



**FINAL REPORT  
PROJECT NUMBER – VG06071**

**GREENHOUSE STUDY TOUR CANADA, SEPTEMBER 2006**

**Graeme Smith**

Australian Hydroponic & Greenhouse Association

**VG06071 –Greenhouse Study Tour Canada, Sept 2006**

**Project Leader:** Graeme Smith  
President – Australian Hydroponic & Greenhouse Association  
PO Box 538  
NARABEEN NSW 2101  
Phone: 02 9939 5993  
Email: [president@ahga.org.au](mailto:president@ahga.org.au)

**Purpose:** The purpose of the project was to assess existing, new and emerging greenhouse technologies and how they may be integrated in existing systems in Australia

**Funding Source:** Horticulture Australia Limited

**Date of Report:** Sept 2007



*Know-how for Horticulture™*

Any recommendations contained in this publication do not necessarily represent current HAL Limited policy. No person should act on the basis of the contents of this publication, whether as to matters of fact or opinion or other content, without first obtaining specific, independent professional advice in respect of the matters set out in this publication.

## Contents

Tour Participants .....	4
Summary .....	5
Tour Itinerary .....	5
Grower Visits & Technologies Inspected .....	6 - 12
Tour Outcomes .....	13
Suggestions for Tour Leaders .....	13
Technology Transfer.....	14
Published Article .....	14 - 20
Budget .....	21
Participants Survey & Results .....	22 - 23
Acknowledgments .....	24

## Tour Participants

Mark Lines – Holla-Fresh – South Australia  
Sue Korevaar – Korevaar Hydroponics - Victoria  
Anthony Brandsema – J&A Brandsema – Tasmania  
Graeme Smith – Australian Hydroponic & Greenhouse Association – Victoria (Tour Leader)  
Joanne Smith – Hydroponic Designs - Victoria  
Mark Millis – Flavorite Tomatoes – Victoria  
Chris Millis – Flavorite Tomatoes – Victoria  
Horst Sjostedt – Flavorite Tomatoes – Victoria



## Summary

This study tour allowed us to view firsthand the Canadian growing methods and glasshouse systems that have been developed over more than 20 years. The Australian protected cropping industry is similar to the Canadian model in growing techniques and technology, therefore we assessed their approach to environmental management and plant physiology, with particular emphasis on their growing techniques and their adoption of new & emerging technologies.

Canada has two main greenhouse growing areas in Vancouver, British Columbia (BC) and Leamington, Ontario and both are well supported by industry training facilities that are also modern facilities for R&D.

Our industry suffers an acute shortage of opportunities for professional training and education, R& D in a range of technologies that are unique to the industry.

Industry benefits are that skills training at all levels is necessary to underpin industry development & growth. Production and quality increases are necessary to meet the increasing demands of QA systems for both domestic and export markets. Industry skilling has the capacity to meet these needs and match the standards of the competitive imports/exports.

Overseas study is mandatory if we are to match production standards with overseas competitors as well as up-skilling the industry resulting in enhanced productivity and farm viability

## **AHGA CANADIAN GREENHOUSE STUDY TOUR – 2006 ITINERARY**

### DAY 1 – Friday 29<sup>th</sup> September

Australia – Vancouver (The Fairmont Hotel)

Depart Australia and arrive Vancouver 1.52pm (same day!)

Recover from flight

### DAY 2 – Saturday 30<sup>th</sup> September (The Fairmont Hotel)

Vancouver - Chilliwack

Visit Calais Farms, Abbotsford (peppers) in the Chilliwack agricultural region in the Fraser River Valley.

Dinner at Grouse Mountain overlooking the city

### DAY 3 – Sunday 1<sup>st</sup> October (The Fairmont Hotel)

Vancouver

Tour city of Vancouver, visit Granville Island (inc Fresh Produce Market), Stanley Park, etc.

### DAY 4 – Monday 2<sup>nd</sup> October (The Fairmont Hotel)

Vancouver – Richmond / Delta region

Morning – Hot House Growers Inc (tomatoes)

Lunch at Fort Langley

Afternoon – Glenwood Valley Farms (cucumbers and packhouse)

Kwantlen University College, Langley

### DAY 5 - Tuesday 3rd October (Wyndham Bristol Place)

Vancouver - Toronto

Morning flights from Vancouver (8.20am) to Toronto (Ontario), arrive 3.45pm

6.30pm Dinner with Rijk Zwaan followed by presentations by John DeVries & Frek Knol

DAY 6 - Wednesday 4th October (Wyndham Bristol Place)  
Toronto  
All day at the Canadian Greenhouse Conference  
[www.canadiangreenhouseconference.com/](http://www.canadiangreenhouseconference.com/)  
Meet growers, network, attend workshops, buffet dinner.

