BENCHMARKING SURVEY
SUMMARY REPORT

Drought and Climate Adaptation Program (DCAP)

Coutts J&R / **June 2017**

COUTTS J&R
MANAGING AND EVALUATING CHANGE

Queensland Government

ACKNOWLEDGEMENTS

This report would not have been possible without the assistance of the project leaders and program leader Neil Cliffe. Additionally, this report provided the opportunity to make an industry first benchmark of the climate change strategies of QLD/NT/WA producers and advisors. This would not have happened without those who completed the survey or the organisations who distributed the survey link through social media, websites, email and e-newsletters.

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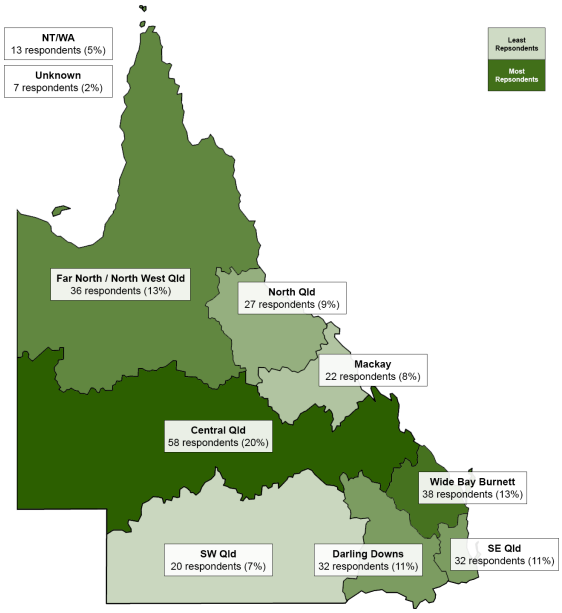
June 2017

KEY FINDINGS

285 RESPONSES

Demographics



Region: 93% of respondents were from Queensland.

Role: 71% Producers and 29% as Service Provider/Other respondents

Industry: Respondents were grouped into three unique groups:

- 54% Livestock only (including beef, dairy, sheep, and goats);
- 28% Other Industries (including sugar, cropping, horticulture, and 'other'); and
- 18% Livestock and Other Industries.

Documented Plan

The majority of respondents (78%) **did not have a documented plan** (or process to use) for managing a variable climate, with 46% of total respondents indicating decisions are made as needed.

Confidence

Overall, respondents were **moderately confident** in their preparedness to meet future climate variability (6.2 avg. n=282) and in their ability to access resources/tools/information needed to effectively make planning decisions for climate variability (5.9 avg. n=283).

Tools and Resources

Tools/Resources: The *BoM Website* (95% awareness, 87% use) was by far the most well-known and used resource when planning (or assisting clients plan) for climate variability. This was followed by *Long Paddock website* (55% awareness, 26% use), *Rainman/ClimateArm* (52% awareness, 13% use), *Stocktake/Stocktake Plus* (41% awareness, 15% use), and *USQ Climate Outlook and Review* (36% awareness, 21% use).

Seasonal climate forecasts: The two most well-known were *SST: Sea Surface Temperature Map* (66% awareness, 27% use) and *IOD: Indian Ocean Dipole* (50% awareness, 19% use)

Climate forecast periods: *Forthcoming Summer/Winter season* (60%) was the most selected climate forecast period that respondents saw as valuable, followed by *Rolling 3-6 months* (54%), *Rolling 0-3 months* (51%), and *Annual 1-2 years* (35%).

Access Barriers

Overall, only **a third of respondents believed there were barriers** preventing them (or their clients) accessing relevant tools/resources and/or knowledge. The top five barriers indicated by these 93 respondents were: *Internet access* (58%); *Lack of understanding about how to use resources* (56%); *Lack of understanding of technologies used in the resources* (42%); *Scepticism about usefulness of products* (37%); and *Lack of time* (35%).

Key Management Practices

The **top five key management practices** used (or clients used) when planning for climate variability by industry were:

Beef/Dairy/Sheep (n=206):

1. Adjusting stocking rates according to forage amount and quality (89%)
2. Carrying capacity (83%)
3. Adjusting stocking rates - buy, sell, agistment, etc. (79%)
4. Fencing (62%)
5. Property planning and land management (59%)

Sugar/Cropping/Horticulture (n=123):

1. Planting time/season (70%)
2. Fertilizing/spraying, weed control (63%)
3. Irrigation (54%)
4. Harvesting and product processing/management (49%)
5. Species selection (45%)

On-farm Changes

Respondents were asked to provide details of any changes made on-farm (whether part of a strategic plan or not) relating to managing for climate variability and the resulting (expected) benefits seen. The most common changes by respondent industry group included:

Livestock:

- **Pasture management** (42 mentions – e.g. *rotational grazing, paddock spelling, grass budgeting, weed reduction, planting improved pastures, fertiliser selection*)
- **Stocking rates/carrying capacity** (23 mentions – e.g. *reducing stocking rates, adjusted to season/pasture quality*)
- **Land/paddock management** (18 mentions – e.g. *fencing, erosion control, watering points, shade*)

Livestock & Other Industries:

- **Pasture management** (12 mentions – e.g. *rotational grazing, improved pastures/grasses*)
- **Water management** (10 mentions – e.g. *bore, dams, recycled water, tanks, securing water supply options*)

Other Industries

- **Water management** (16 mentions – e.g. *irrigation improvements, water storage, water licences, drainage*)
- **Soil/paddock management** (12 mentions – e.g. *zonal tillage, increased ground cover, mulching, shade, controlled traffic, protective structures*)

Final Comments

Respondents were asked to provide any other comments. The most common responses included:

- **Acknowledgement of weather/climate/industry challenges** (7 mentions)
- **Importance/need for accurate/reliable (long-term) forecasts** (6 mentions)

CONTENTS

1. ABOUT THE SURVEY

1.1 Context

This web survey was designed as a part of the monitoring and evaluation (M&E) process of the Drought and Climate Adaptation Program (DCAP) which aims to help producers be more resilient and better able to manage their drought and climate risks and adapt to impacts of climate change.

Focused on producers and advisors, the web survey was designed to benchmark the current approaches to decision making and planning for climate variability (season to season; year to year) and to capture the state of understanding, availability and use of tools and information and issues being faced by the industry in relation to drought and climate risk mitigation. This is a cross industry first and will provide valuable information not only for DCAP but for the organisations who helped distribute the survey link.

By repeating the survey in the future and using the same conduits to invite respondents, it is reasonable to expect a strong participant overlap. This should provide a good measure of change over time within this segment of the target population – and a reflection of any broader shifts across the population.

1.2 Methodology

The questions were interactively developed with DCAP team members to ensure they were relevant and useful. Various rural and agribusiness networks were approached initially by the DCAP Program Manager and then followed up by Coutts J&R to help with distributing the survey link through direct email, e-newsletters and social media. All were very cooperative and agreed to participate including:

- FutureBeef (social media, email distribution list)
- Leading Sheep (E-newsletter, social media)
- DAF communications (social media, website)
- Canegrowers (social media)
- Regional Canegrowers organisation (email list)
- Growcom (social media, E-newsletter)
- AgForce (social media, E-newsletter)
- Queensland Farmers Federation (social media, weekly E-newsletter)
- Other email distribution lists including: USQ Climate updates (Neil Cliffe email list)

There was some sharing of the social media posts (including five retweets of the QFF Twitter post) as well as instances of emails being forwarded by recipients to their respective networks. The survey was open to responses from 16 May 2017 to 13 June 2017.

