



# TOMATO TOPICS



Know-how for Horticulture™

NEWS and INFORMATION  
FOR THE PROCESSING TOMATO INDUSTRY

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## World Processing Tomato News

**California:** This season's harvest in California is down on previous years. 265 000 acres were planted to processing tomatoes this season which is the third lowest area planted in the past 15 years

California Processing Tomatoes (in 1,000 metric tonnes)	
2005	8 490 (harvest still continuing)
2004	10 586
2003	8 392
2002	10 027

**Canada:** Ontario processors indicate that the crop is expected to yield contract tonnage

**China:** One of the poorest crops in many years (reported by Tomato Land). (In addition the acreage in Xinjiang decreased at least 25%. A reason given for this is that the comparative benefits of growing cotton, maize, chilli or other profitable crops is bigger each year than growing tomatoes.)

### Rest of the World :

Turkey : 2005 according to forecasts

Tunisia : a large crop again

Israel : in line with forecasts

Algeria : down more than 40 %

Brazil : lower crop than 2004

**Europe:** European crops look good in most regions but should not exceed forecasts.

The total forecast for AMITOM countries currently stands at 12.49 million tonnes, including 9.72 million tonnes for EU countries. The total volume processed by AMITOM countries in 2004 was 14.455 million tones.

This world reduction in volume of processed tomato products may act to bring production back in line with consumption.

### Tomatoes and Health

The World Processing Tomato Council is currently gaining market information related to tomato products, health claims and product photos from around the world. The aim is to determine how to best use the research data on the health benefits of tomato products for promoting the consumption of tomato products.

A recent study conducted by the University of Illinois suggests that lycopene is one factor involved in reducing the risk of prostate cancer. It also suggests that taking lycopene as a dietary supplement is not as effective as eating whole tomatoes. It is believed that people should consume whole tomato products -in pastas, in salads, in tomato juice and even on pizza.

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### Focus on Potassium (K)

Doris Blaesing, Serve-Ag

**Question:**

Why do we measure high potassium levels in the soil and still struggle to get tomato plant levels within the desired range?

I tried the mathematical approach, looked up literature and checked previous nutrition data on processing tomatoes.

**1 - The Maths**

Table 1 shows a conversion from the soil analysis result (here Colwell extracted potassium) to potential K uptake in kg/ha. For the calculations, I assumed a high soil K level of 420 mg/kg (see Table 2). In table 1, the figures in darkly shaded cells are assumptions. I used 30cm for the thickness of the soil layer the root draw potassium from on average over the season.

Why? - In literature it has been reported that tomato plants have about 70% of their roots in the top 20cm of soil. The very top soil layer of drip irrigated crops would be too dry most of the time and lower soil layers too wet due to the perched water table created by irrigation. According to literature, the average bulk density of soils in the tomato area is 1.4. (If the soil were compacted, the bulk density would be higher). I assumed that 70% of a 1 hectare paddock area in the 30cm layer is penetrated by roots. The assumed uptake efficiency is 50%, which is relatively high. Plants are never efficient enough to take up 100% of nutrients available in the root zone. Usually efficiency is below 50%, but good P and N availability is said to improve K uptake efficiency. As tomatoes are usually well supplied with N at least, I chose 50%. The resulting potential K uptake is 617kg/ha, which just about matches the potassium uptake reported by Matt Stewart for Australian crops in his honours thesis Graph 1.

Table 1 - Conversion of potassium (K) soil test result to potential P uptake in kg/ha

Colwell K [mg/kg] dry soil:	420	or	0.00042 kg K/kg soil
Accessible soil layer depth:	30 cm		
Average bulk density:	1.4 kg/L or g/cm <sup>2</sup>		
Weight of soil block of 100cm x 100cm x 30cm depth:	420 kg		
1 ha area:	10000 m <sup>2</sup>		
Weight of 1 ha layer at 1.4kg/L bulk density:	4200000 kg		
Total available K:	1764 kg/ha		
Percentage of paddock accessed by roots:	70%		
Accessible K:	1235 kg/ha		
Uptake efficiency:	50%		
Potential K uptake:	617 kg/ha		

Table 2 - Extract from soil test recommendations for vegetables

Nutrient	Soil texture	Very low	Low	Marginal	Optimal	High
Colwell K (mg/kg)	Sand and sandy loam	<50	51-100	101-200	201-400	>400
	Clay and clay loam	<100	100-150	151-249	250-400	>400

This calculation suggests that after one tomato crop the soil may be depleted of easily available potassium, especially as nearly 500kg/ha are taken away from the paddock with fruit (Graph 2).

