The Eyre Peninsula Agricultural Research Foundation,
in conjunction with
Minnipa Agricultural Centre presents:

'INNOVATION AND TECHNOLOGY IN AGRICULTURE'





Wednesday 22 July 2015

Minnipa Agricultural Centre

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Welcome

I would like to welcome everyone here today to the 2015 EPARF Member day – Innovation and Technology in Agriculture.

Thanks to all of our sponsors and I acknowledge the support we have received from the EPNRM Board and Carbon Farming Knowledge project to help stage today.

When we first discussed the focus for today, we were aware that the Minnipa Agriculture Centre (MAC) was about to have its hundred year celebration. With the passing of 100 years, we all could see how much technology has changed, and so looking at where new technology is at would be a good topic.

When this broad topic was unleashed, discussion around the table brought out all sorts of subjects bordering on 'science-fiction'. Some of the more level-headed board members helped to reign in the topic to concentrate on those technologies that have now proved themselves and become 'mainstream'. It is these areas that are worthy of serious consideration in order to enable good management decisions and be cost-effective.

Developing the agenda and finding the speakers to help out today has been a challenge, so a big thank-you needs to go to Batsey who used his knowledge of who is doing what and his contacts within the industry.

So please sit back and enjoy the program.

Simon Guerin

EPARF Chairperson

Program

Start	Time + Q's	Location	Topic	Speaker
Tea, Coffee and Refreshments sponsored by Rabo Bank				
1.00	5	Agronomy Shed	**Welcome and Introduction** **Launch EPARF website**	Simon Guerin - EPARF Chairperson
1.05	40	Agronomy Shed	**Ag Engineering in SA: what's the latest?**	James Barr - Uni SA
1.45	25	Agronomy Shed	**Weed Sensing and Mapping**	Sam Trengrove - Trengrove Consulting
2.10	35	Agronomy Shed	**Long Range Forecasting**	Graeme Anderson - DEPI Victoria
2.45	**15**	**Afternoon Tea sponsored by Rabo Bank**		
3.00	25	Agronomy Shed	**Go Protein Sensors**	Ashley Wakefield - Farmer, Urania YP
3.25	10	Agronomy Shed	**EPARF AGM**	Simon Guerin - EPARF Chairperson
3.35	**DECIDE WHAT GROUP ATTENDING - choose 3 sessions**			
GROUP DEMONSTRATIONS				
3.45	15 minute sessions + 5 minute change over	Agronomy Shed	**Water Leak Units**	Shane Oster - Alpha Group Consulting
		Farmer Info Centre	**APPs for Farmers**	Leighton Pearce - Growing Solutions
		Conference Room	**eXtensionAUS**	Robert Norton - DPI, NSW
4.05		Agronomy Shed	**Water Leak Units**	Shane Oster - Alpha Group Consulting
		Farmer Info Centre	**Livestock Innovations**	Michelle Cousins - Cousins Merino Services
		Conference Room	**APPs for Farmers**	Leighton Pearce - Growing Solutions
4.25		Agronomy Shed	**Soil Moisture Probes**	Shane Oster - Alpha Group Consulting
		Farmer Info Centre	**Livestock Innovations**	Michelle Cousins - Cousins Merino Services
		Conference Room	**eXtensionAUS**	Robert Norton - DPI, NSW
4.45	60	Agronomy Shed	**Unmanned Aerial Vehicle**	Leighton Pearce - Growing Solutions
5.45	5	Agronomy Shed	**Close**	
6.00	**Drinks & Dinner**			

Ag Engineering in SA: what's the latest?

Jack Desbiolles, Chris Saunders and James Barr

University of Adelaide

Below is an overview of example farm machinery research being conducted at the University of South Australia, with some selected extension messages. Most of these engineering research activities involve multi-disciplinary collaboration with a number of agriculture research providers, in close partnerships with farming system groups and with the support of a large number of machinery manufacturers.

1. No-till seeding technologies

KEY MESSAGES

- Superior seeding systems for the Mallee include paired row and independent seed boot seeding systems.
- Risk of crop damage from pre-emergence herbicides with single disc seeders are lowered with the use of row cleaners and by careful herbicide selection.
- In-furrow banding of liquid fungicide can significantly reduce grain yield penalties associated with Rhizoctonia root rot.
- Bentleg openers offer unprecedented potential for high speed, low soil throw tine seeding
- Australian no-till seeding system experiences also improve the reliability and productivity of direct seeding in North Africa, the Middle-East, and South East Asia.

- ***CROP ESTABLISHMENT IN MALLEE SOILS***

Collaborative research with Mallee Sustainable Farming Inc. aimed to identify solutions to issues limiting the success of crop establishment in a range of Mallee soils. Eight seeding systems were evaluated in 2014 at Murrayville (VIC) for their ability to establish both canola and wheat crops in stony, mid-slope and sand hill soil types.

Advanced seeding system technologies can benefit crop establishment in challenging soils

EXAMPLE RESULTS:

- Soil type had the most significant effect on crop establishment whereby average crop germination across 48 soil bays varied between 65-96% (wheat) and 35-84% (canola), while seeding system effects varied between 73-85% and 41-64% respectively.

- Plant densities reduced on average in the stones and on sand hill, relative to the mid-slope reference soil, by -12% & -9% respectively (wheat) and by -21% & -16% respectively

(canola). The rate of plant loss in stones was -6.3% (wheat) and -9% (canola) per 10% stone cover level (ranging from 0 to 27% at the site).

- Wheat crop establishment was improved by paired row systems (in stones and on sand hill), and independent seed boot systems (in stones). At harvest, the paired row and independent tine seeding systems overall produced 4-5% better wheat yield compared to a simple knife point system.

- ***OPTIMISING DISC SEEDER PERFORMANCE UNDER PRE-EM HERBICIDES***

Adoption of disc-based zero-till farming systems has increased with growers aiming to create less soil disturbance, maintain more surface residues, and achieve faster sowing. Collaborative research with the University of Adelaide aimed to uncover the mechanisms of crop damage with pre-emergence herbicides applied at sowing and identify the safest disc seeder technologies and settings to maximise crop safety levels.

EXAMPLE RESULTS:

- Triple disc (higher disturbance) seeding systems were found consistently safer (no crop damage) due to better positional selectivity between seed and pre-emergence herbicides and most effective on annual ryegrass ARG (70-89% control) due to superior mechanical incorporation.

- Much greater variability in crop damage and ARG control was found with (lower disturbance) single disc seeders. Sakura™ was found safest (no crop damage) and most effective (79-84% control), while Trifluralin created high plant losses (48-59%) and low ryegrass control (10-30%). Comparatively, BoxerGold™ achieved 71-78% ARG control but with significant plant losses (56-58%).


Row cleaners are an integral part of improving disc seeder field performance

- Crop safety with single discs was significantly improved with the addition of row cleaners, deeper seeding and operating depths, and generally greater soil disturbance (e.g. soil scuffing from seed boot guard).

- ***FUNGICIDE FURROW APPLICATIONS FOR RHIZOCTONIA ENVIRONMENT***

A collaborative project with SARDI is investigating new fungicides and methods of application to help reduce losses from the most yield depleting fungal root disease, Rhizoctonia root rot. Current trials are focussing on closing the gap between generally better performing tine seeders and disc seeders which are typically more prone to Rhizoctonia damage.

EXAMPLE RESULTS:

- Results to date have enabled the registration of the fungicide (*Uniform*™) for in-furrow liquid application which was shown to achieve grain yield responses on average, much beyond the average 5% typically obtained in trials to date with seed treatments.

- Recommended best practice includes a 50:50 split application of *Uniform*™ at furrow surface and at depth below the seed, which was shown to achieve significant grain yield responses of up to 0.32 and 0.46 t/ha on average in wheat and barley, respectively, depending on rate used.

- Higher disturbance disc seeder set-ups were shown to perform better in rhizoctonia environment, and with the potential to at least match tine seeder performance when associated with a surface soil clearing scoop.

- A key challenge remains the predictability of which paddock situations best warrant such in-furrow use of liquid fungicide for cost-effectiveness.

- ***HIGH SPEED TINE SOWING WITH BENTLEG OPENERS?***

Tine seeders typically cause more soil disturbance than disc seeders. In practice this can increase furrow moisture loss, weed seed germination, affect pre-emergence herbicide efficacy, reduce crop safety, and create variable seeding depth. Lateral soil throw is an important aspect of soil disturbance which limits the adoption of narrow row spacings and restricts the operational speed of tine seeders. This UniSA PhD project is investigating a new type of narrow point known as a bentleg opener in order to reduce the extent of soil throw and soil inversion.

EXAMPLE RESULTS:

- Field evaluation showed that bentleg openers, compared to knife point openers were able to: provide low draft requirements due to a low rake angle on the leading foot; very significantly reduce lateral soil throw, with out of furrow spill-over reduced by up to 90%; while ensuring close to 100% of soil remained in the furrow.