1.2.1 Sampling and Confidence

Given the non-random sampling approach, calculating confidence intervals with respect to the data is not appropriate. The data needs to be viewed as a reflection of 'those who were reached through the invitation process and were inclined to respond'. The good response (285 valid responses) however, provides some degree of confidence that the results are reflective of the broader producer and adviser population in targeted groups.

2. FINDINGS

2.1 Demographics

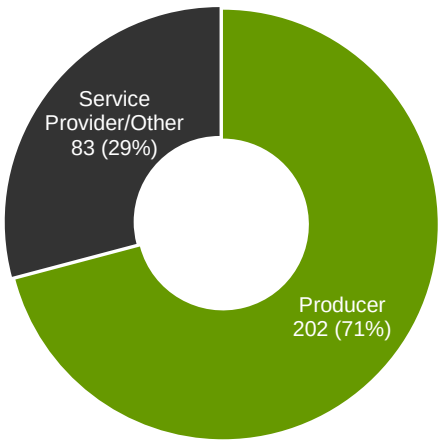
There were **285 valid responses** to the DCAP benchmarking survey.

2.1.1 Role

Seventy-one percent of respondents identified as Producers and 29% as Service Provider/Other respondents. Of these, 41 were service providers/consultants/advisers, 23 'Other', and 19 Extension Officers.

('Other' respondent roles included: analyst, researcher, education, exporter, feedlot operator, government, legal advisor, regulatory, manager, milling, NRM, peak body, and Landcare)

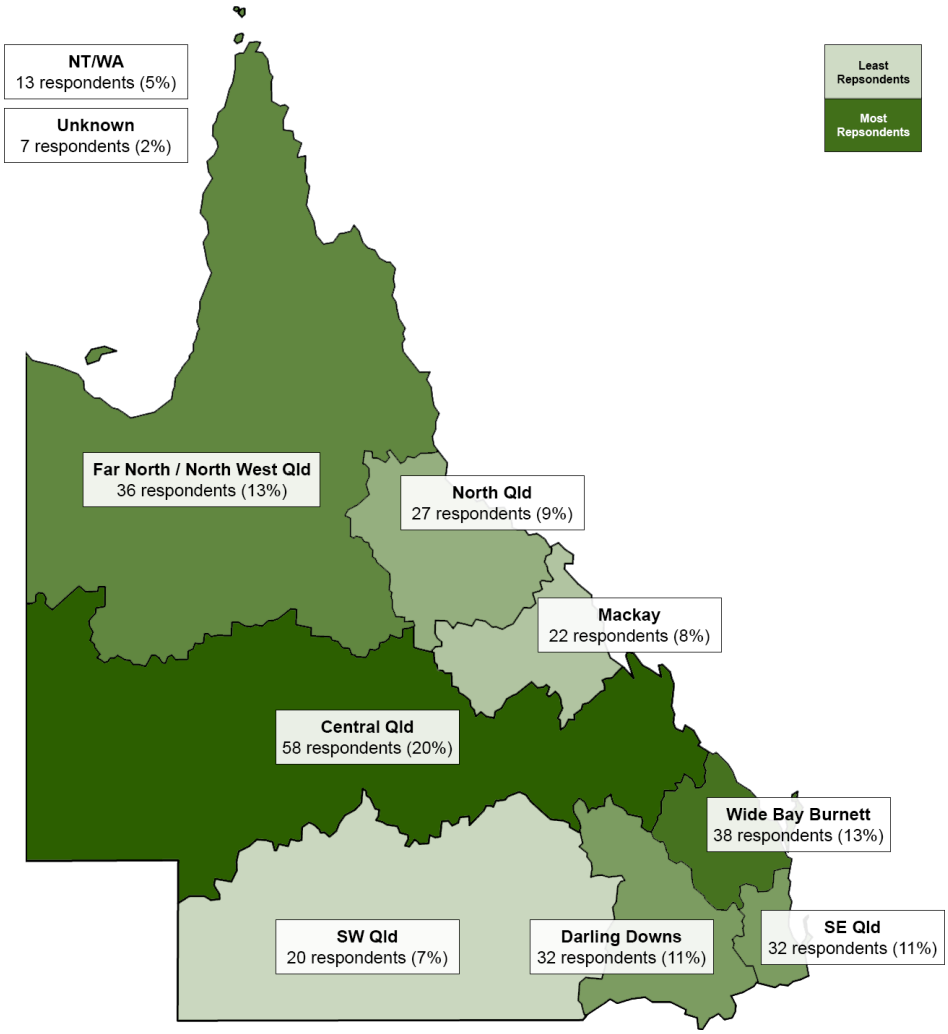
Chart 1: Respondent Role



2.1.2 Region

Ninety-three percent of respondents were from Queensland. Regions represented included: Central Qld (includes Central West, 20%); Wide Bay Burnett (13%); Far North Qld (includes North-west and Gulf, 13%); Darling Downs (11%); SE Qld (11%); North Qld (9%); Mackay, Isaac, and Whitsundays (8%); and SW Qld (7%). Five percent of respondents were from Northern Territory/Western Australian and 2% did not provide a region.

Chart 2: Respondent region



2.1.3 Industry

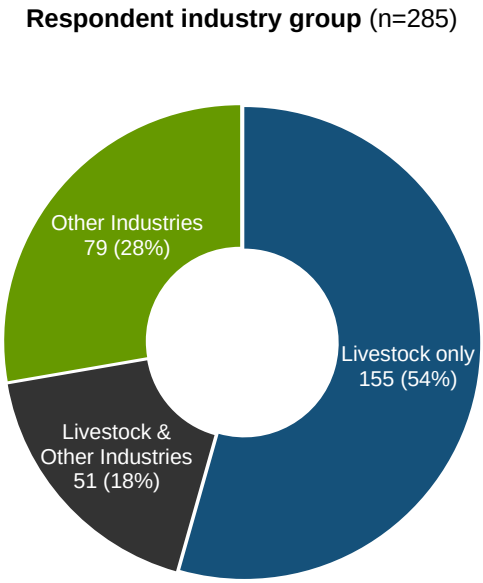
Respondents were able to select multiple industries. Based on responses three main groups were found: 54% Livestock only (including beef, dairy, sheep, and goats); 28% Other Industries (including sugar, cropping, horticulture, and 'other'); and 18% Livestock and Other Industries.