As a comparison, total K uptake of wheat is about 135kg/ha and K removal with grain is 23kg/ha. This means for the above example, that the tomato crop would leave sufficient K behind (uptake – removal = 148kg/ha recycled) to grow a good wheat crop, but not a high yielding, high solids second tomato crop.

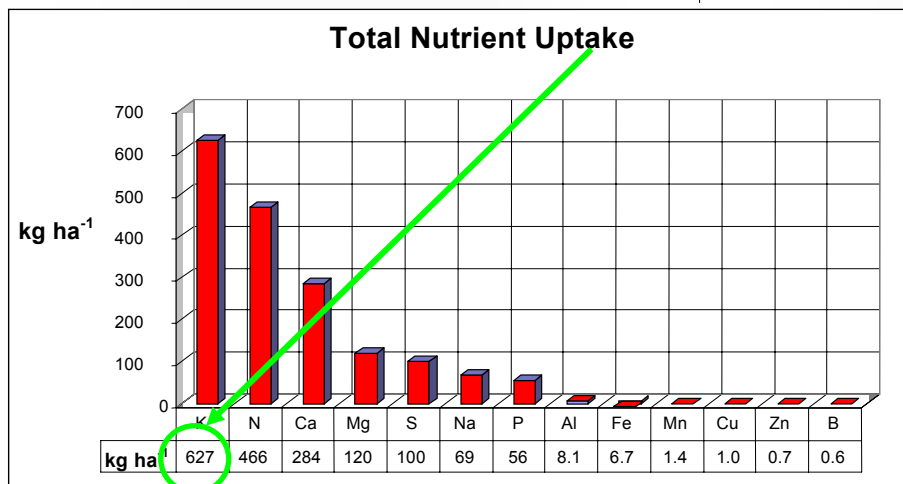
**2 - The Literature**

Below are two citations from literature on potassium uptake in cotton, another crop with a high K demand that often shows deficiency symptoms, even in soils that are well supplied with K according to a soil analysis.

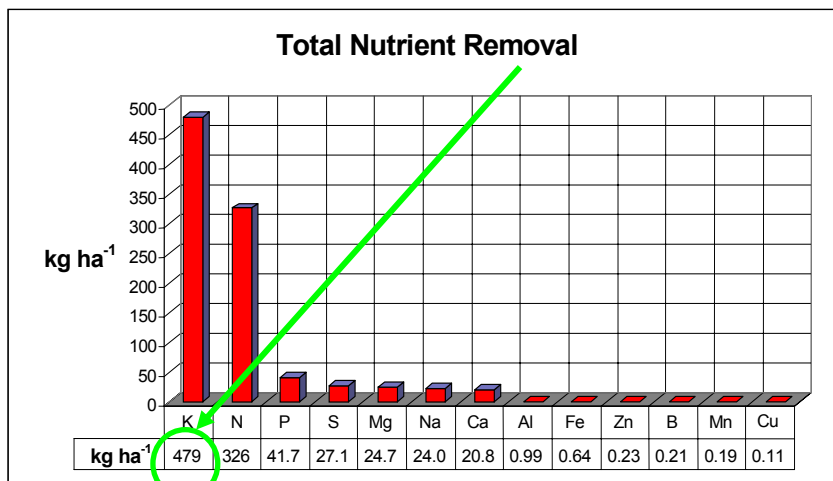
**1) Potassium is required in similar amounts to nitrogen and is very important in boll and fibre development.**

The timing of uptake of K by the plant is similar to that of N, with most occurring in the period from just prior to first flower to peak flowering. K is very mobile in the plant, moving from older leaves to new growth or bolls. This is why one of the first signs of K deficiency in the plant is the death of old leaves.

