IREC Field Day

Irrigation Research & Extension Committee

Wednesday 19 January 2022 — 7.30 to 12 noon

An update on the trials being held at the IREC Field Station

IREC Field Station — Stott Road, Whitton NSW

CSD Cotton Seed Distributors · NSW Department of Primary Industries · MI Murrumbidgee Irrigation Ltd · SunRice · Summit Ag Agricultural Consulting · Deakin University · Padman STOPS The FARMERS Friend

Irrigation Research & Extension Committee

2022 Field Day Program

IREC Irrigated Discussion Groups

As part of IRECs ongoing GRDC funding there will once again be 2 irrigated discussion groups established focusing on irrigated winter crops. There will be a group based in the MIA at the IREC field station, and one in the CIA on a commercial farm.
A survey was sent out to the IREC members asking them the missing information for their production systems as well as what they would be interested in seeing done and the 2 trials have been designed around this.

MIA – IREC Field Station – Manager: Hayden Petty

Aim:

In a changing water market, higher value winter crops are sought to grow with higher value water that allows profitability through larger areas being grown and better-quality grains. Barley has a great fit in our production system but the main issues that have been seen by growers is issues around harvest due to crop lodging in the higher yielding scenarios, as well as head and grain losses.

The aim of this trial is to demonstrate the effect that growth regulator rates and timings have on barley crop, ultimately improving the ease of harvest and crop yield.

Treatments:

- Promote @ Z31
- Promote @ Z37
- 1 x Moddus Evo @ Z31
- 2 x Moddus Evo @Z31 & Z37

There is also scope in this work to look at the effect and interaction of fungicides.

CIA – Coleambally – Manager: Sam O'Rafferty

In a changing water market, higher value winter crops are sought to grow with higher value water that allows profitability through larger areas being grown and better-quality grains. Many growers are turning to durum to grow high yielding, high protein crops using less water than a traditional summer crop making water go a little further while still producing a good margin.

If durum doesn't meet protein specification to make milling then it goes into the feed market so careful nitrogen and water management needs to be undertaken to get the maximum yield and correct protein to insure that return on water investment can be made.

The aim of this trial is to build on older work done from Griffiths and Lacey on growing high yielding cereal crops under irrigation. Majority of durum growers are trying to push their crops to high protein and yielding towards 10 tonnes/ha and this is resulting is some variability in quality. This trial will look at end of season nitrogen (flag leaf) application, growth regulants and irrigation strategies and the influence that has on final yield and quality.

The trial will take one established durum field in Coleambally that until mid-tiller has been treated using standard durum management strategies in terms of nitrogen and water management. The field will be divided into 3 different nitrogen strategies, which will be then overlayed with 3 different irrigation treatments to reflect the estimated yield potential for the urea treatments.

Coil Soil Initiative

What is the Cool Soil Initiative?

The Cool Soil Initiative (CSI) is a paddock to product partnership, working with growers through regional farming systems groups (FSGs) such as Irrigation Research & Extension Committee to test and validate management practices which can then mitigate greenhouse gas (GHG) emissions on-farm, to support the ongoing sustainability, productivity, and profitability of farming enterprises. CSI also provides an avenue for farmers to monitor and manage their greenhouse gas emissions, while providing opportunities to explore changes to farm management which may increase soil carbon and improve profitability

Outcome of Cool Soil Initiative.

The outcome of CSI is to deliver a scientifically credible framework for the food industry to support cropping farmers in the reduction of GHG emissions, leading to increased long-term sustainability and yield stability, through the adoption of innovative agronomic strategies to increase soil health and related function.

The CSI is hosted by Riverine Plains, Central West Farming Systems, FarmLink and the Irrigation Research & Extension Committee (IREC).

Why have corporates invested in this Initiative?

All food and beverage companies have obligations around the sustainable sourcing of their raw products, with grains obviously being a key component. Moreover, many companies are signatories to the Paris Agreement or related agreements whereby they must account for their greenhouse gas emissions. The emissions that they need to report against include in-factory (processing), packaging, logistics and transport, and on-farm food production, which at the moment is estimated using very broad assumptions.

What makes it challenging is that the grain produced on-farm may go through an aggregator such as GrainCorp, to then be on-sold to an end user, or be purchased directly on-farm but still move through more than one company through processing. This means that there can be several layers of interplay for each commodity, with each farmer likely dealing with more than one commodity/aggregator/direct contract across the range of crops grown (not to mention livestock!).

The corporate partners see real value in this Initiative, as it consolidates their emission reporting and enables them to support sustainable on-farm practices. Moreover, investing in this Initiative as a collective means that they can provide much more value back to the industry for common good, rather than each company setting up their own platform, data collection processes and emission calculations, which would mean that each farmer may have to contribute to multiple programs, none of which are comparable, or can work together for betterment of the industry.

Why should farmers be involved?

The Cool Soil Initiative provides an avenue for farmers to monitor and manage their greenhouse gas emissions, while providing opportunities to explore changes to farm management which may increase soil carbon and improve profitability. It also provided peer-to-peer learning opportunities – new innovation, technology and practices to benefit soil health within a range of different farming practices and environmental conditions. This has the potential to deliver significant input cost savings and production gains, as well as provide long-term carbon benefits for farmers.

While the program started with a focus on wheat production, as it is a commodity shared by all partners, the addition of Allied Pinnacle to the program means the focus has expanded to cover irrigated maize grown in the Murrumbidgee (MIA/CIA) and Murray valleys, with further expansion into other crops likely over time.

How will it work?

Farmers who participate in the program will receive support in the use of the participant portal. A platform to enter data and receive their emission information, and relevant satellite imagery suited to their property, and an invitation to participate in a series of small group sessions and larger regional meetings, all focussed on strategies and practices for sustainable productivity.

Each farmer will receive complimentary GPS located soil testing services in up to 5 paddocks each year, along with technical support for interpreting emission results and soil tests. They will also receive information on management options that address key limiting factors in their farming systems that result in efficiency gains and long-term carbon benefits.

All information will be anonymised upon submission, and treated as confidential, with data sharing agreements in place which specify how your information will be used.

How can you be involved?

The Irrigation Research & Extension Committee (IREC) is the local grower group supporting farmers through the MIA and CIA regions. Farmers are encouraged to contact IREC if you have any questions regarding the program. Before committing to share any data with the project, all farmers will be able to review the data sharing agreement between them and Charles Sturt University, where all project information will be held. This agreement outlines how on-farm data is reported using anonymized, regionally aggregated data, with no personal information received by the corporate investors.

There is no ongoing commitment or obligation to continue in the project after year 1. Any farmer who does not see benefit from being involved is free to leave, with their information if they wish.

Please contact Iva Quarisa at IREC on 0402 069 643 or email iva@irec.org.au if you are interesting in being part of this project.

