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# 2018 Business & Technology Forum

Irrigating into the future

Thursday  
28 June 2018

Griffith

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Irrigation Research &  
Extension Committee



**Rice Extension**  
funded by AgriFutures™



# Business & Technology Forum

Irrigating into the future

## Agenda

8.30am – 8.45am	Registrations	
8.45am – 8.55am	Introductions and overview of the day	
Irrigation and this season		
8:55am – 9.25am	Seasonal water price influences	Anthony McCloskey, Key Water
9.25am – 9.55am	Water products – which ones to choose	Michael Ryan, Riverina Agriconsultants
9.55am – 10.25am	2018/19 Season forecast and dam situation	Andrew Nolan, Snowy Hydro
10.25am – 10.55am	BREAK	
Business		
10.55am – 11.25am	Financials for forward planning	Steven Bourke, Rabobank
11.25am – 12.05pm	WHS: Do you have a plan	William Lloyd, Safe Ag Systems
12.05pm – 12.30pm	Protecting the business: succession, insurance, super	Glen Wilson, Commonwealth Bank
12.30pm – 1.15pm	BREAK	
New technology		
1.15pm – 1.45pm	Various images with local results	Thane Pringle, Independent Precision Ag
1.45pm – 2.15pm	Setting up farm WIFI	Dan Winson, Agrinet, James Brinkhoff, Deakin University
2.15pm – 2.45pm	Irrigation automation – a Qld example	Steve Attard, AgriTech Solutions
2.45pm – 3.05pm	BREAK	
What's next?		
3.05pm – 3.45pm	How to think about emerging technologies	Paul Higgins, Emergent Futures
3.45pm – 4.05pm	R&D in rice around the world: towards 2028	Russell Ford, SunRice
4.05pm – 4.20pm	Evaluations and close	



# Seasonal water price influences

Anthony McCloskey, Key Water

What's the top of the market going to be?  
What's the bottom going to be?  
Don't we all wish we knew!

What we do know though is what season influences affect the temporary water price...

Supply and demand is by far the biggest influencing factor in the water market, if there is more demand than supply prices increase, if there is more supply than demand prices decrease. A few of the below points are influencing factors on supply and demand...



## Weather

Has it rained too much to put crops in on time?  
Is there no rain forecast?  
Is there a lot of rain forecast?  
Is it raining today?

Temperatures throughout the growing cycle that are abnormal, or perfect.  
Has it been hot & dry, and crops require more water?

Installing Australian Autumn

50%

Installation failed.  
Error 404: Autumn not found.  
Autumn is not currently available in Australia.

SOLUTION : WAIT A FEW WEEKS AND TRY TO RELOAD.



## Allocation

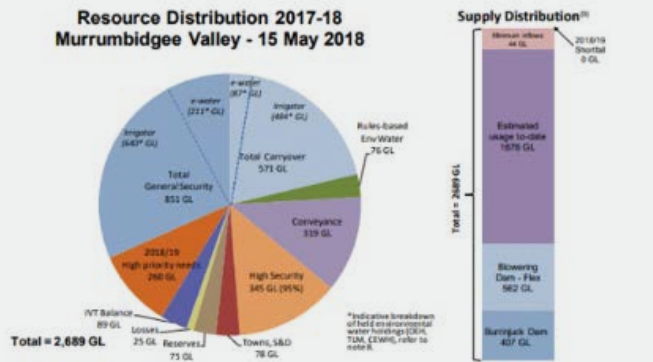
What are allocation forecasts looking like for the season?  
Where are allocations?

## Carry over

How much water has been carried over?

Murrumbidgee Resource Assessment Data Sheet	
Resource Distribution (15 May) for 2017-18	
	Volume (GL)
Total Available Resource <sup>(1)</sup>	2,689
less	
Carryover (GS and Conveyance)	571
Rules based Environmental Water <sup>(2)</sup>	76
Towns, Stock, Domestic	78 (100%)
Reserves <sup>(3)</sup>	75
Conveyance <sup>(4)</sup>	319
Announced High Security	345 (95%)
Losses (transmission, evaporation, operational) <sup>(5)</sup>	25
Murrumbidgee IVT balance carryover at 1 July 2017	89
Late Season Discount <sup>(6)</sup>	0
Announced General Security	851 (45%)
Future (2018/19) high priority needs <sup>(7)</sup>	260

\*See notes below.



## Time of the year

Are farmers trying to secure water ahead of contracting for summer crops?  
Are farmers picking up carry over?  
Is it watering time?  
When do sellers need cashflow?

When do buyers have the cashflow to be purchasing?  
When are crop payments in?



## Water availability

Allocation  
Carry over

Is water available through interstate trade? How much water is spoken for, for crops? As opposed to being sold on the market? How much water is for sale? Do growers have access to alternative water? I.e. groundwater?

## MURRUMBIDGEE IVT ACCOUNT STATUS

Murrumbidgee IVT Account Balance: -13.5GL\*

Allocation Assignments

Murrumbidgee to Murray - Open

There is capacity for 100GL to be transferred out of the Murrumbidgee valley.

Murray to Murrumbidgee - Closed

This information was current as at 9.00am on 4 June 2018

OPEN

CLOSED

## Forecasts/Information

From BOM, weather forecasters, ABARES, Irrigation districts, merchants, water authorities, grower's groups, independent researchers, brokers.



## Commodity pricing

Largely driven by global markets & AUD level  
Where is our dollar today?  
Is there a global demand for X commodity?  
Is there an oversupply of X commodity?  
Forward contract prices  
Cash prices

How much can I afford to spend on water?  
How much will I plant?  
Are more nuts being planted?  
Do growers have enough water for their permanent planting developments?

And last but not least- sentiment!  
Sentiment plays a massive part in the water prices & is probably one of the main reasons why predicting what is going to happen with the market is so hard.

## What is driving the prices for 2018/2019 irrigation season?

- No indication of rainfall predicted
- Limited & high priced temporary water available to purchase for carry over
- Limited & high prices forward water available for purchase
- Allocation forecast predicting 3% opening
- Minimal inflows into storages
- High commodity prices
- A reasonably profitable 2017/2018 season
- No intervalley trade meaning now no water can be purchased from the Murray

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# Water products – which ones to choose

Michael Ryan, Riverina Agriconsultants



### Take home messages:

- There are several water products available including owning or leasing entitlements and purchasing an allocation;
- Each product has pros and cons, owning an entitlement is capital intensive and reliability of allocations vary, temporary markets are volatile;
- Every business is unique so consider which products best suit your cashflow, balance sheet and appetite for risk; and
- Understand your key business drivers and cut off prices that underpin purchase decisions.

### Sources of water

Murrumbidgee water entitlements are summarised in Table 1.

Water Source	Total ML	\$/ML	Allocation Reliability	Capital Invested per Allocated ML
High Security	360,297	5,000	95%	5,263
General Security	1,891,895	2,200	60%	3,667
Supplementary	198,780	600	40%	1,500
Groundwater (Lower Murrumbidgee)	267,500	2,475	100%	2,475

General security entitlements are good value compared to high security, but have significant allocation risk. Over the last 20 years general security allocations have averaged 59%, ranging from 13% to 100%.

Up to 30% of unused general security allocations can be carried over from one water year to the next. As this water is already allocated there is no allocation risk (unless the dam spills). Carry over allows irrigators to manage their own allocation risk.

Rainfall is an important water source, 400mm of rainfall per annum is 4ML/ha.

Entitlements can be leased, with the lessee usually wearing the allocation risk. Typical lease rates are 5% of capital value.

Allocated water can be purchased as a temporary transfer, for use in the current water year or as forward water for use in the next water year.

A comparison of water sources is provided in Table 2.

Water Source	Pros	Cons
High Security	Reliable allocation	High capital cost
	Capital growth	Fixed costs
General Security	Lower capital cost per allocated ML	Capital cost
	Capital growth	Variable allocations Fixed costs
Supplementary	Lower capital cost	Episodic events
		Timing cannot be controlled, often announced when demand is low Need on farm storage to best utilise
Groundwater	Reliable allocation	Expensive infrastructure
	Capital growth	High energy costs
	Can pump and/or carryover 200% in any year	Infrastructure is a depreciating asset
		Extraction limits (annual and daily) Limited suitable bore locations
Lease	No capital investment	No capital gain
	Operational expense	Allocation risk Value subject to allocation
Temporary Purchase and Forward Water	No capital investment	No capital gain
	Buying deliverable water	Volatile market
	Operational expense	

### Comparing Options & Considerations

General security, purchase for say \$2,200/ML, the interest cost (at 5% pa) is \$110/ML. At a 50% allocation the interest cost is \$220/ML. High security, purchase for say \$5,000/ML, at 95% allocation the interest cost (at 5%pa) is \$263/ML. Costs in the irrigation areas include delivery entitlements charges. Riparian irrigators have energy and infrastructure renewal costs.

Leasing general security entitlements at 5% of the capital value is the same cost as the interest cost (if buying) with the same allocation risk. Leasing high security entitlements at 5% of the capital value resolves allocation risk but increases the cost per ML.

- At the end of May 2018;
- Temporary water was listed for sale for \$175/ML. This must be used by 30 June or carried over. Entitlement holders with spare carry over space will sell “carry over capacity” for \$25 - \$35/ML; and
  - Forward water for 2018/19 was listed for sale for \$235/ML.

