AUD.
De-husking and cleaning line seen at the trade exhibition.

De-husker seen at the trade exhibition.
Cleaner seen at the trade exhibition.

A view of grader seen at the trade exhibition.
Machinery sighted, but not inspected, included:

- UV sterilising unit – Japanese technology and manufactured
- Large cracking unit – probably locally designed and built
- X-ray metal detection unit – unknown provenance

Walnut cracking line advertised at the trade exhibition.

No really innovative machinery was seen. The manufacturer of the hulling/cleaning line (priced at approx. 65,000 AUD) was reluctant to sell individual components of the line, such as a trash separator.

Processing line at Fenzhou Yuyuan Native produce Co where the throughput is 20 tonnes daily.
We visited a large, modern processing unit, Fenzhou Yuyuan Native produce Co, which was run using modern business principles. It has a strong corporate culture which values employees, aims for integrity and the highest quality, employs strict quality control in the laboratory and elsewhere and proudly displays ISO and HACCP accreditation, organic certification from the US, EU and Japan. The company exports widely. Kernels are handled in a sterile unit where the floor and walls could be properly sterilized and personnel showered and clothed cleanly. Kernel and in-shell packaging technology appeared highly sophisticated, being largely automated, with strict quality control measures in place. When we visited, many teams were seen removing shell fragments and foreign material - all nuts were visually inspected, and laser, UV and X-ray technology were utilised before packaging the kernel. The plant also had an informative and well-laid out showroom displaying its philosophy, achievements and products. Product presentation, which included ‘best before’ dates and batch coding, was impressive.

Since the walnut industry employs so many people in this region (40,000 households, 120,000 workers, on approx. 36,000ha across 16 towns, producing 12,000 tonnes annually), it is not surprising that mechanisation of the harvesting and early processing stages of production is almost non-existent.
Marketing

The Chinese people have great respect for walnuts as a health-giving food which they eat regularly, whereas walnuts are not well-established in the regular diet of most Australians. At the trade exhibition we saw and tasted a wide variety of walnut products – roasted, salted, milk coated, sugar coated, spicy, sesame coated peeled kernels, walnut oil, puree and flour, and at the Fenzhou Yuyuan processing plant we observed large-scale equipment which manufactures them. They have the equipment to package in small quality cellophane bags where the product is kept fresh but can be easily seen, and in 100g tins with plastic re-sealable lids, all excellent presentations for marketing often to specific countries like Germany and Spain. Walnut oil is extracted by pressing and sold in bottles in similar sizes to extra virgin olive oil in Australia, and in capsules. After extraction, the protein and fibre residue is made into a nutritious walnut milk with a small amount of sweetener, and sold in cans and cartons.
Walnut oil capsules seen at the trade exhibition.

**Packaging in China has developed to an advanced standard.**

The Chinese packaging was brilliant and varied. Some contained a couple of bottles of walnut oil, trays of individual premium in-shell walnut in what looked like expensive satin-lined chocolate boxes, plus a huge variety of glossy bags and boxes with walnuts set out like a special occasion gift. Some even had the insignia of the farm and the harvest date printed on them, which looked somewhat special. The machine which printed this on the nuts was displayed at the trade show. Its stamps looked better than the stickers placed on apples in Australia, and have some value as walnuts can lose flavour over time. The amount of packaging is very extensive for the cost of the raw product but must be added on. While some communities are moving away from such packaging as being a waste of energy, the Chinese must see this as adding value to the product by making the high quality walnuts appear very special, and intended as a gift-wrapped version of the product.

---

**Packaging of walnuts in China**

Packing in individual trays or boxes with each nut dated or vacuum sealed Kernels
Vacuum packaging was also seen, some in thin plastic, others used a thick plastic. The advantage of vacuum wrapping is that the nuts remain fresh for a longer period because they are not exposed to oxygen, so the oils do not turn rancid. Vacuum packaging is expensive and time consuming so a machine doing this automatically at the end of a conveyer belt would be a significant advantage.

Colourful wrapping was an important feature of the Chinese marketing. Printing must be much cheaper in China than Australia and was of very high quality. Packages can be branded to specific farms. This type of packaging would improve the quality of walnut marketing in Australia.