DAY 7 - Thursday 5th October (Ramada Inn)  
Toronto - Leamington  
Morning at the Canadian Greenhouse Conference  
Travel to Leamington (greenhouse capital of North America)  
Dinner at Spago's in Leamington (Italian cuisine)

DAY 8 - Friday 6th October (Ramada Inn)  
Leamington Area  
Visit 10ha pepper production & Amoroso tomatoes and other specialty tomato products  
(Double Diamond Greenhouses and Prism Farms)  
Lunch at Pelee Island Winery and tour of facilities.  
Greenhouse & Processing Crops Research Station (Harrow) tour & presentation  
Dinner at casino in Windsor Ontario.

DAY 9 - Saturday 7th October (Sheraton on the Falls)  
Leamington - Niagara Falls  
Morning in Leamington visiting local greenhouse growers (TBA)  
Travel to Niagara Falls for farewell dinner at Table Rock Restaurant

DAY 10 - Sunday 8th October  
Niagara Falls - Kitchener - Toronto - Australia  
Travel to Kitchener to tour Mennonite country area (if time permits)  
Travel to Toronto international airport for departures (6.35pm)

DAY 11 – Monday 9<sup>th</sup> October  
Lost in Transit

DAY 12 – Tuesday 10<sup>th</sup> October  
Australia  
Arrive Australia (7.55am) and travel to home destinations.

## **Grower Visits & Technologies Inspected**

### **Irrigation Water Temperature Management**

Canadian growers are faced with an unusual challenge in managing the temperature of their nutrient solution due to their climate and water sources.

(n.b. Ideally the temperature should be maintained between 18 – 22°C to avoid root-zone problems like poor development and fungal diseases (e.g. pythium, etc).

Greenhouse growers in Leamington, Ontario source their water from Lake Erie that ranges in temperature from 0°C to 27°C over the year, therefore this water needs to be tempered prior to irrigating crops.

The correct water temperature is achieved by using heat exchange units that can either heat or cool the irrigation water, by exchanging energy with a water sink that is either hotter or cooler than the supply water from Lake Erie.



Heat Exchanger to temperate greenhouse irrigation water



Lake Erie feeds Niagara Falls and is water source for greenhouse crops

### Greenhouse Heating

Canadian greenhouse growers are increasingly turning to alternative energy sources as their primary source (natural gas) continues to increase in price. One such alternative is wood waste that is shredded prior to burning and costs approx CAD\$3.50/GJ, compared to CAD\$9.00/GJ for natural gas.

Energy costs and any savings are considerable as temperatures drop to -15C in winter. One downside is that Carbon Dioxide (CO<sub>2</sub>) is not available from wood waste and must be supplied via a smaller natural gas boiler system or bulk liquid tanks.



Typical wood waste boiler



Wood waste is automatically fed to boiler via a 'moving floor'



Raw supply of wood waste prior to shredding



## Crop Viruses

Two crop viruses are endemic affecting both tomato (Pepino Mosaic virus) and cucumber (Pseudo Yellow Leaf virus) crops. As a consequence, a significant effort is made to limit either introduction or spread of viruses by:

1. footbaths at greenhouse entry points
2. sterilising tools and equipment at end of each row and end of day
3. sourcing seedlings from accredited, 'clean' nurseries
4. ensuring visitors are dressed in suitable protective clothing
5. quarantining affected areas until end of day



Pepino Mosaic Virus  
(tomatoes)



Pseudo Yellow Leaf Virus  
(cucumbers)



Footbaths at greenhouse entry



Tools collected at end of day  
for sterilising

## Labour

85% of all greenhouse labour is performed by workers from either Mexico or Jamaica with females responsible mainly for crop work and males assigned to general maintenance and removal of crop at end of season. Labour rates at average of CAD\$10.30/hour

Some growers allow workers to utilise growing space above access aisles to produce potted plants and ferns for private sale to supplement their incomes

Automatic crop & labour registration systems are used to overcome language problems.

These systems utilise RFI interface units to identify workers, tasks, greenhouse areas, pest and disease areas and start/stop times by simply passing a transponder over reader unit at appropriate times. Additionally, some systems use a biometric system to read individual thumbprints.





Male workers used in general maintenance



Female workers used in general crop work



RFI units for crop and labour registration system



Main Input for crop & labour registration (inc biometric thumbprint reader)



Workers potted ferns above access aisle



Misc greenhouse workers

## Cucumber Crops

Whilst tomato crops are grown in much the same way as in Australia, there are some notable differences in the way cucumber crops are grown.

