



**Centre for Land and Water**



# Winter Lectures 2010

Six informative lunchtime lectures in the  
Green Shed: Fridays at 12 noon

## Lecture 5

**Fuel Mapping – Dan Bloomer**

**BioDiesel Update – Tomo Reed**



# Winter Lectures 2010

---

## REGISTRATIONS REQUIRED

Phone: 06 650-4532 or Email [greenshed@claw.net.nz](mailto:greenshed@claw.net.nz)

Small charge to cover expenses: \$25 inc GST per lecture  
(\$100 inc GST for a Series Registration\*)

You will receive a light lunch (if you register on time), a lecture and an invitation to stay and discuss the topic in more depth should you wish.

## ACKNOWLEDGEMENTS:

The Centre for Land and Water thanks the Winter Lecturers who have generously given their time:



## NOTES:

- \* We may cancel or vary presentations if speakers become unavailable or if registrations fail to meet minimum numbers.
- \* If a speaker becomes unavailable, we may arrange a suitable replacement to cover the same or a similar topic.
- \* Holders of a Series registration will be refunded for any cancelled lectures at \$20 inc GST per cancellation, up to \$100 inc GST total.

# Fuel Use Mapping

## Identifying opportunities for fuel use reduction

---

### Overview

The aim of the project was to develop and field test a methodology to map fuel consumption in detail to assess energy consumption and efficiency of cultivation practice, and scope opportunities to improve on current performance.

This project involved prototyping electronic connectivity between tractor and data logger and display units. We collected instantaneous fuel consumption data from engine management data and spatial data from on board GPS units. This has enabled us to map the location of fuel use.

The follow stages will include identification of conditions, settings and operator practices that offer best opportunities to reduce fuel consumption.

### Achievements

The project required prototyping electronic connectivity between tractor engine management systems and a data logger and presenting the resultant information on a display unit. This has been achieved, although our hope of real time display on the tractor mounted console has not yet been realised.

Simple in concept, and ultimately a simple technical task, capturing gps referenced fuel consumption data proved extremely frustrating. The key problems were identifying which tractors produced the fuel consumption data sought, how the data was presented, which data streams contained the data, and the communication language of the data. It was then necessary to find a combination of equipment that enabled the data capture and logging.

With the assistance of TopCon we now have two units operating and collecting fuel consumption data and gps position as tractors undertake operations in the field. We have a connection from the tractor engine diagnostics port to the TopCon X20 console (which accepts CAN data) and a high accuracy gps unit also feeding into the console. This gives us a system that is independent of any other gps or logging equipment the tractor may have operating, and allows us to fit it to tractors with no gps at all.

## **Data Availability**

The data is available on many (maybe all) tractors complying with the ISO BUS standard and is delivered on CAN BUS. Most new tractors used by cropping farmers will be compliant with the required standards, so increasingly the data should be available.

A second stumbling point was that the engine data is CAN BUS but the loggers (consoles) used by the majority of LandWISE farmers only accept serial data. Cables that convert CAN to serial are now available as a plug and play solution from several manufacturers internationally. Their price is around \$500NZ each, with gps and logger also required.

The third major issue is that we are still unable to display the data in real time on a console in the tractor cab. TopCon may be able to provide us that facility in the near future.

## **Progress**

To date, the equipment has been fitted to two John Deere tractors, a 6420 Premium and an 8420. Both have the CAN BUS management system. It is theoretically possible to use their existing receivers, but we have kept our equipment separate to avoid any potential conflicts.

The first set of equipment is on a John Deere 8420. Data has been captured from a 20 ha paddock being drilled with oat seed at Drumpeel Farm in Otane. The draught requirement was high and initial analysis showed little variation. The tractor was pulling a 6 m wide drill so all engine power was required, despite the cultivation/planting depth being only about 25mm.

We expect to obtain the more useful soil data when we have deeper ground engaged equipment in use – rippers or other deeper tines.