Purchasing entitlements (as set out in Table 1) usually requires finance. Increasing debt increases business risk, so purchasing entitlements requires a strong balance sheet. Entitlements provide a return on capital and have shown strong capital growth in recent years.

Groundwater is highly reliable. The true cost of groundwater includes energy and depreciation costs. A new irrigation bore costs \$200,000 to \$300,000 (or more) to install and has an expected lifespan of 25 years. So a \$250,000 bore, over 25 years is a capital cost of \$10,000 per annum (plus interest), which is \$20/ML based on pumping 500ML per annum. Subject to pumping depth and type of energy, pumping costs (including repairs and maintenance) are about \$75/ML. Government charges are about \$5/ML. Total cost is \$20 + \$75 +\$5 = \$100/ML. The temporary groundwater price is often about \$50/ML.

### What is the best option?

There is no simple answer, you need a range of water sources to manage your balance sheet, cashflow and risk. It is important to understand the impact of each option on the whole of the business, don’t just rely on a simple gross margin. Think and act long.

For those reliant on temporary purchases it is important to understand volatility of the market and have access to funds to buy water when the market dips. You need to know your cut off price, which could be rice \$125/ML, cotton at \$500/bale \$150/ML, cotton at \$600/bale \$200/ML.

### Examples

- Grower 1** – started with general security water only and used 30% carryover to full extent. Purchased high security entitlements, constructed on farm storage and installed a bore. Supplements with temporary purchases and carry forward water.
- Grower 2** – general security water only and uses 30% carryover to full extent. Supplements with temporary purchases and carry forward water.
- Grower 3** – has high security and general security water and uses 30% carryover to full extent. Installed a bore to reduce exposure to general security allocation volatility.
- Grower 4** – has high security and general security water plus on farm storage and uses 30% carryover to full extent. Supplements with temporary purchases and carry forward water.
- Grower 5** – has groundwater and supplementary water and uses carryover to full extent. Supplements with temporary purchases to manage bore extraction limits during peak crop demand. 5 year plan is to construct water storage to better utilise supplementary entitlements.
- Grower 6** – has groundwater entitlements, uses carryover and supplements with temporary purchases to manage extraction limits during peak crop demand.

Common to all six growers above is use of carryover and reliance on a range of water sources, including temporary purchases. The **key driver of success** will be **how well access to water is managed/optimised**. Understanding your cut off price for water purchases is fundamental as the margin erodes as the price goes up. An average sized business can spend \$250,000 to \$500,000 on temporary water purchases.



Groundwater is a reliable water source, but bores are expensive to install and operate



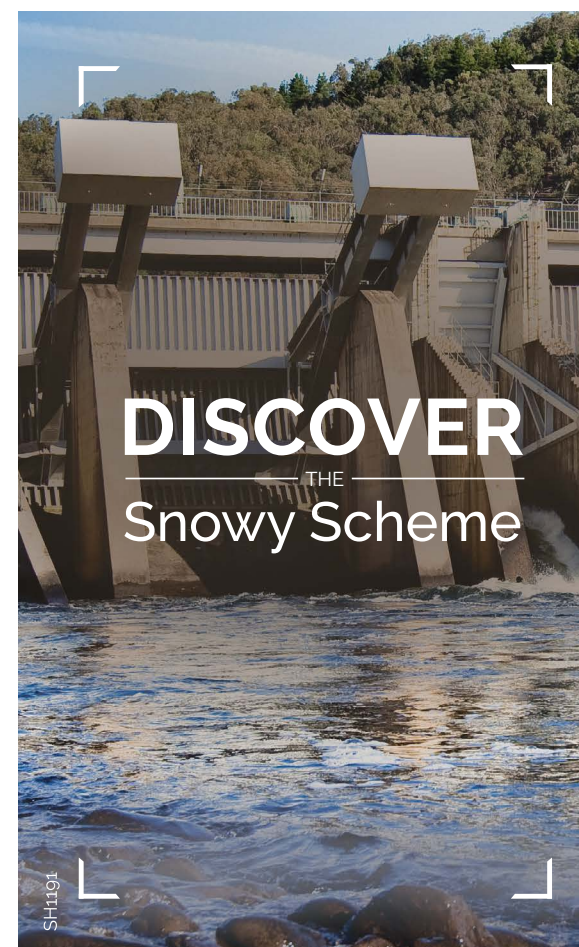


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## 2018/19 Season forecast and dam situation

## Andrew Nolan, Snowy Hydro



A visit to the Snowy Mountains Scheme is a must for those wanting to experience the best of the region. Snowy Hydro owns and operates the Snowy Scheme and provides a range of facilities around the Snowy Mountains for people to see and experience the Scheme.

To find your nearest Discovery Centre, contact:



**Snowy Hydro Discovery Centre**  
**Coffee Shop and Scheme Display**  
 Monaro Highway, Cooma  
 8am - 5pm Monday - Friday  
 9am - 2pm Sat, Sun and Public Holidays  
 Closed: Christmas Day and Anzac Day  
 (Coffee shop shuts 1 hour before closing)

☎ 1800 623 776  
🌐 [snowyhydro.com.au](http://snowyhydro.com.au)

**snowyhydro**  
renewable energy



# Why are financial skills important?

Steven Bourke, Rabobank



Rabobank

## Making a profit in farming is harder than ever before

- Cost of land & water has increased significantly.
- Cost of inputs has increased significantly – leading to diminishing cash returns.
- Advances in technology have improved production but technology costs money.

There is a clear linkage between the level of understanding of the financial position of the business (i.e. capacity, costs and profit drivers) and the long term profitability of the business.

## Challenges facing Primary Producers

- Terms of Trade are putting a squeeze on Agriculture over the long term.
- Cannot rely on increasing commodity prices to maintain your current level of profitability.
- If you don't continue to move forward and improve, you will eventually go backwards.

## Have a plan and goals for the business

In 1979 Harvard Business School conducted a study regarding goal setting and plans.

Researches asked the 1979 graduates from the Harvard's MBA Program and found that:

- 84% had no specific goals at all
- 13% had goals but they were not committed to paper
- **3% had clear, written goals and plans to accomplish them**

In 1989, the researches again interviewed the graduates of that class. The results were as follows:

- The 13% of the class who had goals were earning, on average, **twice as much as the 84 percent who had no goals at all.**
- The 3% who had clear, written goals were earning, on average, **ten times as much as the other 97 percent.**

Source: McCormack, M. "What They Don't Teach You in the Harvard Business School".

## Prepare financial information for yourself and your business partners

	Information Required	Why?
<b>Past</b> – Historical earning capacity	Financial Statements & Tax Returns	Need to demonstrate that you have a history of earning capacity/ profitability. Losses ok but need to be explained. Building equity/repaying debt over longer period.
<b>Present</b> – Current position of the Individual/Business	Assets & Liabilities	Need to demonstrate that the individual. business has sufficient resilience to withstand a below average result. Need to understand oter commitments.
<b>Furture</b> – Cash flow of the business going forward	Cash Flow Budget	Need to demonstrate that the loan can be serviced and repaid AND there is sufficient cash left over for drawings.

## Understanding Key Financial Ratio's

### 1. Equity/Gearing (%)

This is a measure of your net worth and your ability to create wealth for you and your family.

Equity = 
$$\frac{\text{Total Assets} - \text{Total Liabilities}}{\text{Total Assets}}$$

Gearing = 
$$\frac{\text{Total Liabilities}}{\text{Total Assets}}$$

Equity: <60% (Weak); 70% (Satisfactory); >85% (Strong)

### 2. Loan Security (%)

LSR = 
$$\frac{\text{Total loan Security offered}}{\text{Total Assets}}$$

Loan Security: >60% (Weak); 50%-55% (Satisfactory); <50% (Strong)

### 3. Serviceability Ratios

MOST IMPORTANT RATIOS.  
You must be able to service your debts & commitments!

## Interest Cover

Interest cover ratio = 
$$\frac{\text{Earnings before Interest, tax \& depreciation (EBITDA)}}{\text{Total interest}}$$

Interest Cover: <1.25xs (Weak); 1.5xs (Satisfactory); >2.0xs (Strong)

\* Basically how many time does operating profit cover the interest. If you have 1:1, you are only covering the interest. The higher the better. That is there is more room to absorb higher finance Costs.

## Finance costs as a percentage of Income

Interest costs = 
$$\frac{\text{Total finance costs}}{\text{Total Income}}$$

Finance Costs: >20% (Weak); 15% (Satisfactory); <10% (Strong)

\* Farm finance costs to farm income ideally should be no more than 18% if there are to be sufficient surpluses for principal repayments & living expenses. Excessive EF commitments can be a burden, because of the relatively short repayment term.

## Debt/Income

Debt to Income Ratio = 
$$\frac{\text{Total liabilities}}{\text{Gross income}}$$

Debt/Income: >2.5:1 (Weak); 2:1 (Satisfactory); <1:1 (Strong)

\* For a rural business, ideally should be no higher than 2.5:1, anything over this leaves little room to move if the season fails.

## Profit & Loss (P&L)

Includes the consistency of generating profits as well as the level of profits.

