DECIDE AND THRIVE

RESEARCH REPORT

Producer Behavioural Insights: Stock selection strategies before, during and after drought

The use of producer and advisor behavioural insights to co-design and demonstrate / extend / train the enhanced stock selection system to producers, advisory services, and commercial providers of digital platforms.

Dr Cathy O'Mullan

March 2023

DECIDE AND THRIVE

RESEARCH REPORT

"Most of the time, we think fast. And most of the time we're really expert at what we're doing, and most of the time, what we do is right".

(Professor Daniel Kahneman, Nobel Prize Winner, Princeton University)

Introduction

In Australia, the frequency and severity of drought is predicted to increase; this will exacerbate the challenges of managing feed utilization and preventing degradation of pasture and rangeland, as well as loss of natural resources (Howden, Crimp & Stokes, 2008). Traditional rules of thumb that livestock producers have relied on to determine which breeders to sell and what proportion of the herd or flock to keep, may no longer be effective (Tversky & Kahneman, 1974). Making decisions about herd size and ranking of animals has made the task of balancing herd size with feed availability, especially in response to drought preparedness, even harder (Bowen & Chudleigh, 2021).

There are three critical control points at which livestock producers need to make difficult decisions, but the stress of drought can impair sound judgement. Firstly, when to take action in response to worsening drought; secondly, what actions to take (e.g., feed, agist, destock) ; and thirdly when destocking, what proportion of breeders to sell and how to identify them in the herd/flock. While all the critical control points are important, information to inform the extent of destocking and the ranking of animals has the greatest need for development, extension and adoption to improve drought preparedness and response (Bowen & Chudleigh, 2021).

Responding to this requires technological innovation informed by social science insights that address the cognitive barriers drought places on producers. Selling too many animals will slow the rebuilding phase of the herd/flock and selling the wrong animals will impact future production and financial security (Bowen & Chudleigh, 2021). Choosing which animals to cull requires a balance between immediate production (phenotypic merit) and long-term performance (genetic merit) of the herd/flock (Hayes et al., 2009). The decision to cull animals during a drought, therefore, is a complex one. The decision can have significant impacts on the producer's income, as well as the long-term viability of their herd or flock.

To make a well-informed decision, producers must consider a range of factors, including the age and health of their animals, and their breeding potential. They must also assess the financial and emotional impacts of culling, as well as the long-term implications for their farm's productivity and sustainability (Department of Agriculture, Water and the Environment, 2020). Traditional decision-making models have typically emphasized the rational evaluation

of information and the use of analytical tools to guide decision-making (Liu et al., 2020). However, recent research has highlighted the importance of integrating emotional and intuitive factors into the decision-making process (Nuthall & Old, 2018; von Diest et al.,2020).

The concept of "head, heart, and gut" as applied to decision making provides a holistic view of decision-making that integrates cognitive, emotional, and intuitive factors (Brown et al., 2018). The concept is attributed to several different sources (Gigrenzer & Todd, 1999; Goleman, 1996; Klein, 2008) and provides a valuable framework when dealing with complex and uncertain situation such as drought. In this context, 'the head' refers to the logical, rational processing of information by producers, 'the heart' to the emotional aspects of decision making and 'the gut' is intuition which is shaped by knowledge and lived experience. Social influences and factors also play a significant role in decision-making (Liu et al., 2018), particularly in the agricultural industry.

Social factors can include social norms and expectations, peer pressure, community values, and cultural beliefs. For example, a producer may be influenced by the practices of their neighbours when making decisions about culling or breeding their herd or flock. Additionally, social factors such as access to resources and support networks may also impact on decision-making (Jakku et al., 2022). Social cognitive theory (Bandura, 1986) provides a theoretical framework for understanding how individuals learn from their environment, and how they use this information to make decisions. By using this theory as a foundation for a qualitative exploratory approach, we interviewed 30 livestock producers and advisors to answer the following research questions (RQ), with emphasis on the context of responding and recovering from drought:

1.   How do producers make decisions about which cattle/sheep breeding stock to cull?

2.   What are their attitudes towards decision making tools?

3.   What would they like to see/ features of a decision-making tool or system?

Methods

We applied a qualitative, exploratory approach, underpinned by social cognitive theory, to examine producer and advisor decision making related to culling in the context of drought. By using this theory as a foundation for a qualitative exploratory approach, we were able to explore how social and cognitive factors interact to influence decision-making. In line with a qualitative exploratory approach, 30 Australian producers/advisors throughout NT, Qld, Vic and NSW were interviewed.