- The bentleg opener was able to maintain low soil disturbance characteristics at speeds of up to 16 km/h, highlighting potential for a new high speed, low soil throw tine seeder.

- Current work is investigating seed and fertiliser banding boot designs for accurate seed placement in the furrow, how to best handle crop residue interference with performance, and evaluate the potential for this technology to establish crops at high speed in paddock situations.

- Computer simulations are used to guide the directions of design and performance improvement.

- ***ADAPTING AUSTRALIAN NO-TILL EXPERIENCES IN INTERNATIONAL CONTEXT***

The adoption of no-till farming in Australia has been rapid and widespread, relative to the bulk of countries worldwide. In ACIAR funded projects led by the International Centre for Agricultural Research in Dry Areas (ICARDA), the Australian experiences of mechanisation in no-till farming are being shared internationally in rainfed and irrigated Mediterranean cropping contexts of north Africa (Maghreb) and the Middle East. The AMRDC at UniSA has directly contributed to the development of low cost no-till seeder solutions and related capacity building, as a catalyst to the local adoption of conservation agriculture. Small scale mechanised solutions for the direct seeding of rice in Cambodia have also been developed and evaluated.

Two-wheel tractor drawn, low-cost seeder developed for direct seeding rice in Cambodia

Field testing of first Iraq made no-till tine seeder prototype (Apr 2013)

EXAMPLE RESULTS:

- Over 35,000 Ha (>600 farmers) and over 15,000 Ha (>100 farmers) are now being cropped under no-till annually in Syria and Iraq, respectively, from a zero awareness at project start.

- Over the 10 year project period, simple low cost no-till tine seeders for 65-80 HP tractors have been locally developed and commercially fabricated by local workshops for the first time in Syria (x8 manufacturers), Iraq (x2), Jordan (x1) and Palestine West Bank (x1)

- In Cambodia, a low-cost 4 row disc/tine seeder for existing 2 wheel tractors was developed and evaluated, and is now manufactured in-country.

2. Increasing the productivity of soils

- Soil inversion technology is being refined to improve mouldboard ploughing operations and improve productivity in non-wetting soils.
- Research into deep tillage and product incorporating machinery aims to lift cropping productivity in subsoil limiting environments.

- ***IMPROVING MOULDBOARD PLOUGHING OF NON-WETTING SOILS***

A GRDC funded project led by the Department of Agriculture and Food Western Australia (DAFWA) is focussing on improving the productivity of nearly 11 Million hectares of WA's non-wetting sandy soils. Early studies showed that inversion and burial of the non-wetting surface layer can dramatically increase the water intake and productivity potential of the soil profile. Work to date using the mouldboard plough revealed variable quality and often incomplete top-layer burial. The AMRDC at UniSA is currently focussing on optimising the design, configuration and setting-up of the mouldboard plough in this unusual context, including computer simulations of soil movement under mouldboard ploughing, combined with soil bin and field validation in different soil and environmental conditions.

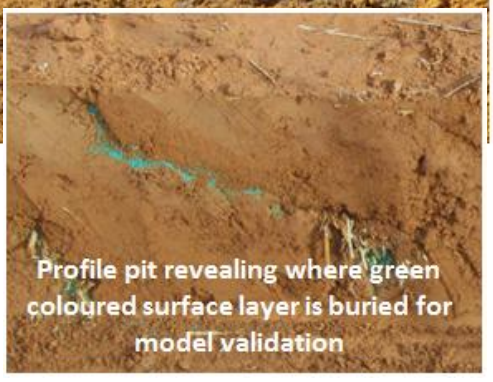
Example mouldboard ploughing of non-wetting soils (top) and typical strips of non-wetting soil left unburied (bottom)

EXAMPLE RESULTS:

- Soil moisture and plough set-up both have a large influence on the quality of work.

- The lack of effective topsoil burial often observed when using the mouldboard plough can be improved by proper setting-up and avoiding very dry conditions.

- DEM simulation shows the potential to compare and modify tillage tools and soil engaging implements for improved operation and soil manipulation. Field validation of the DEM simulation is being carried out using coloured sand as a surface tracer and validated with profile pits in the field.



Profile pit revealing where green coloured surface layer is buried for model validation

- ***SUBSOIL IMPROVING TECHNOLOGIES FOR THE NEW HORIZONS PROGRAMME***

Approximately 40% of South Australia's broad-acre cropping land area has subsoil issues limiting productivity, including low fertility deep sands, poorly structured soils, water repellent sands, and sodic subsoils. PIRSA's New Horizons program focusses on developing best management practices for modifying the top 50cm of soil and increase crop and pasture production in these constrained soil types. Subsoil improvements include the uniform application and incorporation of soil amendments such as fertilisers, organic matter and clay, via an intense deep tillage operation. Pilot investigations to date conducted by the PIRSA led team have confirmed the potential of at least doubling grain yield from subsoil modification operations. The AMRDC at UniSA is currently kick-starting a 2 year machinery research component funded by PIRSA and focussing on developing new or improved technology able to minimise the cost and maximise the benefits of subsoil modification operations.

Compost incorporation typically presents metering and dispensing challenges

Slip plough type delving tines can improve sub-layer mixing potential

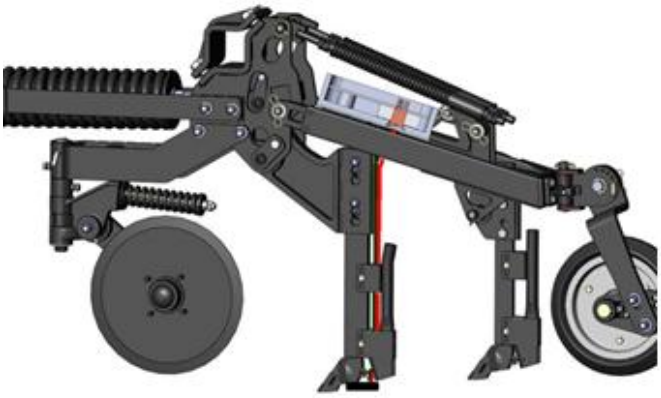
CURRENT FOCUS:

- A review of current technologies, products and related field experiences will form a baseline from which to identify opportunities for improved technologies. Example intervention points for improved performance include lowering machinery cost, reducing power requirements, increasing work rates and improving the accuracy and uniformity of application for difficult products with variable properties such as composts, powders and clays.

3. Soil and plant sensing

- Soil and plant sensor devices are being investigated as potential real-time decision making tools for growers in the future

Micro Electronic and Mechanical Sensors (MEMS) combined with near and mid-infrared (NIR, MIR) sensor technologies have been developed by the University of WA, with the potential to be used in a field based sensing device for measuring soil and plant properties during the growing season. This new technology is held to revolutionise decision making in modern broad-acre grain production by potentially enabling real-time paddock sensing of plant nutrients and soil moisture levels, to allow management decisions using variable rate applications. The AMRDC at UniSA are investigating a range of concepts for field based sensors leading to a prototype device that is suitable for field operation and then looking to collaborate on field validation.



CURRENT FOCUS:

- Development of associated technologies that make use of the MEMS IR sensor chip for field based measurements where their capabilities in terms of measurable soil/plant property range and the resolutions achievable will need to be tested and validated.

4. Harvest technologies for weed management

- Weed seed destruction at harvest (such as Harrington Seed Destructor) is an alternative harvest weed seed control method that both maintains residues in the paddock and does not require further processing or carting
- UniSA research has improved weed seed impact mill efficiency aiming to develop an integrated harvester mounted system

Harvest weed seed control (HWSC) methods such as narrow windrow burning, chaff carts and direct chaff baling systems have been widely adopted throughout Australia as an integrated management strategy to control herbicide resistant weeds. However, on-the-go milling of chaff, such as with the Harrington Seed Destructor (HSD), is an alternative HWSC method which does not require further processing and retains plant residues for nutrient return and mulching benefits. Following agronomy research by AHRI in WA, engineering research at UniSA aimed to refine the milling process, reducing power requirements at high levels of destruction, and develop a concept to be incorporated into the harvester.

EXAMPLE RESULTS:

- Fundamental research identified the impact energy and the optimum number of impacts required to 'kill' annual ryegrass seeds.

- Incorporating ryegrass impact theory into a computer model has led to significantly improved mill efficiency and some alternative prototype impact mills being developed for an integrated weed seed destructor into a harvester.

- The prototypes have shown potential in both laboratory and field testing, however there is still further work required to make a harvester mounted weed seed mill a commercial reality.