## **Data Capture and Processing**

Data is being logged in the TopCon console, and saved as a csv file for easy transfer to other computers. We are currently transferring it to an i7 pc and processing data in excel spreadsheets before importing it into Manifold GIS.

We now know that John Deere tractors fitted with Greenstar 2 GPS and a 2600 console also capture the fuel consumption data if operations are tracked. Provided the data is processed in John Deere's APEX office software, the fuel data may be

exported from APEX as a csv file and then used in a program such as Manifold. The data is not visible in the John Deere tractor console, nor in the APEX program. Andrew Bremner of John Deere Australia has tested the process and sent us resultant data files that we are able to process.

We have also obtained a crop yield data file from a John Deere combine harvester in South Australia. Analysis of the data did find the fuel consumption data, and we mapped it in Manifold.

The fuel use data (in all cases) is fuel consumption as litres per hour. However, the files also record vehicle speed, so by combining that with implement width, we have determined fuel consumption as litres per hectare. We believe the L/ha data may be more able to demonstrate some of the differences we are seeking.

### Can you Fuel Map?

- Yes with the right bits
  - Newer tractor with CANBUS
    - Deere 60 series premium
    - Deere 8R series
    - Others too
  - Either
    - JD 2600 console and Starfire 2
    - Plus APEX software exported as .csv format
  - Or
    - TopCon X20 with fuel logging program
    - 9pin plug connection to engine management



## Drumpeel Case Study

A drilling operation was logged at Drumpeel, capturing data from tractor start-up, through refuelling, transport to the field, field set up, drilling and return to the yard.

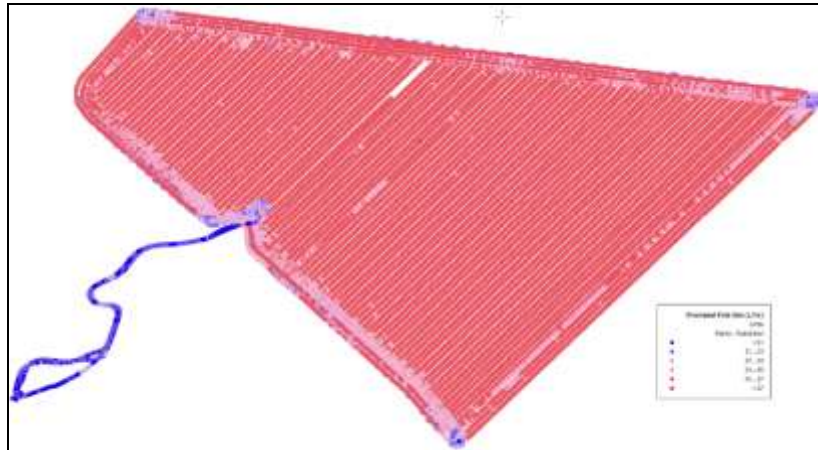


Figure 1: Fuel Use (L/h) by John Deere 8420 with 6m Allen drill planting oats into 20 ha paddock

In the figures presented, lower fuel use is shown as blue points, moving to red points for highest fuel use. Thus figure 1 indicates that for much of the drilling operation, the tractor was using full power. This was borne out by field observations as no additional drilling speed could be obtained. The 6 m drill with included pre working with fluted discs, and twin disc planter coulters at 150mm spacings. Together these create high draft. The blue “tail” shows the path and fuel use by the tractor along the farm road approaching the paddock and then returning to the yard.

