CAMPBELL TOWN
TASMANIA
THURSDAY 4TH

JULY 2024

# GRAINS RESEARCH UPDATE

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# GRAINS RESEARCH UPDATE

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# Campbell Town

Thursday 4th July

9.00am to 1.00pm

The Grange Estate
4 Commonwealth Lane,

**#GRDCUpdates**

**Campbell Town GRDC Grains Research Update**
**convened by ORM Pty Ltd.**

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# Contents

# TOP 10 TIPS

## FOR REDUCING SPRAY DRIFT

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01 **Choose all products in the tank mix carefully**, which includes the choice of active ingredient, the formulation type and the adjuvant used.

02 **Understand** how product uptake and translocation may impact on coverage requirements for the target. Read the label and technical literature for guidance on spray quality, buffer (no-spray) zones and wind speed requirements.

03 **Select the coarsest** spray quality that will provide an acceptable level of control. Be prepared to increase application volumes when coarser spray qualities are used, or when the delta T value approaches 10 to 12. Use water-sensitive paper and the Snapcard app to assess the impact of coarser spray qualities on coverage at the target.

04 **Always expect** that surface temperature inversions will form later in the day, as sunset approaches, and that they are likely to persist overnight and beyond sunrise on many occasions. If the spray operator cannot determine that an inversion is not present, spraying should NOT occur.

05 **Use weather forecasting** information to plan the application. BoM meteograms and forecasting websites can provide information on likely wind speed and direction for 5 to 7 days in advance of the intended day of spraying. Indications of the likely presence of a hazardous surface inversion include: variation between maximum and minimum daily temperatures are greater than 5°C, delta T values are below 2 and low overnight wind speeds (less than 11km/h).

06 **Only start spraying** after the sun has risen more than 20 degrees above the horizon and the wind speed has been above 4 to 5km/h for more than 20 to 30 minutes, with a clear direction that is away from adjacent sensitive areas.

07 **Higher booms increase drift**. Set the boom height to achieve double overlap of the spray pattern, with a 110-degree nozzle using a 50cm nozzle spacing (this is 50cm above the top of the stubble or crop canopy). Boom height and stability are critical. Use height control systems for wider booms or reduce the spraying speed to maintain boom height. An increase in boom height from 50 to 70cm above the target can increase drift fourfold.

08 **Avoid high spraying speeds**, particularly when ground cover is minimal. Spraying speeds more than 16 to 18km/h with trailing rigs and more than 20 to 22km/h with self-propelled sprayers greatly increase losses due to effects at the nozzle and the aerodynamics of the machine.

09 **Be prepared** to leave unsprayed buffers when the label requires, or when the wind direction is towards sensitive areas. Always refer to the spray drift restraints on the product label.

10 **Continually monitor** the conditions at the site of application. Where wind direction is a concern move operations to another paddock. Always stop spraying if the weather conditions become unfavourable. Always record the date, start and finish times, wind direction and speed, temperature and relative humidity, product(s) and rate(s), nozzle details and spray system pressure for every tank load. Plus any additional record keeping requirements according to the label.


# Program

| | | |
|---|---|---|
| 9:00 am | **Announcements and GRDC welcome** | ***GRDC representative*** |
| 9:15 am | **Herbicide management for fabas in Tasmanian rotations** | ***Jason Brand,*** *Agriculture Victoria* |
| 9:55 am | **Managing risk and building business resilience** | ***Naomi Palombi,*** *RMCG* |
| 10.35 am | **Morning tea** | |
| 11.05 am | **Strategies for improving drainage on farm** | ***Reuben Wells,*** *Ag Logic* |
| 11:45 am | **Optimising barley yields – what have we learned from the hyper yielding crops project** | ***Jon Midwood,*** *TechCrop Services* |
| 12.25 pm | **The fit for canola in rotation and value adding opportunities** | ***Rob Henry,*** *Macquarie Oil Company* |
| 1.05 pm | **Close and evaluations** | ***GRDC representative*** |
| 1.10 pm | **Lunch** | |

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SFS holds major events including an annual trial results meeting in March and AgriFocus on the third Wednesday of October, showcasing a range of research trials, technical tours and demonstrations. The much acclaimed SFS annual trial results eBook available to SFS members and Agronomists/advisors have access to a technical workshop annually. SFS work's collaboratively with other organisations to bring an array of workshops throughout the year, all relevant to Southern High Rainfall Zone farming enterprises.

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# Faba bean agronomy 101 for Tasmanian cropping systems?

***Jason Brand[1], Josh Fanning[1], Greta Duff[2] and Audrey Delahunty[1].***
*[1]Agriculture Victoria; [2]Southern Farming Systems.*

**GRDC project code:** DJP2105-006RTX

### Keywords

- faba bean agronomy, disease management, weed management.

### Take home messages

- Be clear on why you want to grow faba beans, assessing the potential benefits and risks.
- Choose a variety that best suits your farming system and combines the traits that manage your key risks. PBA Amberley$^{\Phi}$ is the faba bean variety that is likely best suited to the HRZ of Tasmania due to its potential yield and disease resistance.
- Prepare your soil – minimise key constraints like low pH and compaction.
- Plan your management – given the high rainfall, disease management will be crucial using a strategic integrated approach including SDHI fungicides at critical phases (pre-flowering). Minimise your weed competition by considering newer product options and ensuring good control throughout other phases of the farming system.

## Introduction

Faba beans have continued to grow as a key rotational crop in Australia with approximately 650,000t produced off 300,000ha in each of the last three cropping seasons. Generally, 80% of the crop is grown in South Australia and Victoria, with 15% in New South Wales and the rest distributed across Western Australia, Queensland and Tasmania.

The primary areas of production are in medium and high rainfall zones. While the ideal soil for faba beans is a deep, well structured, alkaline loam to clay loam, they will tolerate a broader range of soil textures and pH than other pulse crops. In addition, they are the best pulse option for soils prone to waterlogging. These factors combined indicate potential in Tasmania, but how can we achieve long term profit stability that is competitive with alternative crops and farming systems?