(Continued on page 3)



Graph 1 - Total nutrient uptake into all aboveground plant parts for Australian Processing tomatoes (Stewart, 2004)



Graph 2 - Total nutrient removal with fruit for Australian Processing tomatoes (Stewart, 2004)

**A Potassium deficiency may occur for a number of reasons:**

- The soil is inherently low in K. This needs to be corrected with ground applied fertiliser applications.
- There are high levels of exchangeable Sodium (Na<sup>+</sup>) or possibly Magnesium (Mg<sup>++</sup>) in the soil. **Sodium** will interfere with P and K uptake.

A high yield potential crop receives stresses during boll fill such as **drought** (DB: e.g. dry soil surface), cold weather, or **waterlogging** (DB e.g. perched water table, summer rain).

2) Environmental stress factors such as cool, cloudy weather and low temperatures in the late season can inhibit the crop's ability to take up potassium, even in soils that are not K deficient.

Soil compaction can also restrict K uptake.

Waterlogging from rain or irrigation is another stress that prevent K uptake in K rich soils.

Inadequate N nutrition for a highly loaded crop is a further factor.

**3 - Previous Data**

Graph 3a shows all potassium (K) and corresponding sodium (Na) levels in plant sap from processing tomatoes, measured over the past 3 years and Graph 3b shows the same for previous years. Statistically, there was a significant negative relationship between the 2 elements, i.e. the higher plant sodium uptake, the lower the potassium levels.

The red lines in Graph 3 show that, when potassium levels were in the desired range above 4000ppm, sodium levels kept mostly below 1000ppm. There was less data available from before 2002 for Graph 3b, because sodium has not been tested regularly then. In 1900 sap samples only 150 sodium levels have been analysed, while potassium was tested for all samples.

The range of sodium levels did not differ much between the two time periods (Graphs 3a and b). The average potassium level analysed in the 10 years proceeding 2002 from the 1900 samples was 4820ppm with a standard deviation of 1160.

The average potassium level in the past 3 seasons was 3670ppm with a standard deviation of 850. The sample number was 800.

This information suggests a declining potassium trend in processing tomato crops. To a large extent, this would be due to increasing yields and thus K removal and closer tomato rotations but little change in potassium fertiliser application practices. As we have been able to repeatedly show a relationship between potassium and brix, this trend is worrying and may contribute to lower soluble solids in fruit.

**What can be done?**

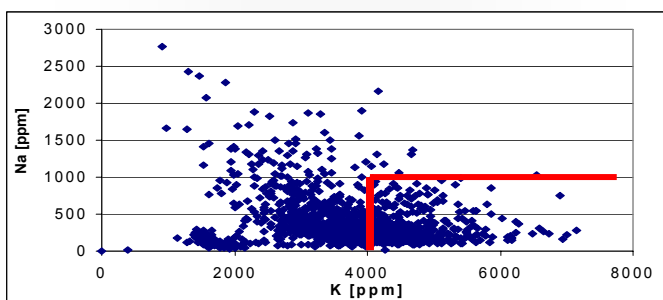
If uptake conditions for potassium are poor, as described in the literature citations, the only way of adding potassium is via foliar applications.

A potassium trial will be conducted in the coming season to investigate the effectiveness of different potassium fertilisers. This trial will be different from the 'traditional' potassium rate trials, were the assumption is made that a certain rate, identified by the trial, will then be applicable to all crops.

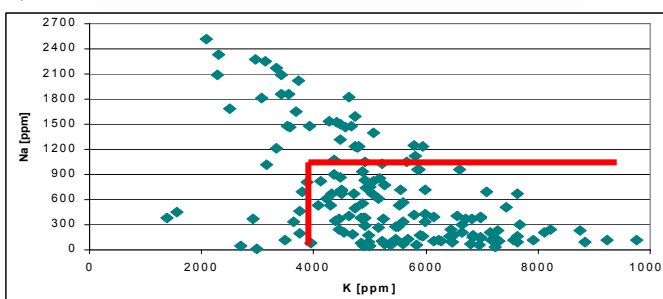
In the planned trial, the K rate will be based on a nutrient uptake budget, using soil test results and uptake / removal figures. The trial plots will be monitored to check that uptake levels are within the desirable range. Yield and soluble solids levels will be assessed at harvest. More details of the trial will be published in the next edition of 'Tomato Topics'.