Breakdown of industries within these main groups:

- **Livestock only** (n=155) – 99% Beef, 9% Sheep, 2% Dairy, 1% Goats
- **Other Industries** (n=79) – 47% Sugar, 34% Horticulture, 13% Cropping, 13% Mixed Cropping/Grazing
- **Livestock and Other Industries** (n=51) – 96% Beef, 41% Mixed Cropping, 39% Cropping, 37% Horticulture, 24% Other, 22% Sheep, 16% Sugar, 12% Dairy

('Other' industries included: cotton, poultry, forestry, beekeeping, and seafood)

Chart 3: Respondent group by industry



2.2 Documented Plan

2.2.1 Documented plan for managing a variable climate

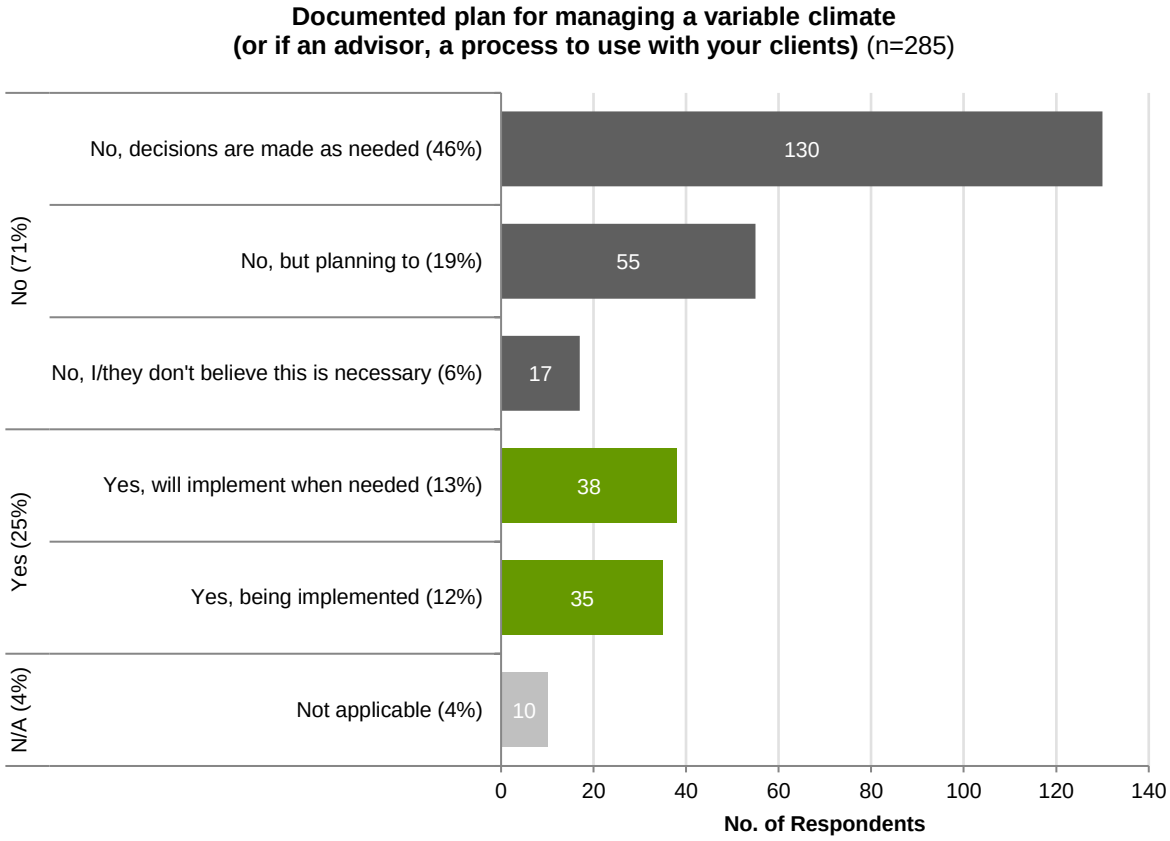
The majority of respondents (71%) did not have a documented plan (or process to use) for managing a variable climate, with 46% of respondents indicating decisions are made as needed, 19% intended to have a documented plan in future, and 6% did not believe it was necessary.

The percentage of respondents **without** documented plans by groupings were:

- **Role:** 78% Producer, 51% Service Provider/Other
- **Industry:** 90% Other Industries, 66% Livestock & Other Industries, and 63% Livestock
- **Region:** 86% Far North Qld, NT/WA 85%, 75% SE Qld, 75% SW Qld, 74% Wide Bay Burnett, 73% Mackay, 70% North Qld, 59% Darling Downs, 57% Central Qld

(Note: percentage summary tables are located in Appendix 3.1)

Chart 4: Documented plan



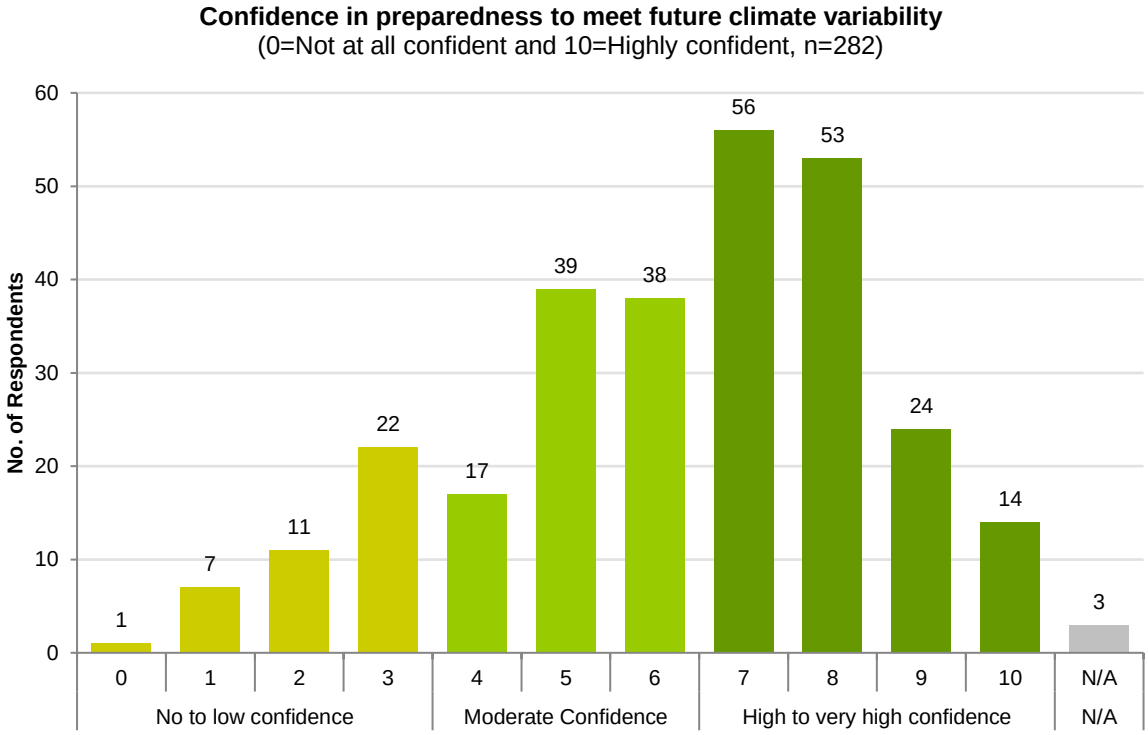
2.3 Confidence

2.3.1 Confidence in preparedness to meet future climate variability

Overall, respondents were moderately confident in their preparedness to meet future climate variability (6.2 avg. n=282). Average ratings by respondent groupings were:

