

Farm decision making and AI

GRDC Farm Business Update

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1. Decision making is a skill

Some of the hardest decisions our business has faced have been about land: buying and selling farms, and in particular whether to sell a generational property on the Yorke Peninsula and shift our base to the Eyre Peninsula. Every piece of analysis we did said it was the right move. We very nearly made the decision to stay, for reasons that had nothing to do with the numbers and everything to do with what the place meant to us. I will come back to that, because it sits at the centre of what this paper is about.

I have spent forty years farming and about thirty of those advising other farmers on productivity and business decisions. Along the way I have studied how those decisions actually get made. One thing has stayed with me. We invest heavily in our machinery and our agronomy and we service the gear religiously, but we rarely stop to service the part of the business doing the deciding. Faulty decision making damages a farm every bit as much as a faulty header.

A decision is simply a conclusion you reach after weighing something up, and then act on. Choosing to do nothing is a decision too, and sometimes it is the right one. The encouraging part is that decision making is a skill, not a fixed trait, so it can be practised and improved.

The research behind the GRDC Farm decision making booklet found that the main thing separating the top twenty per cent of profitable farmers from the rest was not better luck or better country. It was their ability to make the right decision at the right time.

That matters more now than it used to. Data and analysis have never been cheaper or faster to come by, and artificial intelligence is about to make them cheaper and faster again. The bottleneck is shifting. It is no longer getting hold of information. It is deciding well once you have it.

2. A good decision and a right decision

It is worth separating two words we use interchangeably. A good decision is an informed one. To make it, you appreciate the consequences of each option, you set things up so you will have the least regret if it does not go to plan, and you improve your odds of a favourable outcome. All of that is within your control.

The right decision is different. It can only be judged in hindsight, and hindsight takes time. The decision you make today, on what you know today, might look wrong in two years and still have been a good decision when you made it. Many decisions have to be made without hindsight, before the dice are rolled.

Hold onto that distinction, because it sets the limit on what AI can do for you. AI can lift the quality of your information and sharpen your analysis. It cannot tell you the outcome, and it cannot carry the regret. Only you do that.

3. Three types of decision

Not every decision deserves the same treatment. Broadly they fall into three types, and knowing which one you are facing tells you how to approach it.

Type	What it looks like	Farm example	Mostly driven by
Simple	A few variables and a clear right answer	Which herbicide to use, read the label	The head, or a rule of thumb
Complicated	Many variables, but the relationships are known and documented	A crop rotation for weeds, resistance, disease breaks and legume nitrogen	The head plus analysis
Complex	Variables interact and the trade-offs are hard to quantify or model	Selling the family farm	The heart and the gut

The point to take from this runs through the rest of the paper. As a decision becomes more complex, the heart and the gut take over from the head, and they should. That is not a failure of rigour. It is the right response to a problem you cannot fully model.

A decision to sell a family farm is as good an example of complexity and emotion as I know, so it is worth spending a moment on the one I opened with.

The analysis was the straightforward part. Expansion where we were had run out of room, the country on the other side was underutilised and going for a fraction of the price, and the figures on comparative land values, rainfall reliability and what the capital would earn if it went to work somewhere else all pointed the same way. Every one of those is a number you can put in a spreadsheet, and every one of them said move.

What the spreadsheet could not hold was everything else. The place had been in Jeanette's family for multiple generations. Selling it meant working out what we owed the people who had farmed it before us and what we owed the ones coming after, and those two answers were not the same. It also meant saying out loud that expansion where we were had stopped, which is a harder thing to admit than it is to calculate.

Those are not soft factors sitting around the edge of a hard decision. They are the decision. They also work on each other, which is the part worth noticing. The pull of the place made us discount the opportunity on the other side, which made the numbers look closer than they really were, which in turn gave our reluctance somewhere respectable to hide. That is what complexity actually means. Not that there are many variables, but that they move one another, and that some of them cannot be put in a unit.

Nobody builds a spreadsheet that captures what it means to sell the country your grandfather cleared. The work in a complex decision is not to model it better. It is to be honest about which parts you are modelling and which parts you are feeling, and to give both their proper weight.