Cool Soil INITIATIVE

MARS Petcare · Sustainable Food Lab · Charles Sturt University · foodagility · Kellogg's · Manildra Group 100% Australian Owned · Allied Pinnacle

Southern NSW Drought Resilience, Adoption and Innovation Hub

SOUTHERN NSW
Innovation Hub
SUSTAINABLE AGRICULTURE,
LANDSCAPES AND COMMUNITIES

Southern NSW Drought Resilience, Adoption and Innovation Hub is one of eight around Australia established by the federal Department of Agriculture, Water and Environment through a grant from the Future Drought Fund.

Hubs support farmers and communities to get ready for **drought** including -

- adopting innovative tools and technologies
- improving productivity and profitability
- preserving natural capital
- reducing financial exposure to future droughts.

Now their activities are expanding beyond drought to include the National Agricultural Innovation Agenda 2030 priorities which will see Australia become a -

1. Trusted **exporter** of premium food and agricultural products
2. Champion of **climate resilience** to increase the productivity, profitability and sustainability of the agricultural sector
3. World leader in preventing and rapidly responding to significant pests and diseases through future-proofing our **biosecurity** system
4. Mature adopter, developer and exporter of **digital agriculture**

Our Vision

Creating connected and adaptable people and places, prepared to respond to future challenges and capitalise on opportunities.

Our Partners

Our Hub is a partnership led by Charles Sturt University including University of Wollongong, University of Canberra, Australian National University, NSW DPI, NSW Local Land Services, First Nations Governance Circle, RuralAid and Farming Systems Group Alliance.

The Hub's Board provides leadership of skills and diversity, each nominated by our partners and led by Independent Chair, Barry Irvin AM, Executive Chair of Bega Cheese.

Board members include – Lorrae van Kerkhoff (Australian National University), Rene Wood (First Nations Governance Circle), Ron Heinrich (Farming Systems Group Alliance), Pascal Perez (Wollongong University), Kate Lorimer-Ward (NSW Department Primary Industries), Barney Hyams (Local Land Services), Niall Blair (Charles Sturt University), Ross Thompson (University of Canberra) and John Warlters (RuralAid).

Where?

Southern NSW Innovation Hub covers the majority of NSW, over 41 million hectares, from Broken Hill in the west, across to Quambone, and down the East coast from just north of Sydney. The Victorian border is the Southern boundary for the Hub.

You can come and visit the Hub office at Charles Sturt University in Wagga and we have shopfronts established across Southern NSW in our five nodes of Western Rangelands, Central, Orange, Monaro and Capital and Coastal.

This is where you will find our network of 22 Knowledge Brokers and can access our Concierge Service. They're embedded with our partners, established organisations who you already know and are ready to work with farmers and communities to find out what they need to increase resilience, and connect them to the resources, training or researchers who can help.

What are we doing?

Our Activities

Talk to our communities to –

- Describe the impact of drought on communities, landscapes and agricultural systems and identify where improved resilience can be built
- Identify the extension, adoption and commercialisation capacity (people & resources) to support adoption of existing ideas, technologies and systems
- Identify gaps in extension, adoption and commercialisation capacity and work with partners to fill gaps and enhance existing capabilities

Create a values-based, people-focussed agricultural innovation system by working with our partners to –

- provide tools, training, and resources to create a network of skilled people able to engage in communities, provide information and access to tools and support the RD&E program
- Establish and support community-based teams to identify their needs and design solutions together
- Innovation support services to help individuals prioritise and adopt ideas and technologies for their farm/ community/landscape OR creators of new technologies to connect with end users
- Create a forum to introduce ideas from different industries and countries to stimulate creative problem solving

Leverage investment for RDEA&C programs to address the innovation needs of agriculture and regional communities –

- Influence investment strategies of existing investors
- Create and/or facilitate new investment opportunities

"The Southern NSW Hub will identify how we can speed up the adoption of innovations on farms to modernise our approaches for improved community, landscape and production outcomes. This will see us reimagining how we develop and deliver activities that foster innovation and better address the needs of the current farming environment."

— Cindy Cassidy, Director, Southern NSW Drought Resilience Adoption and Innovation Hub

Find out more and connect with us ...

Email
southernNSWhub@csu.edu.au

Social Media
https://www.facebook.com/SouthernNSWHub

https://twitter.com/SouthernNSWHub

Website
https://research.csu.edu.au/engage-with-us/research-impact/southern-nsw-drought-resilience-hub

Australian Government
Department of Agriculture, Water and the Environment

Future Drought Fund

This project is funded by the Australian Government's Future Drought Fund

PARTNERS

Australian National University
Charles Sturt University
CWFS
NSW Department of Primary Industries
FarmLink
MFS Monaro Farming Systems
Southern Growers
Holbrook Landcare Network
Irrigation Research & Extension Committee
Irrigated Cropping Council
TFS Tablelands Farming Systems Next Generation Agriculture
NSW Local Land Services
RiverinePlains
Rural aid
University of Canberra | Centre for Applied Water Science
University of Wollongong Australia

Unlocking the true value of organic soil amendments — 2021 update

An innovative farm-ready tool for the effective management of manures and composts into farm fertiliser budgets for environmental, soil health and economic sustainability.

KEY PARTNERS

- **Queensland University of Technology (Module 1 and 5)**
- **The University of Queensland (Module 2 and 5)**
- **Deakin University (Module 3)**
- **La Trobe University (Module 4)**

The Project

This project will provide farmers, agronomists, and suppliers of manures and composts with a decision support tool for integrating organic amendments into farm nutrient budgets. On-farm field validation and demonstration sites from Queensland to South Australia across vegetables, cotton, cropping and pasture will showcase this tool and provide case studies of reduced fertiliser use and cost reductions, yield benefits possible from using organic amendments, and potential additional soil health and sustainability benefits.

The manure and compost nutrient calculator will be available as a farmer-friendly web and smart phone application (app). This app will, for the first time, directly link producers and suppliers of organic amendments through a national standardised approach for assessing and reporting product and nutrient quality, facilitating the supply of products that can be used with confidence within the farming community and help reduce mineral fertilizer use.

Organic Amendment Nutrient Calculator

Assoc Prof David Rowlings, Queensland University of Technology
d.rowlings@qut.edu.au

The organic amendments nutrient calculator is designed to be a farmer-friendly phone application which will assist with the integration of organic amendments into farm nutrient budgets.