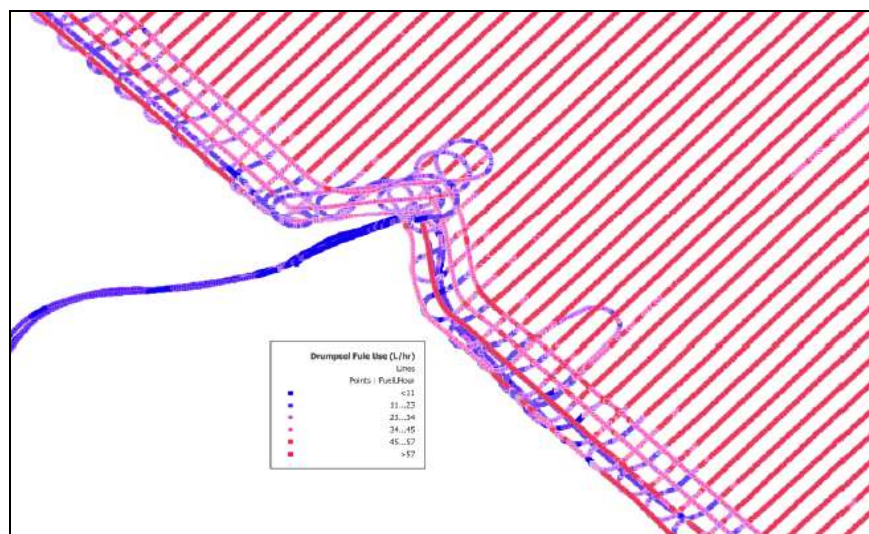
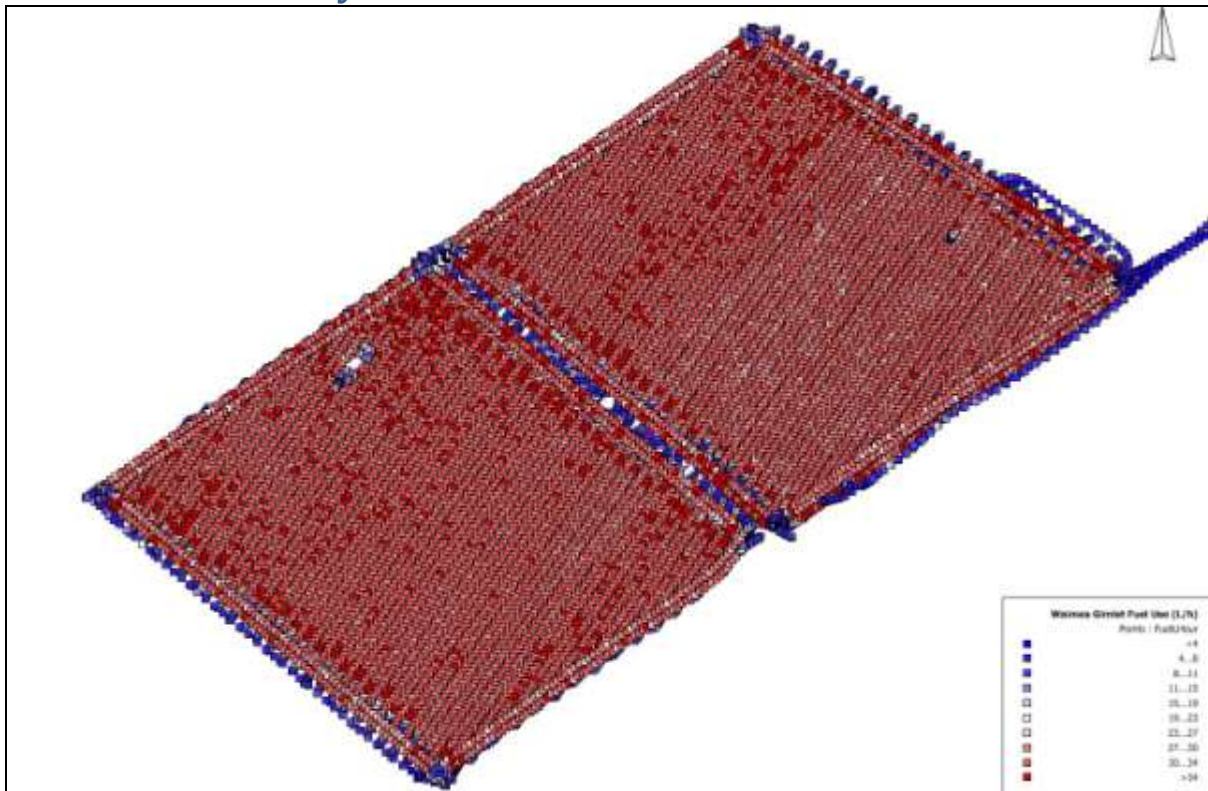