Here, we explore opportunities too make faba beans a 'gem' of a crop in Tasmania by using the Genotype (G) x Environment (E) x Management (M), principles. A gem can be precious or semi-precious stone of high value, especially when cut and polished or engraved. Currently beans in Tasmania are like the newly discovered stone, a bit rough and dirty, but ready to be polished into something valuable. GxExM is an acronym that provides a framework to help achieve optimum profitability for the crop in your farming system.

## Genotype (G)

Genotype is another word for variety and allows us to think about what genes/traits we need to grow a high yielding, high quality profitable crop. Breeders can develop varieties with new traits, such as disease resistance, herbicide tolerance, flowering time, maturity, growth habit, and soil type tolerance. It's the combination of these traits that defines the ultimate yield potential. What is the best genotype (variety) you can choose for your environment and management system?

## Environment (E)

Environment refers to where you intend to grow the crop, and primarily relates to factors outside of your specific control. This includes rainfall, temperature and soil type. We can partly

influence, through management and genotype (variety), the way rainfall is captured, how the crop experiences temperature and some of the chemical and structural components of soil. How will the environment influence the genotype (variety) you need to choose and what management will you need to put in place to overcome or minimise limitations of your environment?

## Management (M)

Management refers to the various factors we can control in growing the crop and the farming system, for example, sowing time, plant density, stubble management, soil amendments, nutrition, fungicide and herbicide application, rotation with other crops, and use of livestock. What are the best management choices you can make given the genotype (variety) you are growing on your farm (the environment)?

If you choose the best variety (G) and optimise the management (M) for each environment (E), you can maximise profitability. Will that ensure faba beans are a 'gem' of a crop for your farm business and cropping system? Ultimately, only you can decide once you understand the potential profit from grain and economic benefits to your farming system.

Detailed information on how to grow a faba bean crop can be found in GRDC GrowNotes – Faba Bean Southern Region and the additional resources listed below. In addition, speaking with an experienced advisor and educating yourself of the risks and rewards is important to ensuring long term success.

Some key points to consider on why? and how? to grow faba beans are highlighted below.

It is essential before growing any crop to be clear on the 'why' of growing the crop. Ultimately, it is about improving profitability and economic viability (sustainability) of your farming system over the long term. There are two key things to consider before growing faba beans.

- Price and yield can be volatile, and marketing has unique challenges. In the last 10 years, the price of faba beans in Victoria has ranged from about $250/t to more than $900/t, with the average approximately $450/t. Grain yields have ranged from 0 to 6t/ha with field trials indicating that greater than 10t/ha is achievable in optimum conditions.
- Farming system benefits can be substantial, so it's important to ensure that value is attributed across the whole system. Faba beans can contribute up to 15–20kg/ha of nitrogen per tonne of biomass produced. In addition, they provide a disease and weed break for cereal crops and stubbles can be grazed. These factors combined could be worth more than $1000/ha in addition to the returns you can achieve from the crop.

Once the 'why' is determined, it is essential a clear plan, the 'how', is implemented. Plan and prepare for success through clearly understanding your risk profile and GxExM.

- Risk – Each person and farm business will have a different attitude to risk and ability to respond to risk. Begin by calculating potential returns and losses that could occur with faba beans, then determine the key production risks: is it disease, is it weeds, is it soil type? This understanding will help to define the key decisions you will need to make regarding variety (G) choice and management (M) strategy.
- GxExM
    - Genotype (variety) – Currently, there are three main varieties which could suit the Tasmanian production system: PBA Amberley$^{\Phi}$, which is high yielding in the high rainfall zone with good disease resistance; PBA Samira$^{\Phi}$, which has good yield stability across a range of soil types with moderate disease resistance; and PBA Bendoc$^{\Phi}$, which has tolerance to imidazolinone 'IMI' herbicides, but is susceptible to disease. It is also important to be aware that the faba bean program will be releasing material that combines these traits in coming years.
    - Environment – Where possible, ensure that any key soil constraints are minimised using amelioration techniques. Soil below pH 5 will greatly reduce yield potential, as will compaction and waterlogging.
    - Management – Some of the key components to consider when growing faba beans include:
        - Sowing time – Early generally optimises yield potential. In the HRZ of Victoria, mid-late April sowing is the optimum sowing window, providing a balance between yield potential and disease pressure.
        - Plant density – 20 plants/m$^2$ is the ideal plant number for high rainfall zones, allowing for good disease management and harvestability.

- Stubble management and row spacing – faba beans are adaptable and can be grown with or without stubble and in row spacings from 15cm to 45cm. Standing stubble and wider row spacing will help reduce disease risks.
- Soil amendments, nutrition and inoculation – Liming the soil to above pH 5.5 will optimise nutrient availability, improve yield and increase yield stability. In low phosphorus soils, faba beans will benefit from a phosphorus-based fertiliser. Inoculation with the latest strains of peat or granular inoculants is critical to optimise nitrogen fixation and plant growth.
- Fungicide strategies – Given the high rainfall, disease management will be crucial and involve multiple fungicide applications. Using a strategic integrated approach including SDHI fungicides at critical phases (pre-flowering) is essential to optimise yield potential. Chocolate spot is likely to be the key yield-limiting disease.
- Herbicide application – Utilising the newer products and ensuring good control of both broadleaf and grass weeds throughout other phases of the farming system is critical. Commonly, in southern Victoria, the newer herbicides Overwatch® and Reflex® are used in combination with a range of Group 5 products to provide broad spectrum control, particularly with the non-'IMI' tolerant varieties. In lower disease risk areas, where PBA Bendoc() can be grown, alternative strategies employing Intercept® applied in-crop are utilised.

## Conclusion

There are substantial opportunities for faba beans in Tasmania, particularly as new varieties combining improvements in disease resistance, herbicide tolerance and broad soil type adaptability are released. Carefully considering your risks and employing a GxExM model of thinking can ensure profitability is optimised.