4. Head, heart and gut

Most decisions are shaped by three influences working together: the head, the heart and the gut.

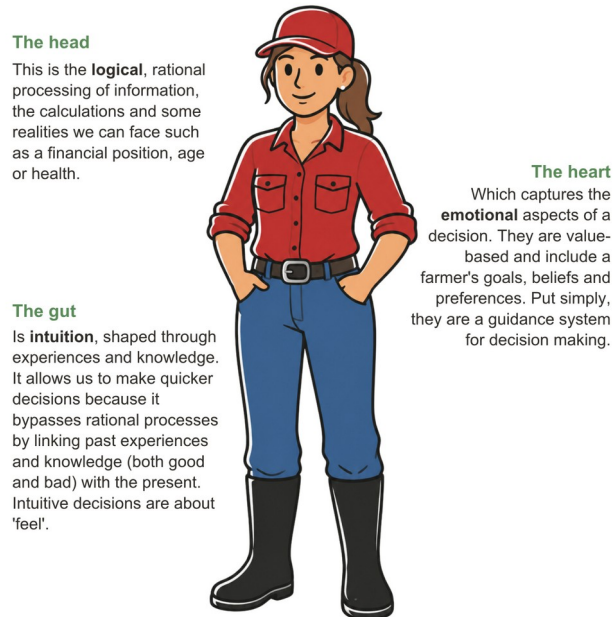


Figure 1. The head, the heart and the gut.

The head is the logical, analytical part. It works step by step, compares options on their merits, and shows its working so others can follow it. A great deal of agricultural progress has come from exactly this kind of analysis, and it is not going anywhere. The economist Bill Malcolm put the standard well: good analysis should be simple but not simplistic, simple figuring underpinned by sophisticated thinking. The trap at this end is the opposite one, of polishing the numbers past the point of usefulness. Better to be roughly right than precisely wrong.

The heart is the emotional influence: your values, your goals, your fears. In farming the heart runs especially strong, because the business is wound up with family, with community, and often with several generations of attachment to a place. That is not a weakness to be analysed away. It is part of the information.

The gut is intuition, built up over years of experience. It lets you decide quickly when you do not have time or complete knowledge, because it draws on patterns you have seen before. Two things are worth saying about it. Intuition can be trusted when it can be explained. You might have to dig deep into the memory and do some mental processing to get there, but mostly there is learned experience behind an intuitive call you might make. And it is only ever as good as the experience feeding it, so a young farmer's gut feel and a forty-year farmer's gut feel are not the same instrument.

5. Why emotion and experience outweigh the analysis

Here is the part I most want to land. In my experience the weight people actually place on emotion and intuition, when they make a real decision, is well over half. The analysis matters, but it is rarely what tips the call.

That farm sale I opened with is the cleanest example I have. The analysis was not close. The figures said move. And we sat on it, because selling the home place felt like a loss in a way no spreadsheet could price. We got there in the end, and it was the right call, but if I had treated the emotion as noise to be overridden, I am not sure we would have. A decision the decision maker cannot emotionally commit

to does not get implemented, or it gets implemented badly. So a more optimal answer that you cannot live with is not actually the better decision.

The booklet describes the mechanism well. We often make a decision on emotion and then go looking for the logical reasons afterwards. Knowing that about ourselves is useful. So is one well-established finding: the pain of a loss is felt about twice as strongly as the pleasure of an equal gain. It is worth asking whether a past loss is quietly holding your business back through fear of repeating it.

None of this means discard the emotion. It means check it. A few simple ways to do that:

Checking the emotion before you commit

- **10/10/10** (from Heath and Heath): how will you feel about this in 10 minutes, in 10 months, in 10 years?
- **The four Ls** (adapted from Sam Kaner's Gradients of Agreement): do I love it, like it, can I live with it, or do I loathe it?
- **Sleep on it.** The subconscious does real work, and things often look clearer in the morning.

A fuller description of these is in the appendix.