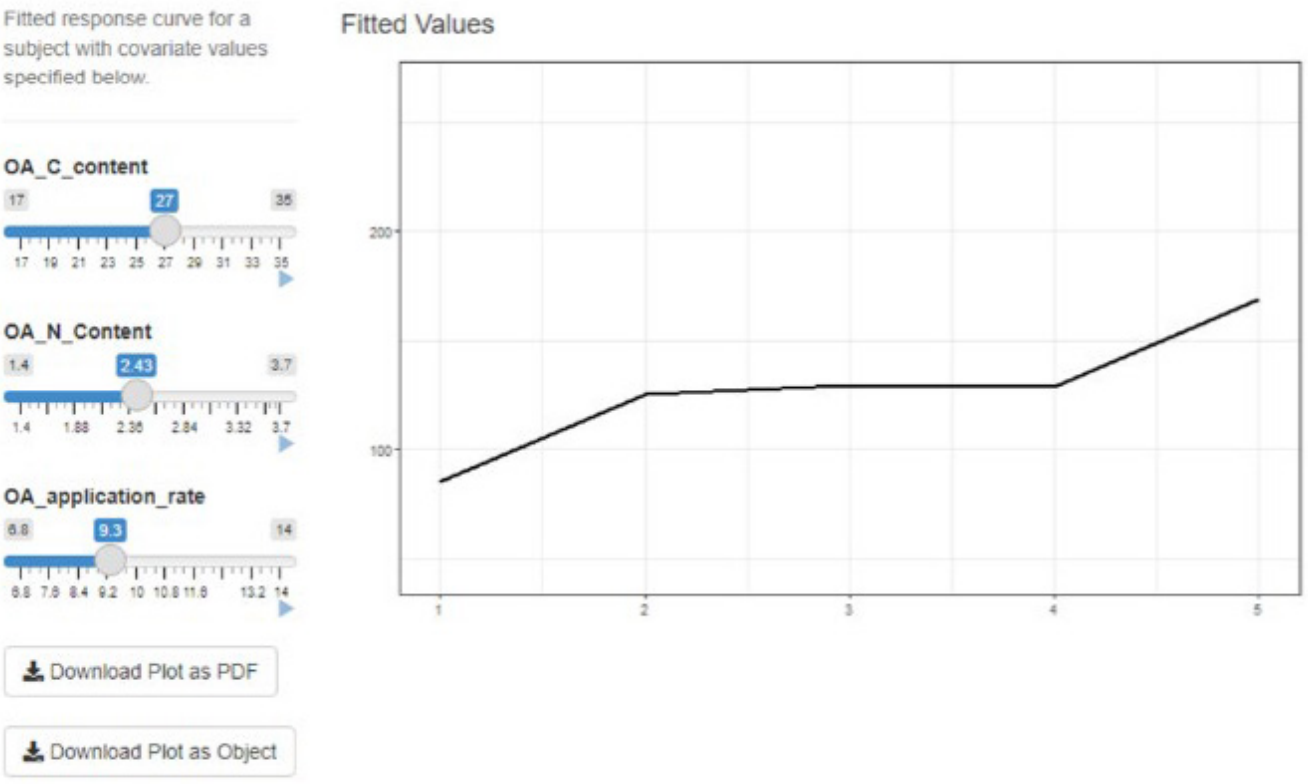
Farmers will be able to simply upload their product's nutrient analysis, as well as basic information such as crop, soil type and target N requirements, and receive high resolution estimates of nutrient release. Users will also be able to upload initial soil test results along with product analysis for assistance in calculating OA application rates, as well as assistance in catering for potential macro and micronutrient deficiencies in their soil system.

This phone app aims to be a hub for field fertiliser application, encouraging the accurate application of organic amendments, as well as accurate supplementation of synthetic fertiliser. In doing so, the app should help farmers reduce their crop fertilisation costs as well as the harmful environmental impacts resulting from overapplication.

Farmers will also be able to use the app as a decision tool on selecting fertiliser products best for their cropping system, providing product comparison and financial estimates based on average costs at the time.

This calculator is being developed using data from a combination of laboratory and field trials across Australia, which investigated long-term nitrogen mineralisation in a variety of organic amendments after application to various Australian soils.

Modelling of the nitrogen release data against nutrient parameters within organic amendments allows for the development of kinetic equations which will provide high resolution estimates of nitrogen release. Initial beta testing of the phone application has been completed for user group validation and feedback.



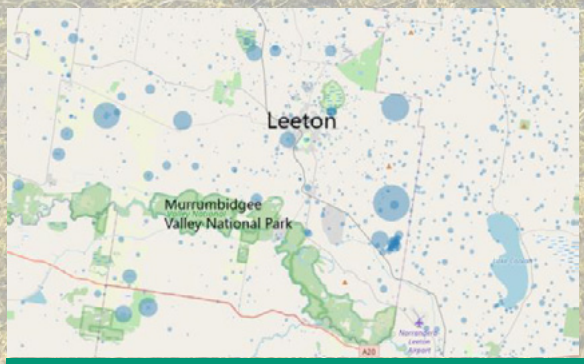
Managing farm dams for emission and carbon benefits

A new project funded by AgriFutures in collaboration with Deakin researchers Jackie Webb, Wendy Quayle, and Carlos Ballester has launched into a new area of research – the role of farm dams in carbon storage and emission reduction in irrigated agriculture.

Including farm dams in the climate discussion

Constructed waterbodies such as on-farm dams are human-made systems that, just like land for crops and livestock, must be included in National emission accounting. Up until 2019, farm dams have not been recognized in the National Greenhouse Gas Inventory. Many farming industries in the irrigation sector are also committing to net zero or prioritizing carbon and emission accounting in sustainability goals. Given the prevalence of water storage and distribution in irrigated landscapes, farm dams need to be included in the climate discussion.

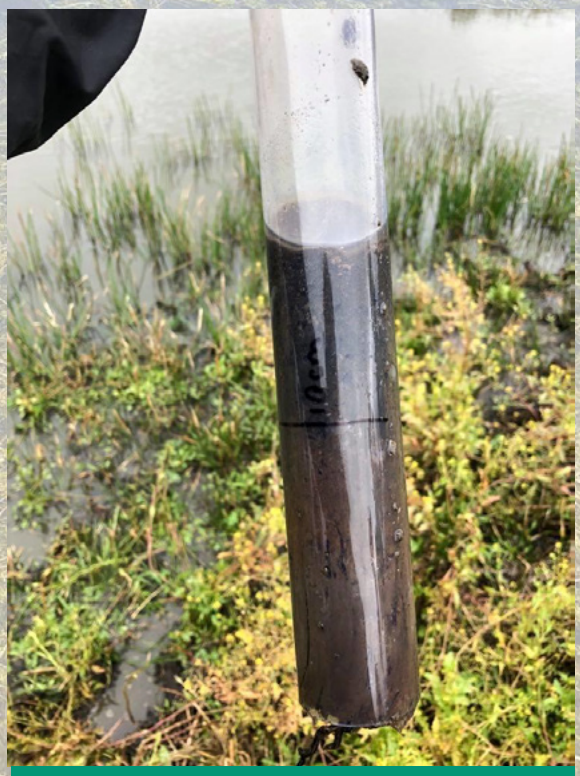
This study represents the first in the Murrumbidgee irrigation region and will focus on waterbodies located on irrigation farms. Although small in relative farm area, collectively they represent > 20 km^2 from Griffith to Jerilderie, which is a substantial inland aquatic area that would otherwise not exist.



