Potatoes
NEW ZEALAND

2019 Field Walk

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2019 Field Walk Notes

13th February, Canterbury

FARMS: Andy Bailey, Tim Pike, Daniel Lovett

TIMES: 2.30pm Southbridge, 4pm Methven, 5pm Ashburton

TOPICS: Psyllid Management Trials, Teralytic Probes & Tamarixia Release

SPEAKERS: Jessica Dohmen-Vereijssen, Lachlan Turley & Steven Dellow

20th February, Pukekohe & Matamata

FARM: Vinu Parsot

TIMES: 10am

TOPICS: Teralytic Probes, Powdery Scab (HIA Project), TPP, Regreening & Tamarixia, Quick N Test Project (FAR)

SPEAKERS: Iain Kirkwood, Graeme Bunckenburg/Lachlan Turley, Peter Wright & Matt Norris

27th February, Manawatu, Horowhenua/Levin

FARM: Chris Pescini

TIME: 2.30pm

TOPICS: Teralytic Probes, Future Proofing Vegetable Production SFF, Psyllid, Tamarixia, Powdery Scab (HIA)

SPEAKERS: Dan Bloomer & Iain Kirkwood
Allan Siano (Climate Change)

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Potatoes NEW ZEALAND

2019 Field Walk Topics

1. Teralytic Probes

Potatoes NZ has 9 probes being trialed at 3 locations across our growing regions. It is hoped if successful, these can be utilized by farmers to operate smarter, more sustainable businesses and to enable farmers to meet the growing requirements to manage nitrate levels.

Teralytic is a soil analytics company that makes it easy for farmers to grow more using less, while reducing the environmental impact of agriculture. Teralytic's wireless probe contains 26 sensors to provide the most detailed soil quality data available, reporting soil moisture, salinity, pH, and NPK at three different depths, as well as aeration, respiration, air temperature, light, and humidity. For more information visit www.teralytic.com.

TERALYTIC CLAIMS TO BE "THE MOST COMPREHENSIVE SOIL PROBE EVER BUILT"

https://teralytic.com/

The probes can send data back to you detailing surface, soil and air content/quality.

- Air Temperature
- Humidity
- Light
- Soil Moisture
- Salinity
- Soil Temperature
- pH
- Nitrate
- Potassium
- Phosphorus
- Aeration (O2)
- Respiration (CO2)

Probes collect data from soils and send wirelessly via LoRaWAN, a long-distance network that transmits sensor data up to 16 kilometres.

Gateways aggregate all probe data and it is sent in a secure live stream to cloud servers, where it is analysed and processed. The results are reported to the farm with real-time and predictive insights, to help managers with decision making and potentially with compliance

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2. Future Proofing Vegetable Production

The following extract can be found at http://www.landwise.org.nz/projects/future-proofing-vegetable-production/

Future proofing vegetable production requires ongoing rapid change in farm practice to meet cost pressures and increasingly stringent demands from regulators and markets for enhanced environmental performance and water quality.

With support from the MPI Sustainable Farming Fund (https://www.mpi.govt.nz/funding-and-programmes/sustainable-food-and-fibre-futures/), industry and regional councils, we're starting the journey.

Landwise is partnering with growers and our funders to develop and test new production and nitrogen mitigation techniques. The project draws on and supplements recent and current research to develop new generation good management practices.

We have four main areas of focus:

1. Precise nutrient prescription (how much is required)

Test strip used to determine available N in a soil sample

2. Precise application (is it going where it is needed when it is needed)

Ensuring the prescribed rate of fertiliser is applied

3. Maximising retention (ensuring leaching is minimized)

4. Recapturing nitrates that move beyond the root zone (constructed wetlands and wood-chip bioreactors)

Installing a wood-chip bioreactor (Lincoln Agritech image)

Sediment and Drainage (http://www.landwise.org.nz/projects/fert-calibration/), and other projects including current research on quick tests for soil nitrate (http://www.landwise.org.nz/soil/matthew-norris/), fluxmeter monitoring of leaching and the use of wood-chip bioreactors (http://www.landwise.org.nz/soil/aldrin-rivas/) to strip nitrate from drainage water.

The research side will be supported with considerable extension and training. We are aware that numerous computer based decision support tools (http://www.landwise.org.nz/projects/fert-calibration/on-line-resources/) have been developed, but we have identified that many growers need considerable support and upskilling to have the knowledge, skills and experience to effectively use them.

To stay in touch about this project, subscribe to our newsletter for updates! (http://www.landwise.org.nz/home/newsletter/)

This project is funded by the Ministry of Primary Industries Sustainable Farming Fund, Horizons Regional Council, Gisborne District Council, Ballance AgriNutrients, Vegetable Growers and LandWISE.