Australian greenhouse growers commonly plant and harvest 3 crops/year, whereas Canadian cucumber growers can target 4 crops a year by 'interplanting' (planting seedlings under a mature crop so that picking begins on the young crop as fruiting finishes on the mature crop)

Alternatively, growers can elect to 'layer' the crop using the high-wire system. This allows each crop to continue for extended periods usually resulting in 2 crops/year

Additionally, growers can elect to grow under horticultural lights during the darker seasons, resulting in an increase of around 80 fruits/m<sup>2</sup> (from 200 to 280/m<sup>2</sup>).



Layered cucumber crop



Cucumber crop grown under lights

## Canadian Greenhouses

These systems range in size from 4ha (relatively large by Australian standards), to a very large 26ha. The size of these systems demand a different approach on how they transport fruit, transport themselves and how to provide suitable comfort & personal hygiene stations, due to the vast distances needed to travel with a greenhouse (sometimes over 1.5km). Additionally, modern fruit grading systems are utilised to speed up grading and avoid over-packing tomato trays (e.g. Christmas tree graders)



Typical large Canadian glasshouse



Internal distances are significant in large Canadian glasshouses





Personal 'chariot' to travel around glasshouse



Internal fruit transport system



Greenhouse comfort stations at regular intervals



Christmas tree tomato grader

### R&D Centres

As mentioned above, each main greenhouse growing area in Canada has dedicated grower training and R&D centres to support industry development and ensures that new and emerging greenhouse technologies are adapted for local use and demonstrate to growers how they might integrate these technologies into their own systems.

Some trials observed included an innovative foam generation system that introduces foam between the twin polythene roof layers to act as both a solar shield (in the day) and an energy curtain (at night).

Other trials included the most efficient way to distribute sulphur power around the greenhouse using HAF fans and sulphur burning pots.

These facilities allow Canadian growers to maximise their opportunities to become the best greenhouse producers in North America and meet the diverse needs of their consumers in terms of production, crops, colours and packaging options.

Such facilities are sorely needed in Australia to drive the industry forward.



Foam injection system in  
greenhouse roof layers



Trial Sulphur  
distribution system



Diverse range of Canadian  
greenhouse products and packaging

## **Tour Outcomes**

The tour group was fortunate to experience a wide variety of technologies, crops, and general growing techniques in a relatively short time frame and clearly highlights the strong value of well structured study tours.

The benefit of assessing new and emerging technologies and how to integrate these into their own systems is immeasurable as Australia currently lacks R&D and demonstration centres.

The value in meeting and talking to growers who are producing the same crops in similar circumstances is important in enhancing the individual learning for each participant.

The information gained is usually freely given as there is no perception of competition from growers from opposite sides of the planet.

It is my common experience that participants experience a kind of 'wow factor' by sensing a glimpse into their own future, and at the very least are able to take back a wide variety of growing tips and tricks to help improve their own enterprise back home.

It is my strong contention that this Canadian Greenhouse Study Tour was no exception and delivered many similar outcomes.

## **Suggestions for leaders of future study tours**

Ours is a strongly technology driven industry and when travelling overseas we will see lots of these new and emerging technologies, however it is important to realise that basic principles still apply. (in terms of plant physiology and environmental management).

Australian growers are yet to fully comprehend the growing basics and maybe should concentrate on these before necessarily investing in expensive equipment that possibly will not improve production or quality if not used well.

The Australian protected cropping industry suffers an acute shortage of opportunities for professional training and education in a range of technologies that are unique to the industry. Overseas study is mandatory if we are to match production standards with overseas competitors as well as up-skilling the industry resulting in enhanced productivity and farm viability.

It was very clear from the start of the tour that obtaining access to the best Canadian growers was almost impossible unless you had an appointment that only major companies (like seed and equipment suppliers) could facilitate. Normal greenhouse access was restricted due to the threat of disease spread (ie Pepino Mosaic Virus) and prior arrangements were always necessary. Do your homework before you travel.

Viruses are rampant in Canada with destructive strains that are not (yet) found in Australia. These viruses (like Pepino Mosaic in tomatoes and Pseudo Yellow Leaf in Cucumbers) would be highly infective if allowed to be imported into Australia.

These kinds of viruses can easily be transmitted via clothes or shoes and as spores can remain viable for up to 40 days, it would be prudent to inform travellers to allow for clothes and shoes to either be discarded on their return or sterilised and placed into home quarantine for a period of at least 60 days before worn in any greenhouse.

Reasonable allowances should be made when planning routes. Growers are happy to welcome us into their greenhouses (provided prior arrangement made), but do not appreciate late arrivals as each & every day in the greenhouse is a busy one.



International phone charges (ie. roaming) can be substantial as charges are applied both to & from Australia and even received calls are charged at a premium rate.

Foreign Currency transaction fees add up to substantial figures when using credit cards, though these are considered desirable as they offer a full financial audit trail for tour costs.