Example of farm dam distribution around the Leeton area. Source: http://ausdams.org/

Unquantified carbon co-benefits

Farm dams may support a number of carbon storage avenues for farm carbon budgets. These include sediment carbon accumulation and carbon stocks in surrounding vegetation. The amount of carbon stored in sediments will likely have a lot to do with water management. If water remains in the dam over a long period, then any carbon stored in the sediments is likely to remain there. Some farm dams support an abundance of vegetation such as wetland plants, trees, and grasses in-and-around the dam area, which may also offer an avenue for longer-term carbon storage. In this phase of the study, we will investigate the amount of carbon stored in both these areas by taking sediment cores and drone surveys for biomass mapping.



Sediment core from an old farm dam. Having wetland-like characteristics means that some farm dams may accumulate carbon in their sediments.

Opportunities for emission reduction

In this phase of the project, we seek to understand the net emission impact of farm dams by measuring the three major GHG's: carbon dioxide; methane; and nitrous oxide. In the IPCC guidelines, aquatic ecosystems under agricultural landuse are assumed to be emitters of GHGs, but preliminary investigations on farm dams in the Murrumbidgee have found that many are instead absorbing CO_2 and N_2O from the atmosphere. There are many questions to unravel on why some dams do this, but it opens up a new area of on-farm emission reduction. From the data collected in the 2021-2022 irrigation season, we hope to identify some key farm dam characteristics that may translated into management strategies for optimizing farm dams for emission offsets.

Sampling a wide variety of irrigation dams across the Murrumbidgee cotton, rice, and horticultural growing areas help scientists find out what makes farm dams emit or consume GHGs

Getting the big picture with sensors

The third phase of the study is to help understand how stable CO_2 uptake is over day-night cycles in the dams. Underwater sensors that measure CO_2 continuously have been deployed in four sites which were identified as CO_2 sinks during spot sampling in daylight hours. These sensors will provide first-time data to help us determine if farm dams are persistent CO_2 sinks over day-night and seasonal cycles, or if certain conditions offset any CO_2 uptake.

We extend our upmost appreciation to the generosity of farmers who have opened their gates for us to conduct this new farm dam research. Insight gained from this study will help further the sustainability goals of Australia's irrigation farming sector.

For more information contact Dr Jackie Webb (j.webb@deakin.edu.au). For Updates on this project follow Twitter accounts @CeRRF_Griffith and @JackieRWebb

DEAKIN UNIVERSITY

AgriFutures® Australia

CERRF CENTRE FOR REGIONAL AND RURAL FUTURES

The holistic approach to improving the efficiency of water in Australia's Murray-Darling Basin, from source to crop.

Rubicon Water's vision is to sustainably increase global food and fibre production by improving the management of irrigation water from the source through to its application to crops. We do this by delivering integrated solutions that significantly increase agricultural productivity through improved water use efficiency. Rubicon continues to improve the water management solutions available to the Agricultural Industry the introduction of their **New Generation of FarmConnect.**

Australia's Murray-Darling Basin, the most extensive river system in the country

The Murray–Darling Basin (MDB) covers much of south-eastern Australia, accounting for around 14% of Australia's total landmass. Agriculture represents 90% of water extractions in the Basin with more than 85% from surface water. Approximately 10,000km of channel networks deliver water to farms throughout the MDB.

Rubicon's technology has played a key role in the modernisation of Australia's Murray-Darling Basin, with more than 20,000 automated gates and metering devices installed throughout the region over the past two decades.

The autonomous control of the channel networks has increased water **delivery efficiencies from around 50-70% to up to 90%** while providing an on-demand delivery to irrigators. The delivery systems have lead to more efficient in-field application, introducing **flow-on benefits to farmers** through better use of available water, better crop production and ultimately, increased farmer revenue. The technology is saving substantial volumes of water while increasing the overall productivity of the industry.

High-performance surface irrigation and precision irrigation scheduling

The combination of precise irrigation scheduling, delivery, and application technologies is resulting in huge water savings. Achieving a 90% distribution efficiency to the farm gate is one element, another is to replicate these efficiencies on-farm to improve water-use and maximise productivity. With water supplied on-demand and at the desired flow rates, farmers are now able to focus on leveraging on-farm investments to apply water efficiently to crops. Irrigators are increasingly adopting accurate measurement and remote-control technology to improve their on-farm operations. This technol**ogy is enabling irrigators to apply the optimal amount of water to crops to save water, cost on labour and improve overall productivity.**

Precision Irrigation Scheduling techniques, along with on-farm automation and on-demand water distribution presents an **opportunity to achieve an additional 20%+ gain in on-farm water-use efficiency**. Rubicon's research collaboration with the University of Melbourne is further extending capabilities in this space by introducing tools that provide farmers with the knowledge to make informed data-driven decisions on-farm.

Rubicon Water has harnessed two decades of irrigation automation, communication and software experience to develop an **on-farm suite of AgriTech callled FarmConnect**. FarmConnect leverages the technologies within Rubicon's proven irrigation district solutions to deliver innovative on-farm automated gate and valve solutions. These high-performance surface irrigation solutions enhance irrigators' operations to provide significant water savings, reduced labor and increased yields.

The introduction of **automated surface irrigation**, with **in-field sensors** for soil moisture, micro-climate inputs, water level, wetting front advance, plus **irrigation scheduling tools** and communications via **IoT-enabled nodes** will help farmers know, with precision, when to irrigate their crops and how much water to apply.

Independent studies have demonstrated that precision surface irrigation solutions can **improve application efficiencies to 85% or better, while significantly reducing labour costs and enhancing yields.** Precision surface irrigation has minimal input energy requirements, allowing high application efficiencies to be achieved with low energy bills.

Learn more about the Next Generation of FarmConnect technology on our NEW website that was launched in Februray this year.

Scan to view our NEW website FarmConnect.com

Introducing the **Internet of Agriculture™** – where physical IoT enabled on-farm devices, edge computing power, sophisticated communication infrastructure and dedicated data storage frameworks work together to stream insightful information to drive accurate decisions on-farm – significantly saving water, cost on labor, expenditure on energy... all while maximizing yield.

IREC Field Station – Rice Seeding Rate Trial 2022

Paddock History

2019/20 Cotton

2020 Barley – non irrigated, planted on beds

2020/21 Rice – variety Viand (late season) planted directly into barley stubble on beds.

2021/22 Rice – variety Viand, planted directly into burnt Viand stubble on beds

2022 Rice Details

The 2022 Viand rice crop was watered up on the 19th October 2021 with 160kg Granulock Z.

Three seeding rates were used: 80, 100 and 120kg/ha. The recommended rate in the DPI rice variety guide is 125kg/ha. The conservative rates were used for two reasons:

1. to demonstrate how rice can compensate from a wide range of plant populations without a reduction in yield through increased tillering and panicle size
2. to demonstrate the ability to apply high N rates in lower plant populations without lodging. Viand is classed as moderately susceptible to lodging which can be further induced by applying excessive nitrogen (Viand Growing Guide - Brian Dunn, DPI).