- P&L shows all income & expenses of the business over the year. Essential difference between profit & cashflow is that Revenue & expenses can include cash & non-cash items (eg. Depreciation). Banks look to assess the consistency of generating profits & the level of profits over a number of years to establish any trends (usually 3-4 years of financials required & the circumstances surrounding each particular financial year impacting results)
- Profitability is important but so is cashflow- whilst clients may appear to be making profits the business itself may be facing difficulties due to poor cashflow & running into deficits during the year which require additional working capital or overdraft increases. Question here: How are profits being used?
- Banks look to calculate the true cash position of the business by making income and expense adjustments to net profit before tax as provided in accounts to arrive at what is referred to as operating profit eg, exclude non-cash items including livestock trading movements, depreciation, related party expenses, internal transactions & profit/loss on the sale of assets.

Cash Surplus = Cash Operating Profit - Drawings & Taxation

## Cash Surplus after Capital movement

Cash Surplus = Cash Operating Profit - Drawings & Taxation - Capital out + Capital in

\* Capital in may be from FMD's, sale of an asset or debt and capital out can be Asset purchase including equipment and debt repayment.

\* The Cash Surplus are the funds the business has to invest.

## Cashflow budget

Cash flow budget is aimed to & useful for:

- Predicting level & timing of peak debt & cash surpluses to strategize how to avoid cash crisis or make best use of surplus funds
- Determining amount & type of funding/credit required & predicting ability to meet overdraft & loan repayment commitments including interest- that is the debt servicing capacity (extremely useful to business managers & the bank.). Lender is more likely to tailor the loan to specific cash needs of the business (cash budget therefore integral part of loan application process)
- Determining ability to finance capital improvements or expansion
- Identifying peak cashflow periods so management practices or timing of events can be changed eg. Payment of interest when inflows are high. Proactive not reactive management decisions can be made.
- Having sufficient cash (working capital) available to meet current obligations is a vital requirement for the survival of all businesses – a good financial recording system will enable managers to assess the current financial position and availability of cash – it's important to be aware that the bank statement isn't a reliable indicator of cashflow (unpresented chqs, outstanding creditors & debtors etc).

## Challenge

At your next review with your bank manager challenge them by asking about your financial ratios and how you compare to the rest of the market. What are your opportunities to grow the business both short and long term? How you can improve the resilience of your business to withstand challenges of a farming business.

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# WHS: Do you have a plan? How safety ready are you?

William Lloyd, Safe Ag Systems



## Safety Ready Self-Assessment

1	Do you know what your legal responsibilities are as a business under WHS legislation.	Y	N
2	Do you know who your PCBU's are and what businesses are liable under the WHS legislation.	Y	N
3	Have all workers (including yourself) completed appropriate inductions.	Y	N
4	Do all workers (including yourself) have easy access to business safety policies. Are your policies specific to your business.	Y	N
5	Do you maintain a current health register for all workers.	Y	N
6	Do you maintain a training register for all workers including a record of all licenses, tickets, internal and external training. As well as planned training for ongoing skill development.	Y	N
7	Do you have readily accessible maintenance records for all tools, machinery and equipment.	Y	N
8	Do you have readily accessible safe operating instructions for all tools, machinery and equipment.	Y	N
9	Can you communicate easily with workers even if they are working in isolation.	Y	N
10	Do you have a record of injuries, near miss and incidents.	Y	N
11	Do you have an Emergency Management plan that gives quick, current information to all workers at all times.	Y	N
12	Do you have regular farm safety inspections to help you identify areas of risk, or simply where you can improve safe work practices.	Y	N

## Yes Action



## No Action



1	That is great but don't assume that other people in your business including workers know their responsibilities. It is best to make sure everyone is well informed.	In your business there are 3 types of responsibility. Each type is legally required to comply with WHS legislation.  1: Corporation - this is your business structure.  2: PCBU - These are the owners, officers of the business.  3: Workers - any person that works in your business whether paid, unpaid, contractor, volunteer.
2	Just check that all directors/partners of the business know they have a WHS responsibility as a PCBU (Person Conducting a Business or Undertaking). They are not able to assign that responsibility to another person. You should also check that all businesses in your farming group are considered.	Please identify your PCBU's & ensure they are fully informed of their responsibilities. The regulatory requirements are very specific & noncompliance presents a high financial and criminal risk to your business as well as the people.
3	Check that inductions are still current. To be current, an induction must be about the work that you are doing. For example; the induction is not current if you have significantly changed the task, the machines, tools and equipment.	It is a high risk (financially & criminally) to conduct any work without sufficient training and inductions. Make sure you act to rectify this situation.
4	Are your policies paper copies? Just check when they were last updated. Policies must be current & applicable to your business not just an "off the shelf" document that doesn't suit you farm.	It is your legal responsibility to ensure your WHS policies are current and applicable to your workplace and your workers.

## Yes Action



## No Action



5	The key word here is "current". It is always advisable to regularly ask workers if they have any health updates for your records.	You are noncompliance in your WHS responsibilities. If you do not know worker health issues then how can you know they are physically capable to complete the tasks you ask of them?
6	Are you sure that all of their licenses are current? Do you have a plan for worker training in the future to ensure skills are updated as needed?	You are placing the business at risk of noncompliance if you cannot show that workers are properly trained and if required, appropriately licensed for the tasks they do. It is also a serious safety risk for workers and significantly increases the risk of injury.
7	Are the maintenance records & pre op instructions easily accessible to all workers? You invest a lot of money in your tools, machinery & equipment so it is sensible to make sure all workers are completing correct pre op checks & maintenance. It is very common to keep these records in the machine in a notebook or you may write service records on the workshop whiteboard. Although these records are sufficient they are easily lost. Consider the benefits of maintaining an electronic file.	You are legally required to properly maintain tools, machinery & equipment so that they are safe for workers to use. Consider the benefits of maintaining an electronic file so they are safely stored & easily accessible.
8	Are you sure that workers are reading & following safe operating instructions? It may also be difficult to ensure all instructions remain current & that workers are informed of updates. Consider the benefits of maintaining an electronic file.	It will be very difficult to prove that workers have received sufficient safe operating instructions if no physical information is available. The lack of records are likely to be a problem if you have a notifiable incident that causes worker injury, illness or death. A good safe system of work should provide simple methods of ensuring workers understand hazards & risks, have access to current safe operating instructions and are following those instructions.
9	You are really caring for your workers because you regularly communicate. This is an essential way to help them stay safe. Have you considered an electronic system that will maintain records of all communications?	You are not providing your workers with a safe workplace. It is essential that you maintain an easy & reliable form of communication to help workers if there is an emergency.
10	You are meeting a key compliance requirement of WHS legislation. Well done!	You are not meeting WHS legislation requirements. Apart from exposing the business to risk of prosecution, how are you able to learn & improve from an incident? There is always a way to improve the way you work after reviewing an injury, near miss or incident. If you don't use this opportunity then you are not properly meeting your responsibilities to workers.
11	It is useful to check your management plan regularly with workers to ensure they all know what to do and who they must contact. They should always have quick access to First Aid items and should know emergency gathering points at different locations on the farm.	If your workers cannot access emergency information immediately when they need it, then you are placing lives at risk and you do not have a suitable communication method. You need to implement a better plan.
12	Do you properly assess all of the high risk areas regularly? Consider implementing an electronic system that allows simple assessment of different areas of the workplace for risks & hazards, ie: the workshop and the chemical shed. As well as keeping a record of the safety check. It is also good practice to ensure that the workers can alert you to risks and suggest improvements.	If you do not have the ability to complete safety checks (risk assessments) easily, will any person in your workplace be able to complete a check? If no records are being kept, then you are at risk of prosecution if a workplace incident occurs. It also means you are not taking safety seriously and integrating simple safety measures into your daily workplace.

# Protecting the business: succession, insurance, super.

Glen Wilson, Commonwealth Bank



## Farm partnerships and succession planning

- How are we going to fund retirement?
- Do we sell up? Or can we transition to the next generation?
- Family Law concerns?
- Do you want to divide equally or fairly?
- Partnership split?

## Super

- Restrictions
- Tax Effective
- To Self Manage or not?
- Rules keep changing

## Business or Personal Insurances

- What's the first thing that happens when a farmer dies, or has a major illness or accident?
- Why do we bother with insurances at all?
- Who are we protecting?
- What type of cover & how much should we have?
- Ownership & Taxation?
- What's the biggest trap?

