



Soil Wealth
NURTURING CROPS



**Integrated
Crop Protection**
PROTECTING CROPS

RMCG



**Hort
Innovation**
Strategic levy investment

**VEGETABLE
FUND**



Integrated weed management

The future of integrated weed management in vegetable farming

Integrated Weed Management (VG15070)

Innovations to support IWM



Paul Kristiansen, Michael Coleman, Chris Fyfe
University of New England

Innovations for IWM

- Background to the IWM in Veges project
- Webinar will showcase examples of technological innovation for IWM: robots, drones and ICT
- Precision agriculture is a rapidly developing aspect of farming:
 - ‘eyes’ – sensors to detect weeds, and soil and crop health
 - ‘brains’ – data processing, machine learning, decision making
 - ‘limbs’ – mechanics to move around farm & take action
- **BUT:** costly – upfront, maintenance and management costs; requires skilled operators

Robotics in IWM – intelligent farm equipment

Common practical benefits (potential)

- more precise application of inputs and control activities
 - ✓ less off-target impacts (e.g. less crop damage)
 - ✓ intra-row weeding possible, off-crop areas
 - ✓ reduced input costs
 - ✓ reduced environmental impacts
- faster work rates: save on labour costs, timeliness of operations
- can operate 24/7, less limited by weather, gets weeds when it is most effective (reduce weed seed bank: **key principle of IWM**)
- **BUT:** innovation is not just about hardware, but also about management strategies, trying new things, and systems thinking

Robotics in IWM – intelligent farm equipment

‘Systems’ benefits

- improved timeliness, multiple actions
→ better efficacy of operation/inputs
- continuous monitoring and action
→ predicting/anticipating problems
- all GPS-ed, what happened where
- collect other info
→ e.g. pests & disease, soil conditions
- collect a historical record of weeds, etc. (‘Big Data’)
- reallocation of labour, planning crop rotations



AGERRIS



THE UNIVERSITY OF
SYDNEY

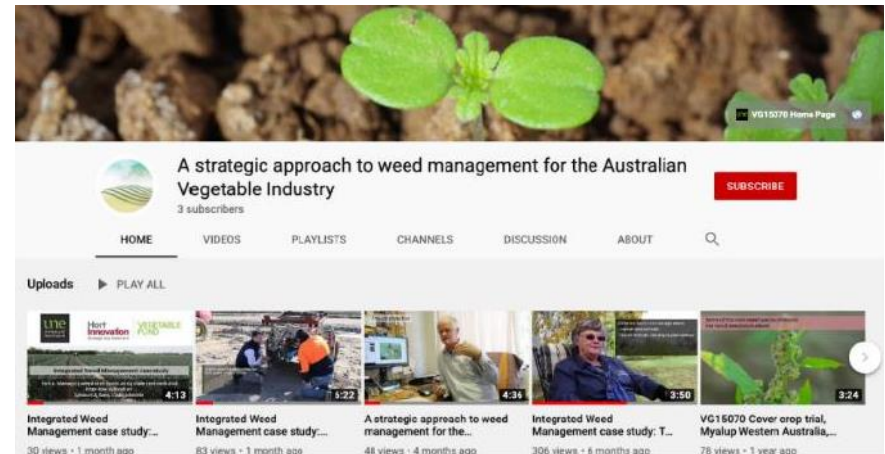


Updates and Resources

www.une.edu.au/iwmvegetables



@iwmvegetables



Thanks

To you for joining us! HortInnovation for research funding, all farmers, industry extension staff and researchers who continue to support the project, and SoilWealth for collaboration and extension opportunities.