Plant populations were assessed on 18th November 2021 as an average of ten 0.2m^2 counts within the plot. The results for each seeding rates:

- 80kg/ha – 195 plants/m^2 (red strip)
- 100kg/ha – 200 plants/m^2 (yellow strip)
- 120kg/ha – 280 plants/m^2 (green strip)

The aim is to get a plant population of between 100 – 200 plants /m^2 so it is likely, given the soil conditions and the planting method, that a lot lower rate could have been used to achieve these populations.

It was observed the higher seeding rate looked thicker and lusher than the lower rates at the time of establishment counts.

Total nitrogen applied was 250kg/ha at late tillering (15th December 2021) with a further 85kg/ha applied at panicle initiation on the 7th January 2022, based on NIR tissue test recommendations.

Total water applied through the meter was 5ML/ha. A total of 350.4 mm of rain was recorded during the growing season. The majority of the crop was watered using rainfall and cotton irrigation runoff from the rest of the field station. This water would normally have been drained off the property.

Figure 1: Areas of different seeding rates. Green 120kg/ha, yellow 100kg/ha and red 80kg/ha)

Weed control consisted of a three-way mix, post plant, pre-emergent application of Stomp/Magister/Gramoxone. This gives cheap and effective knockdown as well as residual control of barnyard grass and a range of broadleaf weeds. Agixa was applied as a post emergent to clean up any remnant barnyard grass weeds.

Results and Discussion

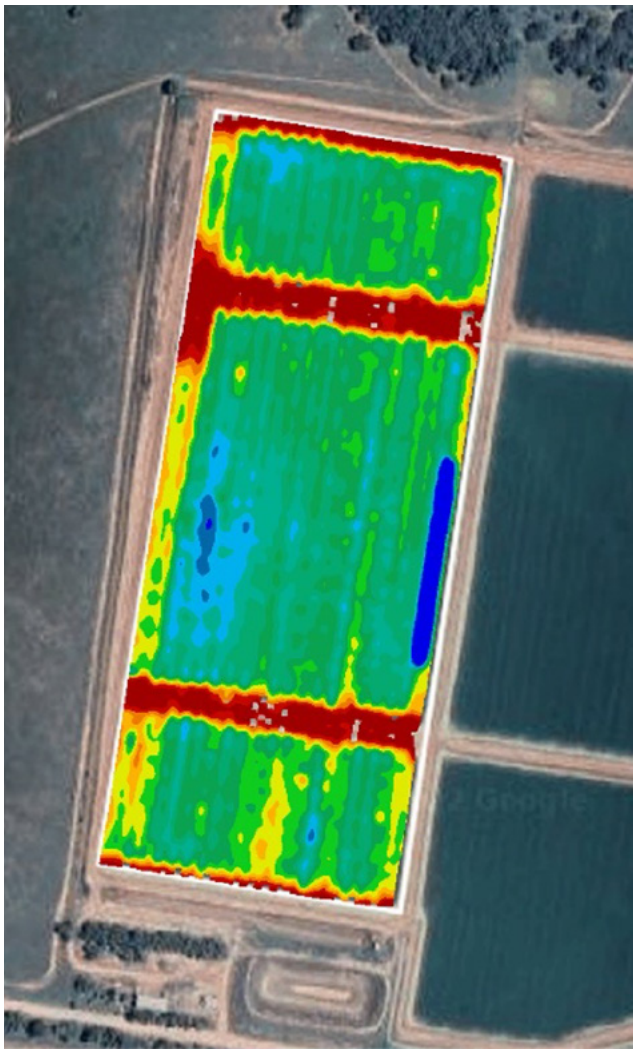


Figure 2: Yield map showing crop uniformity. With three bays from south to north, and banks/laneways between bays showing as red.

The crop yielded 10.2t/ha and was all standing. The yield map (Figure 2) shows relative uniform yield. The lower yielding areas in Bay 1 (bottom of figure) was due to a very thick area of fleabane (controlled in the flood phase of the crop but which was very thick at seedling stage). The lighter blue areas to left of the figure, in the middle bay is a carry over of a deep banded manure trial conducted in the cotton rotation 3 years ago. Note the deep blue area to the right of the middle bay is a calibration error.

The different seeding rates and subsequent plant populations had no effect on yield. This was expected given all the plant populations were above 100 plants/m^2. Rice can still yield well at 40 evenly distributed plants per square metre. When populations are above 100 this takes all the distribution effect out. There is no positive yield effect above 100 and at high plant populations (above 300) the chance of crop lodging increases. Decreasing nitrogen rates are the only tool to decrease the lodging potential, which then decreases yield potential.

Still lower seeding rates could have been used which would give more flexibility with higher nitrogen rates and potentially higher yield without lodging.

Nitrogen use efficiency for the block was 15.1kg of N per tonne of grain. The benchmark for the region is approximately 17kgN/t.

Manual vs Automated Irrigation

Matt Champness – PhD candidate Deakin University, CeRRF Griffith

Setting the scene

Timely water changes are critical prevent over irrigation which can result in expensive water wastage through excessive percolation & drainage losses, as well as burst banks, reduced seedling establishment and pumping costs.

To understand the true labour-saving benefits of automated irrigation in drill sown rice, a trial comparing two adjacent; four bay (flat with 150mm step between), 20ha bankless channel paddocks *(Figure 1)* was undertaken near Griffith in the C22 season. Water in the paddock to the left was controlled manually by the farmer, with the paddock on the right controlled remotely using Padman Automation *Seasonal Autowinch* with water height sensors attached at the outlet (*Figure 2*).

Threshold heights for the automated paddock were determined during the first flush and then set as min/ max heights for the control of water for the subsequent two flushes and ponding for the remainder of the irrigation season. Only the results of the rice flushing are presented in this article as they are likely to be transferable across other crops (eg cotton, maize), with the full season (including ponding period) results to be published later.

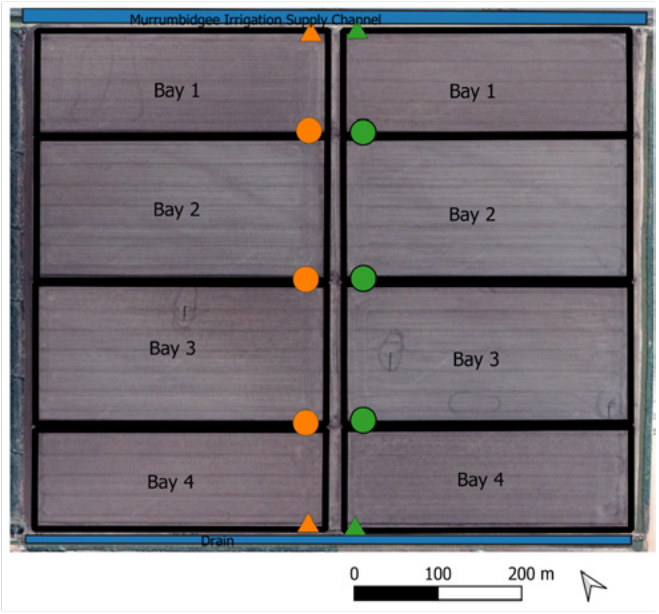


Figure 1: Manually irrigated paddock (left), automated paddock (right). Symbols relate to outlet type seen in Figure 2.