## Acknowledgements

The research undertaken as part of this project is made possible by the significant contributions of growers through both trial cooperation and the support of the GRDC, the author would like to thank them for their continued support. We also thank Agriculture Victoria for ongoing support.


## Useful resources

GRDC GrowNotes – faba bean southern region (https://grdc.com.au/resources-and-publications/grownotes/crop-agronomy/faba-bean-southern-region-grownotes)

NVT disease rating (faba bean, Tasmania) (https://nvt.grdc.com.au/nvt-disease-ratings?crop=23&state=TAS)

Grain legume extension hub, Victoria (https://spahub.com.au/)

Faba bean agronomics for Tasmania (https://grdc.com.au/resources-and-publications/grdc-update-papers/tab-content/grdc-update-papers/2023/06/faba-bean-agronomics-for-tasmania)


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Notes

# The WeedSmart Big 6

## Weeding out herbicide resistance in winter & summer cropping systems.

**The WeedSmart Big 6 provides practical ways for farmers to fight herbicide resistance.**

**How many of the Big 6 are you doing on your farm?**

We've weeded out the science into 6 simple messages which will help arm you in the war against weeds. By farming with diverse tactics, you can keep your herbicides working.

### Rotate Crops & Pastures

**Crop and pasture rotation is the recipe for diversity**

- Use break crops and double break crops, fallow & pasture phases to drive the weed seed bank down,
- In summer cropping systems use diverse rotations of crops including cereals, pulses, cotton, oilseed crops, millets & fallows.

### Mix & Rotate Herbicides

**Rotating buys you time, mixing buys you shots.**

- Rotate between herbicide groups,
- Mix different modes of action within the same herbicide mix or in consecutive applications,
- Always use full rates,
- In cotton systems, aim to target both grasses & broadleaf weeds using 2 non-glyphosate tactics in crop & 2 non-glyphosate tactics during the summer fallow & always remove any survivors (2 + 2 & 0).

### Increase Crop Competition

**Stay ahead of the pack**

Adopt at least one competitive strategy (but two is better), including reduced row spacing, higher seeding rates, east-west sowing, early sowing, improving soil fertility & structure, precision seed placement, and competitive varieties.

### Double Knock

**Preserve glyphosate and paraquat**

- Incorporate multiple modes of action in the double knock, e.g. paraquat or glyphosate followed by paraquat + Group 14 (G) + pre-emergent herbicide
- Use two different weed control tactics (herbicide or non-herbicide) to control survivors.

### Stop Weed Seed Set

**Take no prisoners**

- Aim for 100% control of weeds and diligently monitor for survivors in all post weed control inspections,
- Crop top or pre-harvest spray in crops to manage weedy paddocks,
- Consider hay or silage production, brown manure or long fallow in high-pressure situations,
- Spray top/spray fallow pasture prior to cropping phases to ensure a clean start to any seeding operation,
- Consider shielded spraying, optical spot spraying technology (OSST), targeted tillage, inter-row cultivation, chipping or spot spraying,
- Windrow (swath) to collect early shedding weed seed.

### Implement Harvest Weed Seed Control

**Capture weed seed survivors**

Capture weed seed survivors at harvest using chaff lining, chaff tramlining/decking, chaff carts, narrow windrow burning, bale direct or weed seed impact mills.

### WeedSmart Wisdom

**Never cut the herbicide rate** – always follow label directions
**Spray well** – choose correct nozzles, adjuvants, water rates and use reputable products,
**Clean seed** – don't seed resistant weeds,
**Clean borders** – avoid evolving resistance on fence lines,
**Test** – know your resistance levels,
**'Come clean. Go clean'** – don't let weeds hitch a ride with visitors & ensure good biosecurity.

www.weedsmart.org.au

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# Mastering the whole system – managing farm business risk and building resilience.

***Naomi Palombi*** *RMCG*

**Keywords**

- farm business risk, resilience, farm planning, drought resilience

**Take home messages**

- Good farm management involves managing uncertainties and risks, requiring a careful balance between acceptable levels of risk and desired returns to ensure both immediate and long-term profitability and economic resilience.
- Employing decision-making frameworks, such as decision matrices, helps farmers systematically evaluate their options by integrating data and intuition. This approach allows for more balanced, informed choices that align with the farm's risk appetite and objectives.
- Focusing on strategic planning is worthwhile for farm business. Having structure in decision making processes and effective business planning supports longer-term sustainability and profitability.

*Farm management is the process by which resources and situations are manipulated by farm managers in trying, with less than full information, to achieve their goals* (Dillon . 1980).

*The ability to reorganise in the face of change is the key to survival and success in farm management* (Malcolm et al. 2005).

## Introduction

Farming, inherently, is a business rife with uncertainties and risks. The volatility of weather patterns, market fluctuations, and the unpredictable nature of biological systems make decision-making a complex endeavour for farm businesses no matter the size. Risk isn't always about downsides, however. Any risks to a farming business also carry opportunities from which to profit. So, managing a farm business becomes a balancing act of trading an acceptable level of risk for an acceptable level of return.

At the core of sustainable farming enterprises lies the obvious goal of profitability. This pursuit of profit is essential not just for immediate financial gain but also for long-term wealth accumulation. Wealth provides choices, opportunities, and freedom, empowering farm businesses to adapt and thrive in a changing environment. At the end of the day, economic resilience is business resilience and gives you choices to adapt in the face of change. This paper will delve into some of the fundamentals of farm management decision making, with a focus on risk and uncertainty and frameworks to enhance the process.

## Managing Risk and Uncertainty

To stay productive and profitable, farmers must make changes to the way that they operate in the face of change. That requires managers to take a longer-term view of risk and uncertainty. Risk is best defined as that of which a probability or likelihood of an outcome can be estimated or known, whereas uncertainty is when the probability or likelihood of an outcome cannot be estimated and is unknown. Considering risk means giving thought to what is knowable or imaginable about the future. Managers must then try to quantify the risk, assess what parts of the outcome are uncertain, and make the best decision with the available information at the time. Ultimately, this must be done based on the goals of the business. What is an acceptable risk-return trade-off to one business might not be to another.