6. Rules of thumb

We could never gather and process everything relevant to a decision, even with all the time in the world. Our brains would jam. Herbert Simon called this bounded rationality: we work with what we have and make a best-bet decision, and sometimes the best bet is to wait. Two things let us do that well, intuition and rules of thumb.

A rule of thumb is a mental shortcut that simplifies and speeds up a decision. The difference from intuition is that a rule of thumb is tangible. You can write it down, teach it, and hand it to the next generation, which you cannot really do with a gut feel.

The catch is that a rule of thumb is only as good as its foundation. Good decisions are built on good information, so a rule needs to have been validated, not just inherited. A rule that was sound twenty years ago can quietly go stale while everyone keeps following it.

Rules of thumb, and when to question them

One many farmers have used for years: sell a third of the grain before the crop goes in, a third through the season, and a third at harvest. It has served well as a way to spread price risk. But is it always right? When wheat is sitting above \$430 a tonne, would you really stick to it rigidly? Should you not sell more aggressively? A good rule earns the right to be questioned.

Another common one: to build a budget, inflate your costs by ten per cent and hold your prices flat. Useful, conservative, and still worth checking against the year in front of you. Fertiliser and fuel price shocks like the ones we have seen make a big impact on profit margins, and were worth reviewing before the crop went in this season.

This is also the cleanest bridge to AI. Modelling tools like Yield Prophet have long been how good rules of thumb get made and tested in the first place. AI is the next step along that same path: a fast way to pressure-test a rule you lean on and ask whether it still holds.

7. Making better decisions: advisers, boards and Gibb

Good decision makers do not decide alone. A trusted adviser, a farm board, or even an informal sounding board adds something you cannot get inside your own head. It forces you to say your reasoning out loud, and it gets the problem looked at from an angle you would not have found. Use several advisers rather than leaning on one, and if you run a farm board, let it bring the discipline, the budgeting and the goal setting that are easy to let slide on your own. Online forums have a place too: ask the question, follow the thread, and treat yourself as a problem solver rather than someone waiting to be told the answer.

This is also where I want to plant a flag for later. The best decision makers listen to experts but do not follow them blindly, because any one expert only ever sees part of the picture. That applies word for word to an AI. It is articulate and fast, and it is just as blind to the parts of your situation you have not told it about.

Ian Gibb's characteristics of a good farm decision maker

- Identify the two or three variables that actually matter, and do not get distracted by the rest.
- Listen to experts, but do not follow them blindly. Each sees only part of the picture.
- Act quickly and decisively. Good options disappear fast.
- A near-ideal decision made in time beats a perfect one made too late. Analysis has diminishing returns too.
- Doing nothing is a decision, and sometimes the right one.
- Be prepared. Do not leave everything to the last minute.
- Do not beat yourself up over a decision that only looks wrong with hindsight.

8. AI in the decision process

This is where it comes together. Think of the decision as a flow. AI feeds data, data feeds analysis, and analysis and your gut feel check each other before anything reaches a decision.

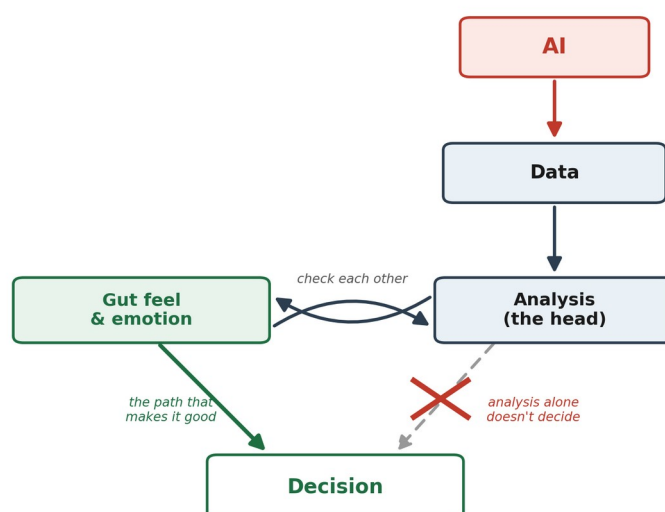


Figure 2. AI strengthens data and analysis, but a decision only becomes a good one once analysis has passed back through gut feel and emotion.