Thanks to Salah Sukkarieh and his team at USyd/Agerris for collaboration



DRONES assist Integrated Weed Management

Oz Tech Drones QLD



StevTech NSW





Jamin Fleming = Oz Tech Drones Bundaberg QLD





Drone Herbicide Application is about farm **HYGIENE**

Invasive weeds

Wet areas & hydrants



Invasive weeds

Fence lines





Drone application is about minding the details

Invasive weeds
small jobs



Lay flat lines
Sweet potatoes



Bundaberg QLD



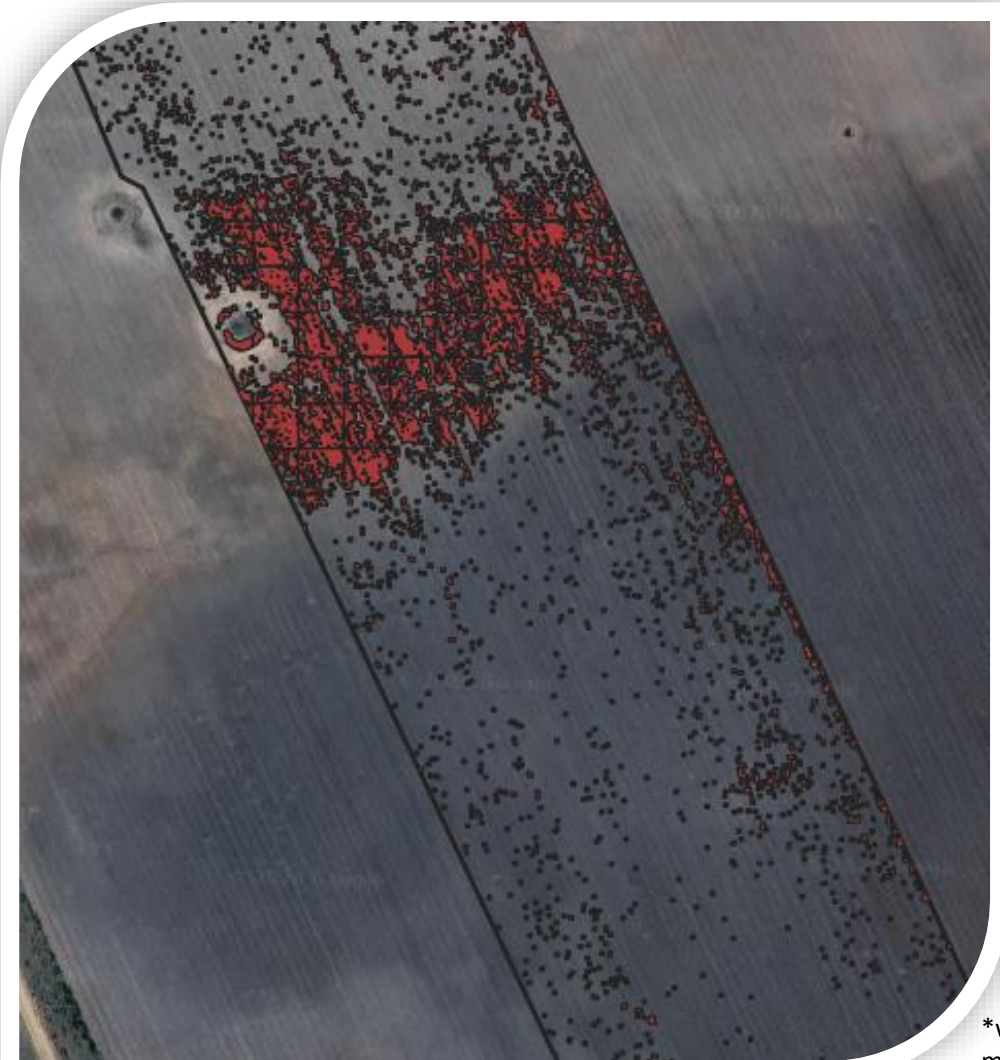
Risk Factors

Drift / Weather (wind, inversions)

Performance / Coverage (droplet size, height, L/ha)

Birds





S T E V T E C H

Drone Weed Detection Service

- Use your *current* spray rig to seek out weeds (individual nozzle or section controlled).
- Got bulk hectares? Buy a drone and do it yourself much cheaper – we will help!*
- Know exactly how much chemical you will need before you start.
- Detects weeds about the size of the base of a coke can.
- Priced from \$2.50 – \$5.90 per hectare.

contact@stevtech.com.au



*we can deliver CASA approved training, acquire the drone, train you on it and manage your data from collection till its on your screen and saving you money.

