

**Tropical vegetable
production: best practices
and opportunities - Study
Tour, August 2009**

Dr Alison Anderson
ARRIS Pty Ltd

Project Number: VG08174

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This final report details the outcomes of a study tour by horticultural producers to Northern Australia, 2 – 12 August 2009. Study tour participants were from the Nambucca Valley (NSW), Gympie (Qld) and Bundaberg (Qld). Farms, packing sheds, research stations, water managers, industry associations and Government Departments were visited in Darwin (NT), Katherine (NT) and Kununurra (WA).

The study tour participants would like to thank all those that gave their time and openly and honestly discussed their farm and business operations with the group. Arris Pty Ltd thanks the following people who helped with the organisation of the study tour, providing contacts and organising farm visits: Kate Peake and Tim West (NTHA), Geoff Strickland (Ord Irrigation Co-operative), Stuart Smith, Barry Condé and Helen Foster (NT Government) and Peter Johnson (WA Department of Agriculture and Food). The organisation of travel requirements by FCM Travel consultant, Robert Holliss is much appreciated. The study tour would not have been possible without the passion and dedication of Nambucca Valley vegetable producers Geoff and Scott Gough. The study tour was facilitated by HAL and was funded by a voluntary contribution and matched funding provided by the Australian Government.

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Abbreviations

DRDPIFR	NT Department of Regional Development, Primary Industries, Fisheries and Resources
FWI	Frank Wise Institute (WA Department of Agriculture and Food)
HAL	Horticulture Australia Limited
NRETAS	NT Department of Natural Resources, Environment, The Arts and Sport
NT	Northern Territory
NTHA	Northern Territory Horticultural Association
OIAMC	Ord Irrigation Asset Mutual Co-operative
OIC	Ord Irrigation Co-operative
ORIA	Ord River Irrigation Area
WA	Western Australia

Units

ha	hectare
hr	hour
ML	megalitre
m	metre
M	million
mm	millimetre
kg	kilogram
km	kilometre
t	tonne
yr	year

1 MEDIA SUMMARY

Fifteen horticultural producers from northern NSW and south-east Queensland had the opportunity to observe the practices of Northern Australian horticulture during a recent study tour of Northern Australia.

In August vegetable and fruit growers from northern NSW and south-east Queensland, including a rural supplier/consultant plus tour leader Dr Alison Anderson (Arris Pty Ltd), travelled to Darwin and Katherine in the Northern Territory and Kununurra in Western Australia to learn about best growing practices and opportunities in horticulture in Northern Australia.

The group included ten members of the Nambucca Valley Horticultural Branch of the NSW Farmers' Association. The study tour was the idea of long-standing former NSW Farmers' Association Horticulture Committee member and vegetable producer Geoff Gough of Macksville. Geoff is passionate about increasing the knowledge and skills of vegetable producers and was extremely pleased when HAL supported the study tour so that horticultural producers in northern NSW and south-east Queensland could observe horticultural operations in Northern Australia first-hand and learn about the opportunities Northern Australia presented to Australian horticulturists.

The study tour included visits to farms, packing sheds, research stations and other industry bodies in Darwin, Katherine and Kununurra. Production of pumpkins, melons, beans, mangoes, snake beans, red grapefruit, Indian sandalwood, chia, hybrid seed, chickpeas, belotti beans and rambutans was observed as well as two large packing facilities.

The major objective of the study tour was to gain insight and increase knowledge in tropical vegetable (horticultural) production in the areas of pest and disease management, biosecurity, natural resource management, supply chains and the availability of land and water resources for example. Another objective of the tour, which was highlighted as being extremely valuable by the tour participants were the networks gained.

Some of the study tour highlights were learning about the water allocation plan in Katherine and the proactive approach to natural resource management by grower associations in the north, supply chains and approach to marketing of producers in the north, the massive growth of the Indian Sandalwood industry in Kununurra and the opportunities being presented by the development of Stage 2 of the Ord River Irrigation Area.

All study tour participants commented on the value of the trip, which was best summed up by Sue Nelson of Stuarts Point in NSW who said "I am returning home with a fresh outlook, inspiration and determination to succeed in the production of fresh food."

2 INTRODUCTION

In August 2009, fifteen horticulturists from northern NSW (10 members from the Nambucca Valley Horticultural Branch of the NSW Farmers' Association) and south-east Queensland (Gympie and Bundaberg) travelled to Northern Australia on a study tour with the focus: 'Best growing practices and opportunities in horticulture in Northern Australia' (with a focus on vegetable growing).

Study tour participants farm a range of vegetable and fruit crops: green beans, zucchinis (green and yellow), sugar snap peas, snow peas, cucumbers, squash (green and yellow), potatoes, rockmelons, tomatoes, capsicum, cauliflower, broccoli, avocados and pineapples. Additionally one study tour participant is the owner of a farm supply and consultancy business near Gympie.

The study tour included visits to farms, packing sheds, research stations and other industry bodies in Darwin, Katherine and Kununurra. This report includes a collation of information gained from these visits and key points.

The objectives of the study tour were:

1. To observe and gain insight and knowledge about vegetable (horticultural) production in the tropics:
 - pest and disease management and biosecurity in a tropical environment;
 - natural resource management;
 - availability of land and water resources;
 - production methods;
 - investing in horticultural enterprises in the NT and northern WA;
 - supply chain management and marketing;
 - market opportunities.
2. To learn about research and development (R&D) in northern Australia and to gain an understanding of its relevance to northern NSW/south-east Queensland vegetable growers.
3. To establish and promote linkages between northern NSW/south-east Queensland vegetable growers in the NT and northern WA.
4. To improve skills, knowledge and confidence of tour participants to critically review their farm business operations and to encourage them to become more actively involved in the vegetable industry (e.g. agripolitical organisations, R&D committees, uptake of industry R&D outcomes).

At the end of each day discussions amongst study tour participants reflected on key observations and knowledge gained. They also completed a survey to highlight what most interested them on the tour, what they learnt, what they will take back to their farms/districts, do they have any recommendations for Australian horticulture or any other comments. The survey results are given in this report.

The outcome of the study tour is that participants have increased knowledge and understanding of production and best practices, the range of horticultural crops

grown, pest and disease management, biosecurity, investment opportunities, availability and management of natural resources, supply chains and marketing in Northern Australia. Participants have also developed valuable networks in northern Australia and have discussed what they learnt on the study tour with their local networks.

This report and media summary will be provided to editors of industry publications such as 'Vegetables Australia' and to grower organisations such as NSW Farmers' Association.

3 FARM VISITS

3.1 Fruitopia, Darwin

The owner/manager of Fruitopia, Kerry Eupene, was not available to discuss operations at 'Fruitopia' with the study tour group. NTHA staff showed the group around the farm and gave some background information.

Rambutan's are the main crop at 'Fruitopia', plus a range of native and specialty crops (e.g. lilly pilly, sapodilla, pomello). A range of citrus types are grown. Rambutan's are high water users, sent to markets in southern Australia and do not have major pest problems. Guinea fowl are used for insect control and netting prevents lorikeets destroying the crop. Approximately 2 – 3 acres are under net. There is a reasonable local market in the NT. They need to be kept red and turn black with refrigeration. Returns are approximately \$19 /kg and \$12/kg as they turn black.

Lilly pillies are used as a shade/windbreak. The owner is looking at value adding through making lilly pilly jam.

Foxtail palms surround the farm – they are an indicator species for termite attack.

Carpet baits are used in the citrus crops for fruit fly. They contain a yeast attractant and malathion.

3.2 Dave and Ruth Cormack, Darwin

Dave and Ruth Cormack started farming at Middle Point (near Humpty Doo) in 1981. They originally grew bananas as they had done in Coffs Harbour, NSW. Panama Disease destroyed their banana plantation after it was found in the NT in 1996.

The Cormack's now grow pumpkins, watermelons and have 960 mango trees. There are too many mangoes grown along the Arnhem Highway and because they are late season mangoes they miss out on good prices.

There are four bores on the farm. From January to March the watertable is above the ground on their farm.

They wash their butternut pumpkins and grade them using their mango machine, processing 2 t/hr.

Transport is a major issue. Pumpkins are moved by railway to Adelaide. They sell through Sydney and Adelaide Markets, visiting Sydney Markets to find an agent (Murphy's). Mangoes are transported by truck to Sydney, Brisbane and Adelaide.

Aphids are the major pest problem in watermelons and pumpkins.

The Cormack's are trialling Mediterranean taro.

Ruth speaks Taiwanese, with farm staff being from Taiwan. They have six staff living on-farm. It is compulsory that all staff attend 2 English lessons per week, given by Ruth.

3.3 Red Dirt, Katherine

'Red Dirt' is owned by PMG Agriculture, a family owned business run by Paul and Rachael McLaughlin. Until 2002 Paul grew beans, sweet corn and watermelons at Canowindra (NSW). In 2003 PMG Agriculture purchased 'Borambil North' at Condobolin (NSW), which they still own and manage. Watermelons and pomegranates are grown in Condobolin (500 ha with drip irrigation including 200 ha of pomegranates). Water is a big issue in Condobolin and PMG Agriculture wanted to be able to harvest pomegranates all year round, which resulted in purchasing 'Red Dirt' in March 2009. Pumpkins and watermelons are also grown at 'Red Dirt'.