3. Psyllid Management

The tomato potato psyllid, Bactericera cockerelli (Šulc) (TPP) vectors the bacterium Candidatus Liberibacter solanacearum (CLso). CLso is the putative agent of zebra chip (ZC) disease in potato tubers. Zebra chip disease makes potatoes unsuitable for processing, causes disease in seed tubers, and affects the taste as well as their internal appearance. In previous field trials we tested action thresholds based on sticky trap counts and accumulated degree days to commence insecticide programmes, and incorporation of agricultural oils.

In the Potatoes NZ funded 'Future-proof spray programme Canterbury' trial we test different spray programmes using integrated pest management tools. Insecticide resistance management and product label have been taken into account when developing these spray programmes with industry. The spray programmes consist of:

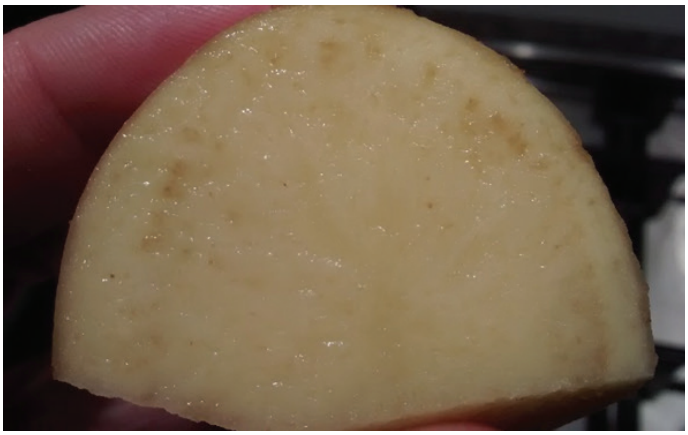
1. A positive control - a standard Canterbury spray programme,
2. Alternating the Canterbury programme with Excel oil from emergence,
3. Canterbury programme but only start when degree day threshold is reached,
4. Alternating the Canterbury programme with Excel oil but only start when degree day threshold is reached,
5. A future proof spray programme without neonicotinoids and organophosphates, and
6. A negative control that will not be sprayed.

TPP adults are monitored using 5 yellow sticky traps in the crop, which are collected and replaced on a weekly basis from crop emergence. A sticky trap is placed on each side of the crop, about 5 m into the crop. The fifth trap is placed in the centre of the crop.

At harvest total yield (kg) per plot, weight and number of marketable and reject tubers, dry and wet weight of 30 tuber sub-sample of marketable tubers to calculate Specific Gravity, and Zebra chip incidence and severity of 30 marketable tubers per plot will be taken for frying to assess ZC.

A tomato potato psyllid adult and yellow eggs on stalks. Copyright © The New Zealand Institute for Plant and Food Research Limited. All rights reserved.

Foliar symptoms in potato related to an infection by the bacterium Candidatus Liberibacter solanacearum. (A) Foliar symptoms early in the eason consist mainly of cupping of the leaves. (B) Later in the season, purpling of the leaves occurs, as well as thickening of the nodes and the growth of aerial tubers.
Photos by: Jessica Dohmen-Vereijssen.



Raw tuber symptoms as a result of an infection with Candidatus Liberibacter solanacearum.

Zebra Chip disease (dark/flecked slices) in potato

4. Tamarixia Trials

A Sustainable Farming Fund (SFF) project aims to establish self-sustaining populations of Tamarixia triozae, a tiny parasitic wasp (around 2 mm long) of TPP, in New Zealand. To date;

- Around 2800 adults of the small wasp were released between Nov 2016 and Feb 2017, across two sites in Canterbury, three sites in Hawke's Bay and one site in the Auckland region. The challenge has been to find release sites where year-round populations of the psyllid are present and that are not exposed to insecticides. We have therefore focused on sites in Canterbury and Hawke's Bay where the perennial TPP host plant, African boxthorn. The Auckland site was a tomato grower's property.
- A post-release survey that began in December 2018, has recovered the tiny wasp from both sites in Canterbury and two sites in Hawke's Bay.
- Plant & Food Research supplied T. triozae to Bioforce, a company that produces biological control agents, and the company is now selling the wasp as a commercial product.
- PFR also supplied Lincoln University, who are successfully rearing the wasp to supply further releases as part of the SFF project.
- Further releases, as part of the SFF project, have been made by growers and other industry personnel keen to establish the wasp on their farms since December 2018.