DECIDE AND THRIVE

RESEARCH REPORT

Recruitment and Sampling

Purposive sampling, a non-probability sampling technique, was used to recruit participants for the study. The goal of purposive sampling is to identify and recruit participants who have unique perspectives that can provide rich and in-depth insights into the research topic. A sample size of 30 was considered pragmatic; data collection would be both feasible and efficient within the given time frame and resources. With the assistance of the project steering committee and professional networks (such as agricultural extension officers), potentially suitable producers and advisors were identified and contacted by email/phone. If a participant met the inclusion criteria, they were invited to participate in the study.

Inclusion criteria:

- Australian producers (and their advisors) in NT, Qld, Vic, NSW

- Primary source of income is agriculture (>50%)

- Beef cattle producers (breeders) minimum of 250 head and/or

- Sheep producers (breeders) minimum of 2000 ewes.

Exclusion criteria:

- Primary source of income is not agricultural (eg consulting, teaching)

Snowball sampling (where participants recruit other participants) was used in addition to purposive sampling. By using snowball sampling, the researchers were able to leverage the social networks of their initial purposive sample to identify and recruit additional participants who met the inclusion criteria for the study.

Data collection and Analysis

Participants who met the inclusion criteria and agreed to participate in the study took part in a telephone or Zoom interview with Dr Cathy O'Mullan. Thirty participants were interviewed (see Table 1) and can broadly be described as: i) highly experienced producers who had experienced varying degrees of drought; or ii) highly experienced advisors.

DECIDE AND THRIVE

RESEARCH REPORT

State/Territory	Region	Participants	Scale	Notes
Northern Territory	Katherine and Alice Springs	3 producers	144,000 to 300,000 hectares	3 beef operations
Queensland	Central Qld, North Qld, Central West Qld and SE Qld	10 producers	4,000 to 140,000 hectares	9 beef producing operations, and 1 mixed Merino/beef operation.
NSW	North Central NSW, New England, South Central NSW. Advisors cover State of NSW	7 producers 3 advisors	700 to 4,000 hectares	3 beef operations, 1 beef/cropping mixed operation, 2 beef/sheep operations, 1 sheep merino operation, 3 advisors/consultant (mixed)
Victoria	Grampians Advisors cover State of Victoria	4 producers 3 advisors	800 to 7,800 hectares	4 sheep/wool operations and 3 consulting businesses (one beef and two mixed livestock).

Table 1: Summary of participant characteristics.

Data collection - each interview lasted between 45 – 80 minutes. Questions (semi-structured) were developed with the wider research team and piloted with two producers. Throughout the interviews, participants were asked to discuss their experiences of making decisions to retain or cull livestock as part of a drought management response. Participants

were also asked about decision making tools and encouraged to share ideas for the development of new tools. All interviews were transcribed and formed the basis for the content analysis. To ensure the anonymity of all participants, we replaced identifying information, such as names and places, thus creating a pseudonymisation of the transcripts.

Data analysis - the analysis of data followed a deductive content analysis approach (Krippendorff, 2013), using pre-existing categories, which were aligned with the research questions, to guide the coding of interview data. To develop a pre-determined codebook, an Excel spreadsheet was used. After each interview, notable excerpts were assigned codes, which were recorded in the codebook. The coding followed a top-down approach. As the coding progressed and key themes started to emerge, the research team met to discuss the data and to produce a narrative for each State/Territory. The purpose of the analysis was to identify producer behaviours, attitudes, and motivations, and to draw conclusions about the factors that influence producer decision-making.

Key Findings

Decision making in the context of drought is complex and varies significantly depending on region and scale. Therefore, the findings are presented by Territory or State (RQ 1 and 2), followed by the suggestions for tool features (RQ 3). Direct quotes from producers or advisors are *italicised* throughout the findings section.

Northern Territory

Three livestock producers were interviewed in the Northern Territory - all properties were family-owned beef cattle farms and ranged from 144,000 to 300,000 hectares. Mob based decision-making prevails with a focus on keeping their herds healthy rather than a focus on individual animal ranking. While profitability remains important, these producers prioritise maintaining their family farms as a source of employment and reputation and preserving the land for future generations. Overall, their decisions were pragmatic and self-reliant, with a focus on preserving their family's legacy.

NT participants in our study "..*have a drought mindset most of the time*" as they expect seven out of 10 years to be affected by drought. While drought was not considered to be a "…*regular topic of discussion,"* drought preparedness is a significant focus. All participants talked about the unique challenges of destocking compared to other States, and the need to carefully weigh the benefits and risks of destocking decisions. Producers also talked about making decisions based on when the final rain finishes - typically in April/May each year. Participants felt this allowed them to work around the drought and make informed decisions based on the available resources at that time. In 2019, however, the rainfall was lighter than usual, which resulted in an extreme fire season and the need to increase culling efforts.
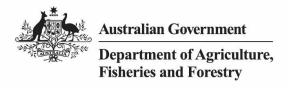
DECIDE AND THRIVE

RESEARCH REPORT

Two producers talked about culling 10% of the herd annually; "…*10% culling is built into our business model*", however, culling increased in 2019 in response to climate variability. Culling decisions are primarily based on temperament and fertility, with reproductive culling coming to the fore during drought years. The temperament of cattle is a crucial factor in the management and culling decisions made by participants from the Northern Territory; "…*we're a family-owned business, we're working the cattle ourselves, so temperament is big, it's our number one thing.*" Cattle with a good temperament were viewed as easier to handle, less stressed and therefore more productive.