Credit cards can be quickly exhausted by hoteliers or hire-car companies, as they typically hold against your card the full rate for accommodation and car hire, then charge the actual rate on top when paying the bill. The booking fees are not released for around 7 days and can be substantial if paying for the entire group!

Excess baggage was a common event charged by international airlines as tour participants often were overloaded due to an array of notes, books, brochures, gifts, etc that were gathered from expo's, training institutions, etc. Best to weigh suitcases at hotels and share around group if possible.

### **Technology Transfer**

The learned outcomes of this tour have been presented at a number of industry association meetings and include the following:

West Australian Greenhouse Growers Association (WAGGA) – Perth July 2007  
Hydroponic Farmers Federation (HFF) Growers Workshop – Mansfield August 2007  
Misc presentations to Victorian TAFE colleges – Shepparton/Geelong/Burnley Jan – July 2007  
Article in the 'Soilless Australia', newsletter of the Australian Hydroponic & Greenhouse Association  
Article in 'Practical Hydroponics & Greenhouse Magazine' – Casper Publications Australia Jan 2007

### **To Come:**

HFF Biennial Conference (HFF) - planned for April of 2008

### **Published Article**

## **Canadian Greenhouse Study Tour**

**SUE KOREVAAR reports on her tour to study the North American greenhouse vegetable industry, including a look at energy, labour and food safety issues.**

Our objective for this 10-day study tour was to visit greenhouse sites growing primarily tomatoes, capsicums (or peppers as they call them) and cucumbers on both sides of Canada, and to attend the Canadian Greenhouse Conference in Toronto.

I may as well say at the outset, I don't sleep on planes very well and if you consider that it took 15 flying hours from Melbourne to Los Angeles, 3 hours in LA airport waiting for a connecting flight, and a further 3½ hour flight to Vancouver, then road transport to our hotel,

all without any sleep, you could say I was a tad tired. However, our intrepid team leader Graeme Smith, looking bright as a button, had us all up and into the cars bright and early the next morning. Bless him.

Before I go any further it would probably be a good idea to give you all an overall picture of the Canadian and US Hydroponic industry.

Basically, there are two main growing areas, British Columbia (the west side) and Ontario (the east side), two vastly different growing climates each with their own individual growing challenges.

The first thing I noticed while travelling in the car, was that petrol was between 90 cents and \$1.00 per litre (so much for world parity prices), and a visit to the supermarket told me that average prices for vine-ripened tomatoes was anything from \$1- \$2.40 per pound, around A\$4.40 per kg top price. This means that growers rely heavily on economies of scale to make any money.

### **Some statistics**

In the delta area of British Columbia (west side) there is approximately 600 hectares of a combination of twin-skinned poly and glass houses. Leamington, arguably the tomato capital of Canada (east side), has a total area of approximately 1,500 hectares. It's an amazing place with large scale farms closely dotted around the Leamington area. Both areas have very large farms, starting around 10 -12 hectares, with the larger growers having some 26 hectares and growing a combination of all three major crops.

Both areas rely heavily on the US market to send their produce, with 15% going to Canadian markets and 85% to US markets, respectively. The US market demands large beef steak tomato varieties (i.e. 250gms average), with no change in the foreseeable future.

Although tomatoes make up the major part of greenhouse hydroponic production, capsicums come in around 280 hectares, cucumbers just over 200 hectares, cocktail tomatoes 40 hectares, and mini cucs 15 – 20 hectares.

In British Columbia, the greenhouses are primarily glass, Dutch venlo systems; however, in Ontario there is a good spread of twin-skinned poly houses as well as glass. Having said that, there is a trend towards glass for new constructions. I asked several growers why they would choose the poly houses over glass, and it came down to a cost factor - glass is twice the price to construct compared to a poly house, and the returns do not justify the capital outlay in many cases. Sound familiar?

Interesting to note, it is the end of the season for many of the growers we visited and most were bemoaning the fact that if they were lucky they would break even this year, with costs running out at approximately 70 cents per pound and returns coming back to them at around the same price, perhaps a little better at 80 cents per pound.

There are some issues for the Canadian protected cropping industry dealing primarily with the US.

- Alternative fuels vs. capital equipment
- Unstable future with the US
- Currency exchange between the two countries
- Food safety programs
- Labor issues
- Border crossing issues.

However, there are strong industry grower groups building and developing better markets/relationships with the US, and their quality to date is of a higher standard than fruit grown in and around Mexico.

Growth rate for greenhouses in Canada in the next five years will continue to displace the field product, and there are continued plans for existing large scale operations to expand.

## **Greenhouse market in the USA**

Glass is preferred over poly. The first greenhouses started in the north, but in the 1990's there was a general trend to move further south, closer to the Mexican border, which allows them to grow all year round in these locations with access to Mexican labor.