The parasitic wasp Tamarixia triozae parasitizing a tomato potato psyllid nymph. Copyright © The New Zealand Institute for Plant and Food Research Limited. All rights reserved.

5. Powdery Scab (HIA Project)

This is an abstract from a grower profile which first appeared in Grower Success Stories, a levy-funded booklet published by AUSVEG to promote real results from levy investment, and was featured in the AUSVEG Weekly Update published 11 December 2018 and was then republished with permission in NZ Grower and on the Potatoes NZ website.

Photography credits: Nigel Marple.

Project PT16002 is a three-year project examining if different field soils affect the development of powdery scab in potato crops across New Zealand. In collaboration with scientists, A S Wilcox and Sons collected soil samples to study links between soil biology and powdery scab, looking to assist growers in selecting those soils as preferable locations for ware potato production.

"It's critical to focus energy in regions growing potato seed crops, otherwise we, as growers, are just inoculating new land all the time with this disease" says Wilcox grower, Bryan Hart.

"Powdery scab is the scourge of ware crop growers and costs the business a lot of money every year. Current chemical controls aren't effective to meet our customer demands (of perfect skin finish) and increasing knowledge of the disease is fundamental to developing long-term solutions," he says.

A project is being conducted to determine if different field soils affect the development of powdery scab on potatoes. Phase two of the project will investigate whether soil physical, chemical and/or biological characteristics influence this disease.

Exploring Spongospora suppressive soils in potato production (PT16002) is a strategic levy investment under the Hort Innovation Fresh Potato and Potato Processing Funds. It is supported by Hort Innovation and Potatoes New Zealand Incorporated.

During the project, Wilcox has collected soil samples from a number of farms with a range of cropping history to help determine if there was a link between soil biology and disease presence and expression in potato crops.

"We are interested in this because currently there are few tools of limited effect at managing the disease, especially when you receive seed lines that are infected or you grow varieties that are highly susceptible to the disease," Bryan says.

Results from the project identified different levels of several physical and chemical factors from similar soil types including soil texture, organic matter, and fertility and nutrient availability. Bryan says this raises questions around what makes these soils different.

"It is very early in the piece, however if there are biological organisms in those suppressive soils, then long-term it may be possible for either selecting those soils as preferable locations for potato production or potentially even for the manufacture of those organisms to be incorporated in-furrow at planting."

"If these facets turn out to be realized, then I would encourage all growers to adopt them."

Exploring Spongospora suppressive soils in potato production has been funded by Hort Innovation using the fresh potato and potato processing research and development levies and contributions from the Australian Government. The project is supported by Hort Innovation and Potatoes New Zealand Incorporated.

6. Regreening

The Regreening Project is another SFF project in which we hope to develop Best Practice Protocols for spraying off seed crops to prevent and/or control re-greening.

One of the greatest challenges is in the post-spray-off period, when we see the highest risk of Liberibacter infections and also ongoing risk throughout the season. We aim to provide growers with guidelines for optimum spray off.

Re-growth plants act as a magnet to tomato potato psyllids and large populations can often be found inhabiting this foliage. Obtaining a rapid and efficient kill is a vital component in seed crop disease management.

- **Chloropicrin soil fumigation**

This project is investigating the use of soil fumigation to manage soil borne disease load.

Chloropicrin has a long track record of effectiveness on many soil-borne pathogens, including verticillium wilt, scab, Colletotrichum (black dot), rhizoctonia, fusarium, and phytophthora.

Chloropicrin advocates in the U.S. and Canada say, because the product can be selectively injected into just the seedbeds, rather than throughout the whole field, this reduces the environmental impact. Because fumigation can mean healthier crops, it can be argued that this also helps reduce the overall carbon footprint of potato farming. Once your plant is healthy then it may not need as many other inputs.

If growers promote the healthy growth of the potato crop, with a much healthier root system then the plant may be better able to scavenge

***Candidatus* Liberibacter**

The potato psyllid, *Bactericera cockerelli*, feeds on a potato and infects it with *Candidatus* Liberibacter solanacearum, the bacterium that causes zebra chip disease.

Source: Wikipedia

and make use of applied water, nitrogen or fertilizer. All that translates into healthier growth, higher yields and higher quality.

In an article on www.spudsmart.com proponents say this:

Regardless of what type of applicator is used, *"it's a closed system, moving right from the container that the product is delivered in, to the soil."*

The fumigant is in a liquid form until it's injected underground, when it then changes from a liquid into a gas that moves throughout that soil profile.

"Chloropicrin is degraded in the soil by microbes, so over a very short period of time, less than three or four days, it is chewed up and degraded into some very safe products. One is carbon dioxide, others are nitrogen and a little bit of chlorine. Basically no residue is left behind."