Reproductive culling becomes a critical aspect of cattle management in drought years, and producers spoke about implementing "*calve or cull*" strategies to maximize their resources. This strategy helps to maintain or improve the overall reproductive efficiency of the herd and conserve resources for the remaining animals. Of note, two out of three producers gave cattle a two-year chance to calve during drought. As noted by one producer "…*it may be more cost effective to give her a second chance rather than culling and investing in a new cow down the track.*"

Participants from the Northern Territory discussed the importance of stocking conservatively post drought. Given the unique circumstances (geographic isolation, limited access to markets and lack of processing facilities) producers did not "… *have the flexibility to lighten off really quickly if required.*" The importance of timely and accurate information was, therefore, essential. Of note, participants from the Northern Territory exhibited a high degree of self-reliance in decision-making and were hesitant to seek advice from external sources due to the unique nature of their properties. They rely on past experiences and intuition to inform their decision-making and view their peers and neighbors as valued sources of knowledge or advice rather than advisors, researchers, or scientists.

Participants placed a high value on local knowledge and lived experience and are therefore skeptical of tools that do not consider the specific nuances of their properties "…*properties are so unique in NT; we consider ourselves to be experts on our property – we are hesitant to seek advice elsewhere.*" However, they do find certain government reports and online resources useful, such as Pasture Advice, BOM website and Fire Tracking tools (Fire North technology). There was very low interest in an individual ranking tool as the scale is too large, and the variables are too great. Overall, participants in the Northern Territory prioritise pragmatic decision-making over nuanced approaches and are proud of their self-reliance and family history.

SUMMARY QUOTE: "We have a proud history (150 years) hence succession planning is important and drives most decision making. Our property is a family heirloom that needs to be preserved. Decisions are based on history (well documented) and local knowledge."

DECIDE AND THRIVE

Queensland

Ten livestock producers in Queensland were interviewed for the study. Properties ranged in size from 4,000 to 140,000 hectares and were predominantly beef cattle producers with one mixed sheep/cattle operation. Nine of the farms were family-owned, with one small corporate farm. The producers in this study have a similar scale to those in the Northern Territory (NT), with a "bigger is better" mentality prevalent. As such, mob-based decision-making is more common than individual decision-making. While five family farms primarily focused on a profit-based business model, the other five producers were motivated by a combination of factors. These factors included succession planning, environmental concerns, and lifestyle choices for retirement.

Our findings highlight the impact of continual drought on the producers, with the most severe effects occurring from 2017 to 2021. While decision making during drought often has a more tactical, short-term approach, in Queensland, most participants seemed to now adopt the position of "*always in drought.*" What might have started as a short-term approach has become the norm. Many participants have changed their practices in response to early drought conditions, including high levels of destocking, with some producers opting for regular soft culling. Participants recognised that destocking is less challenging in Queensland, when compared with the Northern Territory, with restocking being much simpler. Destocking is typically higher over short periods (50-60%), and reproductive culling (calve or carcass) dominates. Unlike participants from the Northern Territory, however, most producers do not give a second chance to cattle who do not fall pregnant.

While destocking and reproductive culling can be a difficult and emotionally challenging process for producers, many producers chose to focus on the benefits of culling animals who were not contributing to the breeding program and acted quickly and decisively. Our findings reinforce the message that early decision-making is crucial for producers; indeed, most producers talked about the importance of making difficult decisions quickly and decisively. *"Don't procrastinate – if summer rains fail, we need to sell."* Early decision making helped to reduce stress and uncertainty. It is important to note that making decisions early does not mean acting hastily or without careful consideration. Having a plan and carefully considering the reasons for culling helped ensure decisions were in line with broader goals and objectives. As highlighted by one producer "… *cull to your motivation, whatever it is. To sustain lifestyle, make money, succession planning, for the environment, to maintain or grow."*

One interesting aspect of the study was the behavior of producers during a particularly bad year (2019). Several participants spoke about making opportunistic decisions to sell certain types of livestock for a competitive price "*I sold my PTIC cows early this year as I got good money"* and *"I normally sell my heavies first – I really didn't think the lights would make weight so I may as well get something."* While the participants acted decisively, upon

reflection, many questioned their decision leading to sleepless nights and a possible rethink of strategies. "*Did I make the right decision, what if it does rain, did I act too quickly?*" While most producers in Queensland made decisions based on gut feel and lived experience, there was recognition that an objective tool may help with "…*psychological safety and may help me sleep at night.*"

In Queensland, decision-making is heavily influenced by peer and family networks. Although participants were not overly reliant on experts, they do seek the advice of consultants and paid advisors when required. Expert advice is particularly sought after in cases where the business is a corporate farm or when producers have experienced adversity and seek a renewed focus on their business model. Overall, many participants talked about trusting their own instincts and knowledge gained through years of working in their industry. They also spoke about the importance of accessing various tools and resources. Some of these tools include Black Box, Long Paddock, RamSelect, BOM website, and MLA tools. Many producers had also developed their own simple Excel spreadsheets, with some producers using Excel to record individual data.