Manual sluice v Automated sluice

Manual layflat v Automated layflat

Figure 2: Padman Seasonal Autowinchs' could be retrofitted to existing rubber layflat and sluice gate infrastructure

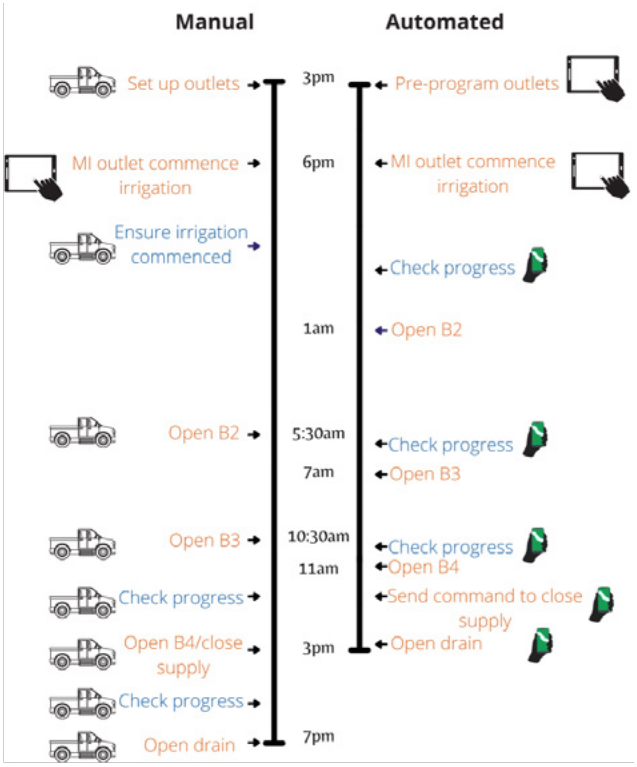


Figure 3: Timeline of irrigation. Orange represents critical actions whilst blue were irrigation checks.

Total Timel	2 hrs 15 mins	15 mins
Total Travel	85km	0 km
Irrigaiton duration	25 hrs	21 hrs

Figure 4: Comparison of the time, travel and duration of irrigation of the manual paddock (left) versus automated paddock (right).

Results

Successful water control was achieved in both paddocks, with the automation providing substantial labour & travel savings with reduced time of flush irrigations (*Figure 3 & 4*).

In this scenario, a minimum of five trips to the paddock are required to set up outlets and change bays during the irrigation with each trip taking 15 mins and 10kms travel. Additional wasted time and travel can and did occur when the grower arrived and water in the respective bay had not yet finished. Thus, the total time taken for the irrigation event was 2hrs 15mins and a total of 85kms.

Conversely, configuring pre-determined water height thresholds for each bay enabled the water changes to occur when the bay had finished, with notifications sent to the phone to alert the user. Furthermore, real time progress could be checked via the webapp without the need to down tools and travel to the field to check progress. Resultantly, only 15 minutes was spent configuring and checking the irrigation using the app.

Timely water changes in the automation paddock resulted in a four-hour reduction in the time irrigation took to occur, mainly due to the delay in changing the first bay whilst the farmer was asleep. Results will obviously vary between irrigators based on field layout, size, flow rate distance to paddock etc. In this case, it was a 15-minute return trip to the paddock, however the benefits of automation would be greater if installed at a farther farm from the house/workshop.

IMO: Is automation worth it?

The direct labour, travel and water saving benefits observed in this trial, were substantial, however, it is my opinion that the true benefit of automated irrigation is opportunity cost.

Opportunity cost refers to the time you could be spending doing other things and will vary between irrigators and throughout the season, thus it is much most difficult to calculate.

Rather than physically driving out and changing water or sitting in the paddock idling whilst you wait for a bay to finish because you got there to early, time could be better spent undertaking other tasks. This could include spraying other paddocks during the limited window of opportunity when conditions are suitable, harvesting winter cereals before another rain event downgrades quality, attending family/social/sporting events, getting away from the farm and spending time with family at Christmas, NYE or Australia Day or simply finishing the day earlier and starting later without night-time water changes. This increased sleep can result in better farm business decision making, decreased OH&S risk and an overall better lifestyle, prolonging your farming lifespan. Other benefits include the ability to lock up, or open winches in the event of rain, without driving around boggy/slippery roads.

The benefits of automation will depend entirely on how much you value your time and how much you would rather be doing other things.

Some key considerations when choosing an automation system and provider include, but not limited to:

Cost – upfront and ongoing (including communication system costs)
Ease of installation – can it be retrofitted to existing infrastructure
Useability – is the interface intuitive and does it provide alerts in the event of failure
Portability of sensors & controls – can reduce cost when rotating paddocks between seasons
Support – Technical support if issues arise
Reliability – of communication systems between devices and user as well as sensors
Robustness – what's the lifespan and is it 'farm tough'
Manual override – in the event of technical failure, can you still manually open/close outlet

On-farm automated irrigation

Andrew Bell – Bidgee Automation

On-farm surface irrigation automation has come a long way in the last few years. Many often view automation as having a system that can identify when an irrigation bay is complete and move the water onto the next bay. This is a form of automation, however systems today are capable of so much more than that.

In the near future, on-farm automation will have the ability to not only determine when an irrigation bay is complete and move on to the next bay, but will also automatically order water, cancel water or vary a flow rate at any given time. They will also have the ability to set up supply channels, schedule fields to irrigate in specified orders, set up all relevant doors within selected fields, as well as monitor and maintain levels through variable flow rate sensing.

The ability to vary flow rates during irrigations is highly beneficial for growing rice, with the goal to automatically maintain set levels in individual rice bays. For example, as the crop develops and starts using more water, the system will automatically request the flow meter to increase the flow rate to compensate for the water taken in by the plant. The opposite is equally beneficial in decreasing the flow rate in a rain event.

Bidgee Automation (Giuseppe Cuteri and I) is currently in discussions with Ed Langdon from Murrumbidgee Irrigation about developing a system that will allow third party automation systems to order/cancel water. This is the next step in achieving systems that have variable flow rate functions. In the short-term having the ability to modify flow rates and cancel orders will allow farmers to pre-set parameters, slow flow meters and shut down at exactly the right time. This will allow growers to finish with less excess water on their farm and improve overall irrigation efficiency.

The work by Dr John Hornbuckle (IREC Field Day Speaker) on Irrigation Smart Sensing is very exciting and will aid in the development of a system that has the ability to order and cancel water during irrigation events.