## Lets look at an example

40yo non-smoking Male Farmer

	Amount Insured
Life Cover	▶ \$ 1,500,000
Trauma Cover Premier	▶ \$ 250,000
TPD Cover Own	▶ \$ 250,000
	Monthly Amount Insured
Income Secure Comprehensive	▶ \$ 3,000

	Stepped Premium	Level Premium
Life Cover	▶ \$ 720.25	\$ 1,735.99
Trauma Cover Premier	▶ \$ 542.28	\$ 1,321.70
TPD Cover Own	▶ \$ 283.94	\$ 764.88
	Premium	Premium
Income Secure Comprehensive	▶ \$ 2,133.18	\$ 3,306.24

## Stepped premiums

### Life/TPD/Trauma

Annualised Premium (if all stepped)	Annualised Premium (if all level)
\$1,646.28	\$4,070.42
\$1,819.42	\$4,072.45
\$2,020.03	\$4,074.67
\$2,240.73	\$4,076.89
\$2,502.81	\$4,079.33
\$2,809.05	\$4,082.06
\$3,176.69	\$4,085.12
\$3,606.97	\$4,088.45
\$4,089.70	\$4,091.63
\$4,665.20	\$4,094.75
\$5,301.32	\$4,097.87
\$6,088.50	\$4,101.55
\$6,987.47	\$4,105.50
\$8,010.56	\$4,109.45
\$9,168.07	\$4,113.78
\$10,548.80	\$4,119.14
\$12,138.50	\$4,125.00
\$13,963.11	\$4,131.27
\$16,033.85	\$4,138.12
\$18,470.68	\$4,145.62
\$21,257.64	\$4,153.73
\$24,518.12	\$4,161.87
\$28,225.01	\$4,170.04
\$32,792.65	\$4,181.31
\$37,108.28	\$4,196.13

### Time Held

Year	Age
1	40
2	41
3	42
4	43
5	44
6	45
7	46
8	47
9	48
10	49
11	50
12	51
13	52
14	53
15	54
16	55
17	56
18	57
19	58
20	59
21	60
22	61
23	62
24	63
25	64

### Income Protection

Annualised Premium (if all stepped)	Annualised Premium (if all level)
\$2,403.73	\$3,694.09
\$2,563.28	\$3,694.94
\$2,734.50	\$3,695.69
\$2,930.09	\$3,696.54
\$3,142.86	\$3,697.26
\$3,336.52	\$3,697.77
\$3,603.06	\$3,698.00
\$3,858.85	\$3,698.07
\$4,167.56	\$3,698.39
\$4,556.83	\$3,698.89
\$4,984.33	\$3,699.50
\$5,434.22	\$3,699.64
\$5,907.55	\$3,699.65
\$6,439.88	\$3,699.75
\$6,968.47	\$3,699.58
\$7,389.37	\$3,698.45
\$7,784.30	\$3,696.98
\$8,144.97	\$3,695.21
\$8,410.88	\$3,692.93
\$8,607.70	\$3,690.17
\$8,688.31	\$3,686.92
\$8,807.83	\$3,683.78
\$8,930.96	\$3,680.79
\$8,286.01	\$3,674.78
\$6,369.95	\$3,665.17

## Key questions

### Succession planning

- Do we have a Succession Plan?
- Do we have/need a formal Partnership Agreement?

### Superannuation

- Where is "our" Super?
- To Self Manage or not?

### Insurance protection

- What's the reason we insure?
- How much cover should we have?
- Does the cost of our cover go up? Why?

Glen Wilson – Senior Business Financial Planner,  
Commonwealth Bank  
0437 511 549 | Glen.wilson@cba.com.au





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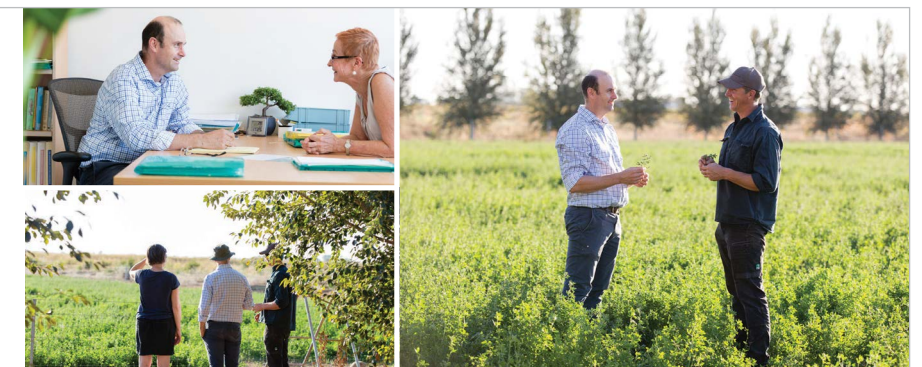
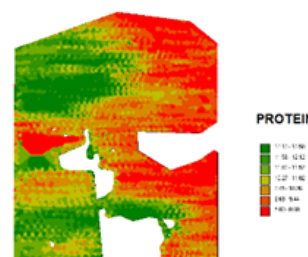
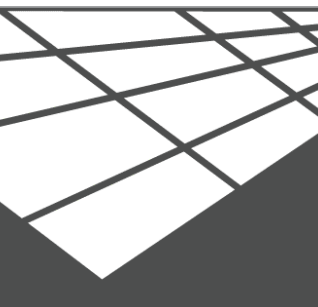
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# Imagery, how useful is it?

Thane Pringle, Independent Precision Ag



## Quick Take

- Imagery is a tool that can be useful when inspecting fields and determining management zones.
- It must be ground-truthed. You can't tell what to do by just looking at an image alone.
- The key to successful use of imagery is understanding, what are the key drivers behind the variability and then making the right decision for that zone.
- More fertiliser may not fix the problem nor does it necessarily mean more yield. It could be the opposite.
- There is a need to think beyond the idea that crop nutrition is the only driver of variability. Other things include, topography, irrigation layouts, drainage, insect damage, animal damage (birds, ducks), soil constraints, (Acidity, sodicity) may be the problem.
- Not all imagery is good imagery, don't believe everything you see.

## Introduction

Imagery has been around for a long time, since the early 1970's. The indices used have not varied much, but there has been a significant improvement in the resolution, going from 30m with satellite down to 3cm with drones. The question as a farmer is, how do you use this information to make a decision to improve your profit.

Imagery has grown in popularity as it is a 'real-time' snapshot of what the crop is doing now. It has the benefit over a yield map of allowing you to intervene, to change the outcome of the current crop. Whereas a yield map only allows you to plan to improve the next crop.

## NDVI or NDV Why?

NDVI was developed in the early 1970's with the launch of satellites. It was developed to investigate the greening up and drying down of the vegetation of the north to south expanse of the Great Plains region of the central U.S.

Green plants reflect more near Infrared and absorb more red light.

NDVI is strongly influenced by the amount of green leaf and the growth stage of a plant. As a plant matures and loses its green leaf, its ndvi values will decline. NDVI is also sometimes referred to as a 'health index'. The healthier the plant the higher the ndvi value, if a plant is stressed, whether that be from moisture stress, insect damage, disease or nutrient deficiencies/toxicities, the NDVI will be lower. NDVI does not tell you what the cause of the stress is. It works very well for what it was originally developed for 'greening up and drying down of vegetation'.

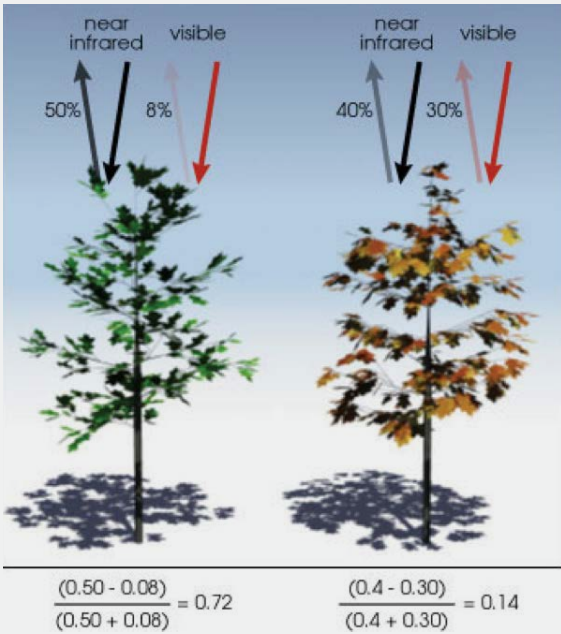


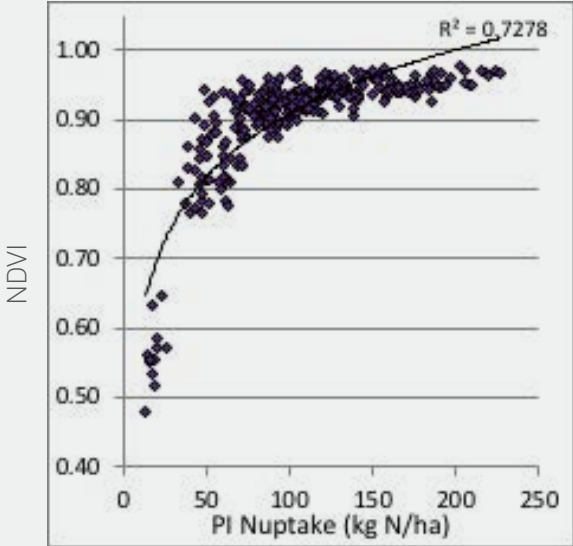
Image Source: NASA.

In agriculture we have been trying to use NDVI in ways it was not originally developed for. In some situations, it has been useful, in others less so. The most common problem with NDVI is that it reaches reflectance saturation at biomasses lower than those of many crops grown and does not correlate well with nitrogen uptake.

It is this flattening out in the response curve that has limited the value of ndvi to predominantly identifying the weakest/poorest growth areas of a field. As a starting point this has been useful. Careful classification needs to be used to extract any useful information in the better sections of crops such as rice, cotton and maize.

Typically, when we are trying to make nitrogen topdressing decisions in bulky irrigated crops, ndvi is nearing saturation. As can be seen in the graph for rice, at lower nitrogen uptakes the ndvi values are more distinguishable. At the higher NDVI values the curve tends to flatten out making it difficult to distinguish changes in nitrogen uptake.

There are other indices being developed and evaluated using different light wave bands. NDRE uses Red edge and is gaining in popularity as a vegetation indice. It uses a different spectral band and has been shown to be able to better distinguish differences in biomass and nitrogen uptake when NDVI has reached saturation.