Analysing a risky decision can be broken down into two parts (Hardaker, J.. (2006).):

- An assessment of the decision maker's beliefs about the probability of the possible consequences, which can be defined as the

likelihood of an outcome estimated from the decision maker's knowledge and experience; and

- An assessment of the decision maker's relative preferences for those consequences, which are informed by the decision maker's beliefs and goals.

These two elements create an understanding of the subjective expected usefulness of a risky decision, which leads to the choice or "good" option being the option with the most usefulness based on not only the risks, but the appetite for risk of the decision maker, and the individual goals and objectives.

A "good" decision doesn't always turn out to be the "right" decision. Whether or not a decision turns out to be "right" usually reveals itself with time when the anticipated risks and uncertainties have been revealed. Whether or not a decision is "good", usually depends on the prudence with which it is made. When it comes to decision making, it's more important to worry about making a "good" decision than predicting whether or not that decision will be "right". After all, most decisions carry some level of uncertainty.

## Decision Making Under Risk & Uncertainty

Good decision-making in farm businesses involves a thorough understanding of the consequences and likelihood of various actions, appreciating potential regrets, and identifying steps to enhance favourable outcomes while reducing negative results. This process begins with gathering and analysing relevant data, considering historical performance, current conditions, and future projections.

A thorough understanding of the odds of different scenarios helps farm managers make informed choices. Acknowledging the potential for regret means being realistic about what could go wrong and how you might feel about it. This honesty helps in weighing options more carefully. The best choice for a decision maker is usually the one whose consequences they can live with, whether they are favourable or not.

Good decision making is vital because farmers are presented with choices to make regularly, even if the decision is to do nothing. Making good decisions is ultimately part of ensuring long-term sustainability and profitability.

A decision matrix is a valuable tool for structured decision-making, especially for complex or high-stakes decisions. The matrix provided by GRDC in 2020, *Farm Decision Making: The interaction of personality, farm business and risk to make more informed decisions* is a good example. This matrix involves several steps:

1. **Clearly Define the Decision:** Identify the specific decision that needs to be made.
2. **List Major Considerations:** Determine the key factors that should influence the decision. Usually, there are four to eight major considerations, such as financial impact, resource availability, market conditions, and potential risks.
3. **Break Down Considerations into Conditions:** For each major consideration, identify different scenarios or conditions that could influence the decision. For instance, financial impact might be broken down into high, medium, and low revenue projections.
4. **Assign Scores to Conditions:** Assign scores to each condition based on its importance. Lower scores typically represent less favourable outcomes, while higher scores indicate more favourable ones.
5. **Create a Decision Table:** Organize the considerations and conditions into a table, making it easy to compare and evaluate the different scenarios.
6. **Calculate Total Scores:** Add up the scores for each scenario to determine which option has the highest overall score.
7. **Review and Adjust:** Test the decision matrix with historical data or hypothetical examples to ensure its accuracy. Adjust the scores and conditions as necessary based on new insights or feedback.

This process helps in systematically evaluating the pros and cons of each option, leading to more balanced and informed decisions.

Using decision-making frameworks does not disregard instinct, flexibility, or the value of human intelligence and experience. Instead, it incorporates these elements into a consistent and structured approach. Although a decision matrix provides a logical structure, it also leaves room for gut feelings and emotional considerations, ensuring that decisions are well-rounded.

This structured approach helps mitigate biases by providing a clear rationale for decisions, enhancing confidence in the process. It allows farm managers to be flexible, as they can adjust their strategies based on new information or changing conditions, while still adhering to a consistent decision-making

process. By integrating instinct and experience into a systematic framework, farm managers can make more confident, transparent, and accountable decisions.

As Kelly and Malcolm (1999) aptly write, sometimes, “For sound farm management decisions it is not necessary to know everything about everything- enough about enough will do.”

## Planning For Resilience

Resilience is defined as: “the ability of a substance or object to spring back into shape; elasticity.” Resilience is a defining trait of successful farm businesses, enabling them to withstand “shocks” to the system and adapt to changing conditions. Resilience is not just about being flexible, it’s about being adaptable. Farm business strategies should be focused on cultivating the overall strength of the enterprise. Embracing a holistic approach to farm management is necessary. There’s no point getting stuck on what rate of nitrogen to apply this year when you should be focusing on how the whole system is running.

Goal setting should be the point to start with for all farm business planning. And goals do change – so it’s worth writing it out in pencil! Developing a vision for your business gives a clear framework for decision-making. Medium to long-term goals offer a strategic vision that helps guide and direct short-term actions, ensuring that daily operations are aligned with the broader objectives of the farm.

The process can start with an assessment of the current state of the farm. Where are you at? This could include assessing financial health, business health, resource capacity, and the state of the market. Identifying where you’re at now will provide a starting point for where you want to go, and what drives the “vision” of your enterprise.

The status quo becomes the impetus for change. Good goal setting can include the development of Specific, Measurable, Achievable, Relevant, and Time-bound (SMART) goals.

- **Specific**: Clearly defined and unambiguous, answering the questions of who, what, where, when, and why.
- **Measurable**: Quantifiable, with criteria to track progress and measure the outcome.
- **Achievable**: Realistic and attainable, considering the resources and constraints.
- **Relevant**: Aligned with broader objectives and priorities, ensuring the goal is worthwhile.
- **Time-bound**: Set within a specific timeframe, with a clear deadline or end date for completion.

The SMART method is so often used as it provides clarity for the here and now when the future seems very far away. Tracking performance in achieving these goals can also be a useful tool for identifying what is working and what isn’t, so any business strategies can be adjusted as needed. Finally, scenario planning and risk assessment are essential, allowing the farm to anticipate potential challenges and develop contingency plans. This structured approach ensures that most, if not all short-term actions are strategically aligned with the medium to long-term goals. By having well-defined goals, farmers can make informed decisions that not only address current challenges but also contribute to long-term sustainability and profitability.