Further information

- Mallee seeding systems: http://msfp.org.au/resources/fact-sheets/farmtalk/ (see: *which seeder set-up for the Mallee?*)
- Rhizoctonia research: https://www.grdc.com.au/Research-and-Development/GRDC-Update-Papers/2014/08/Rhizoctonia-control-improved-by-liquid-banding-of-fungicides
- Disc seeder research:
  - https://www.grdc.com.au/Research-and-Development/GRDC-Update-Papers/2013/02/Disc-seeders-and-pre-emergence-herbicides
  - http://www.caws.org.au/awc/2014/awc201413041.pdf
- Bentleg opener research:
  https://www.youtube.com/watch?v=MjclyDhdNTM
  http://grdc.com.au/Research-and-Development/GRDC-Update-Papers/2015/02/From-soil-throw-to-bentleg-tine-seeding-research
- International CA research:
  - http://www.icarda.org/conservation-agriculture/zero-tillage-seeders
  - http://www.icarda.org/conservation-agriculture/teaser
- Harvest weed seed destruction: http://ahri.uwa.edu.au/weed-destructor-integrated-into-harvester/
- PIRSA New Horizons: http://www.pir.sa.gov.au/consultancy/major_programs/new_horizons
- Ploughing of non-wetting soils: http://www.grdc.com.au/Media-Centre/Ground-Cover/Ground-Cover-Issue-106-Sept-Oct-2013/One-pass-technique-for-non-wetting-soils

Acknowledgements

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New technology for improved herbicide use efficiency

Sam Trengrove and Stuart Sherriff

Trengrove Consulting

Keywords: weed identification, ryegrass, targeted application, herbicide efficiency

Take home messages

- Site specific herbicide application can optimise weed control while minimising herbicide cost.
- The economic return from SSWM with herbicides cannot exceed the cost of the highest cost herbicide applied unless the herbicide has a phytotoxic effect on the crop that reduces yield.
- High density weed patches should be targeted with high efficacy treatments over several years to deplete the seed bank.
- Next generation weed identification sensors are being investigated for use in Australia.

Background

Site specific weed management (SSWM) has the potential to deliver significant improvements in weed control efficiency, through the targeted application of weed control measures only to where the weeds are located. Improvements in weed control efficiency will typically be achieved through reduced herbicide usage where herbicide is not required. SSWM has four principal components:

1. Weed identification: Locate and identify weeds.
2. Treatment decision: Make decision on appropriate treatment to control the weeds.
3. Application: Apply appropriate treatment to the weeds.
4. Documentation: Record weed location and as applied treatment.

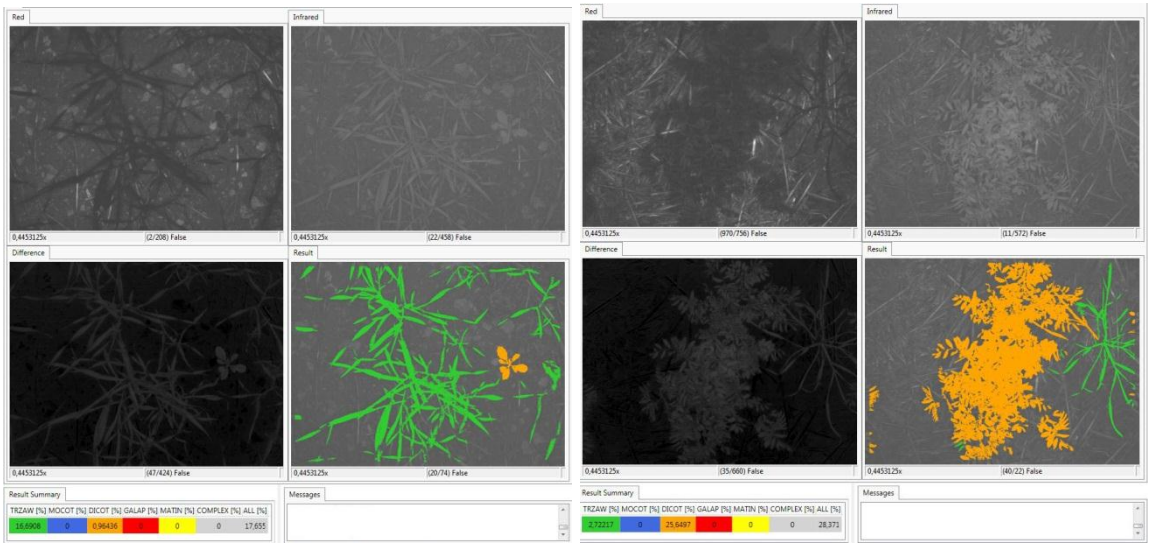
This presentation will discuss the current state of play for weed identification sensors and review recent results of site specific herbicide trials.

Weed identification

Presently, the only commercial weed sensors are spot spray systems that are only for use in fallow situations, where all green plants are considered weeds and sprayed, such as the Weedseeker and WEEDit systems. However, numerous groups around the world have been working on sensing systems that can identify different weed species within a growing crop, including several groups in Australia, however there are no commercially available products yet.

Agricon is a precision ag company in Germany that is developing and commercialising a weed ID sensor for the European market. This sensor uses near infrared and red imagery and leaf shape parameters to differentiate different weed types from crops. SAGIT is funding a project led by SPAA (Society of Precision Agriculture Australia) to assess this weed ID sensor in Australian crops and to produce new adapted classifiers for identifying important Australian weeds in Australian crops. This includes all the grain legumes lentils, field peas, faba beans, chickpeas and lupins which are not typically grown in Germany. Examples will be presented.

Above: The H-Sensor mounted to the ute for mapping and collecting images of the crop and weeds.



Above Left: wheat and an Indian hedge mustard collected in the red and near infrared spectrum, and how the sensor has classified these differently, right: lentil and ryegrass collected in the red and near infrared spectrum, and how the sensor has classified these differently.

Variable rate herbicide application - results

The economic return from SSWM with herbicides can't exceed the cost of the herbicide unless the herbicide has a phytotoxic effect on the crop that reduces yield. Therefore, when costs for weed mapping and variable rate application are considered, it is apparent that SSWM with low cost herbicides will not be economical.

Variable rate applications of pre-emergence herbicides in cereals are more economically viable, as these herbicides are typically more expensive. The herbicide savings are dependent on infestation level, but in one paddock where 35% of the paddock was infested:

1. Variable rate application targeting Boxer Gold to the high density patch and trifluralin to the low density patch would have generated a saving of $15.30/ha.

2. Variable rate applications reduced the risk of low returns from using high cost herbicides across the whole paddock.

3. Variable rate application made it economic to treat smaller patches. To make an economic return in the year of application with a uniform high cost treatment (Boxer Gold in this paddock trial) required at least 11% of the paddock to have a high density ryegrass patch. With variable rate application it was economic to treat patches less than 6% of paddock area. This assumes $7.50/ha for uniform rate application costs and $15/ha for variable rate application costs.

Across a number of paddocks in the 'high' density weed patches the highest efficacy treatments were also generally higher cost, being greater than $25/ha in all cases. In high weed densities these higher costs were returned through increased yields. The exception being where the herbicides caused phytotoxic effects on the crop. The benefit of high efficacy treatments at high density weed sites was often observed in subsequent years with reduced seedling recruitment in following years, but due to the high background seed bank associated with the high density patches the populations were still elevated and required ongoing targeted management with high efficacy treatments to deplete the seed bank further. Where herbicide application was reduced at low density weed sites it was important to continue monitoring these sites for any population increase in subsequent seasons and treat where necessary. Improved weed detection systems will facilitate annual surveillance of weed patches and their change over seasons.

Variable rate seed

In addition to varying herbicides, crop seed rates can also be varied. Increased seed rates in the weed patch are used to increase crop competition and reduce weed vigour. This is generally simpler to apply than variable rate herbicide, too.

Variable rate herbicide to soil type

Several soil applied residual herbicides make label statements indicating different label rates for different soil types, with different soil types often defined by soil texture and organic matter levels. This information could form the basis for variable rate applications of herbicide based on soil type, with data layers such as EM38 potentially being suitable for defining soil types. The advent of on-the-go pH sensors might also provide useful information for producing soil maps of herbicidal activity. While some growers may manually change rates on-the-go according to their assessment of soil type change, there are few examples of this process being automated and used widely.

Application

Herbicide application can be targeted site specifically by varying the rate of a single tank mix with high and low doses targeted to different zones, or with multiple products being turned on

and off independently. Varying rates of a single tank mix is the simplest application and can be achieved with current boom spray technology without modification. Varying the rate of a tank mix is achieved by changing the overall application volume, therefore the range of rates that can be achieved will be limited by nozzle selection, pressure and targeted spray quality. A greater range of rates can be achieved by decreasing ground speed where application volume increases, but this may be problematic in practice. Nozzle technology such as pulse width modulation (Aim Command) allows a much greater range of application volume independent of ground speed and spray quality.

To target different herbicide products to different zones is more difficult. With current boom spray technology with a single tank mixture this requires different herbicide products to be applied in separate applications. To achieve independent control of different herbicide products in one pass requires the use of direct injection systems or carrying two separate tanks at the same time that contain different products and are applied through two separate boom lines. Different options for variable herbicide application will be shown.

Conclusion

High density weed patches should be targeted with high efficacy treatments over several seasons to drive weed numbers down. Significant herbicide savings can be made by reducing inputs into low density populations, these savings are greatest when using high cost herbicides. It is important to monitor weed populations where herbicide application has been reduced for density increase and be prepared to treat where significant increases occur. Improved weed mapping systems and an annual weed surveillance program will help to ensure population increases are monitored and managed.