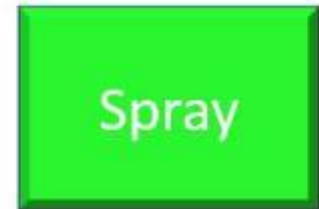


STEVE TECH

How it works in practice



Fallow Spray Weed Detection



=

70% Chemical
Saving





STEVTech

How it might work in nutgrass

- Scan
- Quantify
- Target
- Save chemical and money
- Report for future sprays





-
- Reducing herbicide use within horticulture
 - Utilising microwave technology
 - Targeting horticulture



Growave's 3 modes of action

Emerged Weeds



Challenges of herbicide resistance and herbicide-free consumer pressure.

Weed seed bank



Challenges of residues, soil moisture requirements and resistant weeds.

Soil pathogens



Mainly managed with fumigants, although facing increasing restrictions.

Soil treatment

Field Prototype



**First prototype
designed &
built in 2020**



**Field trials
proving
efficacy in
multiple crop
types**



**Currently
designing V2**



Demo site: The problem – why?

- Intensive summer and winter production
- Rotation: leeks – rye grass cover crop – celery – leeks
- Challenges for managing soil health
- Variation in crop quality and marketable yield:
 - Nutrition constraints
 - Poor drainage and waterlogged soils
 - Insect pest damage, particularly in celery
 - Competition from weeds, particularly oxalis and nutgrass

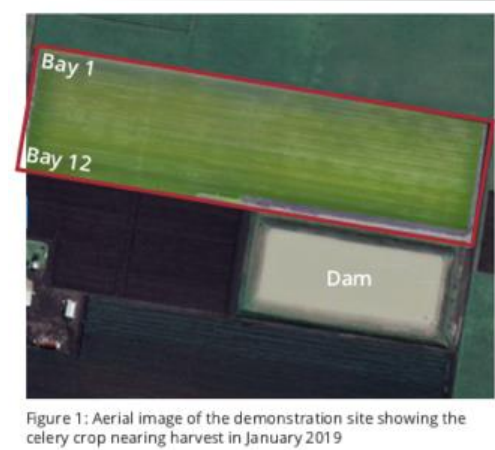


Figure 1: Aerial image of the demonstration site showing the celery crop nearing harvest in January 2019