Farming enterprises are complex ecosystems interacting with the climate, annually, the environment, locally, and the market, globally. Beyond traditional production-oriented strategies, holistic farm management encompasses all aspects of the business - this includes how much you pay yourself and how often you take time off - as integral components of farm sustainability.

Although it can be hard to think about farm business planning when so much time is spent working “in” the business, having the discipline to work “on” the business should be treated with as much importance as getting the technical aspects of farming right.

## Conclusion

In conclusion, managing farm business risk, developing structured approaches to decision making, farm business planning and goal-setting setting is imperative for the long-term sustainability and resilience of agricultural enterprises. By embracing a holistic approach to farm management, farmers can navigate risks and thrive in a dynamic agricultural landscape. The Resilient Farming Tas program is a valuable resource currently available for farmers seeking to enhance their resilience and ensure the prosperity of their agricultural enterprises.

And as always, sometimes it’s just a little good luck, good timing, and good management.

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# ABOUT THE PROGRAM

Supporting farm businesses to build capacity to manage risks and adapt to change, particularly to plan for and manage climate-related risks, including drought; assisting in building resilience and sustainability into all farming operations, the business and its people.

## What is in it for the farmers?

A Resilience Plan will lay out decision-making actions to prepare your land and people for predicted climatic variability and reduce damage and loss – and with the added benefit of being able to seek grants for specific actions.

For the program entry fee of $500 – three people in your business get access to all workshops, webinars, farm tours and online learning that the Resilient Farming Tas program will deliver over the next 12 months. This also includes a farm visit and coaching to develop the Resilience Plan.

## What do you get by participating in the program?

The program is not a course and there is no mandatory attendance or markings of asignments. Participation is always voluntary and you can pick and choose aspects that suits your learning style and timing.

**The program will offer:**

**A farm visit** - to complete a Farm Business Checklist and begin to understand your business/farm risks

**Field days and workshops** - for different cohorts, across the state on specific topics of key interest.

**Support and access to resources** – we have mapped current resources and services on our learning platform. We will use the knowledge gained from your risk assessment to point you to the right direction of topics, tools and resources relevant to your business

**One-on-one coaching** - to develop your Business Resilience Plan

## How long does the program take?

'choose your own adventure' but here are some examples:

**Speed run (4-6 weeks)** - A program officer will visit your site to assist you with a risk assessment. You will attend 1-2 workshops and complete the Plan within 4-6 weeks.

**The guided experience (2-3 months)** - A program officer visits your site and helps you work through a risk assessment, you are guided to review key topics on an online learning platform, you attend a specific workshop, webinar and finalise the plan.

**The self-guided (1-9 months)** - A program officer visits your site and helps you work through a risk assessment, you have access to an online platform with resources and you spend however long you like working through this, you attend as many (or few) of the workshop, field days and webinars are you like, finalise the Plan before March 2025

*The Farm Business Resilience Program is jointly funded through the Australian Government's Future Drought Fund and the Tasmanian Government's Rural Business Resilience Package.*

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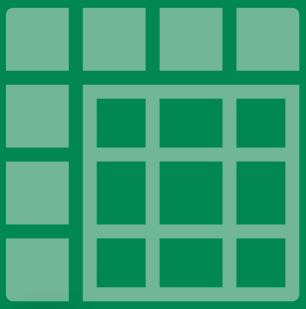

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# Drainage in broadacre cropping

***Reuben Wells***

*Ag Logic*

**Keywords**

- broadacre cropping, drainage, waterlogging

- **Take home messages**
- Drainage planning software using accurate elevation data can drastically improve the effectiveness of drain installations.
- Data from global navigation satellite systems (GNSS) underpin all collection systems.
- Better drain planning leads to better installations.
- The same software tools can often also be used to redesign paddock surfaces and address both surface and subsoil drainage.
- Such modern technology can make drains more accurate and more effective.

## Introduction

Waterlogging is one of the main causes of crop loss in higher rainfall zones. The issues caused by waterlogging can be direct, from stress on plants that stunts growth or causes plant death. The issues can also be indirect, creating conditions that increase the ability of pathogens to impact the plant. There are also a wide range of associated logistical impacts, such as bogging, making operations like spraying and harvesting difficult or impossible. Even small, waterlogged areas with shallow puddles can lead to crop losses, since the site will always end up sitting saturated for longer.

Actions that reduce waterlogging risk make sense for broadacre cropping systems in higher rainfall zones and are particularly important for irrigated crops. Not only does the likelihood of waterlogging increase with irrigation, but the value of crops (and by extension, the financial impact from crop loss) also tends to be higher under irrigated cropping systems.

The most fundamental tool in reducing waterlogging is improved drainage. Installing drains on farms isn't new, and there is evidence that it has been around for almost as long as agriculture itself. While drainage may be almost as old as the hills, that doesn't mean our techniques haven't changed and improved over time. Technology has increased the accuracy and efficiency of many parts of our lives, and drainage is no exception.

## Better elevation data

Drainage planning software can drastically improve the effectiveness of drain installations. All versions of this type of software need accurate elevation data, and technological advances have made several options available for data collection.

LiDAR sensors on aircraft allow regional mapping of elevation at high levels of accuracy. LiDAR is much like RADAR, but instead of recording the echo of a transmitted radio wave, LiDAR uses lasers. LiDAR data have been collected for much of Tasmania and can be freely accessed for most areas within the agricultural region.

The data collected is very accurate, with one important caveat. As LiDAR uses light, the map it provides will be an accurate record of the visual surface of the ground, this means it can be impacted by crops and other dense vegetation levels. However, when the ground cover was minimal at the time of capture, it is a great resource for drain planners.

Drones can generate elevation data as well. Sometimes this will be via LiDAR sensors, but more commonly, it is done using a technology called photogrammetry. Hundreds of images are

compared and the change in location of objects due to changing camera angles as the drone flies allow a 3-D model to be constructed. Drone mapped elevation has two main sources of error. The first source is the same issue faced by LiDAR – it is recording the visual surface, not the hard surface. The other is the need for accurate georeferencing, that is, being able to tie the surface onto known points on the ground. This step takes a few extra skills on the part of the operator.