First grade pomegranates are supplied to the local market and international markets (e.g. Russia), in the northern hemisphere off-season. Second grade fruit is made into pomegranate juice. PMG Agriculture has recently built a juicing factory at Condobolin (for watermelon and pomegranate juice). Up to 600 pomegranate trees are planted/ha on trellises (each tree yielding up to 25 fruit)^A. Pomegranates cost \$4000/ha/yr to maintain. Shelf-life is 3 – 4 months if they are stored properly. The variety, Royal Pom™, are grown exclusively by PMG Agriculture and marketed through Perfection Fresh Australia.

Watermelons are harvested every week of the year by farming in Condobolin and the NT: during their respective seasons 4 – 5 trucks per day are harvested in the NT and 11 per day in Condobolin. A truckload of pallets per day are used.

They are not selling watermelons directly to the supermarkets at the moment but the supermarkets are interested in them doing so. Paul says that the in the last 5

^A www.royalpom.com.au

years the produce industry has changed with the smaller fruit and vegetable shops expanding significantly. Three years ago 80% of their watermelons were sold through supermarkets and now it is only 20%. They are now grading more for the smaller shops. PMG Agriculture is using agents that focus on Harris Farm Markets and Fruitworld, so their grading reflects their requirements. They have one agent in each capital city and have chosen their agents to be family-owned businesses so that Paul can talk to the owner each day. They see their relationships with their agents as extremely important: they want to double their agent's business. PMG Agriculture's agent in the Sydney Markets is a co-owner of 'Red Dirt'.

At 'Red Dirt' there is currently 300 ha of watermelons and pumpkins under drip irrigation (rows 640 m to 920 m). Crops are fertigated twice/week. They plant 12 ha/week. Planting begins in February with picking starting in mid-May and continuing to the end of October. Picking of watermelons at Condobolin begins at Christmas and continues for 3 months. To ensure supply in between these picking seasons PMG Agriculture farms at 'Desert Springs' at Tennant Creek. Providing 12 months supply for their customers ensures that PMG Agriculture receives a premium for their product.

Key pest and disease problems in the NT are powdery mildew, Heliothis, aphids and Jassids (leafhoppers). They do not get the extreme heat that they experience in Condobolin but pests are more of a problem as there is no overwintering. Downy mildew is a problem with the humidity arrives in September. Kangaroos eat some pumpkins.

PMG Agriculture is establishing their own plant nursery in Katherine.

Some produce goes to market on the train but most goes by road. Transport costs \$260/tonne to Sydney. Cool rooms are used from September.

'Red Dirt' has a water allocation of approximately 4700 ML. The new water allocation plan for Katherine has resulted in 'Red Dirt' losing some water allocation but it is now more reliable for those that use it (all high security). PMG Agriculture has another 5000 ML at 'Desert Springs'.

In the off-season green manure crops are grown (e.g. millet, cowpeas).

There is no shortage of manual labour in Katherine. Each farm has about 4 supervisors plus 2 experienced tractor drivers and they are harder to source. PMG Agriculture is trying to recruit some of the manual labourers as some have a lot of experience (e.g. mechanics). They would like to be able to recruit staff for 6 months, but ideally they would stay on for at least 12 months and move to each farming location with the seasons.

Paul is worried about how award modernisation will affect his business. Backpackers want to work for more than 40 hrs/week. They want to work more so that they can earn money and move on. Rural workers need flexibility. Workers earn approximately \$1000/week and earnings are a combination of an hourly rate

and tonnage picked. A harvest manager is employed to check that picking is done properly.

There is accommodation for 50 on-farm.

PMG Agriculture embraces technology (e.g. GPS – global positioning system – precision farming) and is involved in research and development trials. There is total traceability: who picked each bin, what block it came from and time it was picked.

3.4 Seven Fields (Eumaralla and Packing Shed), Katherine

Overview of Seven Fields^B

Seven Fields is a privately owned agribusiness group with hands-on experience in growing, harvesting, packing and marketing fruit produce. They also act as managers on behalf of other investors in managed investment projects.

The company has its roots in having established a 640 acre vineyard on behalf of a number of small investors in South Australia in 1994. Now the company oversees the management of vineyards and almond orchards for over 800 investors covering more than 4000 acres.

Seven Fields has evolved from a promoter and manager of investment projects to one which owns and operates its own citrus and mango farms (located in the Sunraysia region of Victoria and in Katherine). Seven Fields took control of operations on both its Katherine and Sunraysia farms in 2008. They employ over 20 permanent staff across both properties, and utilise up to 200 contracted workers on a seasonal basis. The Mildura office is the central base for their operations team, who oversee the management across their properties in Sunraysia as well as Katherine.

Seven Fields owns two mango and citrus properties in Katherine: 'Eumaralla' and 'Goldings'. 'Eumaralla' and 'Goldings' grow approximately 127 hectares of mangoes (29,000 trees), 14 hectares of lemons and 27 hectares of red grapefruit. With over 400 hectares of unplanted land and an abundant water supply, Seven Fields is currently looking at expanding their production into other varieties.

The company also owns and operates its own packing facility, which is located on the border of the Katherine township. The state of the art facility is capable of processing large volumes of fruit from the Katherine region, which includes both Seven Fields' own produce and that of surrounding properties. The facility is the largest and most up-to-date of its kind in the Katherine region, and one of the only packing sheds in the Northern Territory that is fully air-conditioned. It is capable of processing in excess of 15,000 mango trays per day, and is also capable of packing other produce varieties, including citrus.

^B www.sevenfields.com.au

Produce grown in Katherine by Seven Fields includes: Mangoes (Kensington Pride and R2E2) and Citrus (Lemons, Red Grapefruit – Flame, Rio Red).

The Seven Fields head office is located in Brisbane (finance and marketing functions).

Discussions with Seven Fields staff

The study tour group met with Andy Handcock (Farm Manager) at 'Eumaralla' and Tom Armstrong (Packing Shed Manager) at the packing shed.

At 'Eumaralla' mangoes and citrus are grown. There are 4,500 Eureka lemons plus 3,000 planted in May 2009. Of the red grapefruit 4,500 trees are Flame's and 4,500 are Rio Red's. There are 29,000 mango trees: 1,000 R2E2; 3,000 Honey Gold; remainder being Kensington Pride.

Seven Fields have their own packing facility for mango and citrus. They also pack for smaller growers. They have to be very careful who they pack for as there are strict conditions for sending product into Western Australia and exporting to Asia.

Mangoes need to be picked before they are ripe so that fruit bats do not eat them (dry matter and then sugar are tested as indicators of maturity). There is a very short window to pick mangoes as they have to be picked before the wet season (late October). There is 6 weeks maximum from start of harvest to the end. The fruit on top gets sunburnt and harder to pick so fruit higher than 4 m is left on the tree. In the field washing water has to be changed every 4 bins due to sap build-up (sap causes burns). The packing unit is self-propelled with an average gang of 5 people which pick about 20 bins/day (450 kg/bin), working from 6.30 am to 4.00 pm.

There is no problem in Katherine getting labour for harvest (backpackers). Demountables are brought in for staff to live in. There is a kitchen, amenity block and laundry on-site. The contractor who organises casual labour also organises a chef to cook for staff.

Seven Fields mangoes are sold under the 'Sweet Cheeks' brand. They packed 270,000 trays last year which were sent mainly to the markets in Sydney and Brisbane. They are also sent to Perth, Melbourne, Adelaide and exported. It costs \$200/pallet for transport to Sydney. There is a plan to plant more 'Honey Gold' mangoes as they ripen later in the season and this will allow the packing shed to operate for longer. The packing shed currently operates for 6 months/year.

All bins have a bar code for traceability. 40 – 50 bins/hr are processed. 150 pallets can be packed in 8 hours (128 trays/pallet). Mangoes are treated with dimethoate as a post-harvest control of fruit fly (requirements to send to some states). To send mangoes to Western Australia and Tasmania, and to export, the packing shed needs to be certified to be Mango Seed Weevil free. A couple of Katherine businesses (including Seven Fields) have this accreditation and they have to cut

over 4,600 fruit through the seed annually under Quarantine supervision to maintain freedom status^C. No packing business in or around Darwin can have this accreditation because they must be from an area outside 50 km from a known occurrence of the pest^C.

2008 was a fantastic mango season. \$2 M worth of mangoes was put into Woolworths in 2 days at one point last season.

Mango trees are 4 m apart within the rows and rows are 7 – 11 m apart (10 – 11m is ideal). Pruning occurs after harvest. There are enough bees for pollination. Water requirements vary from year to year. An 'Enviroscan' is used for irrigation scheduling. Under-tree sprinklers are used for watering/fertigation. From the start of flushing to the start of picking about 4 – 5 sprays are applied to the trees (e.g. copper, Mancozeb fungicide). Post-packing diseases are the biggest problem (e.g. Anthracnose). Grasshoppers were a problem at the start of flushing in 2009. Insect pests are more of a problem closer to Darwin (due to humidity).