"A lot of people have a perception that soil fumigants sterilize the soil, and that's simply not the case, in fact, they're fairly specific on the types of organisms that they do suppress, and there are several 'beneficial' organisms that really rebound well, say in the case of chloropicrin. They come back in and re-inhabit the soil, you can see massive growth in these populations. We think that that provides some of the growth benefit that you see in the crop, the fact that after the application, you get rebound in populations of beneficials."

7. Potential climate change impacts on potato production in New Zealand

Allan Siano, Nick Roskruge, Huub Kerckhoffs, Svetla Sofkova-Bobcheva, School of Agriculture and Environment, Massey University, Private Bag 11222, Palmerston North 4442, New Zealand

The expected impact of climate change on potato production is largely on the reduction of crop yield. In general, global potato production under climate change is estimated to decrease by 18-32% (without adaptations) and by 9-18% (with adaptations) (Hijmans, 2003). In the latest IPCC report (Reisinger et al., 2014) it was cited that New Zealand is already experiencing climate change with projected long-term trends toward higher temperatures and shifting rainfall patterns. At present, there is a paucity of study done on the potential impacts of climate change and associated abiotic stress like heat and moisture stress on the yield and tuber quality of commercial potato cultivars in New Zealand. This three-year Massey University PhD research aims to (1) determine if there is early evidence that climate change is already affecting the current potato production system in New Zealand, (2) study how it affects yield and tuber quality of potatoes, and (3) examine if commercial potato cultivars have different susceptibility to abiotic stress associated with climate change. Preliminary examination of secondary weather data showed that variations in climate pattern are evident in potato production sites in Ohakune (Central North Island; 563 masl), Opiki (South-West North Island; 4 masl), and Hastings (Eastern North Island; 8 masl). An increasing trend in temperature and varying rainfall patterns are being experienced across regions. On the other hand, data gathered from randomly collected potato tubers has revealed that yield is primarily affected by the increase in the volume of defective tubers that could reach as high as 85% of the total volume of samples collected. This is largely due to the incidence of an array of tuber physiological defects like enlarged lenticels, growth cracks, netting, malformations, and pre-harvest sprouting. Also, initial findings show that commercial potato cultivars have different susceptibility to abiotic stress and related tuber physiological defects.

With these findings, the first of two-season multi-environment trial is currently being conducted to validate the response of commercial potato cultivars to abiotic stress. A separate glasshouse and controlled-environment trial will be implemented to simulate abiotic stressed conditions. These trials will result in the identification of potential climate change-resilient cultivars as well as understanding the mechanism of abiotic stress tolerance. Ultimately, the research will contribute to the resiliency of the New Zealand potato industry to issues of changing climate for food security.

The principal researcher Allan Siano is a Senior Science Research Specialist of the Department of Science and Technology government of the Philippines, undertaking a PhD programme in Horticultural Science at the School of Agriculture and Environment of Massey University, New Zealand. He is an awardee of the New Zealand ASEAN Scholarships by the New Zealand Government through the Ministry of Foreign Affairs and Trade. The research is under the expert supervision of Associate Professor Nick Roskruge, Dr Huub Kerckhoffs, and Dr Svetla Sofkova-Bobcheva of Massey University.

Figure 1. Tuber physiological defects (a) enlarged lenticels, (b) superficial growth cracks centered on lenticels, (c) pre-harvest sprouting, (d) dumbbell-tubers, (e) growth cracks and (f) bottleneck tubers.

References: Hijmans, R. J. (2003). The Effect of Climate Change on Global Potato Production. American Journal of Potato Research, 80, 271-280.

Reisinger, A., R.L. Kitching, F. Chiew, L. Hughes, P.C.D. Newton, S.S. Schuster, A. Tait, and P. Whetton, 2014: Australasia. In: Climate Change 2014: Impacts, Adaptation, and Vulnerability. Part B: Regional Aspects. Contribution of Working Group II to the Fifth Assessment Report of the Intergovernmental Panel on Climate Change [Barros, V.R., C.B. Field, D.J. Dokken, M.D. Mastrandrea, K.J. Mach, T.E. Bilir, M. Chatterjee, K.L. Ebi, Y.O. Estrada, R.C. Genova, B. Girma, E.S. Kissel, A.N. Levy, S. MacCracken, P.R. Mastrandrea, and L.L. White (eds.)]. Cambridge University Press, Cambridge, United Kingdom and New York, NY, USA, pp. 1371-1438.

8. Biosecurity Advice

PNZ are working on an A3 poster for distribution to stakeholders, based on the following advice.