## GNSS

Data from global navigation satellite systems (GNSS) underpin all collection systems. GPS is the most well-known, but other systems include Galileo, Beidou, GLONASS and QZSS. When uncorrected, this data is fine for a general location but not suitable for drainage – they'll get you within a few metres, but drainage planners need to be within a few centimetres at the worst.

Correcting GNSS data is simple – a base station sits at a known location and sends data out on variation in the incoming GNSS signals. Since the base isn't moving, this variation is the error in the signal. The base sends the correction to the rover, and accuracy jumps from within a few metres to within a few centimetres.

There are a wide variety of ways this can be configured. Solutions include a base station set up in the field to transmit directly to a rover; a network of base stations across a region and the rover receives corrections via the internet; or base stations that communicate directly with satellites that then provide a correction directly to the rover.

The preferred method for collecting elevation data is to simply drive across a paddock with a GNSS receiver, logging points as we go. We use a base station in the field to ensure our data correction is as local as we can make it. The elevation surface is created using what is essentially a 3-dimensional dot-to-dot puzzle.

## Better drain planning

Once the elevation data is loaded into the drain planning software, several extra layers of data can be generated. These include location and depth of puddles, where water accumulates, and the slope.

At its most basic level, a plan can be created by simply tracking where the water would naturally want to run. Layering in more data allows other factors to be taken into account, including pivot wheel locations, outfall locations, soil texture changes, and the impact on surface flow of planting or bed direction.

The output can be a line to follow, either for manually steering or for loading into an autosteer-enabled tractor. With the appropriate drainage gear, the options are much more powerful. The plan can define the depths of cut needed, gradients that drains will run at, and even the cross-section shape of the drain.

One other freely available tool for drainage planning is satellite imagery. Google Earth as a desktop program allows growers to see images captured in the past, not just the image displayed by default. Often, the available imagery will include the paddock in a wet season – being able to back up the modelled water flow with observed crop damage greatly increases the confidence in the plan.

## Better installations

Very similar positioning systems to those needed to collect elevation data can be used on the machinery installing the drains. Fitting a rover antenna to the top of a drainage machine means the height of the machine can be very accurately controlled, and a rover antenna on the tractor towing the drainage gear keeps the machine exactly where it is needed.

The impact of this control is drains can be installed on much flatter gradients than would be achievable by eye. For example, we have installed drains successfully with a 0.1% grade, that is, a fall of 10cm over 100m. It also means drains can be installed much faster, since the operator can enter the paddock already knowing where the drains will go. This means they don't need to spend time thinking and planning, while a large and expensive tractor sits idle.

## Beyond drains – Landshaping

A drain fixes a hole by digging another hole. The surface of some paddocks can be so full of holes that if drains were used to eliminate wet sites, the field would be more drain than paddock. Instead of drains, a much better solution is often filling the holes. This inevitably involves moving soil around, which can become an expensive operation. In shallow duplex soils, it can also become a counter-productive solution, if it leads to excessive removal of topsoil.

The same software tools that are used to create drainage plans can often also be used to redesign paddock surfaces. Implements such as land planes or laser buckets can carry the same implement control systems as the drainage gear, providing very accurate control over depths of cut and heights

of fill. The software allows all planning to get the maximum impact from the soil movement with the maximum efficiency, and without creating cuts that are deep enough to lead to soil damage.

## Beyond the surface

Of course, not all drainage is across the surface. Subsoil drainage works under the ground, removing water from saturated soils. The same GNSS controls are used to ensure that drains are installed at grade, and where they were planned.

Subsoil drainage is substantially more expensive than surface drainage, however, it has many advantages. Surface drains, for instance, are rarely effective if the source of the water is under the ground (such as a spring or a soak). Subsurface drains can be extremely effective at removing such water. Subsurface drains need lower maintenance than surface drains (although they aren't maintenance free), and don't impact on your activities on the paddock surface. Surface drains don't like to be cultivated and can get fouled by machinery or pivot wheel rutting.

## Conclusion

All strategies to improve drainage rely on one marvellously consistent feature of water – it will always flow downhill, until something stops it or pumps it. There is a myriad of tactics to harness this power that gravity has over water, and, just like growers on the banks of the Nile 4,000 years ago, a grower wanting to install drains needs to make decisions about what the best solution will be. Even though the fundamental problem is ancient, using modern technology can make drains more accurate and more effective.

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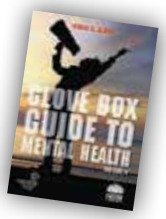
### Looking for information on mental wellbeing? Information and support resources are available through:

**www.ifarmwell.com.au** An online toolkit specifically tailored to help growers cope with challenges, particularly things beyond their control (such as weather), and get the most out of every day.

**www.blackdoginstitute.org.au** The Black Dog Institute is a medical research institute that focuses on the identification, prevention and treatment of mental illness. Its website aims to lead you through the logical steps in seeking help for mood disorders, such as depression and bipolar disorder, and to provide you with information, resources and assessment tools.

**www.crrmh.com.au** The Centre for Rural & Remote Mental Health (CRRMH) provides leadership in rural and remote mental-health research, working closely with rural communities and partners to provide evidence-based service design, delivery and education.

**Glove Box Guide to Mental Health**
The *Glove Box Guide to Mental Health* includes stories, tips, and information about services to help connect rural communities and encourage conversations about mental health. Available online from CRRMH.




**www.rrmh.com.au** Rural & Remote Mental Health run workshops and training through its Rural Minds program, which is designed to raise mental health awareness and confidence, grow understanding and ensure information is embedded into agricultural and farming communities.

**www.cores.org.au** CORES™ (Community Response to Eliminating Suicide) is a community-based program that educates members of a local community on how to intervene when they encounter a person they believe may be suicidal.

**www.headsup.org.au** Heads Up is all about giving individuals and businesses tools to create more mentally healthy workplaces. Heads Up provides a wide range of resources, information and advice for individuals and organisations – designed to offer simple, practical and, importantly, achievable guidance. You can also create an action plan that is tailored for your business.