Interestingly in the US, small family farms with less than 2,000 sqm are still quite prevalent, followed by the next level of around 2 hectares with not much in between. These miscellaneous growers make up around 30 hectares of the total greenhouse pool.

In 2005, there were 300 hectares growing tomatoes, with a breakdown as follows: 90 hectares – beefsteak; 190 hectares cluster (truss); and around 20 hectares of cocktail/specialty varieties. This compares with 1997 (still around 300 hectares), but all crops were beefsteak varieties.

Hothouse cucumbers, or seedless cucumbers as they are known in the US, are not well known or desired at this stage. Specialties – mini cucs or ‘Cool Cukes’ - are starting to become available, but are a small part of the market. Overall, the greenhouse area has stayed much the same; but as the smaller concerns go, the bigger operations take their place.

In the US, growers work on interplanting and two crops per 12-month period. Total greenhouse production in the US is 47,000 tons, which is 2% of the total fresh tomato market. Field tomatoes from Florida (18,000 ha) and California (16,000 ha), with a total production of 2.3 million tonnes, make up the lion's share of table tomatoes in the US. The food service industry is very high and this is primarily serviced by the field tomatoes.

Grafted tomatoes make up 65% of beefsteak crops, because the rootstock has an insurance effect against Pepino Mosaic Virus (PepMV), and 95% of growers use double cropping.

Truss tomatoes in the US are called ‘Tomato-on-the-Vine’ (TOV) or cluster tomatoes, and the demand for quality hydroponic tomatoes is growing, .

Possible trends in the US are niche markets (i.e., cherry, cocktail, heirlooms etc). It would seem that the returns are better and a lot of the smaller family farms are chasing this market to stay viable.

It seems to me that there is a lot of similarity between smaller growers in the US and Australia - slower growth, with some family concerns upgrading and increasing in size.

The US market is increasing protected cropping facilities by approximately 10-20 hectares per year - this is mostly in the southern parts of the US where there is more light and low humidity. There is a greenhouse complex in the southern part of the US that has over 80 hectares on one site. Labour is made up of Mexican immigrants, and 50% of the workers come from the low security Arizona jail. If the prisoners are good they get work in the greenhouses and earn a normal wage, which they can then send back to their families.

## **Wages**

For both Canada and the US, there are agreements the Mexican and Jamaican governments to allow workers from Mexico to come for a maximum period of eight months per year. As part of the deal, most companies supply accommodation, but not their groceries. Including all loadings, the cost of labour per hour is around \$10.30 Canadian. I'm not sure what the American rate would be, but it would be similar with superannuation replaced by a retirement tax. The system works well for all concerned, as labour shortages in both countries is a big

issue. Speaking with some of the growers, all is not happy in some cases. Like all groups, you have your good and bad workers. However, if any worker does not pull their weight, they are given the old 'heave ho' back to their respective countries.

Productivity in the high-tech greenhouses are similar in both countries. Canada (British Columbia) can be as high as 75 kg per sqm using CO<sub>2</sub>, interplanting and growing two crops per year. In the US, the top growers are achieving 80 kg per sqm, growing for a full 12 months of the year. However, a lot of the Canadian growers we spoke to were averaging around 50 kg per sqm.

## **Back to the tour**

Our first visit was to Abbotsford, an open day at a 4 ha glass capsicum farm sponsored by the British Columbia Growers Association. The owner of the farm believes that 4 ha is a minimum for an operation to have critical mass. For all you techno junkies, 5m gutter, with crop wire at 3.3m. The span is 9.6m with six paths per span. The medium is yellow cedar sawdust, however, there is a growing trend for growers to use coir. Using gas boilers to generate heat and CO<sub>2</sub>, the grower averages around 25 kg per sqm.

The grower prefers to leave rotting fruit on the floor along with any discarded vegetation to save labour. I imagine the smell would be a little off-putting in the summer months. Visually, there was plenty of grub damage - he did mention they use 100% biological controls. The farm employed 15 full-time workers, which equates to 1.5 -2 people per 4,000m<sup>2</sup>. The grower's return was around \$65 per m<sup>2</sup>. He used a sand filter for cleaning the recirculating nutrient only. All packing is done by an independent and marketed by a British Colombia grower group.

The glasshouse is made by a local company with costs coming in around \$6.5 million for a 4ha turnkey facility. Labour and energy costs are the grower's largest issues - women are hired for crop work, and men for cleaning out the crop.

The total annual farm gate sales for BC greenhouses in 2005 was +\$220million. The number of people employed is more than 3,200. It is estimated that the greenhouse value to the British Colombia's economy is +\$670 million per annum.