1. Entering a Property
e.g. growers, workers, sales representatives, consultants, crop monitors, inspectors, field surveyors, other visitors

- Limit entry points into a property.
- Park in designated parking areas (using signage will help).
- Wash down vehicles if necessary.
- For anyone coming from another property, wash hands and clean footwear (or provide booties and overalls to visitors).
  If footwear needs cleaning, ensure soil is removed before using disinfectant. (Disinfectant won't work if dirt present).
- For anyone who has recently been overseas in rural areas, ensure footwear and clothing worn overseas is clean.
- Ask visitors to stay on tracks.
- If transporting visitors, use own vehicles where possible.
- If you will not be present when visitors are going to your property – discuss with them prior to their visit, the hygiene/biosecurity practices you would like them to adhere to.

2. Bringing organic material onto your property (including seed)
e.g. seeds, organic fertiliser, compost

- Source certified seed.
- Talk with suppliers about biosecurity, hygiene, testing and record keeping.
- Ask for copies of tests/certificates/declarations if available.
- Inspect on arrival visible pests and diseases.
- Store away from production areas if possible.
- Traceability – record where from and where used. Have the ability to trace backwards and forwards.

3. New plantings

- Regularly check new plantings for anything out of the ordinary.

4. Equipment

e.g. new, second hand, borrowed or lent equipment

- Clean storage/harvest bins, containers (free of debris, waste and dirt) and storage areas.
- When moving between properties wash down vehicles and other machinery.
- Consider establishing a wash facility with a hard stand or sump.
- Do not let water "run off" into production areas.
- Regularly check areas around wash down facility, for new pests or weeds.
- Keep an up to date cleaning record.
- Clean vehicles from top down.
- For maximum protection consider using a broad-spectrum disinfectant after washing.

5. Contractors

What do you want your contractor to do?

- What hygiene/biosecurity practices do you want them to implement?
- How can you check contractors are doing it?
- Contractors following good biosecurity practices may be slower – but what level of risk are you prepared to accept?
- Can you include biosecurity in contractual arrangements with contractors?

6. Know your normal

- Monitor your crop.
- Know your normal – what pests and diseases might you expect to see.
- Know your exotic pests – know what might be of concern.
- Keep the PNZ Pests and Diseases Handbook as reference.
- Train staff to look out for unusual pests and signs/symptoms.
- If any pest of concern is found "Snap it, Catch it, Report it" – Call MPI on 0800 80 99 66.

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EVENT DAY ADVICE

Health and safety

These events are being held on working farms. Please take appropriate care and be aware of potential hazards. For your safety, please:

- Follow instructions from PNZ staff/event manager, at all times.
- Stay within the areas specified by PNZ staff/event staff.
- Stay out of trial plots unless invited by PNZ staff/event staff.
- Report any hazards you see, directly to a member of PNZ staff/event staff.

Biosecurity: All visitors to farms will clean boots/footwear upon entry and departure, or boot covers will be provided by event manager. Biosecurity Advice is covered in Topic 8 & will soon be available in A3 poster form.

Specific hazards to be aware of:

- Vehicles: Take care when moving across or through the car parking, entry and exit areas.
- Trips and falls: Watch out for uneven ground.
- Weather: Sun block is available on site.
- Electric fences.

First aid and emergencies Should you require any assistance, please ask a member of PNZ staff. In case of emergency call 111 and notify a PNZ staff member. Iain Kirkwood has current First Aid certificate and first aid kit.

Event Sites

- **Canterbury**

  Andy Bailey's Farm
  148 Beachcroft Rd, Southbridge, Canterbury (field location: -43.868038, 172.267529)

  Tim Pike's Farm
  2620 Thompson's Track, RD6 Ashburton https://goo.gl/maps/orT8feH7feR2

  Daniel Lovett's Farm
  River Road, Wakanui (between Wakanui School Rd & Gibsons Rd) https://goo.gl/maps/1vSB3tWVz892

- **Pukekohe**

  Vinu Parsot's Farm
  6 Union Rd, Patumahoe (on cnr with Patumahoe Rd) https://goo.gl/maps/XTd9mWZy2uJ2

- **Manawatu**

  Chris Pescini's Farm
  52 Kimberley Rd, Levin (old hort research station)

Vehicles

Vehicles will not be permitted outside of the designated car parking areas.

Smoking

No smoking permitted on these property.

2019 Upcoming Industry Events

29th March - R & D Pukekohe

10th April - Horticulture Industry Forum, Wellington

11th April - Seed Authority Meeting, Auckland

24th-26th June - AUSVEG Conference, Melbourne

13th-15th August - PNZ Conference & AGM, Christchurch

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