Lemons are picked in mid-December. There is a 2 – 3 week window at this time where they are the only people in the world who pick lemons. Lemons are sold domestically as the supermarkets cannot get enough over Christmas. Lemon trees do not receive any water (rainfall or irrigation) from the end of March to August. Red grapefruit are harvested about a month after the lemons. The plan is to start exporting red grapefruit. No insecticides are used for pest control in citrus, but some oils are used.

At 'Eumaralla' they have planted some trial avocados (Hass variety). They have found that this is not the variety to be grown in the region and have planted some Shepard variety. They are also trialling mandarins and have a small stand of African mahogany.

There are 400 ha of cleared land at 'Eumaralla' that they are currently share-farming.

The soil at 'Eumaralla' is very sandy (about 80 m of sand).

3.5 Ballongilly Farms, Katherine

Ballongilly Farms is owned and managed by Peter and Dianne Marks. It is a true family business. Peter is a Director of the NTHA Council and is also on the review committee for water allocations plans in Katherine.

There are 20,000 mango trees on Ballongilly Farms. All mango farms in the Katherine region have more than 5,000 trees (smaller plantings are found on the Darwin rural lifestyle blocks). About 1/3 of the trees at Ballongilly Farms are still coming into production and as they do some older trees will be removed.

^C www.nt.gov.au/d/Primary_Industry/

Originally from Murray Bridge in South Australia, the Marks' started farming at Ballongilly Farms in 1983, growing potatoes, onions and rockmelons. In the late 1980's and 1990's they exported rockmelons. The first mango trees were planted in 1985, followed by another planting in 1989. Major flooding occurred in 1998 and no more rockmelons were grown after 1999.

Ballongilly Farms is planted up to full theoretical development and so has high security water. They have an allocation of 8.6 ML/ha but the maximum they have used recently is 3.5 ML/ha. It has been wetter than average over the last 10 yrs (1100 mm per annum for last 10 yrs).

Most trees on Ballongilly Farms are out of the water in the wet season, some in flood water for 2 days.

There is 3 full-time staff at Ballongilly Farms. Contractors are used for harvest (October/November). As well as contractors, 'Workabout Australia' (www.workaboutaustralia.com.au) is used to advertise jobs at Ballongilly Farms. The proposed new labour laws are a concern for Ballongilly Farms. The NT has used the Federal minimum award rate in the past. The proposed new award would add \$150,000 – 180,000 to the cost of labour over the 4 – 5 week harvest period (for 60 hrs/week). On-farm they can house about 70 workers.

Trees are fertigated with NPK on-ground after harvest. A growth regulant is used on some parts of orchard to slow growth in the wet season. Hedgerow pruning is used and needs to be completed by the end of January so as to not disrupt flowering for the next season.

It is predicted that 2009 will be a big harvest and therefore there will be a need to focus on picking grade 1 mangoes. Standards must pick up when there is a high volume of fruit.

Mangoes are sent to all major markets around Australia with 50% going to Sydney. The Marks' have 20 – 30 year relationships with their agents. NT mangoes are very important to an agent's business as they are harvested before Queensland mangoes. They use long-time carriers to transport their produce. They feel it is all about relationships with carriers and agents.

Ballongilly Farms pack their own mangoes. They average 1000 – 1200 tonnes (130,000 – 140,000 trays) over 6 weeks. 25 people work in the packing shed and can pack 5000 X 7 kg trays/day. There is approximately 10 – 12 trays/tree. Last season it was only 5 and this year it will probably be 14 – 15.

Gas is used at the markets to assist with ripening, depending on the time of the season. Some people gas before transit but this can lead to problems of ripening in transit. Later in the season there is more mature fruit coming through the system.

Kensington Pride mangoes are grown at Ballongilly Farms for the domestic market. Some R2E2's have been planted for the export market. They will start being picked

next year. Ballongilly Farms is Mango Seed Weevil free. No PBR (Plant Breeders Rights) varieties are grown at Ballongilly Farms.

Peter believes that an industry can only grow by having good people involved. Better efficiencies should be made through new varieties and an orderly marketing system is required. The mango industry needs assistance to break the export market (e.g. India would love to import Australian mangoes but it is a long process to get them there). Variety politics may impact the mango levy. There is a need to start educating the consumer about different varieties, just as the apple industry has done.

3.6 Tropical Forestry Services Limited, Kununurra

Tropical Forestry Services Limited (TFS) has 3,500 ha of Indian Sandalwood (*Santalum album*) trees established in the Kimberley region of WA. It is the largest single crop in the Ord River Irrigation Area (ORIA). TFS is the largest grower of Indian Sandalwood in the ORIA. ITC Limited also grows Indian Sandalwood in the region as well as a small number of private operators.

TFS Corporation is a Western Australian company listed on the Australian Securities Exchange.

Indian Sandalwood is the most prized of all Sandalwoods and is now a threatened species in the wild in Indonesia and India. It is one of the world's most valuable hardwoods, selling for over A\$100,000 per tonne of heartwood (Tamil Nadu Forestry Department Auctions)^D. It is renowned for its fragrant and medicinal properties and has a wide range of uses in the global fragrance, incense, worship and carving industries^D.

There are 800 ha at the Packsaddle farm on black cracking clays. The majority of trees are flood irrigated (3 km run; 1 in 2000) and there is a small number drip irrigated. Water is recycled at Packsaddle. It is the only farm in the system to recycle as water is cheap and there has not been any justification to recycle (\$9/ML is the break-even point for recycling).

Indian Sandalwood is a parasitic plant (it does not thrive when grown by itself). Most of the best hosts are leguminous. Corkwood is used as a short-term host. Other hosts include Cassia and Indian Rosewood (*Dalbergia latifolia*). African Mahogany is a bad host as it is too vigorous and provides too much canopy cover.

The heartwood is what the market is interested in. 50% of premium perfumes contain Indian Sandalwood. TFS already has agreements in place to supply Lush Cosmetics and a French cosmetics company. Because much oil is obtained from poached trees TFS can promote themselves as being a supplier of ethical

^D www.tfsltd.com.au/sandalwood-products/about-sandalwood/

Sandalwood. TFS feels that the industry will avoid unethical oils in the future and that the outlook is good for them. Sapwood is used for incense sticks.

TFS has purchased a distillery in Albany (Mt Romance) and will build a processing plant in Kununurra in the future.

Most of the heartwood is in the bottom 2 m of the tree. The whole tree is ripped out at harvest, including the roots. Oil production in the heartwood begins when the tree is 6 to 7 years old. The plantation is on a 15 year rotation (quick due to sunshine and water available).

In August irrigation occurred on a 5 week cycle. It will move to a 4 week cycle as it gets hotter. Pits are dug to determine when to irrigate. The soil is dried out between irrigations in order to get good root growth. Trees under drip irrigation are irrigated daily. New plantings are being established with drip irrigation. Hopefully the drip tape will last 15 years. There is an emitter every 50 cm (1.6 L/hr). Drip irrigation costs \$7000/ha to set-up (with pumps) while flood irrigation costs \$1000/ha. A benefit of drip irrigation is that there is access to the plantation all year round (except in the wet).

Indian Sandalwood in the ORIA is a new industry so there is a lot to learn (e.g. nutrient requirements, host selection). It was only commercialised in 1999. TFS have now collected their first seed for genetic selection. It is still a wild population and usually there is 30% improvement in first selection (if other forestry operations are an indicator). TFS says they are now self-sufficient for seed which is reactivated after being in cold storage. After the nursery trees are hardened up for 6 weeks before planting.

It is very expensive to establish an Indian Sandalwood plantation.

TFS started as a small business in 1999 and was publicly listed in 2004. TFS is moving away from the managed investment scheme model (MIS). TFS has direct investors (33% of plantings are with Middle Eastern partners).

Nutrient requirements are being learned. Foliar trace elements are applied by aircraft. The hosts must be kept healthy. Trees are pruned to age 4.

Pests and diseases are a bigger problem for the hosts as Sandalwood oils is unpalatable and is in the leaves. Sap sucking insects such as mites and aphids are a problem. Aphids are a major problem in the ORIA every 1 in 5 years, especially in the younger plantations.

TFS has 40 permanent staff at Kununurra. There is 150 staff during planting with a reliance on backpackers. All planting needs to be completed by the start of July.

TFS is ISO14001 accredited.



Inspecting research trials at Berrimah Research Farm, Darwin



Guinea fowl are used for pest control in the rambutan plantation at Fruitopia, Darwin



Harvesting at Dave and Ruth McCormack's farm, Darwin



Andy Handcock explaining mango production at 'Eumaralla', Katherine



Removing dust from watermelons at 'Red Dirt', Katherine



On a tour of the Seven Fields packing shed, Katherine

3.7 Oasis Farms, Kununurra

Fritz Bolten and his family have been farming in Kununurra since 1981. He is currently farming 900 ha. Fritz recently lost 300 ha of rented land to sandalwood as he could not compete with the rent that sandalwood companies are offering to pay landholders. The whole farm is flood irrigated. Fritz is a Board Member of the Ord Irrigation Co-operative (OIC).