Due to scale, mob-based decision making prevails in Queensland. As such, there was a mixed response to an individual ranking tool, ranging from *"… who has time to do that, really*?"*, through to participants who felt the idea of an individual ranking tool may be useful for corporates or producers facing challenges and needing to rethink their business strategy. Younger producers appeared to be more receptive to a tool, but the prevailing mindset in Queensland is to build bigger operations rather than focus on improving livestock genetics. Nevertheless, our findings suggest that data-based tools may be useful for psychological safety and have potential to help producers make more informed decisions.

SUMMARY QUOTE: "I think the big difference moving forward in Queensland is the ability to break away from the lifestyle or the romance of being a cattle producer to actually being a business that happens to own cattle."

New South Wales

Seven producers and three advisors based in NSW were interviewed for the study. Properties ranged in size from 700 to 4,000 hectares with three mixed farming operations (merino wool focus with beef cattle) three beef producers and one merino wool producer. Five of the farms were family owned (3rd and 4th generation); two farms were corporate family farms. In NSW, the focus was on 'working smarter' at an individual level, with a greater emphasis on sustainable land management and precision farming due to the scale of the properties. As noted by one producer, unlike areas such as Queensland and Northern Territory "...*we can't destroy as we don't have a spare 300,000ha to play with*". While profitability is a consideration for producers, it was not the sole focus.

DECIDE AND THRIVE

RESEARCH REPORT

Rain fall varies dramatically across the State, although many regions receive relatively stable rainfall with an average catchment rainfall of 800 millimeters. The period from 2017 to 2020, however, was marked by distressing climatic conditions, characterised by prolonged drought and devastating bushfires. Notably, the drought experienced in 2019 was particularly severe and had far-reaching impacts on all producers. A couple of producers made culling decisions based on soil moisture profile rather than 'drought'; others made decisions based on feed quality not rain. Mixed farm producers spoke about the importance of holding cattle for maintaining grass length, however, in the 2018-19 drought, two producers culled cattle by 50 and 60 % respectively. In both cases, cattle were perceived to be "*expendable*", when compared to sheep. In both cases, producers utlised containment feeding to maintain sheep, who were "*held at all costs.*"

The sheep industry focuses on containment feeding as a primary strategy to preserve ground cover during drought, with most producers reluctant to cull sheep as they are considered more valuable than cattle. *"Our aim is always to keep 70% ground cover but look after flock we have.''* Throughout the drought years of 2018-20, the dominant approach among sheep producers and the advice offered by advisors was to "*keep and feed*" their flocks. This was driven by the perceived value of sheep, and the cost of breeding them again if they were sold, *"Our sheep are in 15 micron bracket (valuable and specialized) - if we destock, we have to breed them again – we can't sell and buy back."* However, one farm manager disagreed with this approach and believed that sheep should be culled during drought, based on fertility. All advisors talked about 'soft culling' of unproductive sheep (typically 10%) on an annual basis, with one advisor highlighting the importance of building quality stock through genetic testing. One advisor also focused on building quality stock but felt the focus on genetics was '*overrated'* stating "*you need a lot of ewes to really change the genetic bank."*

It is clear from the interviews that most sheep producers do use ranking systems to evaluate their flocks. While containment feeding is practiced, there is still an emphasis on maintaining quality, which is why tools that can assist with ranking were of interest to the producers. Only one producer culled sheep during the drought, reducing their flock from 3500 to 1500 ewes in two years, while also culling 100% of their cattle. Her traumatic experience led to a rethink in business practice "… *my recovery efforts after the drought have focused on strategic culling based on soil moisture levels and individual flock indexing/ranking.*" As highlighted by one advisor, *"…cash strapped producers often make premature decisions to sell during drought,*" he considers building a quality stock, holding onto that stock, and encouraging a long-term focus (as opposed to a knee jerk reaction) the key to recovery.

As opposed to sheep producers who prioritise preserving their flocks during drought, cattle producers and advisors have emphasised the importance of culling as a means of preserving their land and natural resources. For instance, regular seasonal destocking (10%) has been adopted as a key strategy to maintain ground cover and prevent overgrazing.