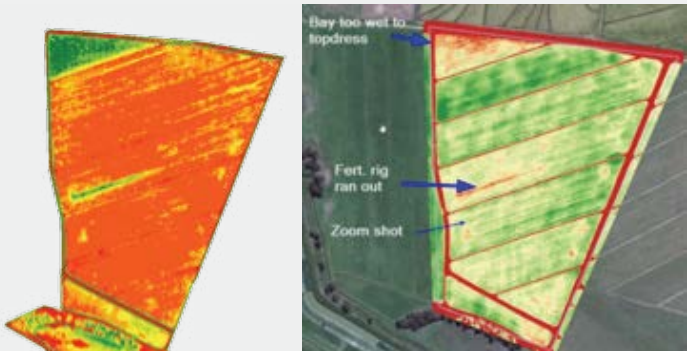


Source: Brian Dunn | Research Agronomist (Irrigation) NSW Department of Primary Industries Yanco Agricultural Institute

The two images below are of the same field taken at roughly the same time. The image on the left is a commercially available NDVI collected with a plane. The image on the right was collected with a drone and uses NDRE. The NDRE has distinguished the differences much more than the NDVI. What Imagery can't tell you.

At this stage imagery can't tell you, which fertiliser to apply, how much fertiliser to apply or even if nutrition is the limiting factor. It can tell you where differences are in you paddock and where you need to look to make a decision.

Good imagery can be useful, but you may not be able to extract the best information about your crop when you want to act upon it, e.g. to make a topdressing decision. You can't always get imagery when you want it. For that reason, you need to create a history of your fields, collecting multiple layers of data and identifying, similar patterns or trends.



## Conclusion

Use imagery as a tool to define zones.

### Have a purpose

What questions are you trying to answer?

- Do you want to increase yield, improve quality or reduce variability?
- Are you trying to make a tactical decision, to get the benefit from this crop, by increasing/decreasing an input such as nitrogen?
- Are you trying to make a strategic decision? How do I manage this problem long term?

### Resolution

More isn't necessarily better but it may provide you with the vegetation index you need.

**Review your decisions.** It's ok if you didn't get everything right this time. Use what you learned about your fields this year to make better decisions for the next crop.

**Sometimes you get an inverse pattern, particularly if double cropping.** The zones are relatively similar, but the crop response is the opposite. Most of the reasons can be explained. Remember, an image is just a snapshot in time.

**Use what's between your ears.** That's the best imagery processor you have. It must make sense and be explainable.

## Acknowledgements

I would like to thank the farmers who are willing to share their information and make it available so that other might benefit. Brian Dunn Research Agronomist NSW DPI, Yanco Research Institute and John Hornbuckle Associate Professor (Research) Deakin University, Centre Regional & Rural Futures, Faculty of Sci Eng & Built Env. Without their cooperation this would not be possible.

**Thane Pringle - Precision Farming Specialist, Independent Precision Ag**  
0418 681 568  
thane@independent-precisionag.com.au

Source: AgPixel NDVI (Left) and NDRE (Right) John Hornbuckle Associate Professor (Research) Deakin University, CeRRF. Note: different colour legends have been used.



# Farm Wide WiFi

Dan Winson, Agrinet and  
James Brinkhoff, Deakin Univerisity



## Connectivity matters

“Producers want to be connected into their business, all aspects of their business, while outside on the farm and not just while inside the farm office” - David Lamb, Accelerating Precision Agriculture to Decision Agriculture, 2017.

Farms around Australia are tackling connectivity challenges by building private WiFi networks that provide farm wide high bandwidth communications for internet access, mobile coverage, remote sensing, automation and security.

This guide is designed to provide a bit of background information on why Farm Wide WiFi is useful, along with some technical information on how you might go about setting up your own network.

## Farm Wide WiFi

WiFi is the standard technology that lets your phone, computer, TV and other devices wirelessly connect to each other and to the internet. You probably already have WiFi inside your house or you might have used it at hotels or cafes.

Farm Wide WiFi is the same thing, just bigger. By using bigger radios and bigger antennas you can send a WiFi signal over huge distances. Point to point WiFi links can be created between properties 20+ km away and WiFi repeaters can connect to fixed or mobile repeaters on buildings or vehicles up to 5km away providing access to devices like phones, tablets, computers, cameras and sensors up to 150m away.

Once you have WiFi around your property it can be used to make and receive phone calls and to connect a wide range of other devices like cameras, alarms, sensors and actuators.

“From a safety and productivity point of view, reliable mobile service is absolutely critical “

Robin Sanderson, Condobolin



Robin Sanderson (below left) didn't own a smart phone, until a few months ago. There was no point, with almost zero mobile coverage on his farm north of Condobolin NSW he wouldn't have been able to use one.

“From a safety and productivity point of view, reliable mobile service is absolutely critical. I knew we had to do something, but didn't know where to start. Dan was more than happy to walk me through the options and I'm very happy with the result.”

With a Farm Wide WiFi network supplied by Agrinet that Robin installed himself he is now able to make and receive calls right across his property using WiFi Calling. The cost worked out around \$1 per acre.

Robin's now looking at options for adding water level sensors and IP cameras to the network to improve operational efficiency.

Robin Sanderson can now make phone calls everywhere on his property.

## WiFi Calling

If you live in an area that can't connect to the mobile network or have areas around your home where you can't make a call, Wi-Fi Calling can help. Wi-Fi Calling provides basic voice calling capability on compatible devices when you're connected to a Wi-Fi network and you can't connect to the mobile network. You don't need to do anything, you'll be automatically connected to the strongest connection.

WiFi calling is available to postpaid Telstra and Optus customers with selected compatible 4G devices. More information:

<https://www.optus.com.au/shop/mobile/network/c-coverage/wifi-calling> <https://www.telstra.com.au/coverage-networks/mobile-technology#wificalling>

## Speed thrills

For people like Kerry Aldred, who manages a property near Carrathool, reliable and fast internet was a pipe dream until recently. Any mobile phone signal to the 5900-hectare property had to cross the river eight times and even with a “booster”, coverage was patchy at best.

“If it was windy, if there was too much humidity or if it was too dry, even if the sun came out the signal dropped out. There was no rhyme or reason to it and getting anything done was an absolute nightmare”

By installing an Agrinet 4G gateway with a high gain antenna on top of the shearing shed and beaming it back to the office, sheds and houses 2km away using WiFi this problem has been solved.

“The productivity and safety aspect is huge,” she said. “If there's a fire or an accident, no-one has to go looking for a signal to call for help.” In addition to solving the phone connectivity problems, the Agrinet WiFi network provides Kerry with fast internet that she can use to attend web conferences, use internet banking and even access Netflix.



## FARM WIDE WIFI

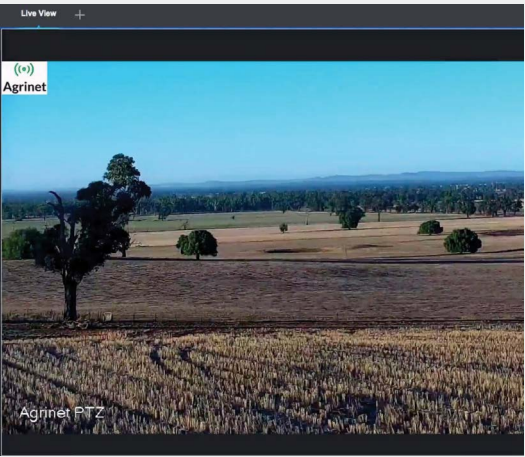
Internet Access

Mobile Coverage

Remote Sensing

Automation

Security





# Farm Wide WiFi

Dan Winson, Agrinet and  
James Brinkhoff, Deakin Univerisity

## Farm Wide WiFi - Frequently Asked Questions

### How far can WiFi go?

It depends. WiFi is a line of sight technology and while links of 20km+ are possible it is usually a better idea to create multiple smaller hops. Long range links are only possible using directional antennas, usually to provide coverage around your farm you would aim to create a backbone of point to point links to key locations and then from each of these locations you would repeat the signal out using an omni directional antenna. At Agrinet we use link planning software to estimate coverage based on topology, if you're technically inclined or want to have a play with designing your own network you can get some pretty useful data from this free site <https://link.ubnt.com/>

### How far can an IP camera see?

It depends. Firstly, it depends on the camera, more megapixels and/or more zoom means you can see further, but if you are using a zoom lens you can only record what you are looking at, meaning it is fine for remotely monitoring something but possibly not as useful for security. It also depends on what level of detail you are expecting, we use language like "identify", "recognise" and "detect" to help set expectations. In real terms, with a 25x zoom lens on a 2MP camera we have had multiple people agree that they could tell if a sheep was on its side from 1km away.