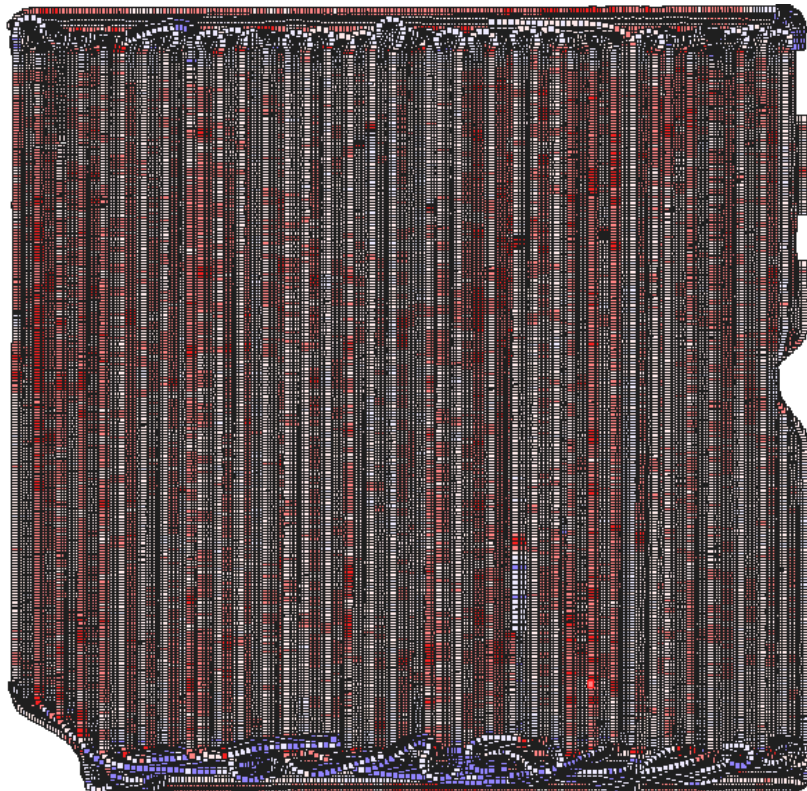
Figure 2: Closer view of part of Figure 1 showing individual runs, turning points and headland sowing