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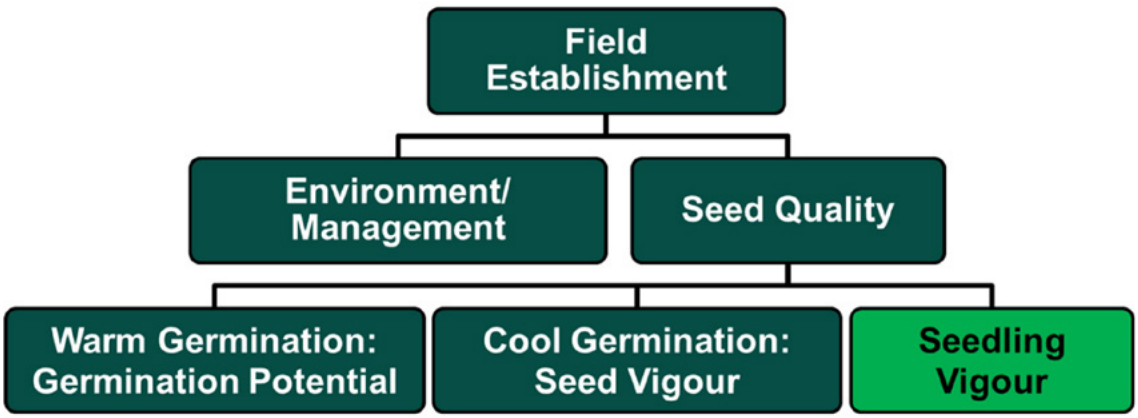
Cotton Variety Trial



CSD provides seed quality information in the form of warm and cool germination for all seedlots sold.

The warm germination test measures germination potential which represents the maximum germination under ideal conditions or the viability of the seed.

The cool germination test measures the seed vigour which represents the seeds potential for rapid and uniform germination under development of normal seedlings under a range of conditions.

- Standard warm test – cyclic 20°C (16hours) / 30°C (8 hours) assessed @ 4 and 7 days.
- Cool test – stress test to measure seed vigour – constant 19°C assessed @ 7 days.

Seedling vigour is the ability of normal germinated seedlings to progress to establishment in the field under a range of conditions and varies significantly between varieties. There is no recognised test method to quantify this.

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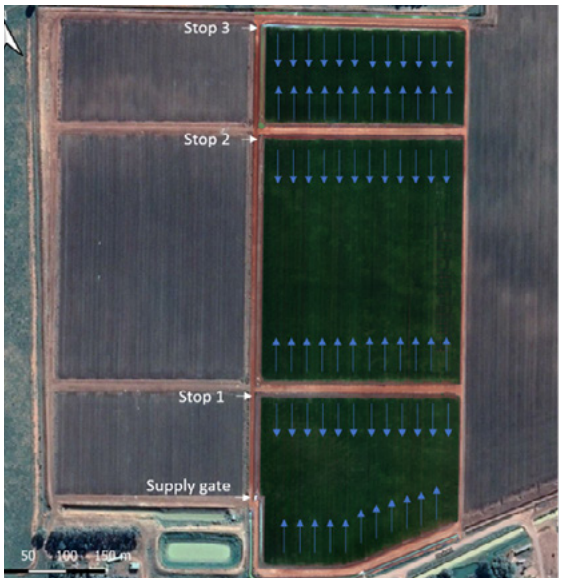
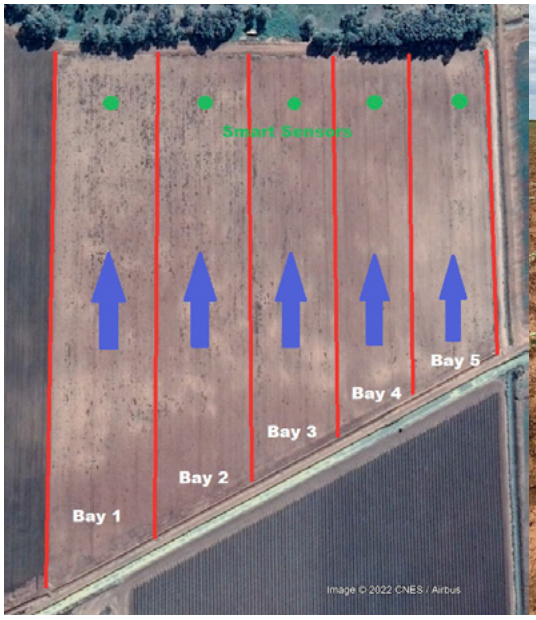
Smart Sensing and Automation