- **Role:** 6.3 avg. Producer (n=201), 6.0 avg. Service Provider/Other (n=81)
- **Industry:** 6.5 avg. Livestock (n=152), 6.4 avg. Livestock & Other Industries (n=51), 5.6 avg. Other Industries (n=79)
- **Region:** 6.9 avg. Mackay (n=22), 6.8 avg. Wide Bay Burnett (n=38), 6.7 avg. Central Qld (n=58), 6.5 avg. Darling Downs (n=31), 6.4 avg. NT/WA (n=13), 6.3 avg. (n=31), 5.7 avg. North Qld (n=26), 5.5 avg. Far North Qld (n=36), 5.5 avg. SW Qld (n=20), 4.1 avg. Unknown (n=7)

Chart 5: Confidence in preparedness



Comments

Comments made by respondents on their preparedness to meet future climate variability included:

- Respondents with high to very high confidence (7-10 rating):
    - **Specific actions to prepare** (8 mentions – e.g. pasture management, water management, feed budgeting)
    - **Acknowledgement of the challenge of climate/seasonal variability** (4 mentions – e.g. *Even with the best planning, our variable seasons leave producers unprepared. A season can change within a few days. [Service Provider/Other, Central Qld, Livestock, 8])*
    - **Need for flexibility/adaptability** (4 mentions – e.g. *In a region where rainfall variability occurs on property to property or even paddock to paddock basis one has to react according to short to medium term forecasts. [Producer, Unknown, Livestock, 7]*)
    - **Experienced/dealt with variability before** (3 mentions – e.g. *Been through drought and floods before [Producer, Wide Bay Burnett, Livestock, 7])*
- Respondents with moderate confidence (4-6 rating):
    - **Confidence affected by uncertainty surrounding severity/length of future events** (5 mentions – e.g. *My confidence is diminished due to the unknown severity of future events. [Producer, Wide Bay Burnett, Livestock, 6])*
    - **Specific actions to prepare** (5 mentions – e.g. calving times, water storage, variety selection)
- Respondents with no to low confidence (0-3 rating):

- **Production severely impacted by seasonal variability** (4 mentions – e.g. *Changing climate can affect the ability to continue to grow our current crops [Producer, Far North Qld, Other Industries, 2])*
- **Confidence affected by uncertainty surrounding severity/length of future** events (2 mentions – e.g. *The length and severity of weather including drought is an unknown variable [Producer, SE Qld, Livestock & Other Industries, 3]).*
- **Lack of understanding** (2 mentions – e.g. *We don't understand the drivers of seafood productivity [Producer, SE Qld, Other Industries, 2])*

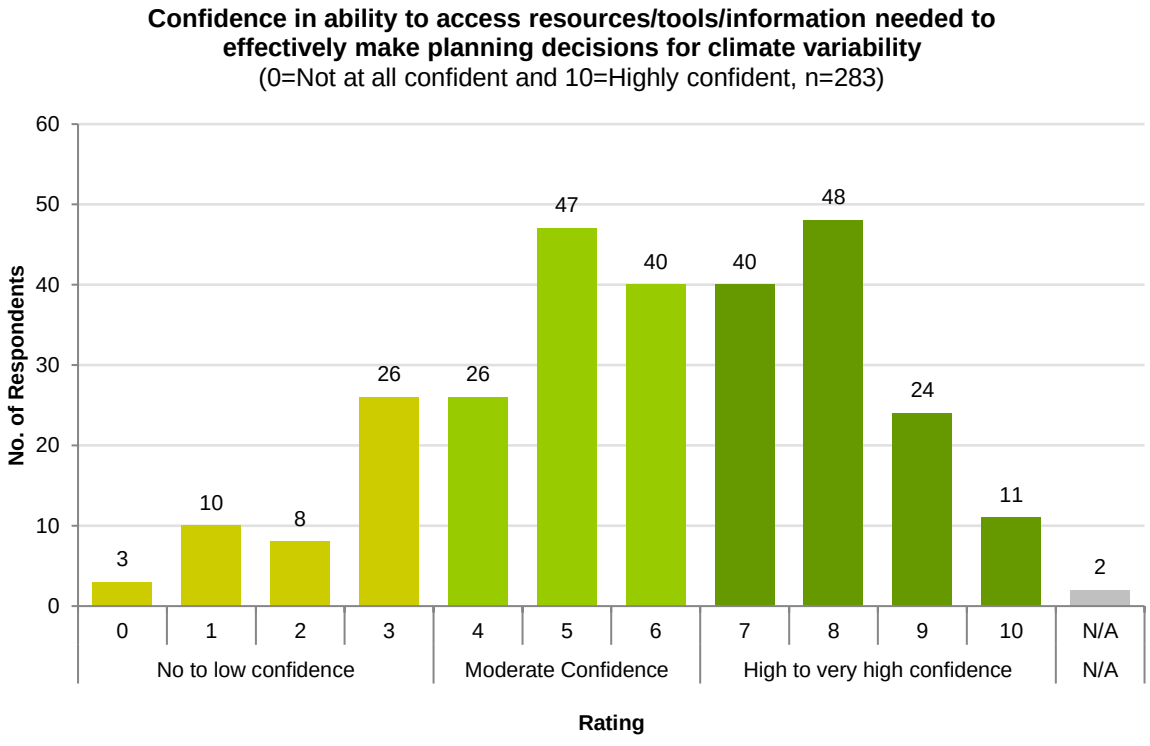
(Note: a complete summary of comments is located in Appendix 3.2)

2.3.2 Confidence in ability to access resources/tools/information needed to effectively make planning decisions for climate variability

Overall respondents were moderately confident in their ability to access resources/tools/information needed to effectively make planning decisions for climate variability (5.9 avg. n=283). Average ratings by respondent groupings were:

- **Role:** 5.9 avg. Producer (n=201), 5.9 avg. Service Provider/Other (n=82)
- **Industry:** 6.1 avg. Livestock (n=153), 5.9 avg. Livestock & Other Industries (n=51), 5.5 avg. Other Industries (n=79)
- **Region:** 6.9 avg. Mackay (n=22), 6.4 avg. Central Qld (n=58), 6.3 avg. Wide Bay Burnett (n=38), 5.9 avg. SE Qld (n=31), 5.8 avg. Far North Qld (n=36), 5.7 avg. Darling Downs (n=31), 5.7 avg. Unknown (n=7), 5.3 avg. NT/WA (n=13), 5.1 avg. SW Qld (n=20), 5.0 avg. North Qld (n=27)

Chart 6: Confidence in ability to access



Comments

Comments made by respondents on their ability to access resources/tools/information included:

- Respondents with high to very high confidence (7-10 rating):
    - **Limited confidence in reliability/accuracy of tools/resources** (4 mentions – e.g. *I am confident I have access to the tools, I don't have confidence in the tools [Producer, Central Qld, Livestock, 10]*
    - **Specific tool/resource used** (3 mentions – e.g. ECMWF, BOM)
    - **Value of local expertise** (2 mentions – e.g. *Our local extension officer is fantastic and always willing to help with advice etc. [Producer, Wide Bay Burnett, Livestock, 7])*
    - **Internet usefulness** (2 mentions – e.g. *The internet is a good tool [Producer, SE Qld, Livestock, 8])*
- Respondents with moderate confidence (4-6 rating):
    - **Lack of confidence in forecast accuracy/reliability** (7 mentions – e.g. *The reliability of the information available is not sufficient to make long term decisions. [Producer, Wide Bay Burnett, Livestock, 6])*
    - **Too many information sources** (2 mentions – e.g. *So many sources of info. Hard to know which are best. [Service Provider/Other, SE Qld, Livestock & Other Industries, 4])*
- Respondents with no to low confidence (0-3 rating):
    - **Lack of confidence in forecast accuracy/reliability** (7 mentions – e.g. *Current long-term forecasts are too inaccurate to be useful. [Producer, Darling Downs, Livestock, 3])*