Acknowledgements

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Making sense of seasonal forecasts

Graeme Anderson

Climate Extension Specialist

DEDJTR Victoria

So, what's the source for your climate forecasts?

When we have an animal health or disease issue to deal with, farmers are quick to contact their local vet to access the latest veterinary science, to diagnose and explain what's going on, and then work out what to do next. However, when it comes to something as critical as seasonal climate forecasts, who's your reliable source of information?

Need for trust before farmers will use in decision making

Farmers know it's dangerous to make decisions based on information you don't trust. When it comes to seasonal forecasts there's some key things farmers tell me they require. To use seasonal forecasts in your decisions requires a few key ingredients:

- Need a trusted scientific and evidence based source
- Specific for your local/regional context
- Uses language you understand
- Not just one single view, but offers a wider consensus
- Insightful commentary that sits behind the forecast
- Trust via some proof it's worked in your patch during previous seasons
- Right timing, and when it's useful versus when best not to bother with

When it comes to the climate and weather for your district, what happens will be due to the physics that plays out in the 15 km of atmosphere that sits above your farm. Look up and ask yourself, who are the people that are taking measurements and monitoring what goes on up there, and what information might they have that could be useful?

Forecasts 4 Profit

In my observation, farmers, advisors and climate scientists agree that we need 3 key things to improve how Australian agriculture uses seasonal forecasts for maximum advantage in a highly variable climate.

Collectively, most agree we need:

- Better forecasts (Good news! - BoM & global forecasts getting better each decade!)
- Improved literacy of local climate & seasonal variability (Good news here too, with more farmers knowing what ENSO & IOD are & how it affects their patch!)
- Improved skills, tactics & strategies for making on-farm decisions (Farmers are always working on this. Seasonal variability = managing income variability too!)

Expectations of weather forecasts versus market forecasts?

Every year is different, but seasonal forecasts can be useful to provide the "pre-season conditions" or the background for how key ocean and climate drivers are setting up from one year to the next. Bear in mind though that there might only be a clear signal once every 2 or 3 years, so a key element is around our own expectations of what we expect from forecasts. Farmers are used to making decisions amidst uncertainty. When to lock in interest rates, hit the sale yards, trade grain, buy fertilizer, forward sell etc. , all which rely on farmers making the most of the intelligence around them (via trusted sources). Most of the time you get it right, but the key is you make the decision on the best information available at the time. In many ways seasonal forecasts are no different.

Weather patterns are complicated just like our markets, so the key is to understand what forecasts are saying and why, but also realizing that they are not a 100% accurate prediction, just like those forecasting prices 6 months ahead.

Seasonal forecasts – probably best thought of as…

"A bit like getting the minutes of the latest Reserve Bank Board meeting.....is there anything special we need to be mindful of about the present situation?" "A quick heads up". And following from that analogy, in typical "Reserve Bank' style language I propose that seasonal forecasts probably only offer a choice from 4 possible main take home messages when it comes to rainfall outlooks for your patch**:**

1. **Upside** (more models suggest likelihood of wetter)
2. **Downside** (more models suggest likelihood of drier)
3. **Average/normal** (models suggest normal climatology) or
4. **Anything is likely** (variety of model outlooks for both wet, average & dry)

Good news - new knowledge about what drives our wetter and drier seasons

Farmers have always had to deal with the fluctuations from wetter seasons to dry - good old fashioned seasonal variability. Thanks to great research by BoM, CSIRO and wider, we now know more than ever about what drives these wetter and drier seasons. For southeastern Australia I often refer to these as the four sheepdogs that round up our rainfall

(see the "ClimateDogs" animations on www.depi.vic.gov.au/climaterisk).

Key climate features behind our natural variability are:

- **ENSO – (El-Nino/Southern Oscillation)** refers to sources of rain bearing moisture that comes from the tropical Pacific Ocean. Historically El Nino years (like 2006) send us less moisture increasing the chance of drier springs. La Nina years (like 2010) send us more moisture and eastern Australia tends be have increased chance of average or wetter springs. Farmers can track ENSO to see what the outlook is for each spring – June-August is a good time to look at how things are set up for southeast spring rainfall. The SOI (Southern Oscillation Index) is a measure of the pressure difference between Darwin & Tahiti. In El Nino years, the pressure is higher over the Darwin/Australia region and lower at Tahiti in the Pacific (SOI negative),

which is not helpful for the flow of tropical moisture towards Australia. While ENSO changes the odds of wetter or drier, it doesn't guarantee it.

- **IOD – (Indian Ocean Dipole)** refers to sources of tropical moisture coming from the Indian Ocean off the coast of northwest Australia. Southeastern Australian spring rainfall has a correlation with drier years when IOD is drier phase (+ve), and wetter springs during IOD (-ve) phases when extra moisture flows down to us via northwest cloudbands which drop out their moisture when they hit our colder air down south.
- **SAM – (Southern Annular Mode)** refers to belts of westerly winds that circulate around the southern ocean, and can influence the strength of frontal activity that gets to southern Australia and how far they venture inland. More regular or stronger fronts leads to wetter winters. Essentially delivers "triggers" for rain making events.
- **STR – (Sub-Tropical Ridge)** is a natural high pressure belt that sits across southern Australia and influences the location and strength of high pressure systems. Farmers know that seasons with stronger or more frequent blocking high pressure systems over southeast Australia don't tend to produce the regular rainfall that we would like. In recent decades the pressure pattern has got a bit stronger which meteorologists blame for the less reliable autumns rains in southeastern Australia.

Recent years - did you know that:

- The wet spring and end to 2010 was wetter due to both ENSO (via strong LaNina) and IOD (IOD-ve = wetter) sending more moisture down this way. The last time both did this at same time was back in 1975….which farmers also remember as wet!
- The 2006 drought was the result of a combination event of ENSO (ElNino-dry), IOD +ve (drier). The risk of bigger droughts are when these climatedogs team up at the dry end of their range.
- While ENSO and IOD seasons doesn't guarantee a drier or wetter spring, historically we know they have certainly shifted the odds significantly. Given that there are tools available to keep track of ENSO and IOD and spring rainfall outlook, it makes sense that southeast Australian farmers consider these as they plan their scenarios.
- To see these 4 climate drivers in action – view the short animations on the 4 climate dogs at www.depi.vic.gov.au/climaterisk
- And also www.dpi.nsw.gov.au/agriculture/resources/climate-and-weather/variability/climatedogs

Any 'curve balls' to keep an eye on?

Amidst the gyrations of good old fashioned seasonal variability, there are a couple of things which are different for farmers in southern Australia today.

- *Warmer* - each decade since 1950's has been warmer than the last, with springs being our fastest warming season, whereby 6 of our last 10 springs have been 1-2 degrees warmer than the long term average, which tends to bring about a shorter or bumpier spring finish. And just to complicate matters, the incidence of late spring frosts is actually increasing in some regions as well.
- *Autumn breaks* - As for rainfall, since 1997 most regions have only had a few wetter than average years in that time, with autumn being the one season where rainfall has

been less reliable than what we would expect from long term records. Farmers have done a great job managing through this period.

- *What's the culprit*? Meteorologists are measuring changes in the intensity of the sub-tropical ridge (climatedog Ridgy) which is a key driver of the high pressure patterns that float across southern Australia. The pressure pattern of today is not the same as it was in the 50s, 60s and 70s. As a result the storm tracks tend to shift southwards more often. This is expected from climate models as global temperatures increase, and it explains what has been happening to our weather patterns since 1997.

Whatever happens from this point on, farmers still just have to stay on the ball managing seasonal and income variability (as well as markets and everything else!) as best they can. We have better skills, tools and technologies than ever to do this - including access to new and improved seasonal forecasting.

The priority - making the most of "known" information

Modern seasonal forecasts are best looked upon as a valuable ten percenter, and the golden information is what's right in front of you.

At any point in time we know:

- Recent seasonal rainfall & conditions
- Existing soil moisture stores (rainfall in the bank, via moisture probes etc)
- 7 day forecast (rain coming or hot/dry?)

Then added to this the forecasts can add some extra insights via:

- 1 month outlook and longer
- Longer term trends or patterns

Farmers employ a range of techniques for triggering decisions, but it's all about focusing on the things under your control:

- Your key points of the year for key decision
- Known benchmarks and thresholds (eg are we above or below average for a key threshold or crop stage)
- Mapped out response options plan a, b, c and trigger dates – and a good seasonal forecast can just help which scenarios you might put more emphasis on.

Stay up to date!