**Marketing the health benefits of walnuts**

Chinese marketing emphasizes the health benefits of walnuts. This is consistent with a significant number of population-based medical trials conducted world-wide over the last 20 years which demonstrate that a regular intake of walnuts may reduce the risk of cardiovascular disease (heart attack and stroke), reduces the risk of diabetes and improves the lipid profile of patients with metabolic syndrome.
IMPLICATIONS FOR THE AUSTRALIAN WALNUT INDUSTRY

The 7th IWS gave good insight into walnut production in China, the challenges faced and where Australian producers have clear advantages. Labour is cheap in China but a large number of growers lack skills to keep up with advances in science. China grows at least 100 different cultivars selected locally but many are not suitable for mechanical processing and are not popular outside China. Tree management to reduce the risk of frost damage is not widely practiced. Orchard planting density and tree training is based on old technology and will limit walnut productivity. Micro-irrigation has been adopted in recent plantings but many orchards are furrow irrigated or rely on rainfall. Irrigation efficiency through accurate scheduling needs further adoption through greater use of decision support tools.

Based on size alone, the Australian walnut industry is small compared with the industry in China. The Australian walnut industry has the advantages of Southern hemisphere production, low incidence of pest and disease, mechanisation and young, modern orchards with the latest cultivars. The take-home message at the 7th IWS for Australian walnut producers was the importance of adopting the best technology from around the world. A strong message from the Symposium is that quality, value-adding and presentation sells in the marketplace.

It was clear that China is interested in importing walnuts from Australia because we are seen as a clean-and-green country, we have the most popular cultivars and we are counter-seasonal to China. We are blessed with stable government, a robust economy, suitable soils and a moderate climate. Our orchards are mostly young so nut size is large, quality is high and our production is increasing. Presently our industry is in a rapid expansion phase with more new players entering the industry creating an opportunity for a quantum leap in the adoption of new research and development technologies.

Summary of differences between Chinese and Australian industries:

1. Farming not mechanised, so Chinese can grow secondary crops between rows to maximise yield of land and provide an insurance against crop failure;
2. Chinese government provides strong support to its walnut farmers to enable them to be economically self-reliant. For example, transport is subsidised.
RECOMMENDATIONS

Orchard management:
Due to seasonal and climatic differences, the possibility of crop failure and the great demand for walnuts from Chinese consumers, there are several benefits to China and Australia ensuing from a cooperative relationship with Australia. The Chinese R&D work on new varieties and cultivars with frost resistance, blight resistance and easy crack-out has potential benefits for the Australian walnut industry.

Processing:
To determine the availability and suitability of Chinese-designed machinery for the Australian walnut industry, a much wider search of the industry is required. The machinery seen did not appear inexpensive or of superior quality. Chinese manufacturers with websites do exist, but not many with English translations. The assistance of a student of Chinese would be a great help in this regard.

Marketing
Promotion of walnuts would be enhanced in Australia by wider distribution of their health benefits. The wide variety of walnut-based products in China is not generally seen in Australia. There is scope to market some innovative products, particularly to ethnic groups living in Australia, as Australian growers report increased interest in walnuts from these groups.

We could learn from the Chinese and improve our packaging by presenting Australian walnuts as a highly prized food, similar to the way chocolates are presented here.

Many Chinese farmers are producing nuts from modern cultivars which give good quality kernels in paper thin shells which can be cracked by hand. These cultivars are rare in Australia but may need to be imported here for Australia to compete in the international in-shell market. The quality of the nuts may be reduced in thin shell nuts, and it takes some years to determine the value of new nut varieties, so a careful evaluation of influence of different cultivars in Australian conditions is indicated.

Export opportunities: We understand that the Chinese need to import walnuts to satisfy demand, indicating an opportunity to export to China, but the Chinese market seems quite sophisticated. We could therefore size our nuts and sell the Jumbo nuts in bulk to be packaged in China. Currently there are only a few processing units in Australia which can provide the bulk of nuts that make this possible. Strategically it would be better to have several large volume suppliers. Therefore some effort needs to be directed to develop another processing unit that can compete on the international market at the highest international standard which can be promoted on our advertising.

Research and Development
It was evident that the rapidly expanding walnut industry in China receives considerable assistance in R&D from government aid at both local and national level, which is something the Australian industry could well pursue. The boundaries between government and private enterprise appeared blurred in China. It goes without saying that China will almost certainly be a key player in the world walnut industry in future years.

Australia’s Chief Scientist, Professor Ian Chubb, recently gave the 2013 Australian Centre on China in the World lecture at the Australian National University, titled Partners in influence: How Australia and China relate through science. He said ‘Australia and China now share a strong and highly
productive relationship in science that has been built over more than 50 years... Australia can build capacity if we commit to a strategy. This becomes even more important when we hear that the resources boom is coming off the boil. Our relationship with China will enter a new and different phase. We will need to start now to work out how to build from the base that has been constructed by all these people over all these years.’ See http://www.chiefscientist.gov.au/2013/08/speech-australian-centre-on-china-in-the-world/.

Our trip to China plays a crucially significant role in what we hope will become an enduring and mutually beneficial relationship with China linked to both country’s rapidly developing walnut industries. The Australian Government can help us build on this trip by increasing its support of the Australian Walnut Industry.