We next visited a 3 ha English cucumber glasshouse. Half the area was lit with lights. The grower aims for 450-500 gm fruit using hire wire and layering. The other half of the glasshouse was unlit, lower wire/umbrella, yielding 155-160 fruit per m<sup>2</sup>. Both sides are leaf pruned, and the plants twisted on the high wire twice a week. The media used is hemlock sawdust, but the grower is going to trial coir. Whitefly is the dominant insect pest. Interestingly, the grower had eggplant as an attraction plant.

In peak times, there are 17 workers in the crop with 30-32 people in the pack house. Mini cucumbers are packed in 500 gm bags, which seemed a lot to me; but they assured me demand for the product was high.

All the growers agreed that research centres were one of the major reasons why protected cropping has developed to the level it has.

## **Sightseeing**

We did manage to sightsee around the Vancouver area on Sunday, which was quite spectacular – at that time of the year some of the leaves were turning and the colours were picture postcard.

A visit to a local park and a spectacular suspension bridge over the Capilano Gorge had me experiencing a fair amount of acrophobia; however, once I was firmly in the middle of the bridge, Chris Millis decided to cause it to sway dramatically, proving how safe it was and alleviating any fears I had. What a nice guy!

Dinner at Grouse Mountain via gondola and overlooking Vancouver at night was a splendid sight. Michael, our waiter from Moonee Ponds, Victoria, gave us excellent service.

## **Canadian Greenhouse Conference**

It was time for us to make the journey to Toronto and visit the two-day Canadian Greenhouse Conference. It was quite a large venue with over 200 trade sites in the exhibition area. Interestingly, the conference combined with the nursery industry, which is a good idea, as it reduced the price of admission for delegates to Can\$30 for the two days. Of course, they didn't supply food or the wonderful conference dinner like we do, but it is possibly the way to go for us in Australia. It's a concept worth looking at.

Unfortunately, organisers did not supply a proceedings book, however, each guest speaker had a stapled handout of their PowerPoint presentation. It was well worth the time we spent there.

Later that day we drove south to Leamington, touted as the tomato capital of Canada. Leamington is also the home of the Heinz processing plant, located in the centre of town, with 17,000 acres of tomatoes grown under contract at a yield of 60 tonnes per acre. Bacterial canker is rife in the outdoor crops, which affects the indoor crop via the wind. Pepino Mosaic Virus is a problem in every tomato crop.

The first site we visited was Double Diamond, which has 20 acres of tomatoes, 4 acres 'cucs', and 26 acres of capsicum. The main tomato crop was, of course, beefsteak, the variety being half 'Macarana' and the other half 'Big Deena'. The yield is approximately 52 kg/m<sup>2</sup> with a plant density of 9,600 plants per acre.

## **Bumblebees**

Bumblebees were everywhere and I honestly believe if they had to manually pollinate, then the tomato sector of the industry would not be viable. Growers use 6-7 hives per week and the hives are left in the greenhouse to die out. They do not spread into the wild and if they do, it seems that they cannot survive the winters. There are three workers per acre used for tomato production, and two workers per acre for cucumbers.

I guess because it is so topical at the moment in Australia, I was quite fascinated by the bumblebees, which were used throughout all the tomato crops we visited. Generally the usage was around 200 hives per 10 acres.

## **Energy and labour issues**

Cost of energy is a major issue, with current costs of natural gas being around \$9 per GJ; however, there is a big trend to go to wood waste, which brings down the cost of heating (including labour to man the heater 24/7) to approximately \$3.50 per GJ.

From a labour perspective they had approximately 44 people working in the greenhouse with another 15 in the packhouse during the summer period. This was for tomatoes only. For capsicum production, the labour component in the greenhouses was approximately 50 people covering 26 acres. Because PepMV is so prevalent, workers are constantly disinfecting their hands after every plant, using a disinfectant called Virkon. With regard to the tomatoes, they are picked at quarter colour, due to the transport time expended to get them to the USA.

Overall, when we spoke to growers throughout Canada, their biggest issues were energy (temperatures drop to minus 15<sup>0</sup> C with snow cover in the winter), high transport costs, and labour. It was very difficult to get any Canadian labour with more than 80% of the workforce coming from Mexico. This posed additional workloads to most managers, and the cheap labour did not come without some headaches.



## **Food safety**

Other points of interest were that food safety programs required all entry and exit points to the greenhouses be locked 24/7. At Double Diamond, they did not leave any leaf material on the floor, indeed, they used a vacuum which ran along the pipes to collect any debris. By comparison, it takes approximately 54 man-hours to sweep the floors, but only 34 man-hours using the manned machine.

A lot of the properties we visited used golf carts and bicycles to navigate the site, and many had a small toilet block in the middle of walk ways in the greenhouses. Good thinking, from a labour-saving perspective.