To help get a heads up in seasonal rainfall outlooks, DEDJTR Victoria's Dale Grey produces a monthly update called "The Break" which is designed for farmers. While specific to Victoria some of the commentary may be of wider use. To subscribe free just email The.Break@ecodev.vic.gov.au. Subscribers also can see a monthly youtube 3 minute slideshow on the latest seasonal outlook https://www.youtube.com/channel/UCIDCIII7gRZhUs03opGqH1g

Some useful links

Where's the rain expected for the next 7 days? www.bom.gov.au/jsp/watl/rainfall/pme.jsp

Weather Chart for next 7 days - hit play button see next week weather chart play out

www.bom.gov.au/australia/charts/viewer/index.shtml

The BoM have just updated their seasonal outlooks, which now have a monthly video snapshot as well as 1, 2 & 3 months outlooks for rainfall and temperatures.

www.bom.gov.au/climate/ahead/

CliMate app - useful tool to look up your local long term rainfall data and then ask questions (eg how reliable autumn breaks are in your area)

www.australianclimate.net.au

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Protein analysis

Ashley Wakefield

Business Farmer, Owner/Manager

Urania, South Australia

Ag Data, the key to our future!

Near Infrared analysers have been used to measure protein, oil and moisture in whole grains for many years at bulk handling sites across the country. In the past 15 years, farmers across Australia have started using NIR analysers to test their grain prior to delivering into the bulk handling systems or storing into their own on farm storage facilities.

Technology within the agricultural industry has developed rapidly in the last 10-15 years. Investment into modern and large scale farming will continue as farmers strive to increase yield and profitability. Precision Agriculture will be a key driver in developing technologies to give farmers the data and tools to farm smarter and more efficiently.

Over the last 10 years I have been working with a local instrument manufacturer, NIR Technology Systems and now Next Instruments, to develop an On Combine Near Infrared Whole Grain Analyser. After several years of trialling different sampling devices we now have a robust system that mounts onto the clean grain elevator. The NIR spectrometer used in the CropScan 3000H is the same as used in more than 1000 CropScan analysers around the world. The software has been specifically developed to provide operators with real time data as well as posting to data to the Cloud.

Over the years we have collected data from my farm to generate protein maps with the help of Michael Wells from Precision Cropping Technologies. In 2013 and 2014 we collected large amounts of data to generate protein maps and this last harvest we conducted some validity and accuracy studies.

We have selected 3 wheat paddocks across the farm and looked at the following:

- Compared protein and moisture results from the CropScan 3000H against the protein and moisture results for each load taken to Viterra.
- Yield vs protein
- Soil types vs protein
- The effect of adding extra nitrogen to part of a paddock.

This presentation intends to demonstrate that the CropScan 3000H On Combine Analyser provides accurate and meaningful information that farmers and their agronomists can use to improve the productivity and profitability from their farms.

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NOTES

Leak detection units

Shane Oster

Director, Alpha Group Consulting

Take home messages

- Receive daily usage reports via text and email
- View usage graphs online in real time
- High usage alerts
- Investment payback by avoiding one major leak
- Many “add-on’s” available

Alpha Group Consulting’s Leak Detection Unit (LDU) was first released in 2011. It was revamped in 2014 with the new model offering significant advantages and has seen broad scale adoption on the Eyre Peninsula.

The LDU offers users the ability to closely monitor water usage via daily text and email messages reporting on total daily water use and minimum flow per hour. This is the cornerstone of the system and is what clients ultimately come to rely on to manage their water systems. High usage alerts can also be configured to give earlier notification of major leak events. Every user also has the ability to view their usage graphs over the internet in real time as the unit uploads the data. This tool has proven itself invaluable at detecting minor water system leaks as well as providing rapid detection of major leaks. In general there is a wide spread pattern where stock don’t drink between about 2 and 6 am in the morning. If a system has no faults the minimum usage should get down to 0 L/hr during this time. A minimum L/hr reading of 100 L/hr will indicate a 100 L/hr leak.

The unit fits to all standard SA Water meters or aftermarket flow meters with pulse output capacity and requires no maintenance. Full installation and ongoing servicing is provided. The units are quick, easy and simple to install with low annual operating costs.

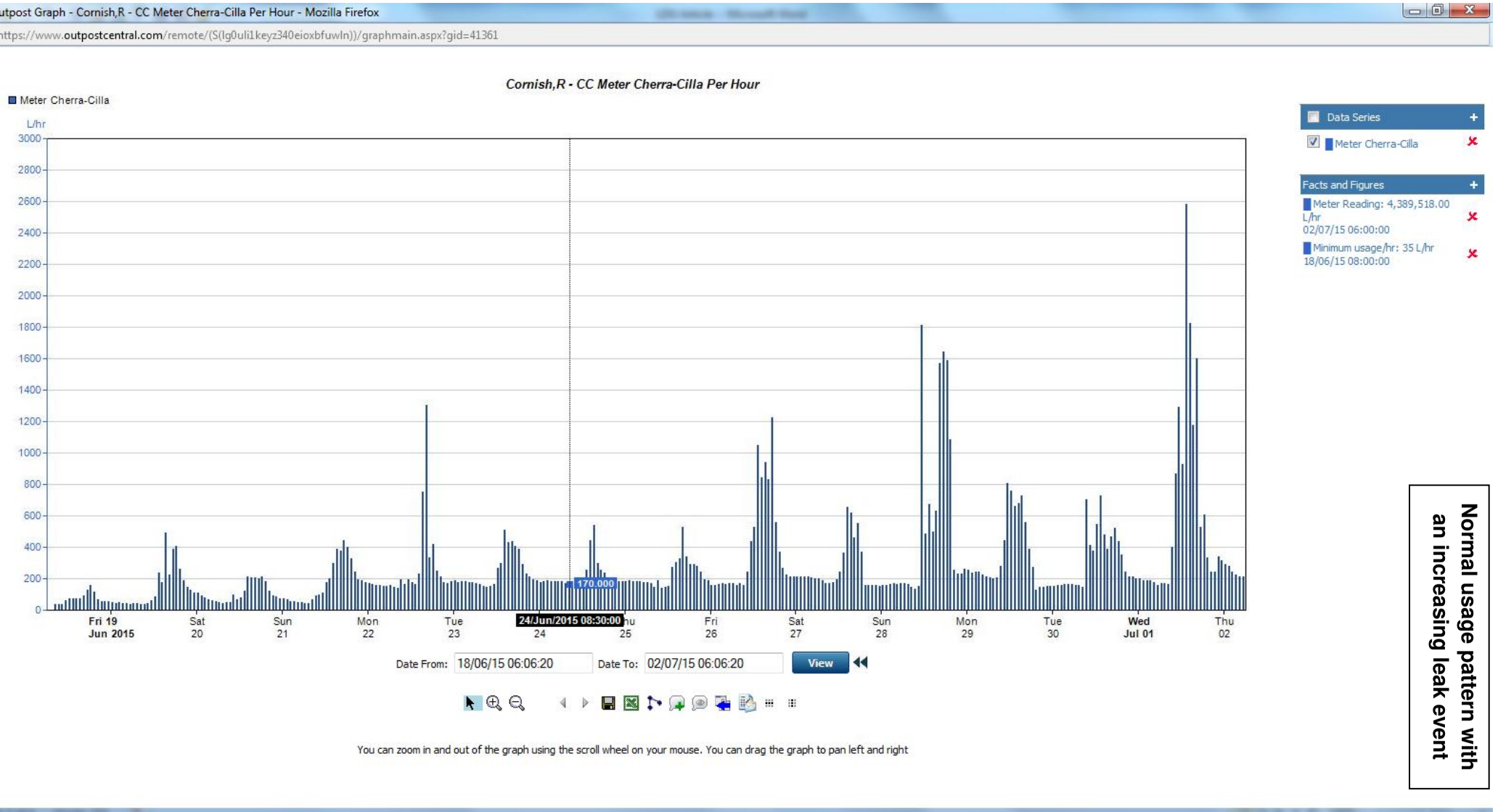
The system operates with a long lasting chargeable lithium ion battery, are moisture and pest protected and are fitted with an external high gain aerial to overcome poor Next G reception.

The system has the capacity to service:

- Two water meters
- Tank level sensor
- Pressure gauges
- Weather stations
- Soil moisture probes
- Rain gauges
- Wind meters
- Salinity meters

Uptake of the system has been quite overwhelming since the new product's release in August 2014. This is especially so on the Eyre Peninsula. What sets the EP apart from many other areas of the state are the distances needed to be covered to do basic water runs. The system allows clients to closely monitor their water system, even while they are flat out with harvest, seeding or fishing… The water scheme on the EP has many private water lines running several kilometres along roadsides or through neighbouring properties even before reaching their own farm. This often makes it near on impossible to keep on top of water leaks. The LDU allows clients to manage their water infinitely better in a fraction of the time that it used to take.