Crops grown: pumpkins; watermelons; hybrid seed (sorghum and maize for Hylan Snowy River Seeds); popcorn (for seed); chickpeas (human consumption); chia.

Sugarcane was grown at Oasis Farms until 2 years ago. The sugarcane industry in the region declined with the loss of the sugarcane mill (the mill was not world competitive).

Employees: 7 – 9 FT

Chia is a completely natural super seed, originating in South America, grown in Australia by The Chia Company. It is very hard to grow, requiring specific climatic conditions. Chia is the highest known plant based source of Omega 3 essential fatty acids. It is high in dietary fibre, protein, antioxidants and vitamins and minerals. More information is available at: www.thechiaco.com.au

There are now 1000 ha (60 % of world production) of chia grown in the valley and Fritz has been growing it for 5 years. A challenge for the Kununurra farmers has been learning how to grow chia as there is no background information. An advantage has been that aphids (a major pest of the region) do not like chia. Chia is direct seeded. It is windrowed and then picked up. Yields are approximately 1 tonne/ha but the growers need to increase production by 40 – 50%.

Fritz believes that “marketing is the most important thing”, if chia is to be a successful crop as it is currently largely unknown to consumers. Chia is an excellent ingredient for bread and a bread containing chia should be picked up by Coles in the future. The Chia Company is also looking to have it as an ingredient in muesli bars and cereals. They plan to process it locally in the future.

At Oasis Farms they are currently growing 1 crop per year. They are investigating alternative crops such as rice that will enable them to grow 3 crops every 2 years.

Insects are generally controllable in the region in the dry but not in the wet. A clean fallow is used so as to keep the farm insect free. From a management perspective the wet season can be very busy.

Pumpkins types grown are Jarrahdale, Butternut and Japanese. The main pest and disease problems are powdery mildew and mosaic virus spread by aphids. This season aphids destroyed the pumpkin crops (spraying did not help).

Watermelons are grown in partnership with a group in Mataranka (NT). They are sent to all markets nationally. Transport has been cheap in the past as Oasis Farms

benefitted from back-freight but this is changing as trucking companies get more loads out of the NT. Freight is \$170/tonne to Sydney.

Fritz uses partnerships to the benefit of Oasis Farms. His knowledge is in agronomy while the expertise of his partners (at Mataranka and also his neighbour) is in marketing. Each partner has identified their skills and they have taken responsibility for those areas that they have expertise.

There is a grain pool at the local co-operative through which Fritz sells his chickpeas.

Birds cause little damage to the chia but broilgas and geese do cause damage to chickpeas and cockatoos damage hybrid seed crops. Bird control costs approximately \$10,000 per year.

3.8 The Hoochery and Farm, Kununurra

Spike Dessert farms and operates a distillery, producing over 50,000 bottles of Ord River Rum a year. The decision to diversify was made in 1995 with the onset of sugar cane being grown in the Ord River Irrigation Area (ORIA).

Spike farms from April to September and grows mainly seed crops (e.g. lettuce, corn, sweet corn, coriander), but also onions, melons and pumpkins (fresh and seed). His crop mix depends on what the customers want. Currently growing seed crops for Pioneer, Spike has grown seed for most Australian seed companies. Indian Sandalwood is also grown to produce seed for TFS.

Onions and pumpkins are sent to the Perth Markets.

Niger (an oilseed like sunflower) is grown for small feed stores that prepare bird seed mixes.

Spike feels that there is probably less insect pest pressure in Kununurra than in most areas of Australia. Heliothis became a major problem in cotton because it was grown 5 – 6 years in a row. There is a problem with not having chemical registration and permits for the smaller crops he grows, e.g. coriander.

3.9 Western Desert Produce, Kununurra

Peter Pegg has been farming in Kununurra for 28 years and grows 100 – 120 ha of green beans annually. All beans are sent to a single agent (who supplies Coles) in Perth. He has 2 X 90 ha blocks.

All green beans are machine harvested between June and September. It takes 60 days from plant to harvest. Price received for green beans needs to be \$3 – 3.50/kg.

Other crops grown are sweet potatoes (problem with the black clay sticking though), sweet corn, chickpeas and pumpkins. Aphids and mosaic virus can be a major problem in pumpkin crops. Weeds are generally not a problem. Green beans are sprayed for thrips (plague) and grubs 2 – 3 times/crop. Western flower thrips are not found in the area. Peter uses a scout from the Ord River District Co-Op for crop monitoring each week.

The majority of the farm is flood irrigated (90%) with the remainder under drip.

Peter says that you can grow anything in Kununurra, the issue being that you have to get produce to a market. It is difficult to export due to the travel required just to get produce to a capital city first. For green beans ozone is used in washing water and cool rooms to increase storage life. Freight is \$175/pallet to Perth which is inexpensive and travel time is 2 – 4 days. 40 pallets of green beans are sent to Perth each week. Pumpkins (butternuts) are sent to a single agent in Melbourne Markets.

Land in Stage 1 of the Ord River Irrigation Area (ORIA) now sells for up to \$16,000/ha. The Indian Sandalwood companies have put upwards pressure on land prices.

There are no problems getting labour as there are plenty of backpackers in the area.

3.10 Ivanhoe Farms, Kununurra

Darryl Smith farms 320 ha at Kununurra, growing rockmelons, honeydew melons and pumpkins (Jarrahdale, Butternut, Japanese) in rotation with chickpeas and belotti beans.

Chickpeas are grown for human consumption and they are sold in Sydney and Melbourne. Extra produce is sold to food processors. A premium price is received for a 10 mm size pea and 70 – 80% of the crop is this size. All chickpeas are pooled and sold through the local Co-Op. Each year growers (approximately 12) decide how much they are going to grow and come to an agreement.

For his horticultural crops Darryl sends produce mainly to Melbourne, but also to Perth, Adelaide and Sydney. He uses 2 agents in each city. He is part of a group of 3 growers who use a local marketer to organise transport and marketing. Each of the 3 growers sell under their own brands. Using a marketer increases costs but it works out well for the group as it is important to focus on your strengths.

Melons are planted sequentially and each planting is picked every day for about 14 days. 1000 boxes/ha of rockmelons are picked. Rockmelons have to be picked at the right time whereas honeydew melons can be left a day or two. At busy times the focus is on picking rockmelons and honeydews and pumpkins are picked on non-busy days. They are picked into blue bins, washed, brushed and graded then palletised and put into the cool room.

Flood irrigation is used but drip irrigation might be used in the future due to water quality issues.

Aphids are the major pest problem. Melon thrips are also present in Kununurra and so Quarantine has to inspect produce before it is transported to South Australia.

A contractor is used to supply bees for pollination in melons.

The property is mainly on black cracking clay but there are a few sections of red soil.

'Ivanhoe Farms' is SQF2000 accredited.

Land value has increased significantly in the area in recent years. Darryl gave the example of non-improved land (20 acres) increasing in value from \$700,000 to \$1.2M in 2 years.

At 'Ivanhoe Farms' there is also a fresh produce store and a café that sells meals prepared with local produce.

3.11 Kimberley Produce, Kununurra

Lachlan Dobson moved to Kununurra with his family from the Dandenong Ranges (Victoria) where they were growing berries in 1995.

Kimberley Produce grows red grapefruit and mangoes. In 2002 they raised capital through investment by the Rewards Group Ltd (www.rewardsgroup.com.au) in Kimberley Produce.

Red grapefruit are harvested from March to the end of May. Kununurra is the only place in the world where they are harvested at this time. Mangoes are harvested from the end of October to the end of November.

Mangoes are planted 10°N of E to minimise sunburn. Kimberley Produce has 120,000 mango trees, planted at a density of 315 trees/ha. Kensington Pride and R2E2 (specifically for export to SE Asia) are grown. Mangoes were chosen for their export opportunity. Variety trials are underway to try and find a better product than the R2E2's.

Contractors (from Robinvale, Victoria) are used for harvest. The award is \$17.50/hr but they pay \$20/hr to help with accommodation costs. Accommodation is \$125/week in the backpacker hostels. They rely on contractors as it ensures a more stable labour supply than backpackers.

Mango production is an expensive operation with labour requirements also for pruning, spraying and mowing. Trees are hedgerow style so that they do not have to rely on cherry pickers. Additionally freight for inputs such as fertiliser is very expensive. When Stage 2 of the Ord River Irrigation Area (ORIA) is developed there will be more business for local supply stores which will assist with input costs.

When in full production they will be able to pack 1.2 M trays of mangoes/yr. Kimberley Produce has the critical mass to make the packing shed viable (e.g. they get a better deal on boxes).

Kimberley Produce has sent mangoes by sea to Europe (42 day trip). This is possible because their post-harvest quality is good as they receive no rain between flowering and harvest.