Most polyhouses replaced ¼ of their plastic every year, which of course means they are continually replacing their plastic, with a general expectation that the plastic would be replaced every four years.

## **Market realities**

As I mentioned earlier, this year has not been kind to many of the tomato growers. To give readers an indication of returns, at Prism Farms, which produces both beefsteak and cherry tomatoes, the grower admitted that prices were somewhat lacking this year. Production costs were approximately \$6-7 per tray, but during the summer period they were only getting a return of \$4-5 per tray. Late winter did produce some better figures of approximately \$16 per tray. This meant that cost of production was approximately 80 cents per pound of tomatoes, but the grower only achieved a return of 90 cents per pound. How familiar does this sound at the moment? The grower went on to say that the reason for some of the lower prices, was the chain stores wanted to make more profit with less volume. This meant the higher prices forced a glut through low consumer demand. Hello, some things just don't change, even in different hemispheres.

For lunch that day, we went to a unique property which used to be a nursery producing potted plants. Unfortunately, there did not seem to be much money in this venture, so the grower converted his glasshouses to a restaurant, with quite a few gift shops. His old glasshouse is the restaurant area with large seating volumes and several huge ficus trees for shelter. Interestingly, these trees looked in tip top condition and when we asked what he did to keep them so healthy, he simply prunes them when required and sprays them once a week with a diluted sunlight dishwashing liquid as an insecticide. All the indoor plants looked fantastic, so go figure. He did sell local hydro produce, with all proceeds going to local charities. The whole operation was very innovative and quite impressive. The male members in our group enjoyed the all-you-can-eat concept of the restaurant.

## **Harrow research facility**

Later that day we visited the Harrow research facility, which is the largest dedicated greenhouse research facility for greenhouse and processing crops in Northern America. Crops on trial were organic cucumbers and tomatoes. Unfortunately, the results were not complete, but it would be interesting to find out if it was viable.

Other research concepts under study include the idea of pumping foam in between the two layers of poly to filter out high light conditions. It was quite impressive to watch. It seems that when the foam was not required, they used water to disperse the foam in a recirculating system. The shading effect was approximately 36-40% with a thermal saving of approximately 50-60%.

Another grad student was researching the possibility of using bumblebees to spread agents for fungal control.

## **Italian connection**

Finally, on the last day in Leamington, we visited a capsicum/cucumber farm consisting of 12 acres. The owner, Albert Mastronadi, is a first generation Canadian from an Italian background. It was interesting to note that approximately 70% of the greenhouse district is from Italian decent, many from the same Italian village called Villa Canale, which is in the Molise region.

Albert was in the process of commissioning the biggest damn boiler/heater I had ever seen. Again, for you techno gurus, it was a 6MW Vincke boiler fueled with wood waste. Albert believes his \$2 million investment (inclusive of building infrastructure) will pay for itself in five years. He has budgeted to use the boiler/heater for approximately 165 days a year, and believes with an additional 12 acres the boiler will be well worth all the effort and cost. Even with wood waste costing him \$40-50 per tonne, he believes it to be a good investment. Currently, Albert is paying \$9 per GJ for natural gas and expects the wood waste system to decrease his costs to \$4 per GJ.

We were now on the tail end of our trip, so with this in mind we made quite a large detour to visit Niagara Falls. Well worth it, the view was one of the most spectacular I had ever encountered. Awesome!

## **Final remarks**

In conclusion, our trip was well worth the effort and I congratulate Graeme Smith and the Australian Hydroponic & Greenhouse Association (AHGA) for organizing the whole event, which went very smoothly from start to finish.

I would like to thank all of the growers we visited in Canada, who to a man/woman were very forthcoming with their information and hospitality. I would also like to single out Rijk Zwaan, who generously took us out to dinner one night (all seed prices are set to rise) and then took the time to show us around many of the greenhouse establishments in Leamington. Thank you John Hughie, Gus Mastronadi and Roelf Schreuder, for your generous gift of time.

A big thank you to Graeme Smith, who worked tirelessly to make sure our days were filled with places of interest to visit. I can say with absolute conviction that there was not a lot of time to check out some of the really important venues (such as the department stores and specialty shops), but I did come away with a whole new prospective of this industry. I am sure that in the not too distant future, the progress I saw in Canada will be emulated here in Australia. Indeed, it is happening now.

I would also like to thank the Hydroponic Farmers Federation (HFF), who sponsored some of my trip. In the New Year, I will be giving a talk to some growers at a HFF grower meeting on some of the many interesting aspects of the Canadian hydroponic industry. I guarantee not to bore you all.