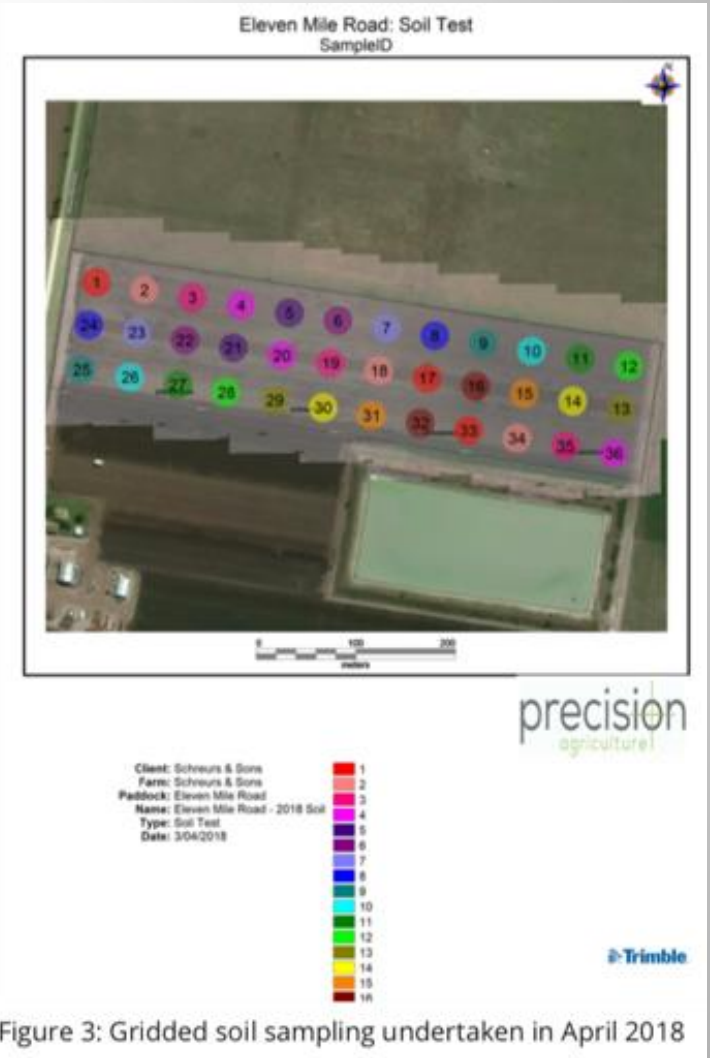


Figure 2: Soil profile in the trial block showing the variation between the heavier clay-loam in the north (left) and lighter loam-sand in the south (right) in September 2018

Demo site: The solution – what we did

Over the past 2 years:

- Gridded and pre-plant soil testing
- Development of a nutrition program and variable rate spreading
- Monitoring of drainage and crop health using drones
- Plant tissue testing
- Installation and use of remote monitoring insect traps
- Yield assessment
- Addition – prototype trial of microwave weed technology



Demo site: The solution – what we did



Figure 9: The remote monitoring insect trap being installed in August (left) and in full-swing during December 2018 (right)

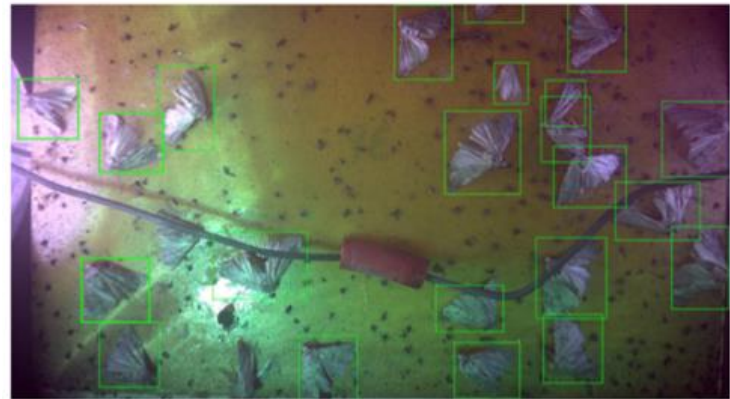


Figure 7: Image showing moth detections in the covered trap in November 2019

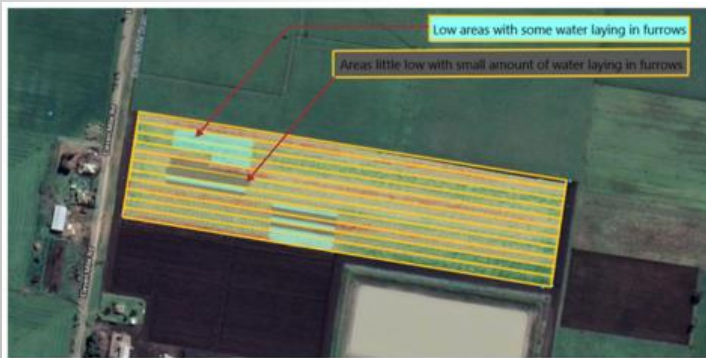


Figure 7: Drainage findings from a drone flight in January 2019



Figure 5: The variable rate spreader being loaded (left) and the in-paddock result (right) during October 2018