Culling during drought is also viewed as an opportunity to improve the genetic potential of the herd and reduce the risk of further land degradation. Interestingly, a number of cattle producers (three) and one consultant viewed drought as an opportunity "…. *to increase genetic potential of herd, to sell and buy back better (genetic shopping*)." Not surprisingly, adversity was referred to as the '*mother of invention*', with some producers recounting experiences of changing practices after an adverse experience. Several producers had also benefited from knowledge passed down and lessons learnt through the generations. One example, "*In the past, my father fed during droughts and passed down knowledge to not feed but sell. By feeding, the land degraded and he lost a lot of money – I've learnt from past mistakes."* Again, this producer and others reiterated the importance of selling early and not looking back *"… destock early, make a decision and stick with it."* Overall, reducing the number of cattle, allowed producers to look after their country and preserve natural assets, whilst still maintaining profitability.

As noted earlier, maintaining ground cover is a key motivator in NSW, hence cattle producers talked about seasonal destocking on a regular basis, typically between November and March. A number of producers closely followed the KLR principles of decision making (training focuses on 3 dials - grass, livestock and money). As one producer explained *"You cannot have too much money or grass, BUT If you have too much livestock you will find yourself in a hole."* Throughout the 2018 – 20 droughts, however, producers talked about moving away from seasonal soft culling to dramatic culling (60% - 100% over 2 years). Several producers spoke at length about "… *rushed decision making in drought"* and lamented the focus on mob-based decision making. During this time, key culling decisions for breeders were based on fertility – calve or carcass, then visuals. Of note, after the drought producers spoke about *"… a renewed focus and recognition of individuals within herd".* As explained by one producer after a recent drought *"Mob based decision making was considered to be a knee jerk reaction in hindsight. I struggled with decision making - hence I'm a fan of tools from here on in."*

Overall, most producers interviewed in NSW valued the importance of engaging with advisors. Only two producers relied exclusively on family or peer knowledge, favouring lived experience, rule of thumb and intuition over objective data. Negative past experiences with consultants and mistrust of scientists were cited as factors influencing the decision to not seek external support. As one consultant mentioned, *"…many cattle producers who are new to the area (NSW) rely on experts and paid advice; intergenerational ownership is less common compared to NT/Qld for example."* Local services seem well utilised in NSW such as DPI and Local Land Services. KLR training, Grazfeed, Lifetime Ewe Management Training were also valued. Other tools such as RamSelect, and MERINOSELECT were highlighted by sheep producers. A relatively recent tool from Qld, Blackbox, was flagged as a tool with potential for cattle producers. Simplicity is key, and Excel has been adapted by several producers for individual ranking purposes. As noted by one advisor, he feels that

producers favour Excel as opposed to Blackbox technology as "*…they can control the input and the output, and have complete faith in the process.*"

Due to the smaller scale of properties, there was a greater focus on working smarter and with precision in NSW. Overall, there was strong support from producers and advisors for the concept of an individual ranking tool, with mixed support for the use of genetics. Producer quote, "*Any tool that adds economic value to individual traits is a good idea.*" Producers focused on the genetics of their breeding stock, however, were particularly interested in the ranking tool for keep / cull / feed decisions but cautioned against the idea of relying on this as the only form of knowledge or a "*one size fits all*" model. Understand motivations and context, and recognising the importance of all forms of knowledge (head, heart, gut) is crucial.

SUMMARY QUOTE: "As genetic profiling becomes more cost effective, I see lots of opportunity in this space. Won't totally replace visuals, gut feel, intuition, but a ranking tool will make decision making a lot easier and more detached."

Victoria

Four producers and three advisors (based in Victoria) were interviewed for the study. Properties ranged in size from 800 to 7,800 hectares. All four producers focused on Merino wool, and farms were family farms (minimum of 2 generations). Of the three advisors, two were beef/sheep focused, one was exclusively beef cattle. In Victoria, the focus was also on 'working smarter' at an individual level, with producers emphasising the importance of having a stable income to meet profit margins. One producer, however, expressed concerns regarding profit focused motivations "*Most producers who are profit driven risk running business into ground - they mine it until there is nothing left at the end.*" Not surprisingly, given the small scale of most farms, soil was identified as an important asset to be protected. Sustainable farming and succession planning were identified as important motivators by all producers interviewed in Victoria. Advisors discussed how decisions were made based on producer motivations. Not surprisingly, advisors were employed to assist with achieving business goals (to improve profit), with a clear *focus having each business "fully operational post drought as quickly as possible."*

Producers and advisors highlighted the relative predictability of rain and the accessibility of dams, especially compared to Queensland and NT. There was a perception that drought happened every few years "*…rather than consistently*" and were typically shorter compared to other parts of Australia. The impact of frosts and bushfires were highlighted as particularly challenging issues, and more recently the additional trials of dealing with severe and
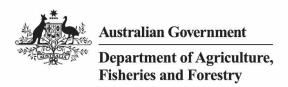
widespread flooding across the State. Managing '*climate variability*' and having a plan as opposed to '*managing drought*' was seen to be imperative.