**www.farmerhealth.org.au** The National Centre for Farmer Health provides leadership to improve the health, wellbeing and safety of farm workers, their families and communities across Australia and serves to increase knowledge transfer between farmers, medical professionals, academics and students.

**www.ruralhealth.org.au** The National Rural Health Alliance produces a range of communication materials, including fact sheets and infographics, media releases and its flagship magazine *Partyline*.

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# 2023–2025 GRDC SOUTHERN REGIONAL PANEL

December 2023

### ANDREW RUSSELL, PANEL CHAIR

**Rutherglen, Victoria**

Andrew is the managing director and a shareholder of Lilliput Ag, and a director and shareholder of the affiliated Baker Seed Co, a family owned farming and seed-cleaning business. He has served on GRDC's medium rainfall zone Regional Cropping Solutions Network and has held leadership roles with Riverine Plains Inc, Victorian Farmers Federation and the Rutherglen Group of fire brigades.

### PRU COOK, DEPUTY CHAIR

**Dimboola, Victoria**

Raised on a mixed farm in Victoria's Wimmera region, Pru has spent her professional career working in extension for the grains industry. Starting her career at the DPI, she has worked at GRDC and the Birchip Cropping Group, managing a number of extension projects. She has recently started her own business specialising in extension, project development and project management.

### TIM MCCLELLAND

**Birchip, Victoria**

Tim farms with his wife, father and aunt on a 6500-hectare mixed property in the southern Mallee. After completing his Bachelor of Agriculture and Commerce at the University of Melbourne in 2006, he took on work at Advisor Edge, Birchip Cropping Group (BCG) and RMCG. In 2011, he moved back to Birchip to become formally involved in the family farm and continue his role with BCG.

### RUTH SOMMERVILLE

**Burra, South Australia**

Ruth is an agroecologist who runs a consulting business. She has a Bachelor of Science in Ecology and Master of Applied Science in Wildlife Management from the University of Sydney, and has worked in sustainable agriculture research, development and extension and property management since 2002. Ruth has been the Upper North Farming Systems Group executive officer and project manager since 2013.

### ANDREW WARE

**Port Lincoln, South Australia**

Andrew is a research agronomist who started his career with the South Australian Research and Development Institute (SARDI) and then spent time at CSIRO in Adelaide. This was followed by 10 years away from research, managing the family farm on the Lower Eyre Peninsula, before returning to SARDI. In 2019, he started his own research company, EPAG Research, delivering applied research across the Eyre Peninsula.

### MICHAEL TRELOAR

**Cummins, South Australia**

Michael is a third-generation grain grower who produces wheat, barley, canola, beans, lupins and lentils on a range of soil types. He has been involved in a number of research organisations, including the South Australian Grain Industry Trust (of which he was chair for four years), the Lower Eyre Agricultural Development Association and the South Australian No-Till Farmers Association (both of which he has been a board member).

### NEIL FISHER

**Adelaide, South Australia**

Neil's family grain farming legacy dates back to 1889, giving him an extensive understanding of the challenges faced by grain growers in SA and Victoria across the Mallee, Wimmera and Riverina regions. With his wife Jenny, he retains a cropping/grazing property at Bordertown, producing wheat, canola, barley, beans and hay. He has held chief executive and board roles in organisations including Sugar Research Australia, Grains Council of Australia, Grape and Wine Research and Development Corporation and Plant Health Australia. Neil has previously worked for GRDC managing a large portfolio of research projects.

### PETER DAMEN

**Kindred, Tasmania**

Peter is a grower from north-western Tasmania with more than 10 years' experience growing and processing commercial grain crops. He holds a degree in agricultural science from the University of Tasmania. Peter has production, research and development experience in quinoa, oats, buckwheat, spelt, hemp, adzuki beans, wheat, barley, ryegrass and more. He is working at Tas Stockfeed, focusing on technical support, sales and grain procurement and processing. In 2017, he was recognised as the Young Farmer of the Year.

### DR KATHY OPHEL-KELLER

**Adelaide, South Australia**

Kathy is a strategic science leader with a strong track record in developing and leading national research programs with industry co-investment, including GRDC. Her own research background is in plant biosecurity and molecular detection of plant pathogens and she has a strong interest in capacity building and succession planning. Kathy is a former acting executive director of SARDI and a research director at Crop Sciences, covering applied research on plant biosecurity, crop improvement, climate risk management, water use efficiency and crop agronomy.

### DR PATRICIA FLYNN

**Douglas, Victoria**

Patricia is a grower in the southern Wimmera, Vic. She holds a Bachelor of Science (Honours) from the University of Western Australia and a PhD from the Australian National University. Her expertise lies in farming systems research with a specific interest in soils management and farm business profitability. Patricia is the financial manager of a family mixed cropping and Merino sheep enterprise – Kwangaloo Pastoral. She held research and development positions at the WA Department of Agriculture, CSIRO, and what was the Department of Primary Industries in Victoria.

### CRAIG BAILLIE

**GRDC Executive Manager**

Craig Baillie is GRDC's general manager of applied research, development and extension. He has oversight of research areas including sustainable cropping systems (agronomy and soils) and crop protection (pests, weeds and diseases). He also has responsibility for GRDC's grower and stakeholder engagement at a national level.