Finally, to my fellow travelers, Graeme and Jo Smith, Mark and Chris Millis, Horst Sjostedt, Anthony Brandsema (who helped with some of the information with this article), and Mark Lines, a big thank you. I enjoyed our sojourn together immensely

## **About the author**

Sue Korevaar is greenhouse tomato grower based in Bittern, Victoria, and President of the Hydroponic Farmers Federation. Sue is also an Australian distributor of the Bloom Master Hanging Baskets and Planters, and a regular contributor to *PH&G*.

Email: [skw@peninsula.hotkey.net.au](mailto:skw@peninsula.hotkey.net.au) Website: [www.bloommaster.com.au](http://www.bloommaster.com.au)

## Budget

Macedon Ranges Travel Service		
Air Travel & Insurance, Hotel Accommodation (x 4)		\$46,815
Alamo		
2 x Hire Cars		\$1,511
Fuel Stations		
Hire Car Fuel		\$527
Australian Geographic		
Thank you Gifts (Canadian growers)		\$234
Restaurants		
Celebratory Dinners (mid and end tour)		\$1,362
Conference		
Conference Entry Fees		\$486
Misc Fees		
Car Parking Fees		\$133
Photocopying		\$44
Study Tour CD's		\$71
International Phone		\$204
Australia Post		\$62
Bank Processing & Foreign Exchange		\$175
Consulting Fees		\$850
Tour Adverts (Good Fruit & Vegetables)		\$500
	Total Tour Costs	<b>\$52,973</b>

## PARTICIPANTS SURVEY

<b>1</b>	<b>2</b>	<b>3</b>	<b>4</b>	<b>5</b>
<b>Strongly Disagree</b>	<b>Mostly Disagree</b>	<b>Agree</b>	<b>Mostly Agree</b>	<b>Strongly Agree</b>
(please <u>circle</u> most appropriate answer!)				

Study tour met my expectations				
1	2	3	4	5

I received suitable information prior to the study tour				
1	2	3	4	5

Canadian National Greenhouse Conference (Toronto) met my expectations				
1	2	3	4	5

Grower visits met my expectations				
1	2	3	4	5

Transport arrangements met my expectations				
1	2	3	4	5

Accommodation arrangements met my expectations				
1	2	3	4	5

The Tour Leader met my expectations				
1	2	3	4	5

I would recommend future study tours to other growers				
1	2	3	4	5

Any general comments re this study tour				

Name: (optional)

Please email or fax completed form ASAP to **Graeme Smith, President AHGA**

Fax: (03) 5427 3843 or email to [president@ahga.org.au](mailto:president@ahga.org.au)

## PARTICIPANTS SURVEY RESULTS

1	2	3	4	5
<b>Strongly Disagree</b>	<b>Mostly Disagree</b>	<b>Agree</b>	<b>Mostly Agree</b>	<b>Strongly Agree</b>

Study tour met my expectations  
**Mostly Agree x 6, Strongly Agree x 2**

I received suitable information prior to the study tour  
**Mostly Agree x 6, Strongly Agree x 2**

Canadian National Greenhouse Conference (Toronto) met my expectations  
**Agree x 1, Mostly Agree x 6, Strongly Agree x 1**

Grower visits met my expectations  
**Agree x 1, Mostly Agree x 6, Strongly Agree x 1**

Transport arrangements met my expectations  
**Mostly Agree x 4, Strongly Agree x 4**

Accommodation arrangements met my expectations  
**Mostly Agree x 4, Strongly Agree x 4**

The Tour Leader met my expectations  
**Mostly Agree x 4, Strongly Agree x 4**

I would recommend future study tours to other growers  
**Mostly Agree x 2, Strongly Agree x 6**

Any general comments re this study tour  
*this tour was well organised and the itinerary was well thought out*  
*All growers were extremely helpful and forthcoming with local information*  
*Highly recommended*  
*Really well done*  
*Visit earlier in the year before crops are finishing*



## **ACKNOWLEDGEMENTS**

In my role as Project Leader, I wish to thank the tour participants (refer page 4) for their co-operation and punctuality. Their interest in all things greenhouse and the general spirit of togetherness was most satisfying. I thank them for their friendship. I specially thank them for their contribution to the information included in this report.

Recognition and appreciation is also given to the following for their welcome contribution to ensuring a successful, informative and interesting tour:

Roelf Schreuder	Rijk Zwaan Australia
Stephen Goodwin	DPI NSW
Marilyn Steiner	DPI NSW
Joyce Lam	BC Greenhouse Growers Association
Jonathan Bos	Hot House Growers
Freek Knol	Area Mgr, De Ruiter Seeds
Gus Mastronardi	De Ruiter Seeds North America
Shalin Khosla	Ministry of Agriculture, Food & Rural Affairs
Gary Jones	Kwantlen University College
Tiessen Family	Prism Farms
Mastronardi Family	H&A Mastronardi Farms
Ondejko Family	Seacliff Nursery

**Graeme Smith**  
**Project Leader**