The thing to notice is the crossed-out arrow. Analysis taken straight to a decision, skipping the gut and the emotion, is not the shortcut it looks like. It skips the part that makes a decision yours and makes it stick.

What AI does well is supercharge the head. It widens and speeds up the data and analysis arm, across all three types of decision:

- **Simple:** best wheat variety for my district.
- **Complicated and benchmarking:** sense-checking a rule of thumb, or checking cost of machinery and debt levels against gross farm income. Modelling tools like Yield Prophet to help determine nitrogen applications or fungicide choices based on possible yield outcomes during the season.
- **Complex and strategic:** the big ones. Do I sell the family farm and move regions? How do we handle succession and transition?

Where it bites is provenance and bias. The question I keep coming back to is simple: where is this coming from? An AI gives a fluent, confident answer whether or not the ground truth is underneath it. Two risks in particular. The first is confirmation bias: it is very easy to keep prompting an AI until it agrees with you, which is just the stale rule of thumb wearing a new coat. The second is provenance: an answer is only as good as what the model was trained on and what you fed it, and it will not flag its own uncertainty unless you make it.

The real skill, and the part most people miss, is prompting AI to surface the human side of a decision rather than bury it. It does not only do the sums. You can ask it to name the biases likely in play, to argue the opposite case, to tell you what you might regret, to run a 10/10/10 on your behalf, or to point out the variable you have anchored on. Used that way it is not replacing your gut. It is defending your gut against your own blind spots.

A worked example: the soil amelioration decision

This season, we had a soil amelioration program mapped and costed across about 75 hectares when diesel and urea prices jumped sharply on the back of conflict in the Middle East. The question was whether the sudden cost increase changed the decision. My son Will put it to an AI and pushed it to do more than add up the diesel.

It built the full cost picture and ran a fuel-price sensitivity, which made the first useful point: at around \$2.50 a litre the job came to roughly \$840 a hectare, and even a big move in diesel only shifted that by about \$140 a hectare. Diesel was not the real driver.

Will asked it to run a Monte Carlo simulation across realistic yield, price and response ranges, which showed the decision actually hinged on one thing: whether the treated country would deliver a durable yield response above about fifteen per cent. Below that the project got fragile; at twenty per cent it was robust. Will also asked it to run a black hat, or inversion, analysis, the Charlie Munger habit of asking what would have to be true for this to fail, and the answer was that no single thing sinks it. It takes a stack of bad luck arriving together.

The part that mattered most was not the maths. AI helped us think through how we would feel if we spent that money and then had a terrible first season, and whether we could even execute the job in the window we had. It put a number on exactly that: a poor opening canola year still left the seven-year case intact on a strong response, but it would feel wrong at the time, with a big cheque written and little to show for it in year one. That is the emotional risk named in advance, before it could ambush the decision. Prompted well, the AI gave us both the analysis and a clear-eyed look at our own likely reaction to a bad outcome.

Good outputs generated from AI are dependent on sophisticated questioning. Ask it to check biases and spell out the likelihood of a poor outcome. Challenge the blind spots in our thinking!

The full report is attached in the appendix.

The closing point is the diagram again. AI will lift the analysis arm as high as you like. The decision only becomes a good one once that analysis has passed back through your experience and your emotion. Analysis that skips that step is the crossed-out line.

9. Take-home

Decision making is hard, and every farmer reading this has lived through decisions that cost them sleep: buying, leasing, selling, the next big machinery call. Good analysis genuinely produces better outcomes and more prosperous businesses, and AI can speed that analysis up and stretch how far it reaches. Use it. But read your emotions through the process and match them against your experience, because that is where the decision is actually made.