If you want to see for yourself check out some example footage here: <https://vimeo.com/256191712>

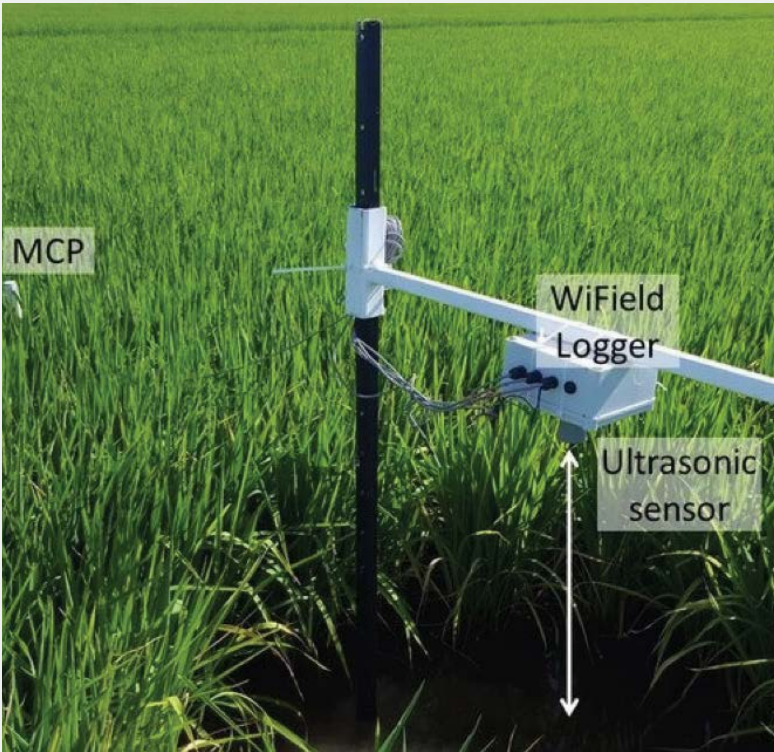
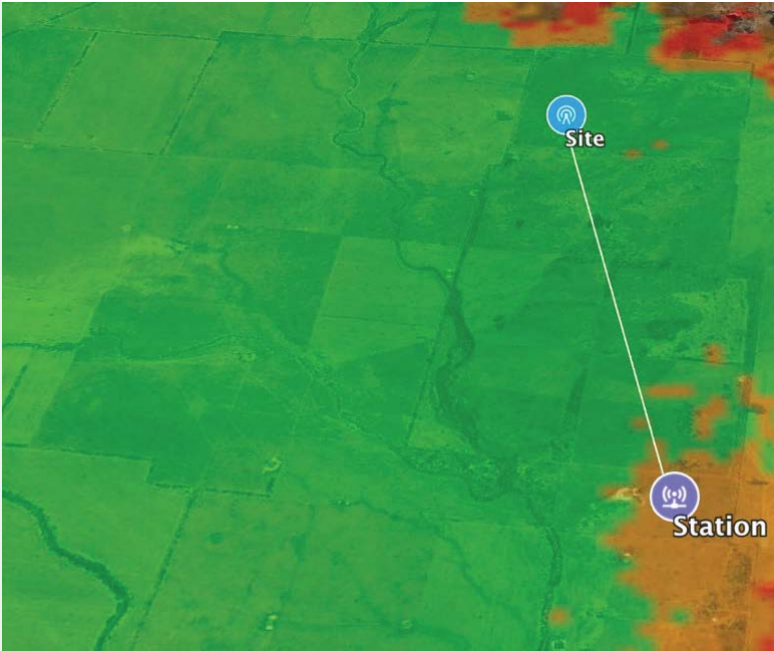
### What kinds of wireless sensors / controllers are available?

At the moment we have suppliers for WiFi enabled:

- Ultrasonic level sensors (tank/trough/channel)
- Pressure sensors
- Weather stations
- Soil moisture
- Soil tension
- Temperature / humidity
- Voltage
- Flood detection
- Smoke detection
- Passive Infrared (motion detection)
- Relays (control pumps, valves, motors, coils, etc)

### Where can I get more information?

Feel free to contact Dan Winson at Agrinet. Whether you want some advice on how to go about designing and building your own network or want a proposal for us to do it for you we're always happy to have a chat.



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# Farm Wide WiFi



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# Smarter Irrigation technology – A Qld example

Steve Attard, AgriTech Solutions

In recent times, two projects have made significant inroads to 1) better understanding the benefits from upgrading surface irrigation through automation, and 2) increasing the adoption of smart irrigation tools by automating the data entry process.

The two projects discussed are:

- Sugar Research Australia (SRA): Modernisation of Furrow Irrigation in the Sugar Industry (USQ, AgriTech Solutions, BPS), and the
- National Environmental Science Program (NESP): Improving water quality for the Great Barrier Reef and wetlands by better managing irrigation using the Internet of Things (JCU, Agritech Solutions, BPS).

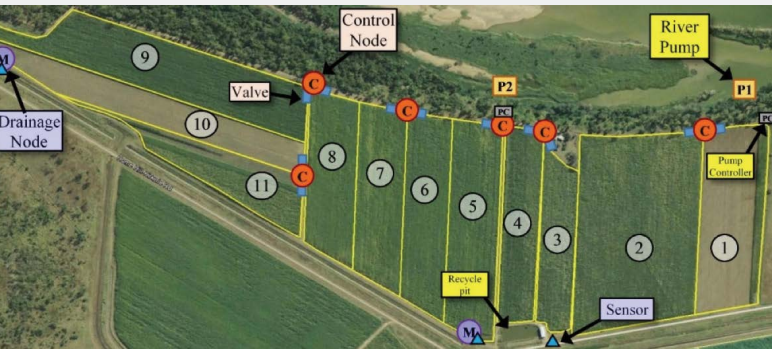


Figure 1. Aaron Linton's Leichhardt farm, in the Burdekin, has 11 furrow irrigated blocks serviced by two river pumps. Flow meters, pressure transducers and drain sensors have been installed to monitor and control furrow irrigation on the whole farm. An improved design would see reduced setup costs through a reduction in the number of radios.

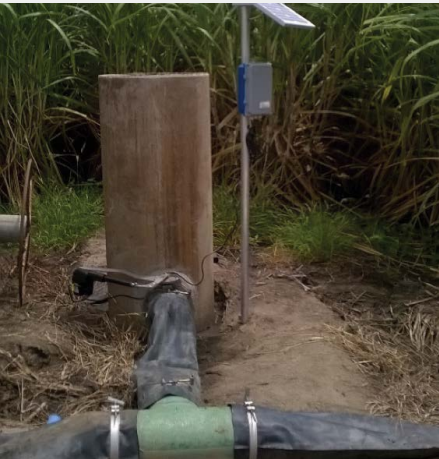


Figure 2. WiSA field radio controlling an irrigation valve is connected to the office base station using a licence-free radio.

## Project 1: Modernisation of Furrow Irrigation in the Sugar Industry

### Key Project Findings

- Automation of furrow irrigation is possible, practical and in many cases cost effective.
- Many systems in the Burdekin can be automated with minimal changes to on-farm infrastructure.
- The installed automation systems allow farmers to control, schedule and monitor irrigations from offsite.
- Automation provides the major benefit of a reduction in farm labour.
- Automation once used to its full potential allows better timeliness of irrigations leading to potential reductions in water and energy use.
- Automation allows irrigators to better target off-peak power tariffs.
- End of row sensors and within field sensors allow the system to adapt to changes in soil intake and/or flow rates and adjust the irrigation timing appropriately.
- The system is commercially available.

### Details

The equipment that has been installed on the project farms is designed to be modular. That is, different areas can be automated as time and funds permit. It is not necessary to automate the whole farm at one time. As the project progressed, a better understanding of the software and hardware's capability was developed, and the project team realised that the total installation cost could have been significantly reduced by using less radios. The economics stated here are based on the initial, higher cost design.



Figure 3. Linear actuators are used to open and close the various types of valves. Brackets are designed to retrofit existing infrastructure.

### What are the benefits?

There were many benefits identified and are summarised in Table 1.

Table 1. Major benefits identified across the three automated farms.

Time saved – checking irrigation progress	Energy reduction – less water pumped
Time saved – travelling to and from the paddock	Energy cost reduced – selecting lower cost tariffs
Water purchase costs reduced	Vehicle costs reduced
Selling of saved water	

Table 2. A positive economic benefit was calculated across all three sites. It is expected that the economic benefit would be increased, at all sites, with reduced equipment delivered through an improved design. Other, non-economic benefits, while difficult to measure, are recognised as being important.

	Russell Jordan	Aaron Linton	Denis Pozzebon
Irrigation delivery system	Upper Haughton	Leichhardt	Airville
Area (ha)	Gravity feed	River pumps and recycling	Bores, open water and recycling pumps
Total Cost	82	53	27
Cost/ha	\$49,700	\$68,365	\$59,700
Annual Cost (assuming 7 yr life)	\$606	\$1,290	\$2,211
Annual Benefit	\$6,957	\$9,766	\$8,529
Annual Benefit - Cost	\$12,653	\$20,034	\$8,581
Summary of Benefits	\$5,553	\$10,268	\$53
Water saving	✓✓ Approx. 10-15%	Blocks were being underwatered	✓✓ Approx. 20%
Energy use saving - reduced pumping time	Gravity system, no pumping	Not applicable	✓✓✓
Saving from changing electricity tariff	No pumping	✓✓✓✓ >40% reduction	Potential saving but investigated during project
Labour saving - time spent changing/checking irrigation and travelling to the farm	✓✓✓✓	✓✓✓✓	✓✓✓✓
Vehicle cost saving	✓✓	✓✓✓✓ > 10,000 km/yr	✓
Improved record keeping - irrigation is automatically captured	✓✓	✓✓	✓✓
Social or family benefits	✓✓✓✓	✓✓✓✓	✓✓✓✓
Water quality improvement	✓✓	✓✓	✓✓
Reduced deep drainage losses (water table impacts)	✓✓✓	✓	✓✓

An economic analysis (Table 2) has been completed for each farmer to quantify the costs and benefits associated with the automation. An attempt has also been made to determine other benefits that don't have a direct economic value such as the social/personal benefits and water quality outcomes. The economics stated here are based on the initial, higher cost design.