(Note: a complete summary of comments is located in Appendix 3.2)

2.4 Tools and Resources

2.4.1 Awareness/use of tools used when planning for climate variability

Tools/Resources

The BoM Website was by far the most well-known and used resource when planning (or assisting clients plan) for climate variability, with a 95% overall awareness and 87% usage rate. The next most recognised tools/resources were: Long Paddock website (55% awareness, 26% use), Rainman/ClimateArm (52% awareness, 13% use), Stocktake/Stocktake Plus (41% awareness, 15% use), and USQ Climate Outlook and Review (36% awareness, 21% use). Usage of specific sections of the BoM and LongPaddock websites included:

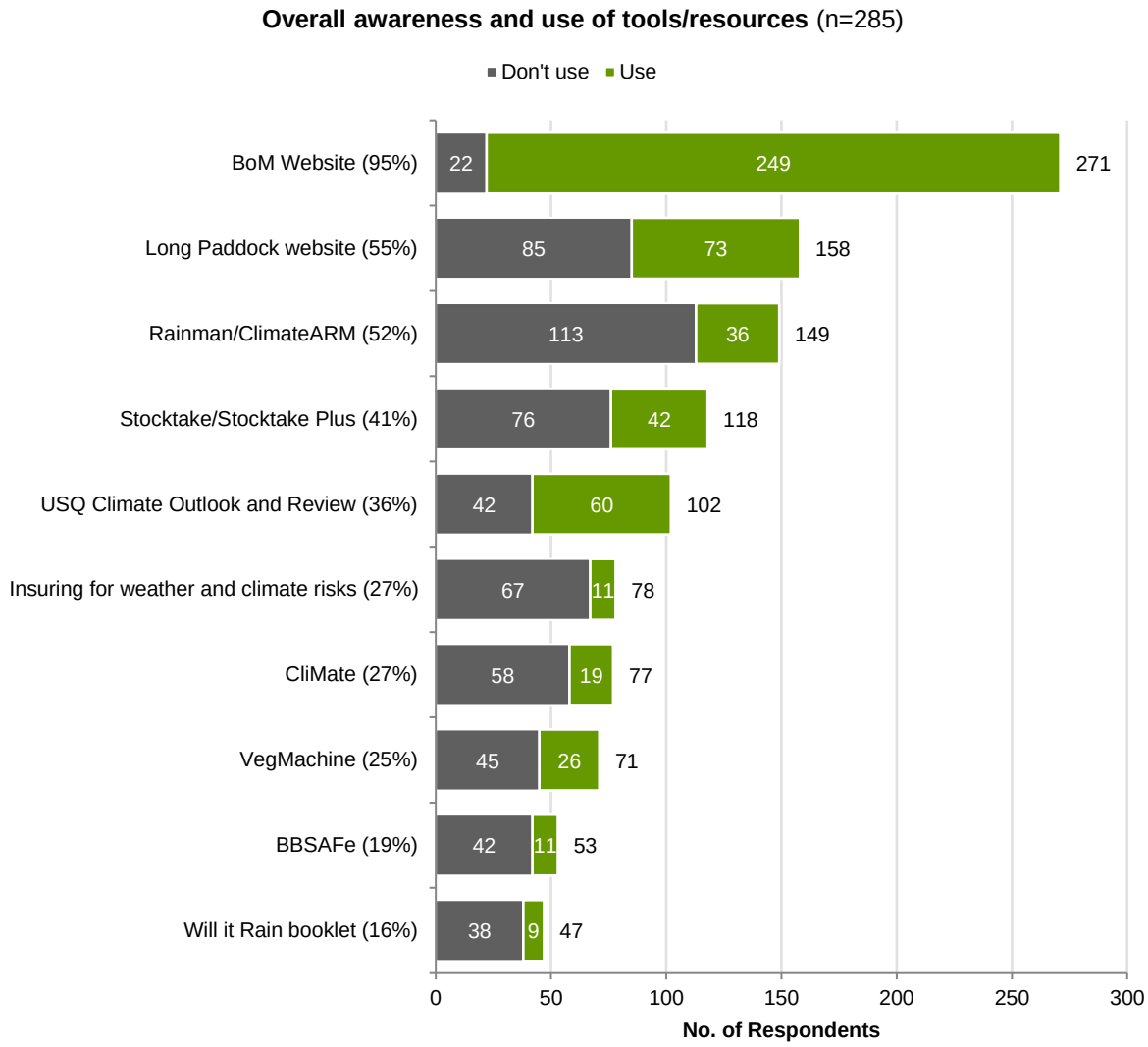
- **BoM website** (n=249)**:** 58% *ENSO tracker*, 55% *MJO or 40 day wave*, and 30% *POAMA*.
- **LongPaddock Website** (n=73)**:** 62% *SOI Phase system rainfall probabilities*, 41% *Forage*, 40% *Rainfall poster, 26% DSITI climate statement*, 25% *SILO*, 23% *AussieGRASS*, and 12% both *SPOTA-1* and *DSITI Climate Risk Matrix Assessment.*

Examples of tools/resources where one respondent group was notably more likely to use one over the other included:

- **Service Provider/Other vs. Producers:** *LongPaddock Website* (42% vs. 19%), *Rainman/ClimateARM* (25% vs. 7%), and *VegMachine* (20% vs. 4%).
- **Livestock vs. Other Industries:** *USQ Climate Outlook and Review* (11% vs. 37%), *Stocktake/Stocktake Plus* (25% vs. 0%), and *LongPaddock website* (29% vs. 13%)

(Note: percentage summary tables are located in Appendix 3.1)

Chart 7: Overall awareness and use of tools/resources and whether they are used or not