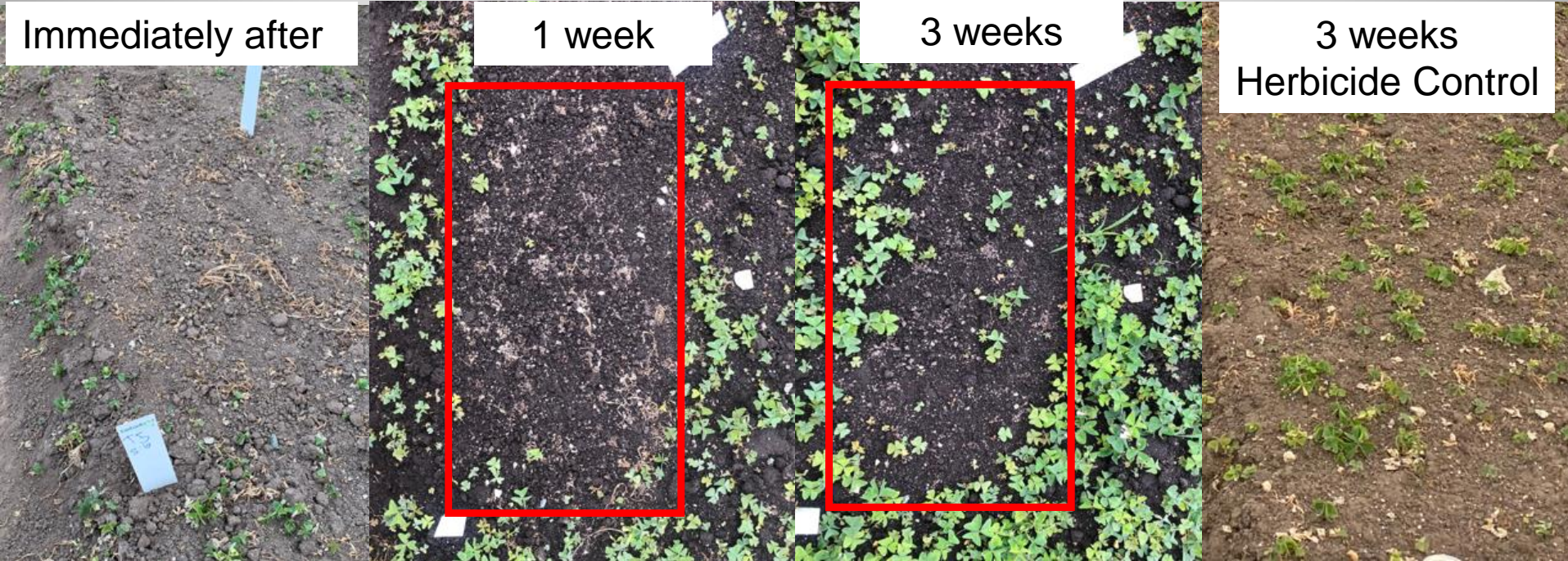
Trial 1 – Soil Treatment Nutgrass

- Controlled Nutgrass for 3 weeks.
- Edge creeping effects trial efficacy
- Trial was spot dosed



Trial 2 – Soil treatment
on emerged weeds

- Edge creeping effects trial efficacy
- Thick established weeds absorbed energy, more efficient treatment expected with earlier intervention
- Majority of reemergence was oxalis



Trial 3 – Soil treatment
on bare soil

- Warmer initial soil temperatures given no plant shading
- Little recovery after 3 weeks
- Edge creeping effects trial efficacy

Summary

Vegetable grower benefits

- **Reducing steps to manage weeds** – One treatment - controls emerged and pre-emerged weeds
- **Reducing herbicide use** – health of soil and employees
- **Problem weeds** – proven efficacy on problem weeds
- **Control periods** – trials indicated close to 3 weeks no regrowth
- **Flexibility in application** – not effected by wind, weed growth stage and no withholding



Working towards commercialisation

- **Travel speed**, decrease time/ha, fit into farm planting cycle . **Automation** could reduce this cost/time.
- **Length of effective kill**, aiming for 4 weeks control at 90%+ effectiveness.
- **Robustness** for consistent and reliable use within farm operations

Moving forward..

- Interested in grower weed management issues
- Conducting more trials within Q1 & Q2 2021
- Contact
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 - 0428634908



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Discussion: Questions & Answers



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