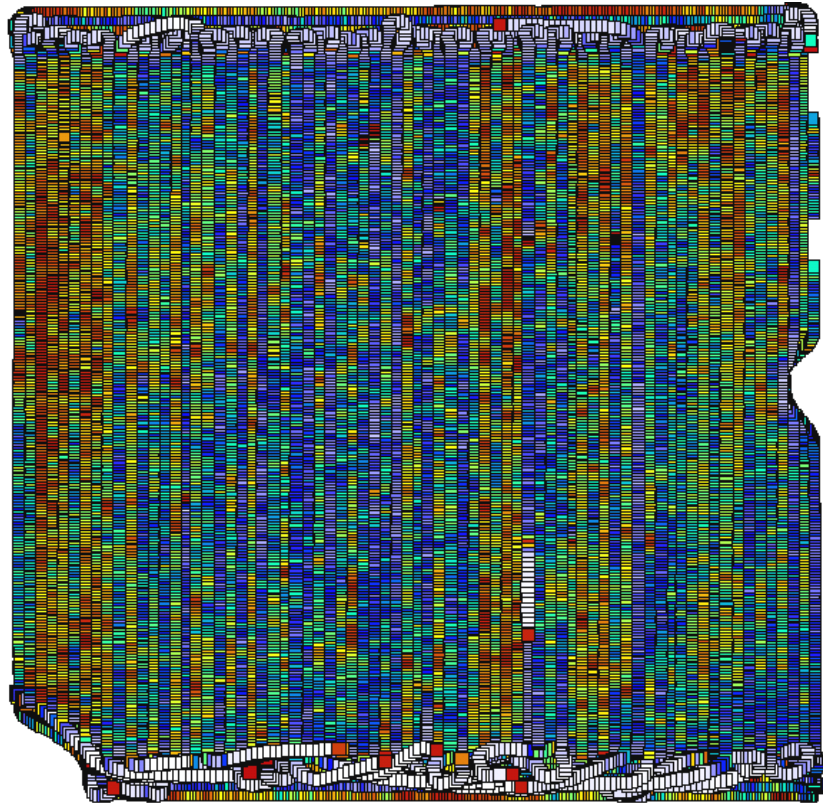
## Nicolle Case Study



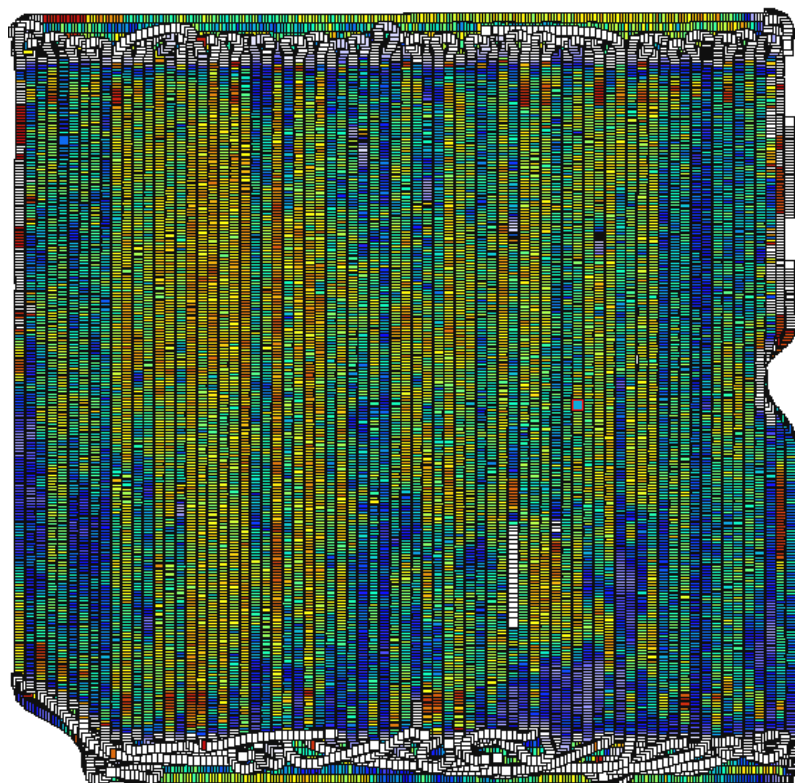
## John Deere Harvester



Harvester Fuel Consumption Litres Per Hour



Harvester Fuel Consumption Litres Per Hectare



Wheat Wet Yield Map – Courtesy Tim Neale



## Attachment

Extract from data file (Excel csv spreadsheet format) showing data fields captured