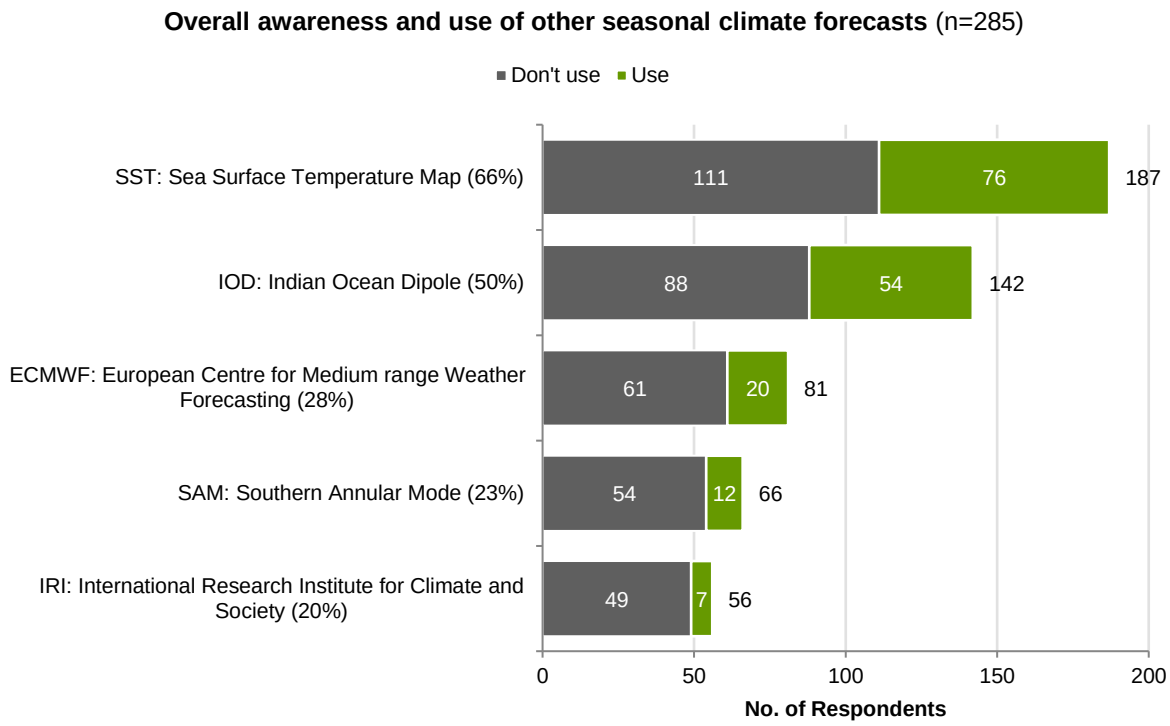
Other Seasonal Climate Forecasts

The two most well-known seasonal climate forecasts were *SST: Sea Surface Temperature Map* (66%) and *IOD: Indian Ocean Dipole* (50%), with 27% of total respondents using *SST* and 19% using *IOD.* The three other listed forecasts had comparatively lower awareness and usage: *ECMWF* (28% awareness, 7% use), *SAM* (23% awareness, 4% use), and *IRI* (20% awareness, 2% use).

There were no notable differences in usage of other seasonal forecasts between the respondent groups.

(Note: percentage summary tables are located in Appendix 3.1)

Chart 8: Overall awareness/use of other seasonal climate forecasts



Comments on other tools/resources/forecasts used

- **Other tools/resources/forecasts cited by multiple respondents:** WX Maps (4 mentions); WeatherZone (3 mentions); Elders Weather (2 mentions); Higgins Storm Chasers (2 mentions); and Yr.no (2 mentions).
- **Other websites/forecasts with single mentions:** AV Weather, Wetterkarte, Hayden Walker, Oz Cyclone Chasers, DSITI Monthly Climate Statement, ECMWF, The Ringer Weather Forecasting, WeatherUndergound, and GFS.
- **Specific mentions of other BoM tools/forecasts** (6 mentions): 4 day rainfall forecast, monthly videos, Climate Ahead, quarterly summaries, SOI, MJO
- **Other comments relating to tool/resource/forecast usage:**
    - Reliance on personal experience/intuition (5 mentions – e.g. *Common sense! Farmers have been using it for centuries! [SE Qld, Producer, Livestock])*
    - Use of historical records (4 mentions – e.g. *Own records and decision dates [SE Qld, Service Provider/Other, Livestock]*)
    - Pasture Feed Budgets (4 mentions – e.g. RCS Grazing Chart, MaiaGrazing)
    - Email updates (2 mentions – e.g. from Neil Cliffe, Roger Stone)

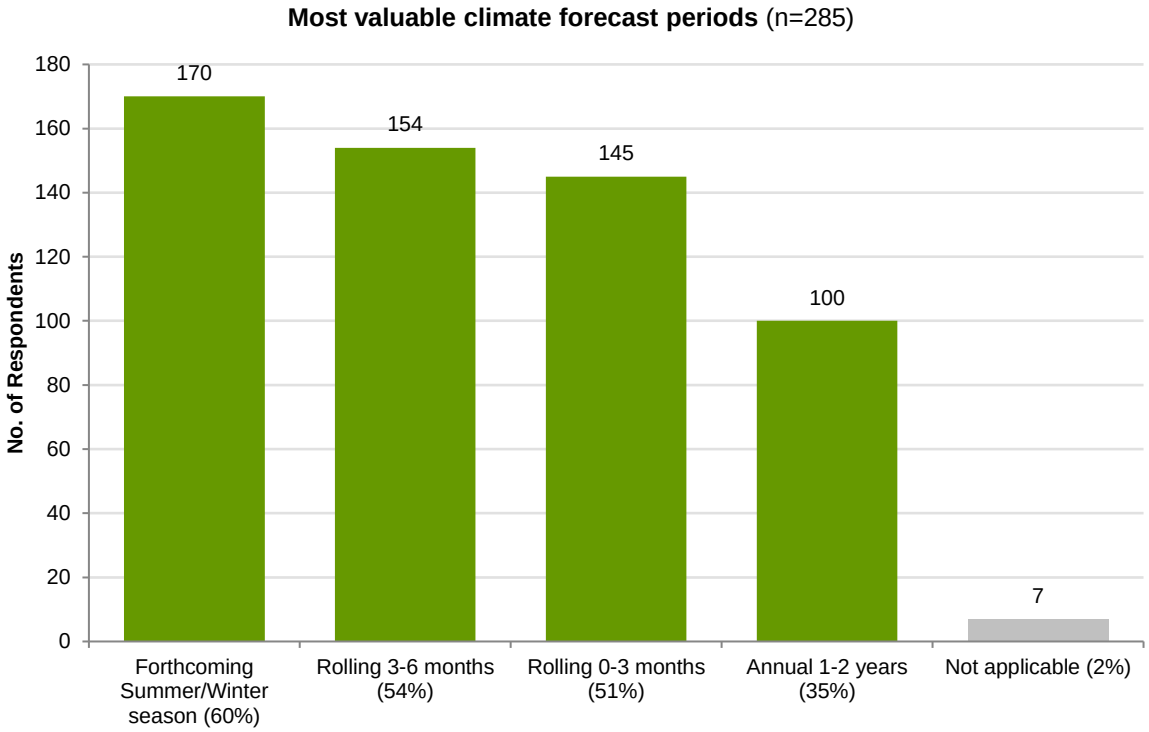
(Note: a complete summary of comments is located in Appendix 3.2)

2.4.2 Most valuable climate forecast periods

Forthcoming Summer/Winter season (60%) was the most selected climate forecast period that respondents saw as valuable, followed by *Rolling 3-6 months* (54%), *Rolling 0-3 months* (51%), and *Annual 1-2 years* (35%).