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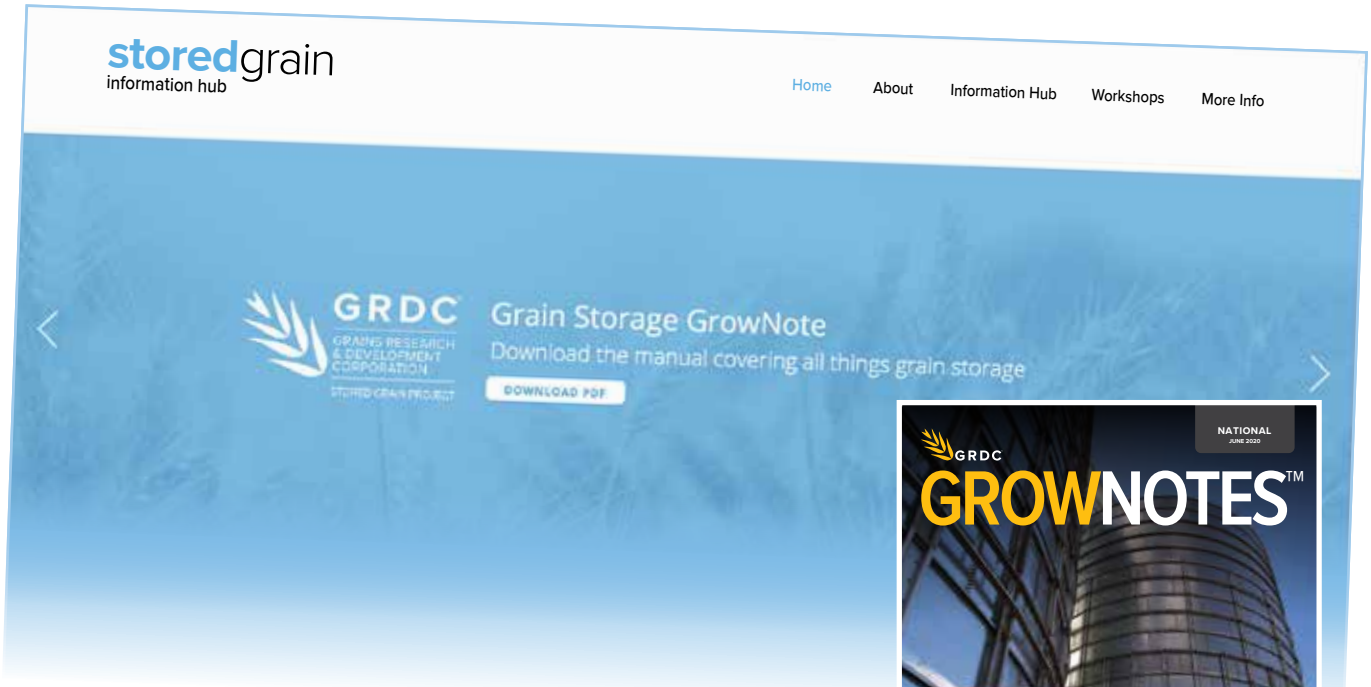


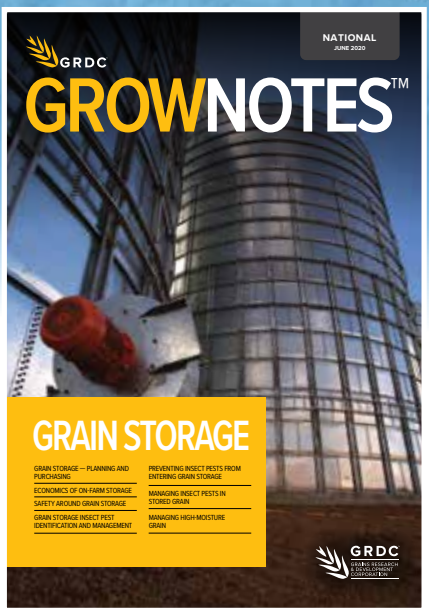


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# Acknowledgements

We would like to thank those who have contributed to the successful staging of the Campbell Town GRDC Grains Research Update:

- The local GRDC Grains Research Update planning committee that includes growers, advisers and GRDC representatives.

- Partnering organisation: Southern Farming Systems

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To leave your feedback - scan the QR with your phone camera

OR use the form on the next page – tear it out and drop at the registration desk as you leave. Thank you!

# 2024 Campbell Town GRDC Grains Research Update Evaluation

**1. How would you describe your <u>main</u> role?** *(choose one only)*

- ❑ Grower
- ❑ Agronomic adviser
- ❑ Farm business adviser
- ❑ Financial adviser
- ❑ Communications/extension
- ❑ Grain marketing
- ❑ Farm input/service provider
- ❑ Banking
- ❑ Accountant
- ❑ Researcher
- ❑ Student
- ❑ Other* (please specify)

## Your feedback on the presentations

For each presentation you attended, please rate the content relevance and presentation quality on a scale of 0 to 10 by placing a number in the box (**10 = totally satisfactory, 0 = totally unsatisfactory**).

**2. Herbicide management for fabas in Tasmanian rotations: *Jason Brand***

Content relevance ☐ /10 Presentation quality ☐ /10

Have you got any comments on the content or quality of the presentation?

**3. Managing risk and building business resilience: *Naomi Palombi***

Content relevance ☐ /10 Presentation quality ☐ /10

Have you got any comments on the content or quality of the presentation?

**4. Strategies for improving drainage on farm: *Reuben Wells***

Content relevance ☐ /10 Presentation quality ☐ /10

Have you got any comments on the content or quality of the presentation?

**5. Optimising barley yields – what have we learned from the hyper yielding crops project. *Jon Midwood***

Content relevance ☐ /10 Presentation quality ☐ /10

Have you got any comments on the content or quality of the presentation?

**6. The fit for canola in rotation and value adding opportunities. *Rob Henry***

Content relevance ☐ /10 Presentation quality ☐ /10

Have you got any comments on the content or quality of the presentation?

| |
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| |

**Your next steps**

**7. Please describe at least one new strategy you will undertake as a result of attending this Update event**

| |
|---|
| |

**8. What are the first steps you will take?**
e.g. seek further information from a presenter, consider a new resource, talk to my network, start a trial in my business

| |
|---|
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**Your feedback on the Update**

**9. This Update has increased my awareness and knowledge of the latest in grains research**

| Strongly disagree | Agree | Neither agree nor Disagree | Disagree | Strongly disagree |
|---|---|---|---|---|
| ❑ | ❑ | ❑ | ❑ | ❑ |

**10. Do you have any comments or suggestions to improve the GRDC Update events?**

| |
|---|
| |

**Thank you for your feedback.**

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