Kimberley Produce has a water allocation of 6,500 ML for 400 ha. They have reticulated irrigation. It has been set up so that they can isolate parts of the irrigation system (1/7) if they have a blow out. Mangoes require 11.9 ML/ha/yr. An issue in Kununurra is that there is no incentive to be more water efficient. Water quality is good. Rainfall in Kununurra is 800 mm/yr and evaporation is 2.5 m/yr.

The farm has black self mulching clay with red transitional soil which drains better. Water and fertiliser supply to trees is used to manipulate flowering.

Kimberley Produce has accreditation for SQF2000, Global Gap and ISO14001.

In 2003 land prices were \$7000/ha. They are now \$16,000/ha where there is more sandy soil. Red grapefruit are grown on the more sandy soil as they are harvested in the wet. Red grapefruit grown in Kununurra are sweet due to the high heat units. However it is hard to grow the domestic market as people remember the acidic grapefruit of the past. Money is being spent on in-store displays.

Japan imports 375,000 tonnes of red grapefruit per year. Kimberley Produce is spending money trying to get protocol established so that they can supply the Japanese market. Lachlan feels that there is a lack of research and development (R&D) resources in Australian agricultural departments. His father had a Churchill Fellowship to research grapefruit production in the USA and South Africa.

Lachlan is the Chairman of the regional biosecurity group which consists of growers and staff from the Agricultural Department. They have developed a regional biosecurity plan.

The packing shed is 4200 m². To build the shed, cool rooms and grader it cost \$5.5 M. It is used for about 6 months/yr. It has also been designed for rockmelons so it can be used for an additional 3 months.

There is full traceability of product and all bins have barcodes. Bins are read and weighed. There are separate lines for mangoes and red grapefruit as the descaling required for grapefruit is too rough for mangoes. All packers have a tag and who packed each box is recorded. It is known if someone prints a label and does not put it on a box. It is possible to recall a batch through the use of barcodes. As soon as a pallet is scanned the marketer in Melbourne knows that it is in the coolroom.

The packing shed is air-conditioned to 24°C when working. It is very humid when they are packing so fruit needs to be dried. About 120 – 150 pallets/day are packed

at full production. At full production 150 people will be working in the packing shed.

Kimberley Produce has 7 permanent employees. It is hard to compete with the wages being offered at Argyle Diamond Mine (\$102,000/yr for 2 weeks on, 2 weeks off). It has been possible to get better workers as unemployment has increased.

4 NON-FARM VISITS

4.1 Berrimah Farm Research Station, Darwin

Berrimah Farm Research Station is part of the NT Department of Regional Development, Primary Industries, Fisheries and Resources (DRDPIFR). The study tour group received a very informative talk from A/Director of Plant Industries Stuart Smith and Senior Plant Pathologist Barry Conde, detailing the history of horticulture in the NT as well as learning about research programs on the research station. A Quarantine Officer also spoke with the group.

There was not much horticulture in the Darwin area before 1990. In 2007^E in the Darwin Region fruit production was worth \$28.6 M (4,325 ha) and vegetable production was worth \$13.4 M (1,290 ha). In the Katherine Region fruit was worth \$16.7 M (2,100 ha) and cucurbits was worth \$14.8 M (371 ha). In Central Australia fruit was worth \$6.8 M (280 ha) and vegetables were worth \$0.60 M (1 ha).

Vegetables grown in the Darwin Region include bitter melon, hairy melon, luffa, winter melon, okra, snake beans, taro, kangkong, cucumber, zucchini, squash and pumpkins. Most vegetables are produced by growers with a Vietnamese background. Cambodians are starting to farm in the Darwin Region.

Watermelons, honeydew melons and rockmelons are a major crop in the NT.

Mangoes are the major tree crop. Early in the season prices can be as high as \$90/tray whereas \$20/tray is more common in September/October. There is a problem in Katherine with 3 MIS mango properties having gone broke. The Government is doing everything they can to get the plantation through to harvest so that there is not a lot of fruit on the ground, adding to the spread of disease.

Table grapes are grown at Ti-Tree but there are problems with nematodes.

There is a lot of potential in Central Australia if water can be supplied. There is a hydroponic lettuce grower at Alice Springs.

The NT specialises in winter production (counter-seasonal to Southern Australia).

^E NT Government Information Sheet IS60, NT Plant Industries Profile 2007



A Tropical Forestry Services Indian Sandalwood plantation, Kununurra



Establishing a new Indian Sandalwood plantation, Kununurra



Chia production at Oasis Farms, Kununurra



A section of Lake Argyle, Kununurra



The Diversion Dam and Lake Kununurra, Kununurra



The Ord River Irrigation Area, Kununurra

Research is being carried out on a new biocontrol agent for the weed of national significance, *Mimosa pigra*. If the biocontrol agent can complete its lifecycle on any other plant it cannot be released.

Work is being done to protect avocado germplasm for climate change.

The study tour group were shown a trial, investigating grafting snake beans to control Fusarium wilt. Fusarium wilt is a serious problem of snake beans grown in the Darwin area. It is caused by a soil-borne fungus, *Fusarium oxysporum* f.sp. *tracheiphilum*, which infects plants through the roots, especially if plants are damaged by implements or are infected by root knot nematode. The fungus is also seed-borne. Research has shown that a variety of cowpea called Iron is resistant to snake bean Fusarium wilt in Darwin and can be used as the rootstock for snake beans. More information can be found in the NT Government Agnote No: I61, 'Grafting Snake Beans to Control Fusarium Wilt', which is available at the website: [www.nt.gov.au/d/publications/index.cfm?fj=Snake Bean](http://www.nt.gov.au/d/publications/index.cfm?fj=Snake%20Bean)

There is a wide range of publications available about growing horticultural crops (e.g. growing notes, pest and disease management, statistics) in the NT at the website: www.nt.gov.au/d/publications/

The document 'Information for Prospective Investors in Agricultural Enterprises in the Northern Territory (July 2009)' published by the NT Government is designed to lay out a pathway for proponents wishing to develop enterprises by identifying the legislation and regulations relevant to agriculture, outlining the 'rules' within those frameworks, summarising the role of various agencies and providing further contacts and information sources. It is available at the website: www.nt.gov.au/d/Content/File/p/pi/AgriBro.pdf

4.2 Northern Territory Horticultural Association, Darwin

Overview of the NTHA^F

The Northern Territory Horticultural Association (NTHA) is the peak representative body for horticulture in the Northern Territory and represents horticultural enterprises in Darwin, Katherine, Alice Springs, Kununurra and the areas surrounding these regions.

The Northern Territory Horticultural Association (NTHA) is an industry organisation that is directed by a Council whose voluntary members and office bearers are elected by members of their relevant industry commodity groups. The Northern Territory Horticultural Association is an incorporated body.

^F www.ntha.com.au

Commodity groups under the membership banner are as follows:

- Banana Growers Group
- NT Citrus Growers Association (NTCGA)
- North Australian Cut Flower Growers (NACFG)
- Katherine Horticultural Association Incorporated (KHA)
- Nursery and Garden Industry Association NT (NGINT)
- Northern Territory Mango Industry Association (NTMIA)
- Organic Producers Association of NT (OPANT)
- Tropical Exotic Fruit Growers Association (TEFA)
- Table Grape Growers
- Vegetable and Cucurbits Growers Group
- Associate Women In Primary Industries (WIPI)

The NTHA is recognised by government and non government organisations and all members have a formal conduit to contribute to debates on issues that affect our industry locally and nationally.

As the peak representative body for horticultural industry groups in the Northern Territory, NTHA is building strong foundations and alliances to assist producers build their capacity to succeed in highly competitive and quality focused markets.

Discussions with NTHA Staff

The study tour group met with Kate Peake (Executive Officer) and Tim West (Environmental Development Officer) to discuss the activities of the NTHA.

The NTHA represents vegetable growers', however not many are members of NTHA. Mangoes are the biggest commodity group of NTHA.

In August 2009 the focus of NTHA activities was award modernisation, water management (the NT receives a lot of water but it is an issue because rural areas use groundwater), promotion of fruit and vegetables, industry development activities. The NTHA focuses on horticulture in Darwin and Katherine.

The minimum wage is \$17.50/hr plus a casual loading of about 25%. Discussions about Award Modernisation has mobilised the rural sector (a large number of submissions have been made).

Sustainable development is of critical importance in the NT. There is strong growth anticipated for the NT industry aims to avoid the problems that are occurring in Southern Australia (e.g. the Murray Darling Basin), that is learn from past mistakes. Many see the water in the NT and think that there is a lot and believe that the NT could be the food bowl of Asia. The yearly top up of aquifers is not well understood. Bore numbers have increased significantly and salt intrusion is a problem in some areas.

There are not a lot of generational farmers in the NT which has positives and negatives. A positive is that they are receptive to information about more sustainable farming systems.

Soil variability is significant even over 5 acres. Kandosols are the main soil type of the Darwin region, which are very low in carbon. Water quality is good but there are iron and calcium issues.