(Note: percentage summary tables are located in Appendix 3.1)

Chart 9: Valuable climate forecast periods



2.5 Barriers

2.5.1 Barriers preventing access to relevant tools/resources and/or knowledge

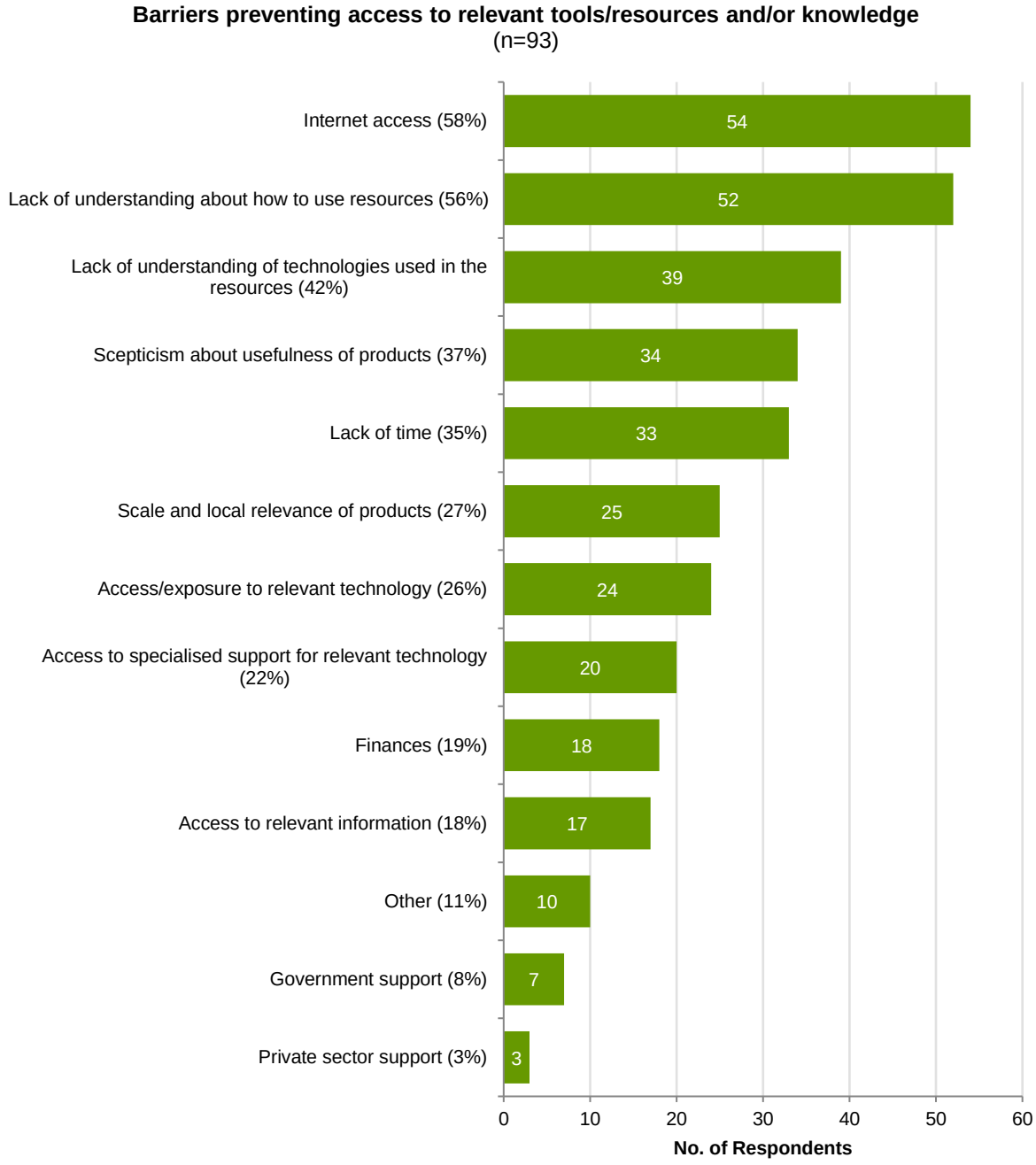
Overall, only a third of respondents believed there were barriers preventing them (or their clients) accessing relevant tools/resources and/or knowledge. The top five barriers indicated by these 93 respondents were: *Internet access* (58%*); Lack of understanding about how to use resources* (56%); *Lack of understanding of technologies used in the resources* (42%); *Scepticism about usefulness of products* (37%); and *Lack of time* (35%). Barriers experienced by respondent groups were:

- **Role:** 31% Producers and 36% Service Provider/Other had experienced barriers. Examples of barrier differences by role included:
    - Noticeably more Service Provider/Other respondents (compared to Producers) indicated that *a lack of understanding about how to use resources* (77% vs. 46%) and a *lack of understanding of technologies used in the resources* (60% vs. 33%) were barriers.

- **Industry:** 49% Livestock & Other Industries, 34% Livestock, and 20% Other Industries had experienced barriers – examples of barrier differences by industry:
    - Noticeably more Livestock respondents indicated *a lack of understanding of technologies used in the resources* compared to Other Industries respondents (44% vs. 19%), while those in the Other Industries group were more likely to cite *lack of time* as a barrier (50% vs. 27%).
- **Region:** The regional breakdown of those who had experienced barriers was - 54% NT/WA, 40% Central Qld, 40% SW Qld, 38% Darling Downs, 33% Far North Qld, 29% Wide Bay Burnett, 29% Unknown, 28% SE Qld, 22% North Qld, and 14% Mackay.

(Note: percentage summary tables are located in Appendix 3.1)

Chart 10: Access barriers



Comments on barriers

Respondent comments on barriers included:

- **Forecast accuracy/reliability** (6 mentions – e.g. *A lot people I work with don't have faith in the accuracy of forecasts and so don't use these to make good decisions…[Central Qld, Service Provider/Other, Livestock])*
- **Internet speed/reliability/access** (4 mentions – e.g. *Too unreliable to get in the habit of using internet required tools. [SW Qld, Producer, Livestock]*)
- **Lack of locally/industry relevant information/forecasts** (3 mentions) – e.g. *BoM is only relevant for east coast [North Qld, Producer, Livestock])*

(Note: a complete summary of comments is located in Appendix 3.2)