A word for anyone starting out. When you are a young farmer or a young adviser, you do not yet have the depth of experience the gut runs on. The answer is to borrow it: sit with people who have made these calls before. Couple what the experienced folk might say with some modelling that you have to systematically think through. This helps fast-track intuitive thinking. Using tools like Yield Prophet quickly improved my understanding of the soil water holding capacity of soils in the region and how this relates to crop performance. The more I used it, the more I developed my own rules of thumb, and in time I could make judgements on crop performance and yield potential with a lot more confidence. Building intuition takes time.

I will raise one risk and then deliberately not make it my final point. AI makes it so easy to assemble an argument that we may stop building the argument ourselves. We are cognitive misers by nature; we take the easy path. If we let the machine do all the constructing, the critical thinking muscle wastes. My daughter Alice and I used Claude AI to help put this paper together, but I had already done the thinking over many years. We gave it the material and references to work with. It saved me the cutting and pasting, not the preparation work. That is the right relationship in a task such as preparing a paper: do the thinking, then let AI help organise and construct.

So the last word is the one the booklet and forty years both point to. A person's ability to recall an experience, and the emotion wrapped around it, is something AI will never reproduce and slot into a decision for you. Weigh your emotion and your experience carefully and wisely. They are not the soft part of the decision. They are the part that makes it yours, and the part that makes it good.

Valuable reference

Nicholson, C., Long, J., England, D., Long, B., Creelman, Z., Mudge, B. and Cornish, D. (2020). *Farm decision making: the interaction of personality, farm business and risk to make more informed decisions*. GRDC.

Acknowledgements

This paper was a real “team Long” effort. There have been years of family discussion on the broad topic of decision making and, as a family, we have made plenty of tough ones that have not always turned out the right way. The outcomes you do not want to occur are where we do our real learning. Mostly though, the decisions we have made have turned out okay, partly because we analyse and model options pretty well, but mostly because we check them against our emotions. If an option does not align with a set of

values and a clear purpose with a strategic outcome in mind, it will not pass the test and the status quo continues.

Thanks to my wonderfully talented wife Jeanette, and champion and deeply thoughtful adult kids Alice and Will, for your contributions and demonstrations of good decision making.

Appendix 1. A decision in practice: the soil amelioration call

Will Long

How AI, prompted well, helped with the numbers and with the harder question of how I would feel if it went wrong.

The decision, and the fear underneath it

We had a soil amelioration program mapped and costed across about 75 hectares. Then diesel and urea prices jumped sharply on the back of conflict in the Middle East. On the surface the question was whether that cost spike changed the call.

It did not, and finding that out was the easy part. The real question sat underneath the diesel, and it was not a numbers question at all:

- Am I confident these soils are constrained enough to respond?
- Can I actually execute the job properly in the window I have?
- How would I feel if I wrote a cheque for roughly \$63,000 and then had a terrible first season?

That last one is the question most analysis quietly skips. It is also the one that would have kept me up at night. So I asked the AI to help me face it head on, not just tally the costs.

What I asked the AI to do

The instruction was deliberately more than “add up the diesel”. I asked it to:

- Build the full cost picture and test how much it moved as fuel prices changed.
- Run a probabilistic simulation across realistic yield, price and response ranges, to find what the decision actually hinged on.
- Run a black hat, or inversion, analysis: what would have to be true for this to fail?
- Then help me think through the human side: whether I could execute in time, and how a poor first year would actually feel.

What the analysis found

Diesel was not the driver. At around \$2.50 a litre the whole job came to roughly \$840 a hectare. Even a large move in diesel shifted that by only about \$140 a hectare. Waiting for cheaper fuel was never going to make or break the decision.

The real hinge was the yield response. The simulation showed the whole decision turned on one uncertain number: whether the treated country would deliver a durable response above about fifteen per cent.

True long-run yield response	Risk of losing money (normal seasons)	Risk with a poor first year
10%	69%	83%
12%	29%	42%
15%	4%	7%
18%	under 1%	under 1%
20%	under 1%	under 1%

Below about 15 per cent the project is fragile. At 18 to 20 it is robust, and can absorb a bad opening year and still pay over seven years. The decision was never about diesel. It was a bet on whether these particular hectares were constrained enough to respond.