PCTime	Lat	Long	GPS Qual	NSats	Elevm	GPS Speed	GPS Dir	RPM	Torque	TempC	Oil kPA	Fuel LHour	Fuel	EngHours
20:18:15.640	-39.8861	176.6622	2	8	82.2	0	343	935	16	35	0	4.25	0	7489.75
20:18:16.046	-39.8861	176.6622	2	8	82.2	0	343	936	16	35	0	4.3	0	7489.75
20:18:16.250	-39.8861	176.6622	2	8	82.2	0	343	934	16	35	0	4.25	0	7489.75
20:18:16.640	-39.8861	176.6622	2	8	82.2	0	343	936	16	35	0	4.35	0	7489.75
20:26:19.062	-39.8861	176.6622	1	9	82	0	3	920	17	39	0	4.6	0	7489.9
20:26:19.468	-39.8861	176.6622	1	9	82	0.3	347	959	20	39	0	6.05	0	7489.9
20:26:19.656	-39.8861	176.6622	1	9	82	0.3	344	956	21	39	0	5.75	0	7489.9
20:26:21.062	-39.8861	176.6622	1	9	81.9	1.4	344	959	42	39	0	13.3	0	7489.9
21:34:07.468	-39.8848	176.6677	1	9	80.2	10.5	220	2006	80	69	0	52.65	0	7491.05
21:34:07.656	-39.8848	176.6677	1	9	80.2	10.5	219	1989	80	69	0	52.65	0	7491.05
21:34:07.859	-39.8848	176.6677	1	9	80.2	10.5	219	1979	81	69	0	52.75	0	7491.05
21:34:08.250	-39.8848	176.6677	1	9	80.2	10.6	219	1986	81	69	0	52.75	0	7491.05
21:34:08.453	-39.8848	176.6677	1	9	80.2	10.6	219	1987	81	69	0	52.65	0	7491.05
21:34:08.656	-39.8848	176.6677	1	9	80.2	10.6	219	1996	80	69	0	52.65	0	7491.05
21:34:08.859	-39.8848	176.6677	1	9	80.2	10.6	219	1989	81	69	0	52.65	0	7491.05
21:34:10.062	-39.8849	176.6677	1	9	80.3	10.6	218	1973	81	69	0	52.75	0	7491.05
23:51:58.062	-39.8834	176.6666	1	9	81.8	11.3	219	1837	85	66	0	53.8	0	7493.35
23:51:58.281	-39.8835	176.6666	1	10	81.8	11.3	219	1847	85	66	0	53.8	0	7493.35
23:51:58.468	-39.8835	176.6666	1	10	81.8	11.1	218	1831	85	66	0	53.8	0	7493.35
23:51:58.671	-39.8835	176.6666	1	10	81.8	11.3	219	1831	86	66	0	53.9	0	7493.35
23:52:00.078	-39.8835	176.6665	1	10	81.8	11.6	218	1891	83	66	0	53.15	0	7493.35
23:52:00.281	-39.8835	176.6665	1	10	81.8	11.5	219	1884	82	66	0	51.8	0	7493.35
23:52:00.468	-39.8835	176.6665	1	10	81.8	11.5	219	1870	83	66	0	52.25	0	7493.35

## Biodiesel for your business?

Tomo Reed - EECA

Many businesses and organisations around the country are looking at ways to implement more sustainable practices, reduce greenhouse gas emissions and lessen their impact on the environment. One response to these concerns is to use biodiesel blends in vehicles.

Biodiesel is an attractive transport fuel option that's suitable for businesses running fleets of all sizes. Biodiesel-blended diesel is a similar cost to diesel, partly due to the government grants available to New Zealand biodiesel producers.

Biofuels, including biodiesel, are produced from renewable feedstock. Biodiesel available in New Zealand is produced from used cooking oil, tallow (a by-product of meat processing), or rapeseed (grown as a break crop). In New Zealand, a 5% blend of biodiesel with 95% ordinary diesel (B5) is the maximum blend ratio of biodiesel with ordinary diesel allowed for retail sale. Higher blends such as B20, however, can be sold directly to commercial users where there is a written contract for supply.

Using biodiesel reduces greenhouse gas emissions. Consumers are increasingly aware of the carbon footprint of the goods and services they use, and are more willing to support businesses that are working to reduce their environmental impact. Biodiesel burns more cleanly than ordinary diesel, which improves air quality. It also has good combustion and lubrication properties which makes it easier on engines.