HOW INFORMATION GATHERED WILL BE DISSEMINATED

AWIA will disseminate our learnings from this trip in the Australian Nut Industry journal The Nutgrower, at the AWIA Winter Seminar, on the AWIA website (www.walnut.net.au), through press releases to The Weekly Times, The Land, Stock and Land, and other appropriate media outlets. Also Harold Adem will present our findings to the Goulburn Valley growers who have been affected by the closure of their cannery. The report can also be sent to http://www.farmonline.com.au/horticulture/goodfruitvegetables/index.aspx in Australia and http://www.walnuts.org.nz in NZ, and Treecropper, the magazine of the NZ Tree Crops Association.
APPENDICES

Travel Itinerary
Visiting Schedule in Shanxi
Contact details of AWIA delegates
ALL INCLUSIVE TOUR

12 day tour price TBA  
Per person  

New AWIA members discounted application fee is available to enable non members to be eligible for the announced discounted tour cost

DEPARTURE DATE:
July 18

PACKAGE INCLUDES:

- Return economy class with China Southern with taxes
- One Way economy class Taiyuan to Beijing with China Eastern with taxes
- Return Airport transfers in Taiyuan
- Conference Hotel
- 7 day Beijing luxury coach tour
- Hotels stated in the itinerary
- Meals stated in the itinerary
- Admission fees stated in the itinerary
- Return airport transfers in Beijing
- RMB100,000 Chinese Travel Agency Liability Insurance and RMB500,000 Chinese Tour Bus Accident Insurance.

ITINERARY

DAY 1  
Melbourne - Taiyuan

DAY 2  
Fenyang City, IWS

DAY 3  
Fenyang City, IWS

DAY 4  
Fenyang City, IWS

DAY 5  
Fenyang City, IWS

DAY 6  
Fenyang City

DAY 7  
Fenyang City

DAY 8  
Fenyang City

DAY 9  
Fenyang City - Beijing

DAY 10  
Beijing

DAY 11  
Beijing

DAY 12  
Beijing - Guanzhou

Conditions apply. 7 day service/tipping fee for Beijing driver and tour guide will be collected by your local tour guide, USD10 per day, total USD70. Exclusions: Airport and Luggage tips, Travel Insurance, personal expenses, Chinese visa fee

Contact Travel Design International for more details -  
1300 360 809  
travel@traveldesignint.com.au
### Day by Day Itinerary

<table>
<thead>
<tr>
<th>Date</th>
<th>Activity</th>
</tr>
</thead>
<tbody>
<tr>
<td>18 July</td>
<td>Depart Melbourne on China Southern Airlines to Taiyuan</td>
</tr>
<tr>
<td>19 July</td>
<td>Arrive in Taiyuan. You will be met by your local representative and escorted to Yuhe Garden Hotel at Fenyang Shanxi</td>
</tr>
<tr>
<td>19 - 23 July</td>
<td>Enjoy daily breakfast at the Yuhe Garden hotel in lieu of the International Walnut Symposium</td>
</tr>
<tr>
<td>24 July</td>
<td>Whilst enjoying the hospitality of the Yuhe Garden, coach hire is provided for a toured visit of the Fenyang Yu Yuan Native Produce Co. a walnut machinery manufacturer, demonstrating growing, processing, trading walnuts and value adding food research. Followed by a trip to the Wenhua Scenic Spot a combination of ecology, nature and ancient cultural relics.</td>
</tr>
<tr>
<td>25 July</td>
<td>Today visit Fenzhou Walnut to learn about the science &amp; technology of developing high quality walnut cultivars &amp; seedling production techniques. This includes walnut processing, trading, R&amp;D, training of walnut industry personnel and a museum of walnut history. Also take in some organic walnut orchards in surrounding local villages.</td>
</tr>
<tr>
<td>26 July</td>
<td>Our last day in Fenyang, tour the Breeding Garden of Fine Walnut Varieties in Fenyang - production &amp; scientific research on fine walnut varieties. Transfer to the airport and fly to Beijing with China Eastern Airlines where you’ll be met by your local representative and escorted to your hotel.</td>
</tr>
<tr>
<td>27 July</td>
<td>After breakfast, visit Tiananmen Square and the Forbidden City. After lunch, visit the Temple of Heaven. Then proceed to “The Place” - the shopping area with the largest LED screen in Asia</td>
</tr>
<tr>
<td>28 July</td>
<td>After breakfast, visit the largest Jade Museum in China, then proceed to the Great Wall. Later, enjoy the Kung Fu Show. After dinner, take a night tour on Chang-An Street</td>
</tr>
<tr>
<td>29 July</td>
<td>Visit the Summer Palace, the largest and best-preserved garden in China. After lunch Transfer to the airport for your flight to Guangzhou. Transfer to the airport for your flight to Guangzhou, then on to Melbourne.</td>
</tr>
</tbody>
</table>