The calculation in Table 1 is available form [dblaesing@serve-ag.com.au](mailto:dblaesing@serve-ag.com.au) as an Excel spreadsheet for anybody who would like to calculate potential K uptake, using your own assumptions.

Graph 3 - Relationship between sodium (Na) and potassium (K) in plant sap a) in the past 3 seasons, starting with 2002/03



b) from 1991/92 to 2001/02



## Current Season's Research Funded by the APTRC and HAL

### TM05003: Managing soluble solids in processing tomatoes

Doris Blaesing, Serve Ag.

#### 1. Potassium fertigation trial

Aims:

- To investigate the effect of different potassium sources on the yield and soluble solids of processing tomatoes, variety 9614
- To investigate whether potassium fertigation improves yield and soluble solids even if adequate potassium is theoretically available from the soil.

#### 2. Nutrient Calculator

A prototype calculator has been prepared for major nutrients used in mixed farming enterprises. It allows growers to budget for in and outputs of major nutrients. The planned tomato calculator has to be fine-tuned to suit the tomato growers' crop rotation practices, and their requirements as far as the capability/complexity and design of the calculator is concerned.

Training in the theory of nutrient budgeting (e.g. how to develop a fertiliser program based on test results and monitor actual nutrient uptake), and fertiliser selection based on fertiliser properties (how they may affect crop quality and the environment through leaching, salt index and soil acidification), will be conducted for the industry.

#### 3. Soil Quality / Capability

This module follows on from the nutrient budgeting part of the project.

If natural resources such as soil nutrients and water are used up at a rate faster than they are replenished, the farming system will become unsustainable. Sustainability is also dependant on maintaining a high level of biodiversity, especially in the soil and the surrounding environment.

The aim of a soil quality/capability assessment tool for the tomato industry is to provide a snapshot of the current status of the soil/water resource so comparisons can be made in the future to quantify and assess changes and impacts of management practices. The aim is to put together a complimentary set of readily available, affordable tests which provide an indication of the resource status. Results have to be presented in a format that can be interpreted by growers in cooperation with agronomists. Within the one-year timeframe of this project, it is deemed to be possible to develop an assessment tool to a 'proof of concept' stage, ready for fine-tuning by the industry in the following years. Previous work on soil and environmental sustainability, conducted for the tomato industry and by the project manager for other industries, will form the basis for the tool.

The assessment tool will cover three main areas and should provide data for growers that can be used in self assessment programs such as enviroveg, EMS systems etc.

- Soil / Water Chemical status (conventional soil and water analyses, may include 'toxic substances such as heavy metals and pesticides, if budget allows)
- Soil Physical Status (e.g. penetration resistance, aggregate stability, texture)
- Soil Biological Status (C/N, soil biological test)

While chemical and physical methods and their interpretation are available 'off the shelf', biological tests need evaluation in regards to the interpretability of information they provide.

The selection criteria for a biological soil test are as follows

- Ease of use and affordability
- Proven relationship to crop performance / interpretability of results for growers or their advisers
- Ability to adapt the test to Australian conditions, if from overseas

Using the above criteria, two tests have so far been identified for comparison.

- Biological Crop Protection, QLD [www.biocrop.com.au](http://www.biocrop.com.au)
- DHM Labs NZ <http://www.dhmlab.com>

### TM05008: Cultivar evaluation for the processing tomato industry

Applied Horticulture Research and NSW Agriculture

Trial structure:

5 observation trials (3 Vic, 2 NSW)

10 machine harvest full row trials

- NSW, each machine harvest contains 1 full row of each variety
- Vic, each machine harvest contains 2 full rows of each variety (only one trial in each of regions may be harvested)

#### Victoria

(primary contact is Mike Titley, Applied Hort Research)

#### **Early Observation**

Chirnside

#### **Early Machine Harvest**

Chirnside & Wakeman

#### **Mid Paste Observation**

NCP

#### **Mid Machine Harvest**

NCP and Cedenco

#### **Whole Peel Observation**

Rathjen

#### **Machine Harvest**

Rathjen and Kennedy

#### NSW

(primary contact is Tony Napier, NSW Agriculture)