The water allocation process is a lot more complex in Darwin than Katherine. This is because there are 5 acre rural residential lots with large numbers of bores. Domestic water consumption in the NT is considerably higher than elsewhere in Australia. Carbon footprints are very high in the NT and an education program is needed. In a population of 80-90,000 there are approximately 80 ethnic groups.

In 2005 the NTHA gained funding through the National Landcare Program for project on 'Best Practices for Sustainable Land Use in the NT'. The project has been driven by growers and a consultative process used. The project was a collaborative effort by stakeholders in the NT Horticultural and Agricultural Industries, including growers, researchers, extension/regulatory officers, non government organisations (NGOs) and educators.

An output of the project is the 'NT Sustainable Land Use Guidelines' which are a non-regulatory set of generic guidelines designed to provide land managers with a means of self-assessing their practices against Industry "best practice"^F. The guidelines enable land managers to work towards developing environmental management plans for their enterprises and will assist with attaining environmental accreditation for sustainably grown produce. The guidelines are comprised of an introduction booklet termed 'Sustainable Agriculture' and 13 key area booklets covering land management issues identified by stakeholders during the project: air, biosecurity, carbon, climate, chemicals, ecosystems, energy, fire, nutrients, soils, water, waste, weeds. The guidelines will be implemented through workshops.

4.3 Water Management Branch (NRETAS), Katherine

Water Management in the NT^G

The Water Management Branch has been set up to implement the primary piece of water resource legislation, the Northern Territory Water Act. The Water Act is an Act to provide for the investigation, allocation, use, control, protection, management and administration of water resources, and for related purposes.

The Water Management Branch is responsible for the development of Water Allocation Plans across the Northern Territory. Water Allocation plans are statutory instruments, declared under the Water Act to ensure that water extraction is undertaken in a sustainable and equitable manner with priority given to environmental and cultural flows to protect our unique environment.

^G www.nt.gov.au/nreta/water/manage/index.html

The other main function of the Branch is to ensure that Licensing, regulation and compliance are undertaken in a thorough and transparent manner.

Presentation

The study tour group received a presentation about the 'Water Allocation Plan for the Tindall Limestone Aquifer, Katherine' (released 19 August 2009) from Water Resource Planner, Lachlan Kelsall. Key points of the presentation are given below.

Responsibilities of the Water Management Branch:

- Manage all ground and surface water;
- Licensing and regulations as per NT Water Act (permits for bore construction, issuing of licenses to extract water); and
- Planning and implementation of Water Allocation Plans.

In the NT there are 4 drainage divisions:

1. Gulf of Carpentaria
2. Lake Eyre
3. Western Plateau
4. Timor Sea

There are 7 major aquifer types, mainly sedimentary rocks.

Aquifer: body of rocks or sediments which stores, conducts and yields water in significant quantities.

Need to manage aquifers for the dry season. They fill in the wet. In the northern areas of the NT aquifers keep rivers flowing all year round (e.g. Katherine, Mataranka and Daly Rivers).

Around Katherine is a limestone aquifer capable of yielding usable quantities of ground water to boreholes and/or springs.

The main reason for managing groundwater is that aquifers feed surface water. They need to be managed so that late season river flow is not affected.

Average annual rainfall in Katherine is 1100 mm/yr, which falls from December to April. Annual rainfall ranges from 600 – 1500 mm/yr. Northern Australia has received above average rainfall in the last 10 years, compared to below average in southern Australia. The question is will it continue to get wetter in the north?

The water control districts in the NT, where a licence is needed are:

- Darwin Rural;
- Daly Roper (includes Katherine);
- Alice Springs;
- Ti Tree;
- Western Davenport
- Tennant Creek; and
- Gove.

A licence is not required in the large pastoral areas.

There has been increasing pressure to develop Water Allocation Plans. Katherine has been completed and Ooloo and Mataranka will be completed in 2010. Benefits of the 'Water Allocation Plan for the Tindall Limestone Aquifer, Katherine' include^H:

- The allocation of 73 licences with defined level of security;
- Water Trading in the Plan Area;
- The introduction of standards and procedures to protect water quality;
- Sustainable management of discharge from the Tindall Aquifer to the Katherine River;
- Consideration for Indigenous uses and values; and
- Protection for groundwater dependent ecosystems, such as the Katherine Hot Springs.

An Implementation Strategy will be developed for the monitoring, investigation, and compliance of the Plan. This will be an ongoing process and the information gained will be used to improve the Plan at the 5 and 10 year review.

An aim of the Water Allocation Plan is to give landholders protection by giving them high security water for existing plantings. Low security water is given to latecomers (developments post 2003). Licences are free and are given out for a purpose, e.g. mangoes at full development. At the 5 and 10 yr reviews landholders that have not fully developed will have their allocations reduced.

Additionally water planners wanted to ensure that landholders received their allocation (full allocation at least 7 out of every 10 years). In a wet year 13% is for consumptive uses and the rest for the environment. In drier years 20% will be allocated to consumptive uses. In areas where research has been done it can be changed (up to 20%).

Average recharge of the aquifer is 74,000 ML.

Recreation adds more dollars to the local economy than agriculture.

4.4 Ord Irrigation Co-operative Ltd, Kununurra

Ord River Irrigation Area (ORIA)^I

The Ord River Irrigation Area (ORIA) delivery system was built in the early 1960s and it was considered state of the art technology. Very little was done to introduce new technology into the system through the 70's and 90's.

Today water efficiency and channel automation are key priorities. Automated Channel Gates are gradually being introduced throughout the irrigation area in key

^H www.nt.gov.au/nreta/water/kwac/index.html

^I www.ordirrigation.com.au

locations for better system management, more accurate water accounting and improved delivery system efficiency.

The Ord Dam provides a reliable storage of 11,000 GL in Lake Argyle of which 335 GL are allocated to Stage 1 of the Ord River Irrigation Area.

Water is released from Lake Argyle through the Ord hydro power supply and through controlled releases through the Water Corporations regulating valves at the base of the dam. An additional flow is also released through the Spillway Plug into Spillway Creek to provide a dry season flow.

These combined releases comprise the inflow into Lake Kununurra which, through the operation of the Kununurra Diversion Dam, provides the head required to supply the gravity channel network of the Ivanhoe Plains system and the Packsaddle pumping station.

Water is gravity fed to farms via a series of earth lined open supply channels, using a range of flow regulator structures.

Ord Irrigation Co-operative (OIC)¹

The Ord Irrigation Co-operative (OIC) was formed to operate and manage the business of providing water and drainage services to the farms within Stage 1 of the ORIA as part of the transfer of the irrigation assets and business from the State to the growers. The OIC is owned by the growers and is a not for profit organisation whose irrigation shares are determined by the level of funding required to manage, operate and maintain the infrastructure. A Board comprising 6 shareholder directors is responsible for the governance of the organisation.

The OIC's Mission Statement is: "To foster prosperous irrigated agricultural and horticultural industries in the Ord Irrigation District (Western Australia) through the delivery of agreed Irrigation and drainage to all customers in an efficient, environmentally sustainable and financially viable manner."

Ord Irrigation Asset Mutual Co-operative (OIAMC)¹

The Ord Irrigation Asset Mutual Co-operative (OIAMC) was formed as the company that owns the irrigation assets that were transferred to the growers. The OIAMC is also owned by the growers and collects an asset levy which is intended to provide an adequate source of funds to undertake any capital works required. A Board comprising 3 share holder directors is responsible for the governance of the organisation.

Farming Systems in the ORIA¹

The irrigation and drainage infrastructure was designed and constructed in the early 1960s. The first five (trial) farms were released in 1962 with commercial farming commencing the following year. Farm blocks are typically in the range 260 to 360 ha in size and have predominantly heavy black cracking clay soils most suited to furrow irrigation.

Each farm has at least one supply point and drainage outlet and typical farm slopes are in the range of 1:1000 to 1:4000. The original 'water right' allotted to farmers by Government under the Rights in Water and Irrigation Act 1914 -1954 Division 1V, was a total of five acre-feet of water per holding (15.4 ML/ha) per annum.

Internal farm layouts vary significantly throughout the district depending on block size and shape, slope and soil type. Furrow lengths can range from 200 m to over 1000 m in length, although lengths of 400 to 800 m are more common.

Watering from the head ditch is usually carried out manually using groups of 2 to 3 metre long flexible piping to siphon water into each furrow. Few electronic irrigation aids or automated watering systems have been introduced to assist in improving water efficiency.

In order to promote improved water efficiency, some irrigators have initiated recycling practices in which excess water draining one block is used as part of the irrigation input to the next block.

Presentation

The study tour group was given a presentation at the Ord River Co-operative by Technician Mathew Dear. Key points of the presentation are given below.

Sustainability: Environmental health; Economic profitability; Social and economic equity.

Water Use Efficiency: Driven by keeping water for environmental benefits rather than a lack of water.

Every minute the amount of water going out of the river mouth in the wet is what Sydney uses domestically every year.

Wet years do vary. They can be heavy with flooding and longer than average.