Example of daily text message received



Normal usage pattern with an increasing leak event

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NOTES

APPs for farmers

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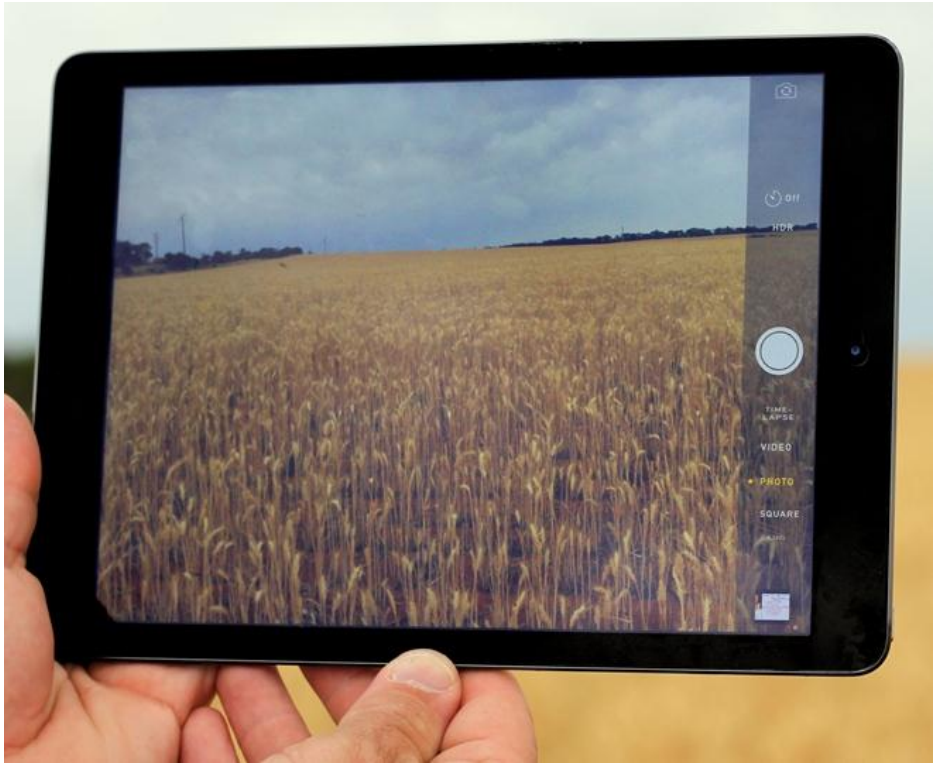

Finding apps for farmers

In late 2011, Ag Excellence Alliance produced a booklet of smartphone applications (apps) for farmers, after those with a joint interest in agriculture and smartphone/tablet technology had noticed that while farmers were beginning to adopt the technology, and the number of apps beneficial to farmers was increasing, these apps were extremely difficult to find. The booklet was very successful, quickly becoming the most visited page on the Ag Excellence website. In 2014, further funding was received from the Department of Environment, Water and Natural Resources to update the book. Ag Excellence contracted Growing Solutions to review and update the publication.

“Smartphone Apps for Smart Farmers v2” contains 414 apps, categorised as Production, Environment or Social, then split into further sub-categories. For each app, a picture of the app’s icon, a description, the cost, download size and a link is provided. It is noted whether the app exists for both platforms (Android and iOS) and an indication is given as to whether internet is required to operate the app. It can be downloaded in its entirety, or just the iOS version or the Android version can be downloaded from
http://agex.org.au/project/smartphone-apps-smart-farmers-v2/

In addition to producing the updated version of the booklet, Ag Excellence also created a new page on their website for farming apps. With the world of apps changing so rapidly, the book, produced in December 2014, would now have some inaccuracies; however the website is updated monthly, so farmers can be assured of finding current information at http://agex.org.au/farming-applications/

Some interesting apps

In preparing for this presentation, I was looking for apps which would be useful to farmers, were available on both iOS & Android, were free, and could be operated without internet.

Production Wise:

This is an app designed to be used in conjunction with ProductionWise online farm management system (www.productionwise.com.au). Depending on the level of service, costs range from free through to $5,500 per year. A free advisor version can be downloaded, and linked with the farmer's account.

The app syncs with a farmer's existing ProductionWise account, and allows the user to look at and change paddock operations and inputs, add observations to paddocks, view maps of paddocks, or the whole farm, and enter data for individual paddocks, or several paddocks at once.

Data can be recorded in areas of no or intermittent internet service, and will sync when service is available.

GRDC suite of apps:

GRDC offer a suite of free apps including:

- Winter Cereal Nutrition: The Ute Guide

This app provides information on cereal nutritional disorders, allowing the user to search for topics on nutrient deficiencies and toxicities and environmental, chemical and physiological disorders which can give similar symptoms to nutrient disorders. Photos of nutritional disorders can be compared with pictures in the app.

- Field Peas: The Ute Guide

This app provides comprehensive information on field peas, allowing the user to search for topics on disease physical, nutritional or chemical disorders and their management. Photos of field pea disorders or pests can be compared with pictures in the app.

- Insect ID: The Ute Guide

This app allows the user to search by region and find photos of insects to compare against insects found in the fields. Insects can be searched for by common name or by scientific name. Beneficial predators and parasites can be identified to assist in control of insects.

- Weed ID: The Ute Guide

This app allows the user to search by region and find photos of weeds to compare against those found in the field. Weeds can be searched for by common name or by scientific name, and search results can be filtered by lifecycle, whether they are native, currently flowering or have a distinctive smell.

- Coming soon from GRDC:
    - Canola: The Ute Guide
    - Lentils: The Ute Guide

Willy Weather:

Willy Weather is an easy to use weather app that includes BoM radar and satellite, detailed wind, rain, tide, swell and UV forecasts, as well as moon phases, and sunrise and sunset times. Forecasts are provided for over 17,000 Australian locations including all suburbs, towns, beaches, rivers, parks, lakes and islands.

Smartphone Apps book cover page

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NOTES

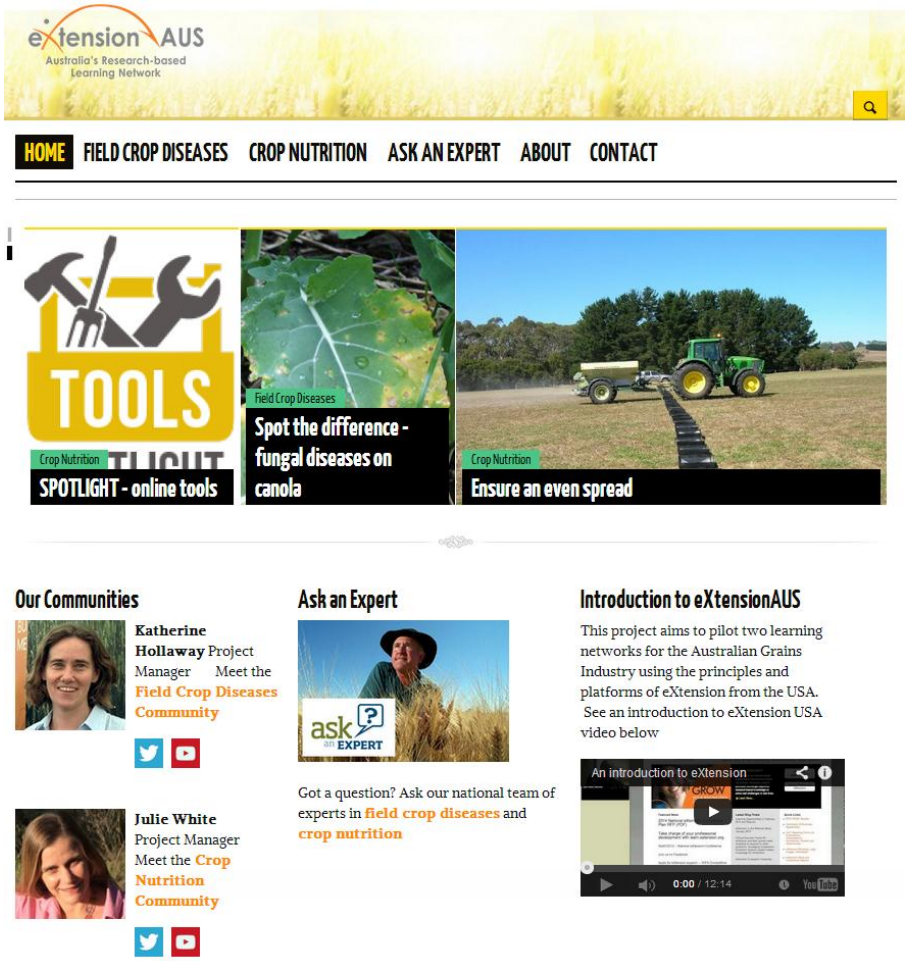
eXtensionAUS

Gavin Beever

Managing Consultant, ORM

Expert grains information is on tap through the new online platform www.extensionaus.com.au

The GRDC funded project has been launched and is enjoying rapid uptake as grain growers and advisers network in with the latest on field crop diseases and crop nutrition.



The project presents a significant development in making available information and expert advice for grain growers.

It has the potential to change the way Australian grain growers approach cropping issues by providing open access to leading industry experts.

Websites and social media tools have a natural advantage as an information service as they are available around the clock. Through eXtensionAUS people can engage with one another and access information at any time. It allows people to connect, have real conversations,

explore issues in a personal way, have an influence over the information made available and to interact with tools that give great learning opportunities.