#### **Early Observation**

Amaro and Stott

#### **Early Machine Harvest**

Amaro and Kooba Station

(Continued on page 8)



## UPCOMING EVENTS

**4<sup>th</sup> National Conference of EMS in Australian agriculture**  
17<sup>th</sup> - 20<sup>th</sup> October 2005, Beechworth, North Eastern Victoria  
For information email: [emsconf.vic2005@dpi.vic.gov.au](mailto:emsconf.vic2005@dpi.vic.gov.au)  
[www.cdesign.com.au/ems2005](http://www.cdesign.com.au/ems2005)

**ANCID (Australian National Committee on Irrigation and Drainage) conference**  
23<sup>rd</sup>-26<sup>th</sup> October 2005  
Mildura  
[www.lmw.vic.gov.au/ancid2005](http://www.lmw.vic.gov.au/ancid2005)

**Information seminars to clarify proposals in a discussion paper reviewing DPI's pest and disease legislation, the Plant Health & Plant Products Act 1995**

Following the wide circulation of a discussion paper from 27 October 2005 containing 41 proposals for changes to the legislation, DPI will offer short information seminars (up to 2 hours) for industry groups. The aim is to clarify the proposals so that industry groups can give formal feedback via industry submissions officially due by 12 December 2005. While any growers are most welcome to participate, the seminars are aimed at industry leaders.

Mooroopna (NVFA office)  
Monday 7<sup>th</sup> November 2005, 4:00 – 6:00 pm

**Annual Pre Harvest Social Gathering**

Friday 20<sup>th</sup> January, 2006  
Echuca/Moama

**National Conference and Exhibition of the Irrigation Association of Australia**

Brisbane May 9<sup>th</sup>, 10<sup>th</sup> and 11<sup>th</sup>, 2006.

For more information visit the IAA website; [www.irrigation.org.au](http://www.irrigation.org.au)  
Funding from Horticulture Australia has been received to enable growers to attend this at a reduced cost (total cost to growers will be 55% of the full cost)  
Please let Liz know if you are interested in attending.

**7<sup>th</sup> World Congress on the Processing Tomato &**

**10<sup>th</sup> ISHS Symposium on the Processing Tomato**

5<sup>th</sup> –8<sup>th</sup> June 2006  
Tunisia

[www.worldtomatocongress.com](http://www.worldtomatocongress.com)

Expressions of interest to Liz Mann ASAP to qualify for HAL funding.

*HAL funding for the attendance of industry members at this conference has been obtained through the Technology Transfer Project. Total funding available to the industry is capped and will be evenly distributed to participating industry members.*

Total cost to be determined but airfare and conference registration approx \$4000

## Additional Research Occurring During the 2005/06 Processing Tomato Season

A number of other small on farm trials are being conducted across the processing tomato region. These include the following:

- Composted cow manure trial, treatments include manure with and without starter fertilizer. This trial will also enable the industry to collate some data on soil biology, from plots that have been treated with composted manure compared to untreated.
- A fully replicated trial is being conducted at Rochester to evaluate a product called Acadian SSE. (Acadian SSE contains a multitude of naturally occurring plant growth substances such as plant nutrients, amino acids, carbohydrates and vitamins. Together these compounds contribute to overall plant health, nutrition and quality.) Yield and solids data will be collected.
- A small amount of pelletised seed will be trialed through a nursery to enable single seeding of cells.
- A plant growth hormone will be trialed to evaluate the effect on plant yield, size and solids. This trial will be conducted in conjunction with Cedenco on their farm.
- Large scale commercial trials of AquaGro™ Soil Surfactant will be conducted in conjunction with a number of processing tomato growers., yield and solids data will be collected. The unique polymers in AquaGro™ enable the treated water to adhere to hydrophobic or difficult to wet soil and therefore enhance its capacity to absorb water. This results in a more uniform wetting of the root zone and allows moisture to move more effectively in both a lateral and vertical direction into the soil o find out more information about AquaGro™ please visit [www.agricrop.com.au](http://www.agricrop.com.au) or call David Bell in Shepparton on 0417-501.503

Using simulation models and remote sensing to optimize management strategies in tomatoes production.