Contact Travel Design International for more details - 1300 360 809
travel@traveldesignint.com.au
## Visiting Schedule in Shanxi for Australian Walnut Industry Association

| **July 24, 2013** | 08:00 | Leave Fenyang Yuhe Garden Hotel for Xiaoyi to visit the Walnut Orchard and Rootstock Nursery Orchard of Bishan Walnut Science and Technology Co Ltd; To visit the king of walnut tree in Xiaoyi and Walnut Walnut Orchard of Xiabo Town |
| | 12:30 | Lunch held by Xiaoyi City Government |
| | 15:00 | Leave for Jiaocheng Bizhou Walnut Farming Corporatives to visit walnut orchard and walnut breeding |
| | 18:00 | Return to Fenyang Fengtaiyuan Hotel for dinner held by Bishan Walnut Co Ltd |
| | 19:30 | Return to Fenyang Yuhe Garden Hotel |

| **July 25, 2013** | 08:00 | Visiting Pingyao Ancient City (traveling agency) |
| | 18:00 | Return to Fenyang Yuhe Garden Hotel |

<p>| <strong>July 26, 2013</strong> | 08:00 | To go to Yu Yuan Walnut Import &amp; Export Co to visit the processing of walnuts |
| | 10:00 | To go to Jinlong Walnut Research Institute for visiting the grafting technology |
| | 12:00 | Lunch held by Jinlong Walnut Research Institute (by Wang Gui) |
| | 14:00 | Technical exchange |
| | 17:20 | Leave Fenyang for Beijing |</p>
<table>
<thead>
<tr>
<th>Name</th>
<th>Email</th>
<th>Telephone</th>
</tr>
</thead>
<tbody>
<tr>
<td>Paddy Elphick</td>
<td><a href="mailto:pelphick@omegawalnuts.com.au">pelphick@omegawalnuts.com.au</a></td>
<td>08 9772 1502</td>
</tr>
<tr>
<td>Nick Pantou</td>
<td><a href="mailto:nickpantou@hotmail.com">nickpantou@hotmail.com</a></td>
<td>0400-380-010</td>
</tr>
<tr>
<td>Pat &amp; Margaret Fitzgerald</td>
<td><a href="mailto:patfitzgerald@ozemail.com.au">patfitzgerald@ozemail.com.au</a></td>
<td>03 9435 4716 0418 126 730</td>
</tr>
<tr>
<td>Harold &amp; Julie Adem</td>
<td><a href="mailto:harold.adem@dpi.vic.gov.au">harold.adem@dpi.vic.gov.au</a></td>
<td>0407 335 231 03 5821 8753</td>
</tr>
<tr>
<td>Norm &amp; Jennifer Wilkinson</td>
<td><a href="mailto:wilkinson@eastvic.net">mailto:wilkinson@eastvic.net</a></td>
<td>03 5140 1258</td>
</tr>
<tr>
<td>Patrick &amp; Meryl McNamara</td>
<td><a href="mailto:pjnagambie@hotmail.com">pjnagambie@hotmail.com</a></td>
<td>0427 992 229 03 5794 2181</td>
</tr>
<tr>
<td>Ross &amp; Sally Smith</td>
<td><a href="mailto:sallysmith@ozemail.com.au">sallysmith@ozemail.com.au</a></td>
<td>02 9436 4257 0418 664 672</td>
</tr>
<tr>
<td>Ruth Marsh (NZ)</td>
<td><a href="mailto:clive.marsh@clear.net.nz">clive.marsh@clear.net.nz</a></td>
<td>+64 21 220 8227</td>
</tr>
<tr>
<td>Clive Marsh (NZ)</td>
<td><a href="mailto:clive.marsh@clear.net.nz">clive.marsh@clear.net.nz</a></td>
<td>+64 21 220 8227</td>
</tr>
<tr>
<td>Jeffrey Feint (NZ)</td>
<td><a href="mailto:margjeff@hotmail.com">margjeff@hotmail.com</a></td>
<td>+64</td>
</tr>
<tr>
<td>Mike Burston</td>
<td><a href="mailto:burstonmj@skymesh.com.au">burstonmj@skymesh.com.au</a></td>
<td>0417 565 493 03 5729 7647</td>
</tr>
<tr>
<td>Mac McArthur</td>
<td><a href="mailto:mac@walnut.net.au">mac@walnut.net.au</a></td>
<td>03 5482 2460 0448 905 290</td>
</tr>
</tbody>
</table>