To manage climate variability, the sheep industry focuses on "*doing the basics well*" all year round. Three of the four producers destock seasonally, approximately a third of the flock each year irrespective of drought. The focus is on keeping the best breeding stock and then trimming around the edges. Reproductive culling (*removing the empties*) dominates and then lesser performing animals (visual check – age, poor physical condition, dental) are removed. As noted by one producer "*Culling a third is most profitable and sustainable. We are able to regenerate pasture growth with this strategy.*" Individual data is collected during regular animal management activities, and Excel spreadsheets were used to store data. One producer was using genomics to identify best traits/heritable traits and was adamant that small scale producers need to be moving towards objective decision making "*The farm is not big enough, you can't rely on decisions based on gut and emotion; it's got to be business.*"

When experiencing climatic extremes (bushfire, drought), containment feeding was a priority. Most producers had accessed government drought funding to ensure containment pens were set up. "*We've never approached a drought with the strategy of selling excess sheep, or selling any sheep. We focus on building and maintaining our good genetics so it's better to feed and look after the stock we've got.*" This comment was echoed by other producers, with most discussing how difficult it was to replace "*precious and high-quality ewes*". Producers in Victoria also highlighted the opportunities offered during terms of adversity. As one producer commented *"big production years are big cost years - low production years are time to breathe and plan."* Successful navigation of climatic challenges centered around strategic planning and objective decision making based on producers' motivations and their vision for the future. While emotions and instincts still played a role, their influence appears to be less significant than in other States, such as Queensland.

Consultants had mixed views regarding culling, with one beef/sheep advisor favouring containment feeding for livestock during drought "… *in the last drought my advice was that there was adequate evidence to suggest that there was greater financial reward from retaining livestock relative to culling them.*" He did recognise the importance of reproductive culling if containment feeding was not an option, though. In contrast, another beef/sheep advisor advocated for more targeted/aggressive culling during drought, highlighting the aggressive marketing of containment feeding as a concern. In his words "… *there's a passion for feeding at present – but there are more ways to skin a cat.*" He discussed the approach of using commercial classifiers to assist with targeted culling during drought, especially for sheep. He believes individual ranking offers much potential and can assist with "*fine tuning the culling process during drought".* Two out of the three consultants were enthusiastic about individual ranking; both highlighted the importance for the sheep industry in particular, and the potential that genetic testing can offer. One advisor (beef consultant), felt that "…*we hide behind the genetic potential too much*", stressing that for most producers

DECIDE AND THRIVE

RESEARCH REPORT

"…*the most important thing is to have a cow producing a calf every 12 months and weaning that calf to breeding.*"

All consultants emphasised the importance of having a plan and echoed the importance of decision making based on objective data, not just intuition. Getting the basics right and following "… *the key messages of planning, of acting early, and having trigger points*" were considered imperative and time-honoured approaches. In Victoria, participants tended to value the use of external consultants when making decisions during climatic extremes, rather than relying solely on family or peers. By seeking out the advice of external consultants on a regular basis, producers felt more confident in their decision-making. Smaller operations often have less room for error and fewer resources to fall back on in the event of a crisis, hence producers valued impartial advice based on data and industry best practice. Family and peers were also involved in decision making but to a lesser extent when compared with Queensland and NT.

Overall, due to the smaller scale of properties in Victoria, there was a greater focus on working smarter and with precision. While there was strong support from producers and two consultants for the concept of an individual ranking tool (and some support for the use of genomics). A number of participants felt the tool would be a hard sell. There was a perception among some producers and most advisors, however, that producers may only consider new technology if they had experienced or were close to experiencing a catastrophe; "*The pain of making a change needs to be less than the pain of continuing on same path.*" There was a lot of support for simple ranking tools, however, especially a tool based on Excel which most producers were familiar with. There was a perception that most producers were simply "…*too tired and too stressed to learn complex programs.*"

SUMMARY QUOTE: "As a whole we need to start focusing on profit, because if we make a higher profit per sheep / animal, scale becomes less important, reducing risk and taking the pressure off our resources, and vulnerability to the impacts of drought."

Suggested Tool Features

- Excel is widely used and a preferred approach. Don't need bells and whistles.

- Simple and easy to use especially for the not very techno savvy (age 50 plus bracket). Illiteracy/dyslexia issue. This is key.

- Needs to synchronise or be integrated with other existing tools eg Gallager, Tru-Test.

- Ability to upload photos and notes. Print off and save option.

DECIDE AND THRIVE

RESEARCH REPORT

- Phone based useful but must synchronise across devices. Needs to be able offline. Do not want to re- enter data.