Davide Cammarano (Italian PhD student on fully funded scholarship –  
**No Cost to Industry**)

Advances in technologies such as Global Positioning Systems (GPS), Geographic Information Systems (GIS) and remote sensing have created the possibility to assess the spatial variability present in the field and manage it with appropriate site-specific practices. Site-specific management (SSM) strategies may be able to optimize production, but their potential benefits are highly dependent on the accuracy of the assessment of such variability.

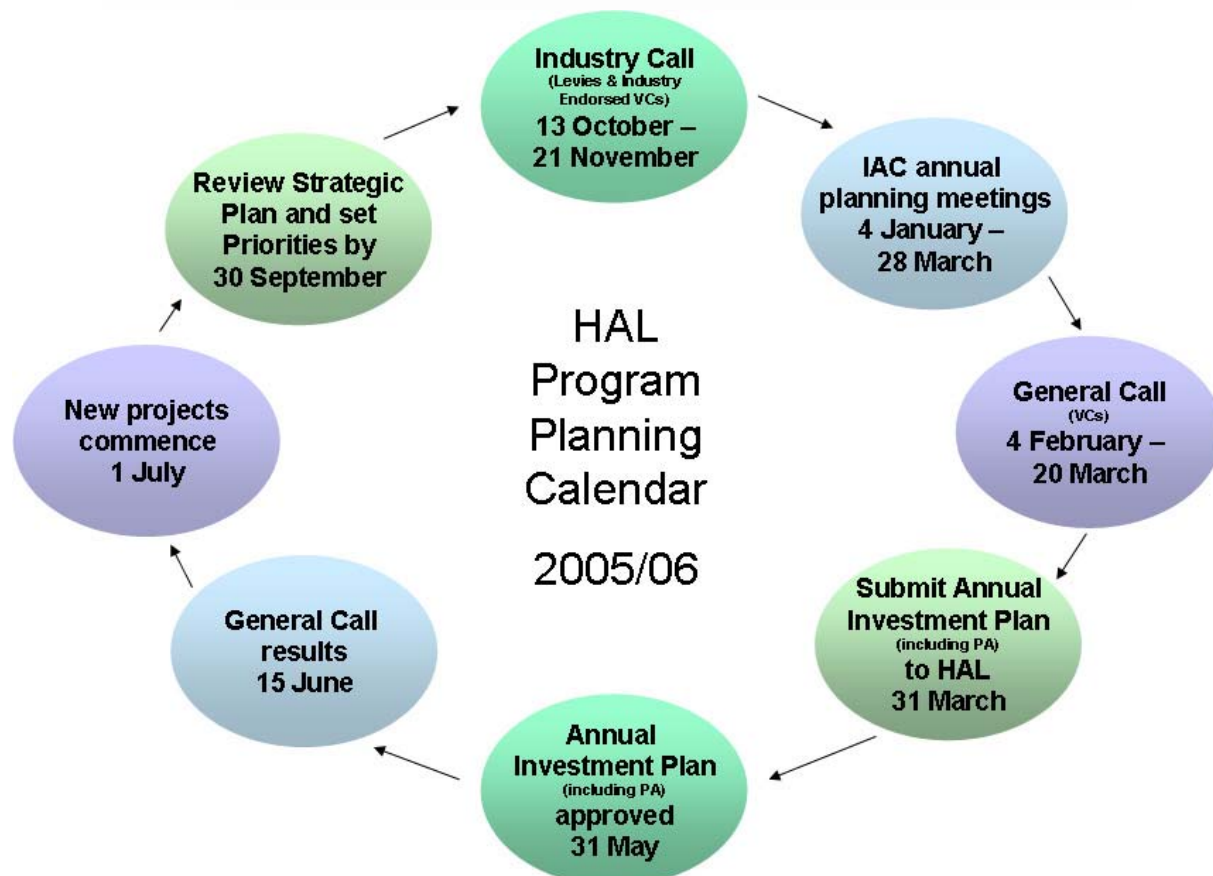
The number of costly, multi-treatment, time-consuming field trails can be substantially reduced by crop simulation as crop models can quantify the magnitude and variability in response to treatments. Process-oriented crop growth models simulate plant growth over homogeneous area. The advent of Precision Farming has resulted in the need to extend the use of point-based crop models to account for spatial processes. Spatial processes include surface and subsurface water flow and spatial and temporal interaction of plant growth with soil water, nutrient and pest stress and management practices.