Growers can use the service to request information on specific crop nutrition and disease issues, with more than 100 leading researchers and agronomy experts all over Australia lending their knowledge to the eXtensionAUS platform and providing tailored responses and working together in new ways.

The platform is based on a system successfully implemented in the United States over the last decade, where technical experts can identify issues as they emerge in real-time and provide tailored advice to growers.

After securing agreement to a transfer of the technology to Australia, the Grains Research and Development Corporation (GRDC) in partnership with the New South Wales Department of Primary Industries (DPI) and the Victorian Department of Economic Development, Jobs, Transport & Resources (DEDJTR) have successfully piloted the approach over the last year.

The platform offers expert feedback on specific and topical challenges. There's enormous scope for the grain growing community to better understand significant issues as they emerge, like beet western yellows virus last season and find solutions by working directly with experts.

More than ever before, farmers are able to access digital resources and communicate online. The central resource for growers is often their on-the-ground agronomist who can look in detail at particular cropping issues and find solutions for individual growers; but eXtensionAUS can provide that first step to getting a handle on key issues or what new practices could deliver benefits on-farm, that can then be followed up with advisers.

The project is a great example of how we can take innovative technology and initiatives from global grain-producers like the US, where there is a huge focus on effective extension, and shape those for Australian grain growers.

eXtensionAUS can be accessed at http://www.extensionaus.com.au/

and via twitter @AusCropDiseases and @AuCropNutrition

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Livestock innovations

Michelle Cousins

Cousins Merino Services

New technologies or innovations are going to be an important component of all livestock businesses either directly or indirectly, how will be dependent on the nature of the business and the goals of the **producer**. We need new technologies to address the changing needs of the livestock industry and to improve the productivity and profitability of enterprises as new challenges are being met or created.

Many technologies are not new but are continually being developed to meet producer's needs. The way we use these technologies within our business is the most important component of new technology. It's no point having the latest equipment and measuring all traits if it's not going to improve profitability or viability of the business.

What is out there?

- On Farm Fibre Measurement (OFFM)
- Ultrasound Scanning (Pregnancy and Fat & Eye Muscle Scanning)
- Electronic Identification
- Automated data capture and auto drafting systems, including remote management.
- Data support systems and software.
- Remote management systems – drones, telemetry.

The value of Electronic Identification in Livestock Systems

Electronic identification of livestock, commonly known as EID or RFID (radio frequency identification), has enabled us to change the way we manage our livestock systems. It has allowed for improved data accuracy, reduction in time to collect data, quicker recall of data and improved stock handling methods. Perhaps most importantly it has enabled us to make decisions based on individual animals, exploiting the variation that exists within all flocks and identifying the most productive and unproductive animals.

Variability within a Merino Flock

Trait	*Production level of flock:*		
	Top 25%	Average	Bottom 25%
Wool Traits:			
Clean Fleece Weight (kg)	5.3	4.6	3.9
Fibre Diameter (µm)	18.9	20.4	21.9
Staple Strength (N/ktex)	42	35	28
Meat Traits:			
Growth rate (g/day)	357	284	200
Fat depth (mm)	8.9	10.6	12.5
Reproduction:			
Lambs weaned per ewe joined	1.43	0.86	0.28
Profitability traits:			
Fleece value per ewe ($)	82	54	37
Carcase value per ewe ($)	56	33	12

Source: *Atkins, Richards and Semple 2006*

What uses does EID have in a livestock business?

Electronic identification is being used in stud, commercial, merino and meat livestock businesses. It is being used for recording:

- Weight, growth and condition score
- Carcase feedback
- Fleece weights, fleece tests, WEC
- Classing scores and visual traits
- Pregnancy status, number of lambs weaned
- Health treatments
- Mating and pedigree records
- Stock audits and inventory

How is this information used?

How producers use information is varied and as more producers start using EID we are going to see many more ways that this information collected is used. Currently we are seeing clients using it to:

- Manage groups – e.g. twins, twice dry, low CS, low weight.
- Rank of production – utilising indexes of production traits e.g. Rampower
- Culling and breeding decisions
- Husbandry treatments and withholding periods
- Estimate time to market lambs
- Record pedigree
- Reproduction history – number and weight of lambs weaned
- Individual fleece values at shearing
- Preparing sale lines

How do I incorporate it into my business?

It is important to realise that new technology or innovation isn't the magic answer to a more easily managed profitable livestock enterprise. It creates opportunities for the producer and should be based on individual's needs. If labour is an issue an automated sheep handler could pay for its self in two years, if accurate and easy recall of data is important (e.g. Sheep stud) then electronic sheep tags can save both time and money.

In my experience those clients that are getting the most benefit from using new technologies, be it EID, remote management, genomics, the ones that are achieving the most are those that have gone in with clear objectives of what they are trying to achieve. Livestock producers face many challenges in the future, with changing climate and markets and the continual need to make more from less. New technologies may just provide the answer to ensure the long term profitability and productivity of your enterprise.

Providing: OFDA2000 On Farm Wool Testing: Pregnancy Scanning: Sheep Classing: Ram Selections: Fat & Eye Muscle Scanning: EID Requirements, including software & hardware needs.

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Soil moisture probes in dryland farming

Shane Oster

Director, Alpha Group Consulting

Take home messages

- Use probes as a tool to know exactly how much stored water is in your profile at the start of each year
- Know how effective rainfall events have been, where the wetting front is and where the crops are drawing moisture from
- The most powerful data from probes is from multiple years of data
- Improvements in how users access the data has been the big advancement in the last 1-2 years
- Answer with confidence, “Is nitrogen or moisture my greatest limiting factor?”
- Correct installation is critical
- Ensure that you seek help to interpret the probe graphs (they can sometimes be like looking for the man on the moon!)

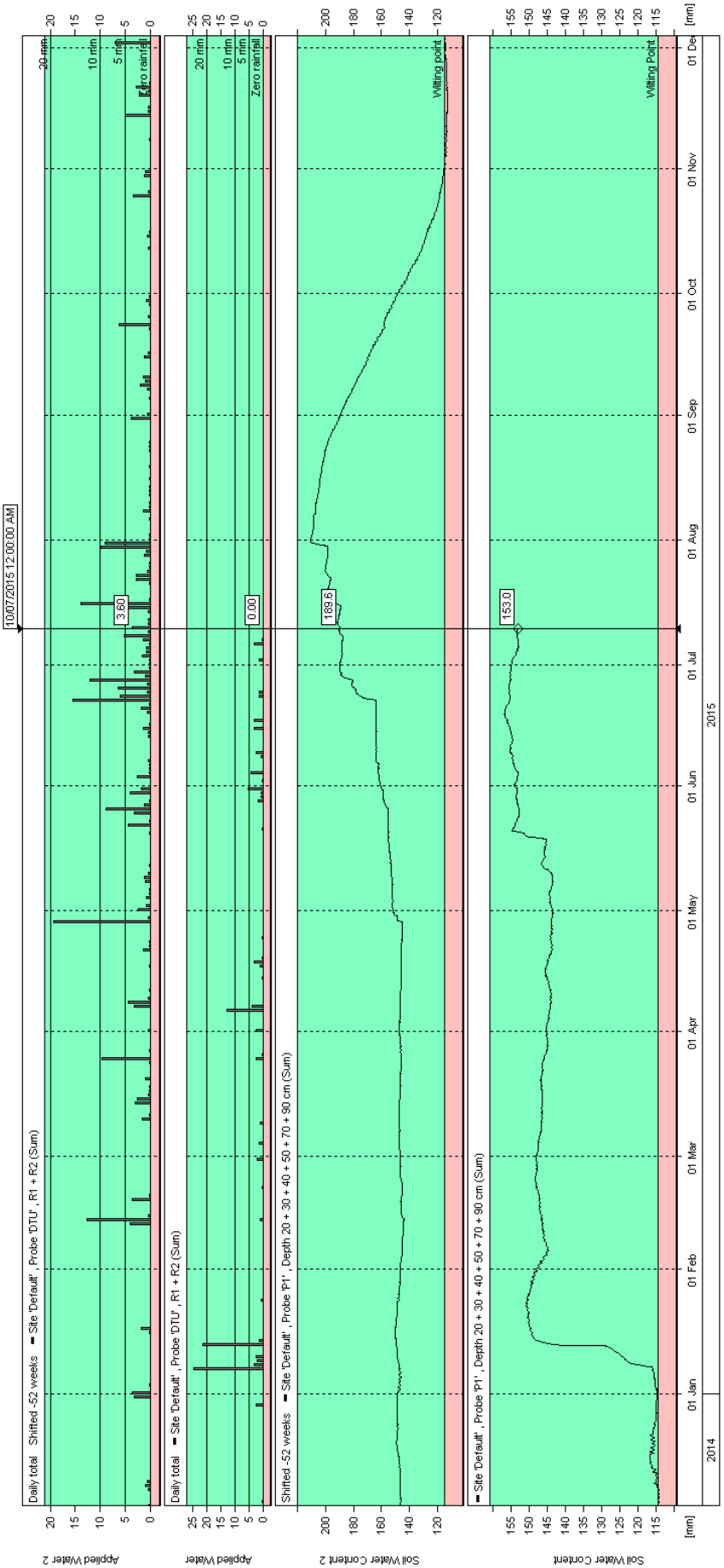
Soil moisture probes saw their genesis in the irrigated scene in the 1980s. They experienced a rapid increase in adoption since the telemetry systems for relaying the data have become more versatile, cost effective and user friendly. The uptake of soil moisture probes in the dryland sector over the past 5-10 years has been slow and largely confined to the research sector. It has fallen into the category of being “interesting, but how do I make money from it?” The advent of smartphones, tablets and better, easy to access software has changed that trend.