## More information

If you are interested in using biodiesel or would like more information, contact

EECA's Biodiesel Account Manager

Phone (03) 353 9283, 0800 358 676

Email [biofuels@eeca.govt.nz](mailto:biofuels@eeca.govt.nz)

More information is available at [www.eeca.govt.nz/biofuels](http://www.eeca.govt.nz/biofuels)





## Centre for Land and Water

### WELCOME

Welcome to the Centre for Land and Water, a venue supporting sustainable agriculture through training, research and consultancy.

The Centre provides professional offices, meeting and seminar facilities and land for research and training.

We currently have rental offices available. Terms by agreement - phone, fax, copy and print facilities available on-site.

The Green Shed seminar venue is available for training, meetings or for general event hire. Contact us: Phone: 06 650-4532 or Email [greenshed@claw.net.nz](mailto:greenshed@claw.net.nz)

The Centre is located on a 4 ha site with easy access and plentiful parking. Entry is from Ruahapia Road, accessed from Karamu Road (SH2) at Waipatu or Pakowhai Road at Chesterhope. It is 4 km (8 minutes) from the Hastings CBD, 17 km (20 minutes) from Napier CBD and 18 km (20 minutes) from Hawke's Bay Airport.

### COMING SOON

#### CLAW Short Seminars:

Communications: Media Training – 9 – 12noon 31 August 2010

Communications: Writing popular articles 9 – 12noon 21 September 2010

Communications: Writing technical reports 9 – 12noon 12 October 2010

Communications: Preparing and delivering public presentations

Irrigation: System calibration theory and practice

Irrigation: How much water do I really need?

#### CLAW Short Courses

NZQA Certified Irrigation Evaluator

#### The Micro Cropping Farm for Research and Technology Transfer

Contact us to become involved in this exciting new initiative



Centre for Land and Water

## WINTER LECTURES 2010

### **1. NIWA Virtual Climate Station Network: Friday 16 July**

Speaker: Andrew Tait, NIWA

The Virtual Climate Station Network provides daily climate estimates at 5km intervals across N.Z. Andrew will explain how the data is estimated, and how the network can be accessed.

### **2. Nitrogen Testing and Sample Preservation: Friday 23 July**

Speaker: Peter Lorentz, Analytical Research Laboratories

Peter will explain the different soil nitrogen tests, outline correct soil nitrogen sampling methods, and describe the steps needed to make sure the samples you take in the field get to the lab in good condition for analysis.

### **3. Soil pH - Crop Response & Soil Mapping Options: Friday 30 July**

Speaker: Stephen Trolove, Plant and Food Research

Stephen will discuss crop responses to pH, including critical pH ranges for key Hawke's Bay crops, and will describe a process for farmers to determine whether the expense of a detailed soil pH survey may be warranted.

### **4. Vehicle Tracking and Fleet Management: Friday 6 August**

Speaker: John Brew, Astrata

Astrata designs systems combining GPS, wireless communications and GIS to monitor machinery or other assets. John will talk about applications for agriculture, asset management, fleet & personnel tracking and health & safety.

### **5. Fuel Use Mapping and Bio-Fuel update: Friday 13 August**

Speakers: Dan Bloomer, LandWISE and Tomo Reed, EECA

Dan will explain how to capture engine data and create maps of fuel consumption by tractors and present 'proof of concept' results from fuel mapping. Tomo will up-date us on bio-fuels and how to make bio-fuel available in Hawke's Bay.

### **6. Surfactants; types, actions and combinations: Friday 20 August**

Speakers: Gordon Harris, Zeland, and David Manktelow, AR&T

Gordon and David will outline the types of surfactants available, how they work, and will give guidance for growers contemplating multiple product mixes as part of their spray programme.