The black hat check made the risk honest: failure needs a stack, a modest response, a poor season, weak prices and imperfect execution all arriving together, not one bad number.

The part that mattered: naming the fear before it could ambush me

Here is where good prompting earned its keep. I asked the AI to stress-test the exact thing I was afraid of: a poor first season, straight after writing the cheque.

The poor-first-year arithmetic

A weak opening canola crop, say 1.5 tonnes a hectare at \$650, returns only about \$195 a hectare of uplift in year one, against roughly \$840 a hectare just spent. On paper that looks like a disaster, and it would have felt like one. Yet the same simulation showed that if the true response is strong, the seven-year case stays intact despite that ugly first year.

That is the difference. The AI did not tell me how to feel, or pretend the fear was irrational. It put a number on it: a bad first year would feel terrible, and would not, on its own, be fatal. The fear was named and sized in advance, instead of quietly vetoing a good decision.

The framework it left me with

- **Green light now:** proceed if I genuinely believe the treated hectares deliver 15 to 20 per cent, and the business can carry a poor first year without losing its nerve.
- **Stage it:** if confidence is moderate, cash is tight, or the season looks risky, do the highest-confidence paddocks first.
- **Wait and learn:** if I increasingly suspect the response is only 10 to 12 per cent, or I am not ready to execute the job well, hold off and do more diagnostic work.

The upside, for balance. If the response lands as hoped, about \$63,000 invested becomes roughly \$130,000 of extra gross revenue over seven years, near \$65,000 to \$70,000 of added profit. The carrot is real, and so is the risk.

The point for the paper

The AI lifted the analysis as high as I wanted. It still could not make the call. That came down to three things it could inform but not decide: am I confident in the response, can I execute it, and can I live with a bad first year. Two of the three are gut and emotion, not analysis.

Appendix 2. Biases in farm decision making

These are the mental traps that quietly bend a decision. Naming the one you are prone to is half the defence.

Bias	What it is	Farm example
Confirmation	You seek out information that supports what you already believe	Holding wheat and reading only the analysis that says the price will rise
Anchoring	You fix on an early number or reference point	The first tractor quote becomes the basis for the whole machinery decision
Availability	The event easiest to recall feels the most likely	Over-weighting a recent hail or frost when it is actually rare
Overconfidence	Thinking something is better than it is	A block that is not yielding, but you are sure it will come good
Loss aversion	The pain of a loss outweighs the pleasure of an equal gain	Changing a practice feels like a loss, so you do not, and you keep stock too long
Sunk cost	Throwing good money after a past spend	Keeping a header running because of what you have already put into it

What to do about it. The same handful of habits guard against most of these: name the two or three variables that actually matter, deliberately argue the opposite case, ask what you would regret, and use the tools in Appendix 3 before you commit. An AI is good at running these checks on demand, as long as you ask it to challenge you rather than agree with you.

Appendix 3. Decision tools

Quick frameworks for checking a decision against your head, your heart and your gut before you commit.

10/10/10

When emotion is running high, ask how you will feel about this decision in 10 minutes, in 10 months, and in 10 years. It pulls a hot decision out of the heat of the moment. From Chip and Dan Heath, *Decisive* (2013).

The four Ls

When you are stuck on a call, run it through four questions: do I love it, do I like it, can I live with it, or do I loathe it? A decision you can only just live with is a different animal from one you love, and it pays to know which you are signing up for. Adapted from Sam Kaner's Gradients of Agreement.

KASA

A self-check before you commit, across four areas:

- **Knowledge.** Do I actually know enough to make this call, or am I guessing?
- **Attitude.** How do I really feel about it? Keen, reluctant, overwhelmed?
- **Skills.** Can I, and the people I have, actually execute this in the time available?
- **Aspirations and motivations.** Does this move me toward what I want for the business and the family, or just away from a problem? Am I motivated to do this?

Sleep on it

For any big decision, buy yourself some time. The subconscious keeps working on the problem, and things that look tangled at night often resolve by morning. Even trying to figure out a relatively simple problem can be awkward at times. I have often come back the next day with a solution that was not clear to me the first time.