One of the benefits of automation is measurement and record keeping. While Denis and Russell have saved water, Aaron did not. The project identified that he was under -irrigating – therefore the automation has enabled him to better meet the crop demands. Having measurement of water flow, and knowing how much water was applied was a stepping stone to improved knowledge and improved irrigation practice. While the economic impacts of the automation systems are relatively easy to quantify (Table 2), there are other benefits that are harder to allocate a dollar value to, especially the personal and water quality benefits. All three growers consider the social benefits to be one of the greatest positives from the project. This saved time is reflected in these growers having more time with their families, and also means that they now have a better opportunity to reflect on and actively manage their farm businesses.

# Smarter Irrigation technology - A Qld example

Steve Attard, AgriTech Solutions

## Outcomes

The three farms in this project have demonstrated a range of costs and benefits. All three farmers are currently installing more automation across their farms.

The effect of the automation on water quality is hard to measure. However, irrigation losses are considered to be the main pathway for the movement of nutrients and pesticides in the Burdekin. By reducing the amount of water running off blocks or being lost to drainage below the root zone there should be an improvement in overall water quality

## Acknowledgements

The project team thank the participating farmers, Aaron Linton, Denis Pozzebon and Russell Jordan for their cooperation and enthusiasm. Their willingness to be involved in communication activities and to speak with and show other growers around their farms and explain the systems installed has really contributed to the success of the project.

## Project 2: Improving water quality for the Great Barrier Reef and wetlands by better managing irrigation using the Internet of Things.

### Main issues being addressed:

- Irrigation management is a considerable time investment for many sugarcane farmers.
- Typical Burdekin sugarcane crops require between 15-25 irrigation events per year
- Burdekin water quality improvement plan aspires to achieve significant increases in water quality leaving farms, especially dissolved inorganic nitrogen (DIN) and pesticides.

### The problem:

- Manual record keeping is time consuming and a barrier to adoption
- Smart irrigation tools exist but they do not talk with each other.
  - o Furrow irrigation automation software measures and controls irrigation events, however
    - it needs to be told which field, when to irrigate and how much water to apply
  - o IrrigWeb, web-based sugarcane crop model, calculates when to apply irrigation and how much to apply, however
    - it requires regular data entry of rain and irrigation events, i.e. date and amount applied for each field.

## Solution:

Farmers recognised that having these two smart tools interact and supply information to each other would improve use of both, and assist farmers make smarter irrigation decisions.

### Stage 1 Creating an Uplink Program

An uplink program has been designed to connect WiSA automation software with IrrigWeb. The uplink program can access the database of WiSA irrigation management software (Aqualink) to extract the data entries for each field. The program will then use the extracted data to calculate the irrigation depth for each individual irrigation set on the farm, e.g. the irrigation date, and mm of water applied. The resulting data file will then be stored and uploaded to IrrigWeb. The first stage of the project has been successfully completed and has been operating on a small number of farms for several months.

**How much time has it saved? The first farmer to test the uplink program registered 1001 irrigation events and 118 rainfall events in a twelve-month period. It is estimated that a minimum of 50 hours of manual data entry was saved.**

### Stage 2 Creating a Downlink Program

At present, the irrigation schedule developed by IrrigWeb, must be manually entered into the automation software (WiSA in this case). Stage 2, which is currently underway, is developing a downlink program to automatically export, convert and apply the optimised irrigation schedule from IrrigWeb to WiSA.

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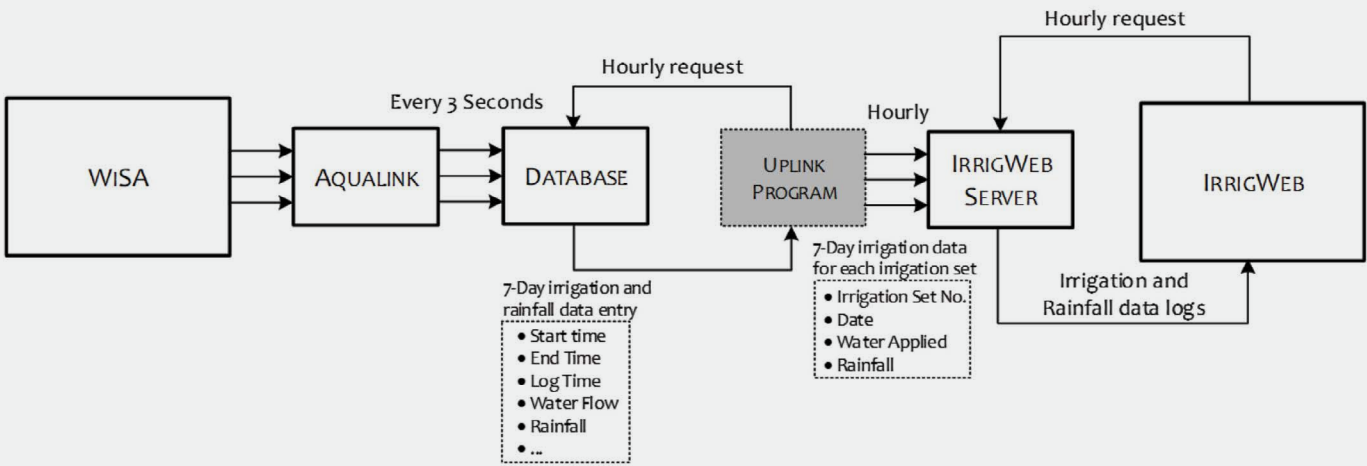


Figure 4. Each hour, the Uplink Program accesses the WiSA database and calculates the amount of irrigation each management unit (field) receives; any rainfall registered by logging rain gauges is also extracted. The generated data is sent to the IrrigWeb server and the data automatically populates the corresponding IrrigWeb fields.



Funded by Burdekin Cane Growers and Wilmar Sugar





## The future of rice research and development : towards 2028

## Russell Ford, SunRice



The increased value on water has seen the focus of Rice R&D shift to an increase in concentration on delivering an agronomic package that can grow rice with less water. We know that conventional rice breeding is starting to reach its potential maximum yields without either the introduction of hybrid breeding or genetically engineered options. Both of the last two options have their own challenges in meeting premium market expectations.

The Australian Temperate Rice production system is leading the world in conventionally bred rice varieties. We lead in Water Use Efficiency and Yield. Our Quality is also regarded as some of the best in the World. The challenges keep coming to do this efficiently and economically, and marry Rice Growing with other high returning Agricultural Enterprises.

In many parts of the rice growing world, rice is grown as a mono crop, with 2 to 3 cycles per year. Most of these countries are not limited by water and the climate limits the diversity of options. In Australia, rice is mainly grown in a temperate environment with many options to alternative crops and animal farming systems. Understanding the rotational options in our farming system is not well researched and many R&D organisations tend to concentrate in their own back yard.

There is a real opportunity for additional funds to be focused on the local blend of farming systems and how they can improve through rotational farming options. Research and Development Corporations (RDC's) should collaborate and seek Federal Government funding opportunities including the Murray Darling Basin Authority.

The future of rice in the Riverina will need to focus on high value, low water use, high yield and a balance of all of these to deliver a high return on Water used. Gross margins measuring \$/hectare has been well replaced by \$/ML for the new breed of farmers. Where land is unlimited, \$/ha still has a strong fit for many rotational options.

Our climate is changing whether we like it or not.  
Late announcement of allocation is becoming the norm.  
Being able to manipulate a cropping plan that best fits  
available water, looks after the soil and returns high value  
is the complex equation that we all face.

The future of Rice in the Riverina will need to see a distinct shift into the following areas:

1. **High Value** - breeding and marketing
2. **High Yield** - breeding and farming practices
3. **Low water use** - breeding (abiotic stress tolerance)
4. **Short season** - option
5. **Reduce in-field variability** - Precision Agriculture
6. **Part of a high value rotation** (maintain soil health)
7. **Easily adopted into other farming systems**  
(irrigation design and technology)
8. **An efficient storage and processing system**  
(designate delivery sites by variety)

The use of technologies and a greater effort in R&D is the key to having a successful Australian Rice Industry in 2028. Also being prepared to work with all rotational options including cotton, corn, winter crops, legumes and livestock will be important to maintaining diversity and soil health.

We have already come a long way in our irrigation systems, but new layouts and control infrastructure can add the next level that helps work in with cropping diversity. A recent study of precision agriculture completed on the Australian Rice Industry identified ground levelling (re-grading) was the most beneficial outcome one can do if there are known problems within fields. Irrigation layouts (bed farming) can now work the same for Cotton and Rice, along with the full suite of winter crop options.

The adoption of Drill Seeding Culture, Alternate Wetting and Drying (AWD), and Delayed Permanent Water (DPW) techniques will all be part of the cropping system in 2028. Rice Varieties will have transformed agronomically (via speed breeding) to adopt to greater stresses from heat, cold and drought and have improved nitrogen use efficiency.