The most common form of moisture probe currently available is the **capacitance probe** which works by sending an electrical signal into the soil and translating the data that comes back into a moisture reading. The recent adaption into the broad acre scene has seen their value being derived by assisting growers to predict with a high degree of accuracy how much water is in the “bucket” at any one time. This may then influence decisions they are making about nitrogen applications, grain marketing and risk management strategies. There are many growers also now combining the use of soil moisture probe data with that of Yield Prophet as a means of ground truthing the data.

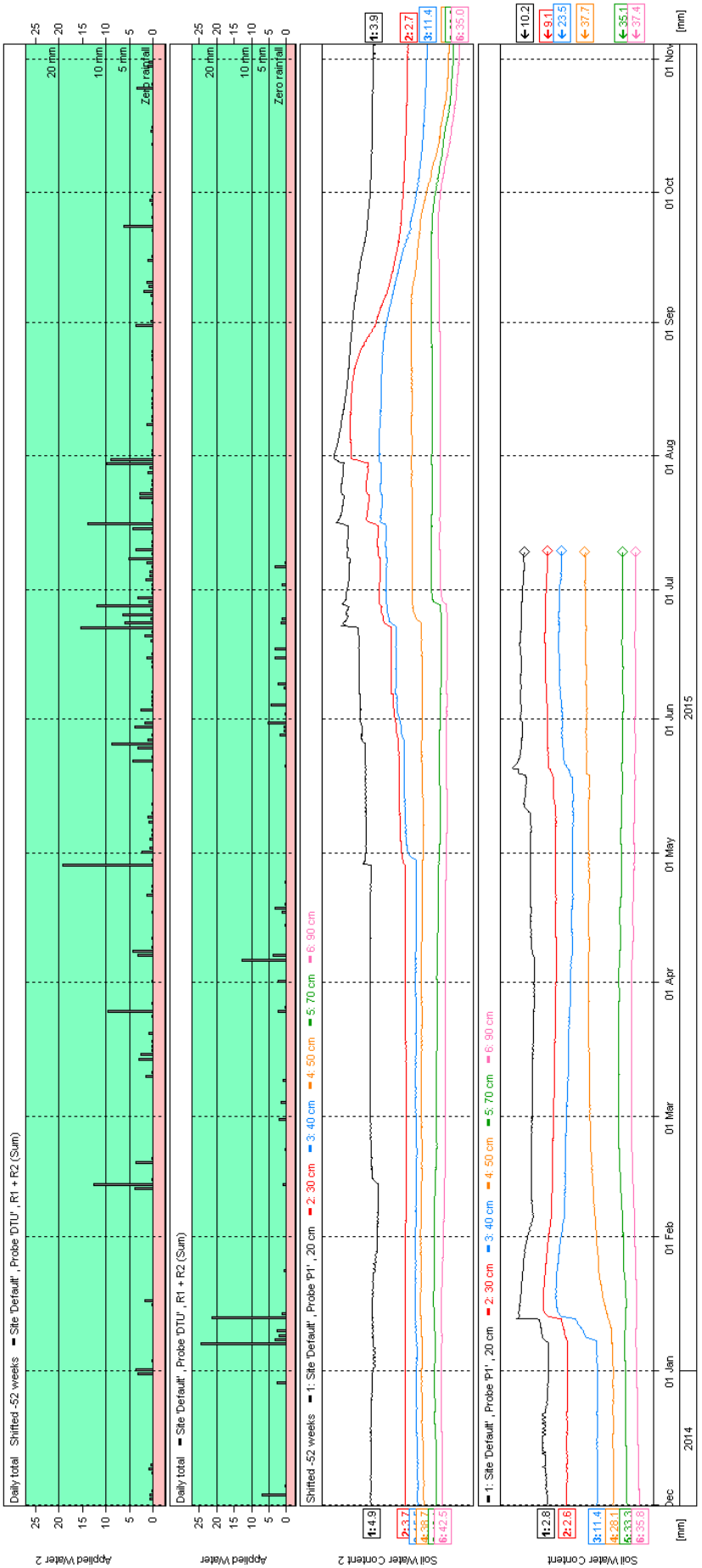
Farming in 2015 requires us to place so much emphasis on predicted outcomes. Grain prices, weather forecasts, climate change, input prices, the Aussie dollar and the list goes on. Soil moisture probes allow growers to make decisions on ACTUAL data. Growers can go into the season knowing exactly how much soil moisture they have stored and monitor this right through the growing season in real time. The screwdriver in the ground is not a bad moisture monitoring tool, but to understand a wheat crop you need a very long screw driver!

The placement of soil moisture probes is best done by combining EM 38 data and yield maps. This allows the probes to be placed in an area which is representative of the paddock or farm. This ensures that the data from the probes is representative of what is in the paddock. The most important aspect in achieving sound probe data is correct installation. It is critical that the probe hole is the exact size needed and that there are no air gaps. My experience suggests that slurry installs should be avoided in sandy soils as it changes the soil properties too much and results in poor quality data.

As with yield maps and EM 38 data the most important aspect is interpreting the data. The same theory holds with soil moisture data. Often when confronted with a “stacked” soil moisture probe graph finding usage trends can be like looking for the man on the moon. Seeking help in understanding what the probe is showing is key to their success. Ensure that either your consultant/agronomist or whoever you purchase the equipment from can offer the advice needed for probe graph interpretation.



2 year rainfall and summed soil moisture data



2 year rainfall and stacked soil moisture data

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Unmanned Aerial Vehicles – UAV's

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The use of Unmanned Aerial Vehicles (UAVs) or drones in agriculture is a relatively new industry, but one which is rapidly growing.

As expected, there are quite strict regulations in place, enforced by the Civil Aviation Safety Authority (CASA). One of the most significant regulations impacting on farmers is that it is illegal to operate a UAV for commercial hire and reward without an unmanned operator's certificate covering that type of operation. The operator's certificate can be viewed as a "UAV Pilot License". A myriad of other regulations apply to operating UAVs, for example, the UAV must fly below 400 feet, stay in line of sight of the operator, and can only be flown clear weather. Additionally, a 30-metre boundary from people must be maintained, and UAVs are not allowed to fly within 5.5km of an aerodrome or landing site (this includes a farm landing strip), unless prior approval has been granted via CASA. UAVs may not be flown in built up areas without permission from CASA.

While strict regulations govern the use of UAVs, there is no doubt that they can be operated within these guidelines, and still deliver a significant advantage to the agriculture industry. UAVs can be used to monitor crop health and obtain a bird's-eye view of paddocks. They will

be able to be fitted with monitoring equipment including an NDVI (Coloured infrared) camera that will enable the user to determine the health status of crops from another perspective and monitor N application accordingly. NDVI is the difference between the amount of visible light absorbed in relation to the amount of near infrared light being reflected by the plant. The results of poor crop health can be evident weeks prior to being visible to the human eye. Drainage and prescription maps can be developed based on the information gathered from the UAV.

In the past, this information has been obtained via satellite, or by use of light aircraft, helicopter or dedicated hardware fitted to farm machinery. While these avenues are still options for farmers, UAVs have some clear advantages. For example, UAVs offer on-demand, real-time analysis, as opposed to the images from a satellite which are low resolution and may not be recorded when you need the information. UAVs allow for a much more versatile and flexible service, delivering only the information farmers need and only when they need it. The imagery is much more detailed than that obtained by a satellite and the cost of the service is considerably less than the cost of a light aircraft or helicopter.

From herding sheep, viewing solar panels or inspecting fence lines and water troughs, the potential use of UAVs extends well beyond our ideas today. As sensors become available on the market that are cost effective and provide production benefits, the growth in UAVs on farms will incrementally increase in a short period. Reports from the USA suggest that 85% of the total UAV market worldwide will be in the agricultural industry, with this becoming an $82 billion dollar industry by 2025 in the USA alone.

UAVs offer a platform that is work safety conscious, environmentally friendly, and saves time and money. The ultimate success in the adoption of UAVs on farm will result from production increases. Rather than focussing on what UAV to buy, farmers should be directing their attention to the data management and collection systems, because for benefit to be derived, these need to be right.

Leighton ready to fly UAV

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