- Output visuals are important (pie graphs, bar charts).

- Flow charts help – real time assessments that can be adapted.

- Filters are useful to select different variables.

- Needs to be habitually used and introduced 'outside of drought'.

- A tool that can be used to help producers deal with drought *and other weather extremes.*

- Data needs to be accurate and clean. Key training focus.

- Hook with a simple tool (free) and offer extra layers if required.

- Pilot test extensively.

- Less features and more support.

- Demonstrate how to use data generated in a meaningful way.

- Front end support is vital. After hours support.

Useful tools/training recommended by producers include CSIRO GrazFeed, Lifetime Ewe Management app, Black Box Co, Decision Wizard, KLR Decision Making, RCS Training (Yeppoon), RamSelect, MERINOSELECT, RAM Power.

Insights for Messaging

- Emphasis on nuanced messaging that balances the competing priorities in farm decision making, such as profit, pasture management, environmental protection, and psychological peace of mind.

- Producers are receptive to the message to 'sell early' and 'not look back' – it will be important to show how the ranking tool can help make this decision easier.

- In Southern States, messaging needs to tap into the idea that a tool can also increase their resilience to climate variability.

- Messaging will need to tap into the mixture of objective and subjective information processing by producers. Even the most progressive and objective producers still rely on local lore and family traditions to inform some activities.

- Local knowledge and propriety need to be respected (as a generalisation, there is an inherent mistrust of academics and scientists).

- Gut, intuition, and history must be part of a balanced message that a rankings tool is just part of a suite of information sources that producers should consider when decision making.

- Family, friends, advisors, and peers play a key role in influencing farming behaviour. Messaging will need to also consider and target these important influences.

Limitations

While purposeful and snowball sampling can be a useful method for selecting participants in qualitative research, these sampling techniques are not without limitations. The selection of participants was based on inclusion criteria that were deemed important by the research team. As such, the sample does not fully capture the diversity of experiences and perspectives within the farming population and limits the generalizability of the findings. Purposeful sampling may also result in smaller sample sizes as it may be difficult to identify and recruit participants who meet the criteria set by the research team. While we were able to interview 30 participants, the research team received little response in the Northern Territory or from producers in Southern NSW and Victoria. There was limited response from producers in the NT, potentially due to different operating systems, which may not have aligned with our research questions or objectives. Producers in southern NSW and Victoria were preoccupied with floods during the data collection phase and may not have been responsive to inquiries about drought. The inability to recruit from these regions limits the scope of the research and prevents a comprehensive understanding of the impact of drought on producers across *different regions* in Australia.

It is important to note that the primary sampling method used in this study was purposeful, relying on established networks of the CQU, UNE, and CSIRO research teams to identify potential participants. This approach may have resulted in a sample that is skewed towards producers who are already implementing best practices or involved in research, potentially excluding those who are not as engaged or innovative in their farming practices. Snowball sampling, particularly in Victoria and NSW, may have resulted in a limited variety of participants and responses. Participants typically referred producers who shared similar views or experiences, thereby reducing the diversity of perspectives and potential insights.

Given the relatively small sample size, the findings presented should be considered suggestive rather than definitive. However, they do provide a valuable snapshot of the perceptions and experiences of producers and advisors.

DECIDE AND THRIVE

RESEARCH REPORT

Final Thoughts

The interviews have provided valuable insights into the decision-making priorities and processes of producers before, during and after drought. A lack of perceived benefits or clear value proposition for the individual producer's context has been identified as a perceived barrier to the adoption of new technologies or tools. Thus to increase adoption rates, any new tool or ranking system should be user-friendly, with well-defined value propositions. Furthermore, it should tap into various motivations, including the ability to enhance drought resilience, increase profitability, achieve sustainability goals, and improve land condition.

Key insights obtained include:

- There is little interest in the NT for selection tools operating at the individual animal level – the size of the herds and the scale of the properties dictate a mob-based approach, with strong emphasis on local knowledge.

- In Qld mob-based decision making also dominates, although with a stronger focus on dollars as opposed to family and lifestyle in the NT. Prolonged drought in some areas has already shifted behaviours, with culling based firstly on reproductive performance and a strong lesson learned to cull early. Decision making is a mixture of gut feel, lived experience and some use of experts. There was also a difference in attitude between younger, debt-heavy producers, and those of older and more financially comfortable producers, with the former more willing to embrace objective tools and new practices. Recommendation to keep the tool simple and provide support.