An old benchmarking technology that worked extremely well a decade ago was the Rice Check Program run by John Lacy. This benchmarking system needs to be revitalised via the SunRice GIS and other related technologies. Accurate farmer data is one of the most valuable tools a researcher can use to focus efforts in the most suitable area, but also ask the correct questions. Analytics of reliable farmer data is the next level of data management that is sweeping the digital world. Crunching of data and interpreting outcomes to deliver improvements will be one of the major challenges to drive the continued success of rice growing in the Riverina over the next 10 years.

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## Notes



# How to think about emerging technologies

Paul Higgins, Emergent Futures

Emerging technologies have a long arc from the genesis of the original idea, to custom built models, through to industrialised models and finally to utilities or commodities. Think of the development of computers from the early mechanical concepts of Charles Babbage and Ada Lovelace in the 19th century, though to the custom-built models of the fifties, sixties and seventies, on to the industrialised models of Hewlett Packard and Dell, and now to a world where you can hire computing services by the second from Amazon or Google. The same can cycle applies to electricity, or cars, or a myriad of technologies.

The arc is a way to think about change although the time frames for each stage differ. In the present day there is an acceleration of the time frames, but even things we think about as being relatively recent developments have a long history. Take artificial intelligence (AI). Research on AI started in the forties or fifties depending on who you listen to and how you define the term. Real developments of any significance had to wait until the further developments of computers. There was much excitement in the eighties over the possibilities for AI. However, the technology failed to live up to its promise and an “AI Winter” descended for about 20 years before the field accelerated again. Now we are seeing many AI products, and the big technology companies supply machine learning as a service on top of their computing services. Both computers and AI are an example of the “adjacent possible”. What this means is that while the concepts of a technology may be strong sometimes a technology has to wait until the underlying components are developed enough to make it a practical reality. The design that Charles Babbage created in the 19th century is still the basic architecture for computers today, but he had to build it from mechanical parts. We had to wait for the development of silicon, and integrated circuits before the actual applications could take off.

For those that want to think more about this I would recommend Steven Johnson’s excellent book : Where Good Ideas Come From: The Natural History of Innovation.

A story of early innovation in agriculture was when farmers in the USA used barbed wire fences as telephone lines. Grabbing adjacent technologies and making something new out of them. So, when we think about emerging technologies in agriculture we should think about:

- 1. The arc – where is this technology along the arc from idea to utility/commodity
- 2. At what stage of development are the underlying and adjacent technologies that are needed to make the technology a practical reality

And just as importantly in the case or agriculture how “hardened” is the technology. It is fine for the technology to work in a lab or in a comfortable city environment but is it too fragile to stand up to practical applications on farm or along the supply chain? Barbed wire as telephone wires worked because it was an already installed technology that was resilient in the real world.

So, we can end up with a set of questions that will help us think through about adopting new technologies in our farming operations. This is particularly important in the current situation because we have seen an explosion in investment in new technology ventures in agriculture. While this is great in itself it also increases risk. The increased investment is great for the sector overall but means a much greater failure rate of companies in the supply chain. This means that we have to be careful about how we adopt the emerging technologies and who we partner with because there is an increased risk they will not be around in two years time.

An example of a set of questions you can use is the following:

- 1. Do they make us money now?

If a technology can make us money straight away, then this reduces the risk. For example beef feedlots are using drones for stock counts.
- 2. Do they fit into a long-term plan for our business?

Long term data is going to become more and more important and the value of data grows as we get more of it over time. Therefore, the initial technology may not make money straight away but if it fits a long term vision it can still be positive.
- 3. Are enough parts of the technology at a product or utility level now?

Risk is higher the earlier in the arc of innovation to utility we sit. If the technology is already well along the curve this reduces risk and increases the likelihood that even if an individual company fails that we can keep using the technology.
- 4. Is the technology built on top of other major business or consumer products so that most components will receive lots of ongoing investment and attention?

For example, drones are built on top of the smartphone and tablet supply chain where billions are being invested continually. This means that drones benefit from that research.
- 5. Do you have the capabilities/can easily source the capabilities in your area in order to keep the technology running/innovate?

You need the capability of keeping stuff running. This question is partly ties into questions 3, 4 and 6. If you have a utility technology that is “farm hardened” then you need less capability to keep it running.

## 6. Is the technology sufficiently “hardened” to run in a commercial farm environment?

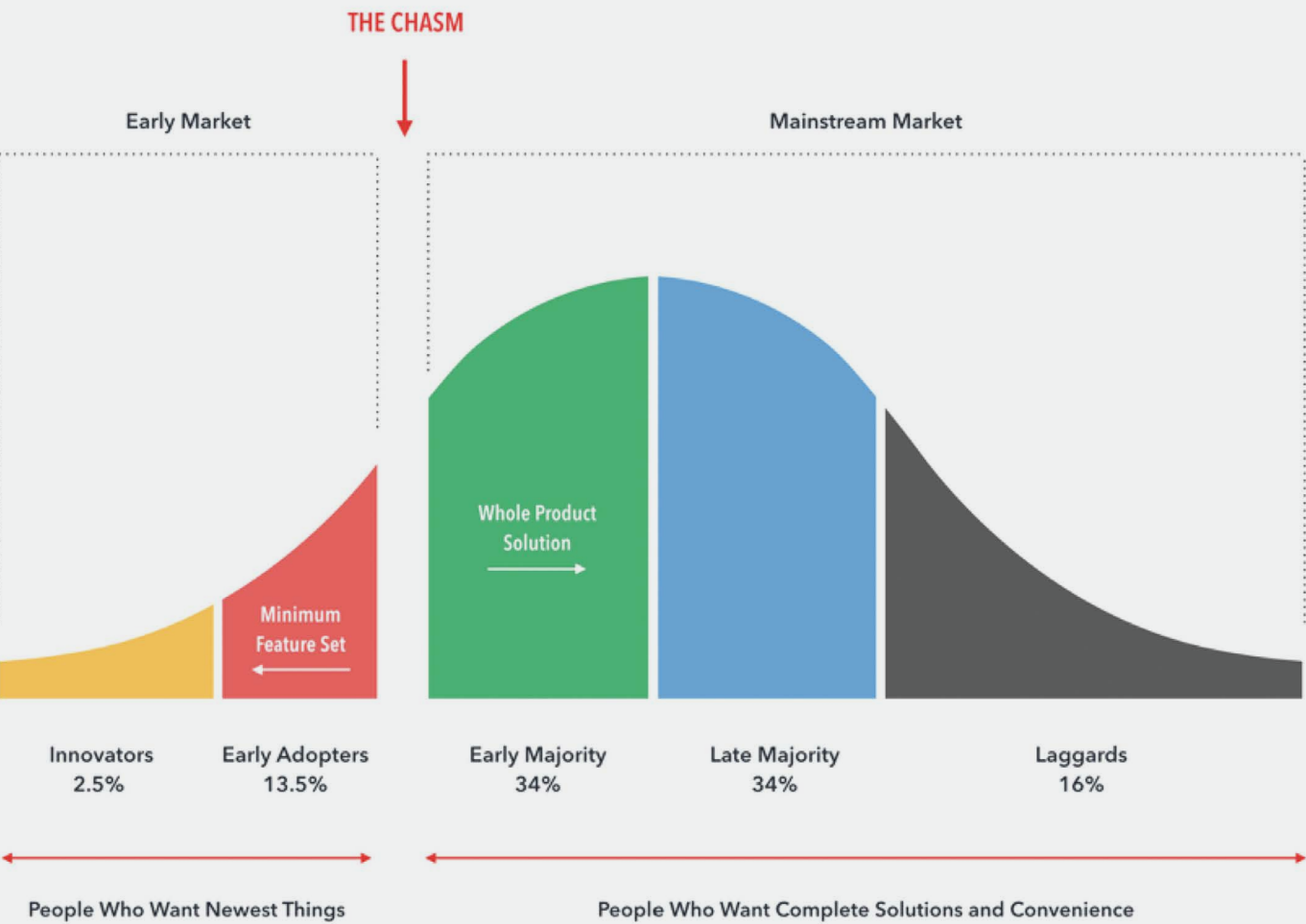
Farms are harsh operating environments. There is a risk that in the rush to compete with new technologies that stuff will be rolled out that is not “farm ready”.

You need a positive answer to question 1 or 2. You must have a positive answer to questions 5 and 6. You need a more detailed assessment of questions 3 and 4.

## Overall Adoption Strategy

My general advice is that you should position yourself as an “early majority” adopter as shown in the following graphic:

To the left of the chasm too many things break, or don’t work, but if you wait too long then your competitors will be adopting the next thing while you are still working out the last thing.



Any variation from being an early majority adopter should have very good strategic reasons behind it>

For example, industry as a whole cannot survive by only having early majority adopters. You need innovators and early adopters. If you are psychologically inclined to be one of those then there should be increasing opportunities for you to be given incentives to act as demonstrators/test farms. This will come from industry bodies trying to increase adoption rates, but also from commercial companies trying to ensure their products work. There is a niche here to be exploited. If you are not naturally good at this then make sure that you maintain strong links with those in your district or industry who are.

They will be the best indicators of when stuff is ready for you to adopt.

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# Notes



## Notes



Irrigation Research &  
Extension Committee



Rice Extension  
funded by AgriFutures™

Thanks to our sponsors



This project is supported by Local Land Services through funding from the Australian Government's National Landcare Program.



Local Land  
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