Prime crop: Originally sugarcane covering 37% of irrigated land; now sandalwood covers 47% of irrigated land.

The Ord Irrigation District benefits from producing counter-seasonally to Southern Australia.

Lake Argyle at full capacity holds 10,700 GL of water (Sydney Harbour is about 20 times smaller). The highest recorded capacity is 19,200 GL (in 2001).

All power in Kununurra is hydro power. There are 8 diesel backups.

The purpose of the Kununurra Diversion Dam is to gravity feed water to the Ivanhoe Plains for irrigation.

The annual Ord Irrigation Co-operative (OIC) water allocation is 335 GL for Stage 1: 3 % of secure storage. There is very secure water coming into the system. Approximately 200 GL of the allocated 335 GL are actually used. ORIA (Stage 2,

currently being developed) has an allocation of 400 GL and Pacific Hydro has an allocation of 1,324 GL.

The OIC was formed as a farmer co-operative in 1996. It operates the irrigation and drainage network and is licensed to extract 335 GL annually. Shareholder water entitlements are calculated at 17 ML/ha. For Stage 2 it will be about 10 ML/ha.

The OIAMC owns and maintains infrastructure.

Achievements of the OIC include:

- Modernised development – improved water delivery efficiency from <50% to >80%;
- Environmental benchmarking projects;
- Automated most supply structures with sophisticated telemetry (>\$1 M); and
- Aerial electromagnetic surveys.

There are 3 water charges for farmers:

1. Asset levy - \$52.22/ha/yr paid to the OIAMC;
2. Fixed charge - \$60/ha/yr; and
3. Volumetric charge - \$6/ML (a \$0.50/ML surcharge applies to pumped supplies, e.g. at Packsaddle).

Value of farm activity:

- \$28 M – horticulture;
- \$11 M – field crops;
- \$57 M – tropical forestry.

Crop diversity (2008):

- Sandalwood (34%);
- Sweet Corn (4%);
- Fresh Beans (1%);
- Cucurbits (12%);
- Hybrid Seeds (17%)
- Leucaena (6%);
- Mangoes (4%);
- Chickpeas (5%);
- Fallow (9%); and
- Chia (5%).

Stage 2 of the ORIA is currently being developed. It is being managed by Landcorp and at the time of the study tour they were asking investors what they want (e.g. what technologies they want available in bulk infrastructure). Stage 2 consists of:

- WA side – 16,000 ha;
- NT side – 16,000 ha;
- Carlton Plain – 8,000 ha;
- Mantinea – 4,000 ha; and
- Cockatoo Sands – about 50,000 ha.

To be allowed to plant on land in Stage 2 there is a requirement that there is a return within 3 years (this rules out sandalwood). Stage 2 should be ready in 2010/2011.

On the 8,000 ha at Carlton Plain there will be 22 individual farm blocks released at first with 1 water supply point and 1 drainage point. However all water must be kept on-farm except in wet. Land will be \$6000 - \$7000/ha.

In Stage 1 land does not come up for sale very often.

The OIC organises shed meetings for farmers to learn about farming practices and outcomes of research projects.

Scale is of critical importance because:

- Reduces the development costs/ha
- Decreases costs of production (bulk purchasing, lower freight)
- Enable new industries to establish (e.g. cotton)
- Enables efficient water delivery and irrigation management.

Due to transport costs and other input costs growers say that water costs cannot go up much more.

The ban is being lifted on GM cotton ban and hemp. Need to find what lead to the demise of cotton in the region and address as growers still have the infrastructure required to grow cotton. Growers also have the infrastructure for sugar but doubt sugar will be grown again in the region on a large scale.

The future is bright for the ORIA. It may be possible to irrigate >80,000 ha and therefore develop a flexible water trading policy. Additionally the region is building automated and efficient irrigation structure and encouraging new base industries, e.g. cotton.

The Department of Water is involved in studies on sedimentation from inlets and evaporation. A report, 'Ecological water requirements for the lower Ord River' (May 2007) is available from the Department of Water website (www.water.wa.gov.au/Managing+our+Water/Water+planning/Allocation+planning/Ord+River+surface+water/default.aspx).

4.5 Department of Agriculture & Food, Kununurra

The Frank Wise Institute (FWI) was built in the 1940's. CSIRO pulled out in the early 1980's and now FWI is owned by the WA Department of Agriculture & Food. There is 25 – 30 staff (down from 60 staff 20 years ago). Many are involved in regulatory work, biosecurity, border protection and looking after the rangelands. There is also a focus on research and extension. There are 900 ha at the FWI.

The study tour group met with Peter Johnson (Horticulturist) and Gae Plunkett (Farm Manager) for a tour of the farm and research trials.

The main perennial crops of the region are mangoes and red grapefruit. There is an opportunity for longans but although trees grow well there is a problem with flowering. There are trials underway with soil and foliar treatments with promising results.

The area has black clay soil with sandy loams along the riverbanks, which is the preference for perennial crops. It is expensive land to buy so mango plantations are spreading onto the clays.

Grapefruit is a tropical fruit but there is a history of growing them in the wrong areas in Australia. Therefore the sugar to acid ratio is not right. There is currently an evaluation of rootstocks for red grapefruit underway. In the USA red grapefruit make up approximately 20% of the entire citrus industry so there is potential for growth in Australia. The domestic market is damaged to historical supply (acid fruit) so there is a need to launch a new product. The domestic market is started to appreciate red grapefruit with the market doubling every year for the last 3 years. Half of the red grapefruit grown in Kununurra (Kimberley Produce) are exported as that is where the opportunities are. FWI staff are working with Kimberley Produce to get their product into Japan (disinfestations). Taiwan and China have now accepted their protocol.

Birds are a major pest of the region especially in rice crops (e.g. magpie geese). Brolga's cause problems in chickpeas.

Dragonfruit trials are underway, with 4 varieties being looked at. It is an ideal crop for the small scale farmer. Trials are also underway in lychees, rambutans, duku, rice, sugarcane, cotton and teak. Hemp trials have not been successful. New varieties of fruit are introduced at the FWI and if they show promise larger trials are done. Trials of avocados have shown that the Mexican varieties do not perform well but the West Indian varieties do.

The FWI is involved in the Australian mango breeding project. A lot of work is done in partnership with the researchers in Queensland. The advantage of growing mangoes in the ORIA is that there is no rain between flowering and harvest ensuring good post-harvest quality for export.

The Indian Drumstick Tree (*Moringa oleifera*) is being investigated at FWI as a possible biofuel. The seed pods are used in Indian curries, leaf is used in soup and the pulpy stem can be used as stock feed. It grows on poor land. It ticks all the boxes for a biofuel as it can be grown on poor land and will therefore not replace land used for growing food. It produces good quality diesel and perhaps in the future farms in the area can grow their own fuel. Oil is extracted from the seed. It is easy to propagate so there is a chance it could become a weed especially in riparian zones. It is not as weedy as Neem or Leucaena. There is a program to control Neem in the region.

There has been a lot of research into cotton in the last 10 years, especially now that Bt cotton is available. Cotton production was terminated in the Ord River Irrigation

Area (ORIA) in 1975 due to poor fibre quality and insecticide resistance in *Helicoverpa armigera*^J. Research has looked at growing cotton during the dry season rather than the wet season so as to avoid key insect pests. Water use efficiency and chemical use are two problems that the cotton industry has to address if cotton is to be reintroduced to the ORIA. Cotton could be grown in Stage 2 of the ORIA. Trials are being done at the FWI for CSD, Monsanto, Delta Pine and CSIRO. The potential yield is 12 – 14 bales/ha (in southern Australia it is 17). The area would need to have a cotton gin if cotton was to be reintroduced.

Corn is grown at the FWI as a commercial crop in order to fund research trials. It is sold as stock feed. Corn varieties are now smut resistant. Soybeans are grown for human consumption (Japan) and hybrid sweet corn is also produced.

There were 12 varieties of wheat grown in 2009. Breeding is fast-tracked in Northern Australia.

At the FWI they are aiming to grow 2 crops/year. This will improve land values and productivity.

In pumpkins work is focussed on stopping aphids spreading virus. They are looking at millet between rows, belotti beans and shade cloth. Pumpkins are grown sequentially so to prevent the spread of virus the aphids need to be stopped from moving from planting to planting.

5 KEY POINTS

The following are key points from the farm and non-farm visits.

- Use lessons learned from Southern Australia when it comes to water allocation and environmental management. Be cautious if research has not been done.
- The water allocation plan in Katherine will protect the water resource for the environment and give current producers security.
- Sustainable development is of critical importance.
- Aphids are the major insect pest of vegetables in Northern Australia. Problem diseases are powdery mildew and downy mildew and viruses spread by aphids. Birds can cause significant damage to crops. Post-harvest disease is the biggest problem for mangoes.
- Pests and diseases need to be understood and are part of farming.