- In NSW and Victoria there was strong support from producers and mixed support from advisors for the concept. Due to the smaller scale of properties, there was a stronger focus on working smarter and with precision. There was higher use of consultants and greater concern for managing the natural environment. Producers and advisors focussed on the genetics of their breeding stock and were interested in the ranking tool for keep / cull / feed decisions. A tool that adds economic value to individual traits was perceived to have relevance, especially in the merino wool business. Participants cautioned against the idea of relying solely on objective knowledge though and advocated for a simple ranking tool. In Victoria, the tool needs to move beyond language of "drought"; terms "climate variability" and "dealing with weather extremes" may help the tool gain more traction.

These insights will inform the development of a communications, extension, and training package in mid-2023. Based on the findings so far, there is likely to be an emphasis on nuanced messaging that balances the competing priorities in farm decision making, such as profit, pasture management, environmental protection, and psychological peace of mind. It

appears clear that producers are receptive to the message to 'sell early' and 'not look back' – it will be important to show how the ranking tool can help make this decision easier.

The messaging will need to tap into the mixture of objective and subjective information processing by producers. Even the most progressive and objective producers still rely on local lore and family traditions to inform some activities. This local knowledge and propriety need to be respected, especially given there is an inherent mistrust of academics and scientists. Gut intuition and history are important and must be part of a balanced message that a rankings tool is just one of a suite of information sources that producers should consider when decision making.

In the context of enhancing agricultural practice, it is evident that producers and advisors possess a wealth of experience and expertise in their field. As stated by eminent scholar Professor Daniel Kahneman: "***Most of the time, we think fast. And most of the time we're really expert at what we're doing, and most of the time, what we do is right".*** However, it is essential to acknowledge that there may be instances where decision-making processes may not be optimal or may be impacted by external factors such as drought. Ongoing collaboration between producers, advisors and researchers is crucial in developing solutions to industry problems and ensuring sustainable outcomes. We express our sincere thanks to the producers and advisors who generously shared their time and experiences with us, enabling us to gain a deeper understanding of their decision-making processes.

DECIDE AND THRIVE

RESEARCH REPORT

References

Bandura, A. 1986, *Social Foundations of Thought and Action: A Social Cognitive Theory* (Englewood Cliffs, NJ: Prentice-Hall).

Bowen, M. K., & Chudleigh, F. (2021). Achieving drought resilience in the grazing lands of northern Australia: preparing, responding and recovering. *The Rangeland Journal*, *43*(3), 67-76.

Brown, H., Dawson, N., & McHugh, B. (2018). *Psychology, emotion and intuition in work relationships: The head, heart and gut professional*. Routledge.

Department of Agriculture, Water and the Environment. (2020). Decision-making in agriculture: A guide for farmers and graziers. Retrieved from: https://www.agriculture.gov.au/sites/default/files/sitecollectiondocuments/ag-food/publications/decision-making-in-agriculture-a-guide-for-farmers-and-graziers.pdf

Gigerenzer, G., & Todd, P. M. (1999). Fast and frugal heuristics: The adaptive toolbox. In *Simple heuristics that make us smart* (pp. 3-34). Oxford University Press.

Goleman, D. (1996). Emotional intelligence. Why it can matter more than IQ. *Learning*, *24*(6), 49-50.

Hayes, B. J., Daetwyler, H. D., Bowman, P., Moser, G., Tier, B., Crump, R., ... & Goddard, M. E. (2009, September). Accuracy of genomic selection: comparing theory and results. In *Proc Assoc Advmt Anim Breed Genet* (Vol. 18, No. 18, pp. 34-37).

Howden, S. M., Crimp, S. J., & Stokes, C. J. (2008). Climate change and Australian livestock systems: impacts, research and policy issues. *Australian journal of experimental agriculture*, *48*(7), 780-788.

Jakku, E., Farbotko, C., Curnock, M. and Watson, I. (2022) Insights on technology adoption and innovation among northern Australian beef producers. CSIRO, Australia.

Klein, G. (2008). Naturalistic decision making. *Human factors*, *50*(3), 456-460.

Krippendorff, K. (2013). Content analysis: An introduction to its methodology (3rd ed.). Thousand Oaks, CA: Sage Publications.

Liu T, Bruins RJF, Heberling MT. Factors Influencing Farmers' Adoption of Best Management Practices: A Review and Synthesis. Sustainability. 2018;10(2):432. doi: 10.3390/su10020432. PMID: 29682334; PMCID: PMC5907504.

Nuthall, P. L., & Old, K. M. (2018). Intuition, the farmers' primary decision process. A review and analysis. *Journal of Rural Studies*, *58*, 28-38.

DECIDE AND THRIVE

RESEARCH REPORT

Tversky, A., & Kahneman, D. (1974). Judgment under Uncertainty: Heuristics and Biases: Biases in judgments reveal some heuristics of thinking under uncertainty. *science*, *185*(4157), 1124-1131.

von Diest, S. G., Wright, J., Samways, M. J., & Kieft, H. (2020). A call to focus on farmer intuition for improved management decision-making. *Outlook on Agriculture*, *49*(4), 278-285.