The objectives of research are:

- To evaluate the utility of the Tomatoes simulation model included in the DSSAT (Decision Support System for Agrotechnology Transfer).
- To use remote sensing through vegetation indices to asses stresses in tomatoes production and for interpreting spatial variability of a tomatoes yield map. Vegetation indices will also be used to find identify spatial patterns across the field to target soil and plant sampling and to provide spatial inputs for the model.

## Horticulture Australia IMPORTANT DEADLINE

Are you interested in undertaking a project funded by Horticulture Australia Ltd? If so the processing tomato industry services representative from Horticulture Australia needs to be notified by the 21<sup>st</sup> November, as detailed in the HAL Program Planning Calendar 2005/06. From this point the project will need approval from the APTRC Inc. for inclusion on the annual investment plan. Without this approval from the APTRC your project will only be considered by HAL for funding during the general call which is a very competitive process.



Projects that have been endorsed by the industry in the past include:

- Rotational crop to be incorporated into the processing tomato system
- Evaluation of insecticides for western flower thrips resistance
- Implementation of an environmental management system for processing tomatoes
- Managing soluble solids in processing tomatoes
- Technology transfer to the Australian processing tomato industry
- Feasibility of machine harvesting tomatoes to significantly reduce the cost structure of the semi-dried tomato industry
- USA Technology Tour
- Attendance at the 5th World Congress on the Processing Tomato in Turkey, 2002, fol-

lowed by a technology tour to the UK and Canada

These industry endorsed projects may be funded either by the APTRC (through your research and development levy) or by individual or groups of growers or processors.

If you are interested in undertaking a project either individually or as a small group, with a start date during the 2006/07 financial year please contact Liz Mann ASAP.

Additional information about Horticulture Australia Ltd. may be obtained by visiting the web site [www.horticulture.com.au](http://www.horticulture.com.au) or by contacting Liz Mann (0427 857 578).

*(Continued from page 4)*

**TM05001: The development of innovative tomato management practices to improve soil-health and productivity**

University of Melbourne

This project will focus on the following areas:

- Soil Health assessments will be conducted in crops that have weak plants
- Possible use of break crop to alter soil microbial levels
- Soil Health issues with consecutive tomato crops

Growers that have crops showing unexplainable poor growth are urged to contact Liz Mann to be included in this study.

**TM05007: Technology transfer to the Australian processing tomato industry**

Liz Mann

This project is continuing for an additional 3 year period. Activities to be continued *include the publication of the quarterly industry newsletter, Tomato Topics* and the annual *Australian Processing Tomato Grower Magazine*.

This project is closely linked to the overall industry research and development program working closely with all research personnel to ensure the success of the industry funded research program.

**FOR SALE**

2000 Guaresi Tomato Harvester complete with 2002 model Waco Electronics

In good working order \$140,000 +GST  
 contact Bryan Ellis 0407 843 700 or  
 bryan.ellis@bigpond.com



Following equipment from  
 Rob and Cheryl Hosking phone: 0428 300 056:

John Deere 7600 FWA 4198 hrs, Power Quad Dual 14-9-46 Tyres, Radar & Front Linkage  
 \$ 71,000 Plus GST 78,100

John Deere 7610 FWA 2831 hrs, Power Shift 14-9-46 tyres, \$74,000 Plus GST

John Deere 2130, Two to choose from, \$11,000 plus GST

John Deere 2140, 7000 hrs \$ 12,500 plus GST

4 Bin Trailers 6 bin, Very strong \$ 1,800 plus GST

Balalini Incorporator, With roller \$ 3,000 plus GST

Mobile Toilet, On trailer \$1,750 Plus GST

3 row Cultivator with Cole, Fert. Units Complete with Disc's and Knifes, \$3,000 Plus GST

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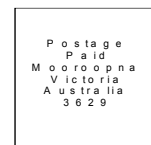
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