Bankless System



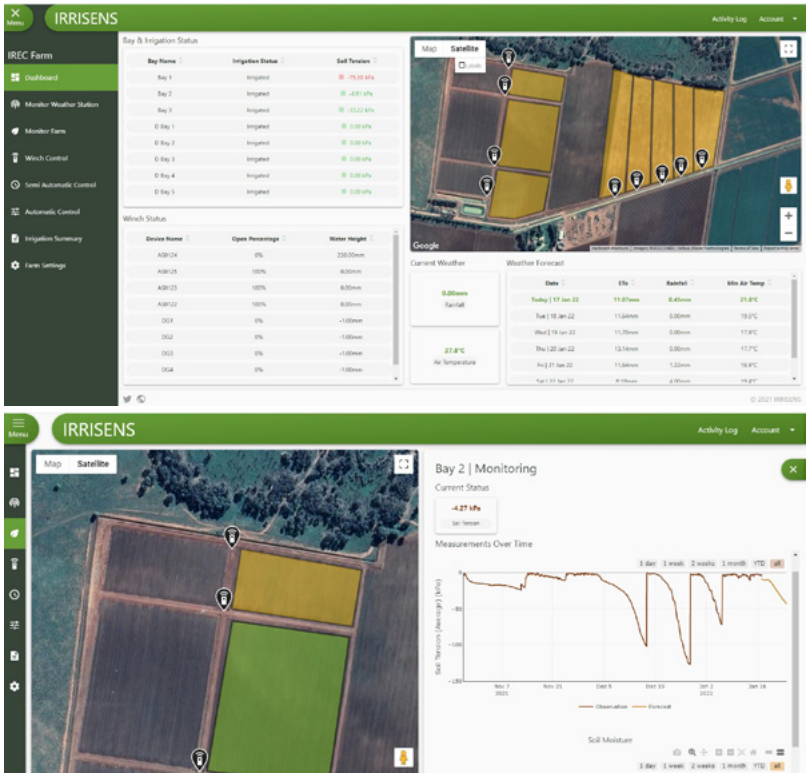
Pipe Through Bank (PTB) System



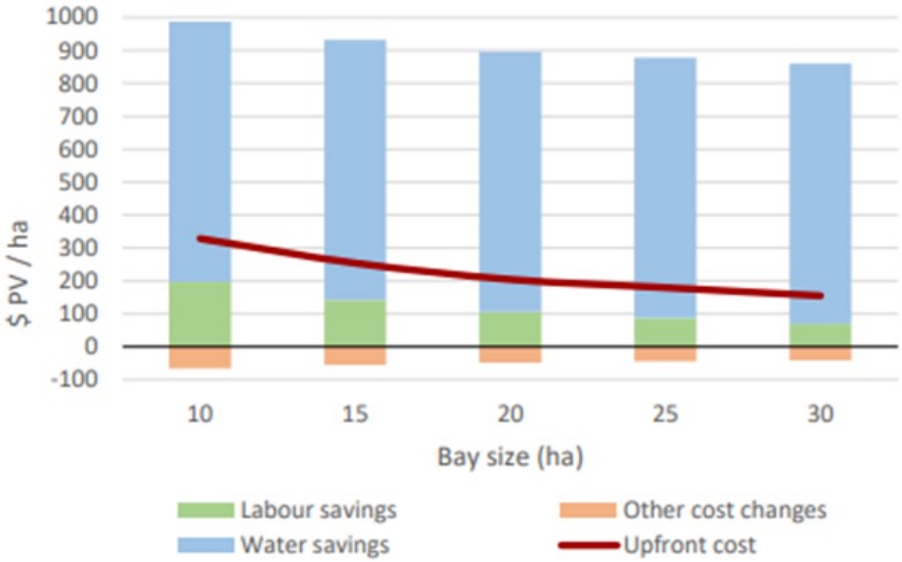
- Both irrigation layouts use soil tension (measured + forecast) for irrigation scheduling decisions
- However, control of water during irrigation events is different. The bankless uses water depth sensors on outlets, where as the PTB system uses in-field sensors, advance (water position in-field) or soil tension to control gate movements

This project is supported by funding from the Australian Government Department of Agriculture as part of its Rural R&D for Profit program.

IrriSENS smart sensing and automation control dashboard



Investment costs and benefits (10 years, 5% discount) for 100 ha cotton with different bay sizes (AgEcon)



Further information:

https://smarterirrigation.com.au/wp-content/uploads/2021/08/Smart-Sensing-and-Automation-in-Cotton_Case-Study_Aug-2021-.pdf

https://www.cottongrower.com.au/read/60#22

Project Team: John Hornbuckle, Rodrigo Filev Maia, Carlos Ballester-Lurbe, Matt Champness

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IREC Area Wide Management of Weeds Project December 2021- December 2022

Aim:

Looking at weed management of key species of issue being Fleabane and Annual Ryegrass.

Testing methods of control of these weeds in the hard to manage areas where seed burden initiates from stops and hard to access areas on channels.

Overview:

To evaluate different methods of control of key weeds around structures etc. of farms where the majority of weed escapes occur

Treatments:

1. Control (untreated)
2. Weed matting
3. Bio diesel
4. Pebbles
5. Residual

Method:

Select a site with 15 stops or similar present. Do an initial survey of weeds present.

Apply treatments

Mark and monitor (counts) 3 zones over 2022 to capture weed germination periods on a monthly basis.

Hayden Petty (Summit Ag)

Soil Health Test Package

The relationship between healthy soils and the environment as a whole has seen Australian soil formally identified as a significant national asset under the Federal Government's National Soil Strategy.

The relationship between healthy soils and the environment has seen Australian soil formally identified as a significant national asset under the Federal Government's National Soil Strategy.

Australian farmers manage approximately **60% of the Australian landscape** and witness firsthand the role soil health plays in driving the productivity, profitability and sustainability of Australian farm businesses.

The ability to measure and monitor the soil's key biological, chemical and physical characteristics is essential to understanding and improving soil health. To do this, farmers need scientifically verified soil testing to benchmark their soil health and guide decision making.

For over 50 years, Nutrient Advantage® has been Australia's leading provider of nutrient analysis and expertise, helping farmers cost-effectively manage their input requirements.

Now, a new soil health package has been added to the Nutrient Advantage testing service to help farmers better measure and manage their soil health, and empower them to make decisions that boost their productivity today while safeguarding the sustainability of their businesses into the future.

The first in a series of soil health tests, the new package comprises four test components:

- Total Carbon & Total Nitrogen & C:N ratio (combustion)
- Aggregate Slaking & Dispersion (Loveday & Pyle)
- Active (labile) Carbon (0.033M KMnO4)
- Microbial Respiration (1 day Solvita CO2 burst)

It is recommended the tests be repeated every two to three years at the same time of year. Using the *Health1* code, they can be ordered as a standalone package for $80, or added to any existing Nutrient Advantage test order for $70.

To order or find out more, visit www.soilhealthtesting.com.au or call 1800 803 453.

About the soil health package

Nutrient Advantage®

Total carbon

Total carbon is the sum of three carbon forms: organic, elemental and inorganic. Total organic carbon influences many soil characteristics including colour, nutrient holding capacity, nutrient turnover and stability, which in turn influences water relations, aeration and workability.

Total nitrogen

Nitrogen presents in soil in two forms – inorganic, as mineral nitrogen, and organic, such as soil organic matter, micorogranisms and plant residues. Total Nitrogen is a measure of all nitrogen present in the soil.

C:N ratio

Microbes use carbon and nitrogen as a food source. The carbon to nitrogen (C:N) ratio measures how many units of carbon are present for every unit of nitrogen. Soil microorganisms have a C:N ratio near 8:1, and their capacity to release plant-available nitrogen is influenced by this ratio. The C:N ratio determines how long it takes for organic matter to break down and whether nutrients (N and S) will be immobilised or mineralised.

Aggregate slaking & dispersion

Aggregate slaking and dispersion tests the response of a soil aggregate to water.

The test identifies sodic and dispersive soils with structural instability, and it is used to determine if a soil will slake (fall apart), set hard or crust. Each of these three things will increase erosion potential, nutrient run off, block macropores and reduce air and water movement into and through the soil.

Well-aggregated and stable soils are more likely to maintain their structure in response to physical stress such as tillage, precipitation and compaction.

Labile (active) carbon

Labile carbon is a fraction of the organic carbon pool that breaks down relatively quickly (<5 years). It is the major food source for soil microbes, acting to supply and recycle nitrogen, and is involved in the formation of soil aggregates. Labile carbon levels respond quickly to crop management practice changes, and it is a useful indicator of management impacts on organic matter and soil health.

Microbial respiration (activity estimation)

The microbial respiration test measures the amount of CO2 released from soil microbes after the soil has been dried and re-wetted over a 24-hour period. This test provides an indication of the potential anerobic microbial activity from the soil's microbial biomass.

Microbial activity affects the nutrient cycling rate, soil aggregation and organic matter formation, disease suppression and stimulation of plant growth.

Incitec Pivot Fertilisers

Learn more at **soilhealthtesting.com.au**

Irrigation Research &
Extension Committee