^J www.regional.org.au/au/asa/2006/concurrent/systems/4591_yeates.htm

- Develop farm and business plans.
- Many farming businesses in Northern Australia have embraced technology such as precision farming, irrigation scheduling equipment and total product traceability to protect assets and improve yields.
- Know about local issues that affect your farming business and find out about research and development outcomes.
- Biosecurity is critical at the farm, packing shed, regional, state and national level – do not jeopardise your business. Have strict controls in place. Growers in Kununurra have established a biosecurity group for the region.
- Focus on your strengths and employ specialists where required, e.g. marketing, crop pest monitoring.
- Develop the relationship between yourself and your market agent – building their business is building your business. Visit them and talk with them regularly. The same goes for carriers of your product.
- You can gain a premium position in the market if you can supply 12 months per year.
- Educate the consumer about your product.
- Australian horticulture needs to focus on the health benefits of our products.
- There are good export opportunities where there are production gaps in the northern hemisphere.
- Australia can produce crops that may not be popular (or unknown to) with Australian consumers but have good international markets.
- There is no shortage of labour in Northern Australia.
- Know your costs of production.
- Land prices have increased significantly in Kununurra in recent years.
- Stage 2 of the ORIA is currently being developed.
- If appropriate look at ways to diversify your business.
- Research and development is critical when you are growing a new crop.
- To grow industries need good people.
- Horticultural producers need to join their local/state grower association for the benefit of their business and the industry.

- Your business will benefit if you invest in the education of your staff in English literacy, and you are also improving their future job prospects and their ability to cope with the requirements of day-to-day living.
- A lack of chemical registrations and permits for smaller crops is an issue.

6 SURVEY OF STUDY TOUR PARTICIPANTS

Study tour participants were asked questions about what most interested them on the tour, what they learnt, what they will take back to their farms/districts, do they have any recommendations for Australian horticulture or any other comments. Below are the responses.

6.1 What part of the trip most interested you?

- Seeing the large size of plantings and packing sheds for melons, mangoes, green beans and pumpkins.
- The emerging new crop, chai.
- The Frank Wise Institute at Kununurra – excellent staff and farm management with a focus on the commercial outcomes as well as building long-term strategies to grow crops with established markets in Asia.
- Paul McLaughlin – an inspirational and forward planning strategic thinker. He has built up partnerships and properties to enable a year round supply of melons for his customers. He also has invested heavily in the ‘new’ industry of pomegranates, having researched the world need for the healthy juice.
- Diversification of the business at Ivanhoe Farms – the café producing fantastic food with local produce and also selling fresh produce.
- Peter and Dianne Marks at Ballongilly Farms – a well run family operation and doing a very good job, showing that huge \$ investments are not necessary for good throughput of fruit.
- Rewards Group packing shed in Kununurra was amazing – no expense spared approach to fruit packing. Not necessarily the most cost-effective way to achieve efficiency gains. Very good to see and learn from.
- Seven Fields packing shed in Katherine – has recognised the efficiency of locating a packing shed in the town industrial estate to access transport and labour supply. The shed manager was very informative and clearly experienced in the logistics of packing fruit. I gained many excellent ideas that can be used in my own packing shed.

- Fritz Bolten at Oasis Farms in Kununurra – a very modest and knowledgeable grower with wide experience in the Ord River area. His large shed contained a wonderful collection of machinery, showing that every crop requires its own specific gear. The Chia story was inspirational – the thorough research, disciplined determination and extreme patience required to establish a new industry.
- Visits to Ballongilly Farms (Peter & Dianne Marks), Red Dirt (Paul McLaughlin) and Western Desert Produce (Peter Pegg).
- Meeting with Paul McLaughlin and learning about the success of PMG Agriculture.
- Meeting with Lachlan Dobson and visiting Kimberley Produce.
- Visiting Western Desert Produce and talking with Peter Pegg (his approach to farming and how he keeps his costs down).
- Learning about the Indian Sandalwood industry.
- Learning about the snake bean research at Berrimah Research Farm, Darwin.
- Hearing about the history of farming in the Ord from Spike Dessert.
- The water allocation process in Katherine and in the Ord River Irrigation Area.
- Visiting ‘Red Dirt’ and how to gain a premium spot in the marketplace by being able to supply all year round was excellent and learning about the industry from Peter Pegg at Western Desert Produce.
- The Frank Wise Institute and farms in Kununurra.

6.2 What did you learn?

- The importance of produce quality and pest and disease control.
- Avocados would not be viable as harvest would coincide with the wet season.
- Much was learnt at the presentation in Katherine about their water allocation process.
- Strategic planning is the most important aspect of farming – in order to realise the opportunities available in new crops, new areas, new machinery/technology, water efficiency gains, labour hire, new marketing strategies, etc. Working very hard with the same methods each season will not guarantee long term survival. The daily work required by a farm leaves

little time and energy for strategic planning. Travelling away from my own business and looking at the 'big picture' provides a time to reflect and view my own plans as compared to a wide range of other operations – all striving to achieve a similar outcome.

- Learning about and seeing the Ord River Scheme first hand has satisfied a long term curiosity of mine.
- The Ord seems to be riddled with a history of lost opportunities – new technologies may overcome some of the previous issues (e.g. GM cotton to control *Helicoverpa armigera*, new varieties of crops better suited to the climate of the region).
- Farmers in Northern Australia struggle with the high cost of inputs and low returns, just as farmers in Southern Australia do.
- Need to be proactive with environmental management to ensure sustainability, the program being run by the NTHA (providing guidelines and training) is excellent.
- Growers in Northern Australia are good growers and skilled marketers.
- The staff at the Frank Wise Institute, Kununurra are very forward thinking and practical.
- Excellent management and distribution of water to farms in the Ord Valley.
- From a benchmarking perspective I feel that my district is performing at the top end of Australian vegetable growing.
- Need to diversify business.
- A good workshop is imperative in remote regions.
- Backpacker labour is easy to find in Northern Australia.
- How aquifers recharge and how it is important to look after the groundwater resource and gained an understanding of the water allocation process in Katherine and of the Ord River Irrigation Area.
- It is obvious that for farmers to survive we have to use local/interstate and export markets – sales managers are the way of the future.
- The tour expanded my knowledge on water management.
- It is good to look and learn about new crops.

6.3 What will you take back to your farm business/any recommendations for Australian horticulture?

- An increase in State and Federal assistance into research into crop selection, integrated pest management and the efficient use of water is required.
- The key to success in horticulture seems to be aligning your business with a market seller to give a better chance of securing top prices for your product, e.g. an agent may own a % of the business.
- Snake bean research underway at Berrimah Research Farm in Darwin may be transferrable to my farm in NSW.
- Quarantine requirements across Australia need to be standardised so as to make interstate movement of horticultural products easier (through one set of clear requirements).
- Knowledge that it is hard to beat my local area (Bundaberg) for climate and a long growing season.
- Improve water use efficiency.
- Government should have better foresight with regards to development of food bowls and wealth creation in agriculture/horticulture.
- Careful management is required to ensure successful crop production (production, labour, transport, markets).
- Continue to use trickle irrigation – can apply water directly at plant roots and easier to fertilise, more efficient use of water and can irrigate at the right time (improving plant health).
- Farmers should continue to educate themselves and travel is a great way to learn about new technologies and farm management.
- A publication for new (and existing) Australian vegetable growers (similar to the NT Government 'Information for Prospective Investors in Agricultural Enterprises in the Northern Territory' would be beneficial to the industry. It would inform industry of processes, requirements, roles of various agencies and organisations, contacts and information sources.
- The need to progress towards best practice in all aspects of growing, packing and marketing in order to remain competitive in the local, Australian, and export markets. Also the need to continually 'step back' to assess the big picture, long term goals and pathways to security.
- Recommendations for horticulture in my local area- LOOKOUT! Here we come.

- Returning with a fresh outlook, inspiration and determination to succeed in the production of fresh food.

6.4 Do you have any other comments?

- Smart operators are growing across a wide range of districts in Australia to give their customers 12 months supply of produce.
- It is a concern how much of the arable land in the Ord is being planted with Indian Sandalwood at the expense of food production.
- Growers in Northern Australia are gaining advantage with market timing.
- Katherine growers are well aware of their local issues.
- The assistance that Ruth Cormack was giving her staff in learning English was very commendable, adding value to her business as well as improving the education level of her staff thereby improving their employment opportunities.
- All businesses visited were open and honest and networks developed – there were a lot of business card exchanges and sure there will be follow-up.
- Study tours are an excellent learning experience and networking opportunity.
- Food production cannot compete with Indian Sandalwood in Kununurra due to prices being offered for land.
- The whole trip was very informative and I propose to implement some ideas and also pass them on.
- Study tours are very informative.



Crops being grown for seed production at The Hoochery and Farm, Kununurra



Hearing about research trials at the Frank Wise Institute, Kununurra



Discussing bean production in the ORIA with Peter Pegg of Western Desert Produce, Kununurra



Inspecting a bean crop at Western Desert Produce, Kununurra



Rockmelons at Ivanhoe Farms, Kununurra



On a tour through the Kimberley Produce (Rewards Group) packing shed, Kununurra

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