2.6 Management Practices

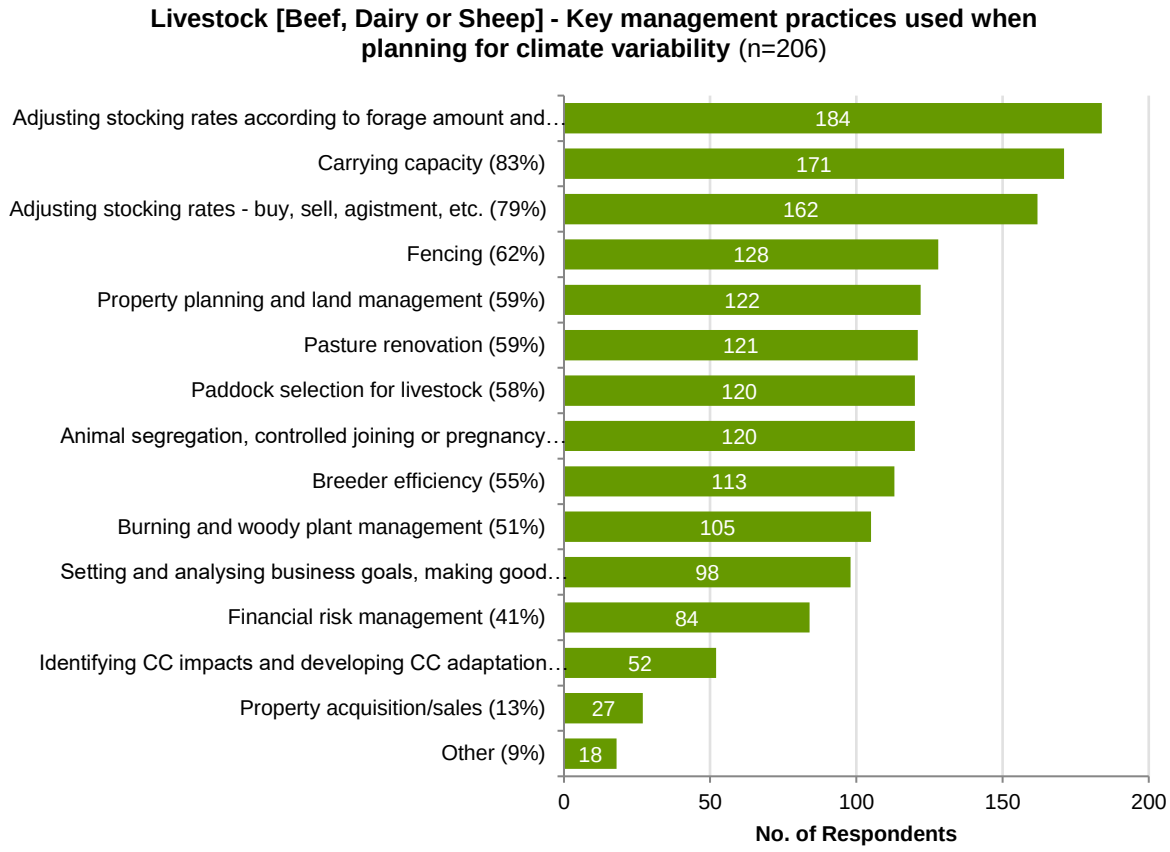
2.6.1 Key management practices used when planning for climate variability

The top five key management practices used (or clients used) when planning for climate variability by industry were (respondents were shown a list of specific management practices based on the industry/ies they selected):

- **Beef/Dairy/Sheep** (n=206):
    1. Adjusting stocking rates according to forage amount and quality (89%)
    2. Carrying capacity (83%)
    3. Adjusting stocking rates - buy, sell, agistment, etc. (79%)
    4. Fencing (62%)
    5. Property planning and land management (59%)
- **Sugar/Cropping/Horticulture** (n=123):
    1. Planting time/season (70%)
    2. Fertilizing/spraying, weed control (63%)
    3. Irrigation (54%)
    4. Harvesting and product processing/management (49%)
    5. Species selection (45%)
- **Other Industry** (only 3 options provided, n=25):
    1. Identifying climate change impacts and developing climate change adaptation strategies (56%)
    2. Developing a drought management plan (32%)
    3. Other (8%)

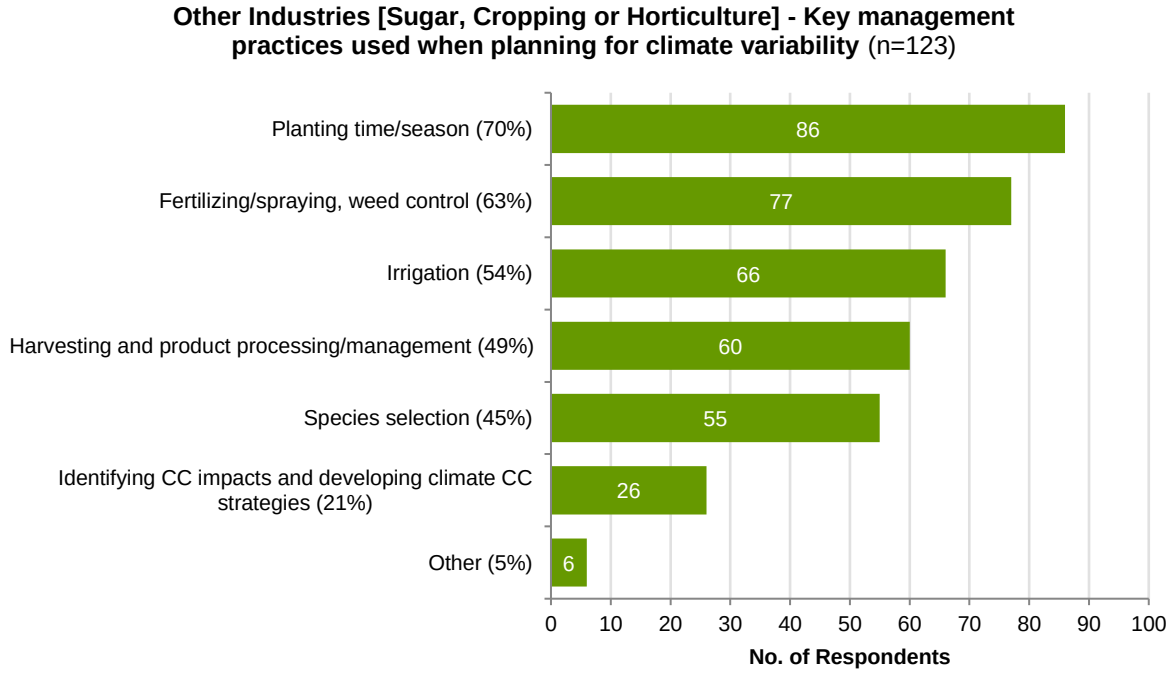
(Note: percentage summary tables are located in Appendix 3.1)

Chart 11: [Beef/Dairy/Sheep] Key management practices



(Other included: watering points, supplements, variety selection, rotational grazing, holistic management, cattle trading, fodder conservation, parasite management, weaner management)

Chart 12: [Sugar/Cropping/Horticulture] Key management practices



(Other included: cover cropping, water storage, zero till, laser levelling, crop timing, controlled traffic)

2.6.2 On-farm changes relating to managing for climate variability

Respondents were asked to provide details of any changes made on-farm (whether part of a strategic plan or not) relating to managing for climate variability and the resulting (expected) benefits seen. Types of changes by respondent industry group included:

Livestock

- **Pasture management** (42 mentions – e.g. rotational grazing, paddock spelling, grass budgeting, weed reduction, planting improved pastures, fertiliser selection)
- **Stocking rates/carrying capacity** (23 mentions – e.g. reducing stocking rates, adjusted to season/pasture quality)
- **Land/paddock management** (18 mentions – e.g. fencing, erosion control, watering points, shade)
- **Water management** (12 mentions – e.g. water and irrigation infrastructure, water diversion, water use efficiency, solar pumps, water storage)
- **Business management** (8 mentions – e.g. market selection, trading, farm management deposits, strategic preparations)
- **Weening/breeding/joining** (7 mentions – e.g. changes to timing, early weening, controlled joining)
- **Strategic/flexible decision making** (5 mentions – e.g. based on weather/seasons/rainfall/forecasts)
- **Property/agistment selection** (5 mentions – e.g. purchasing in areas with reliable rainfall)
- **Other changes:** silage storage (4 mentions), nutrition supplementation (4 mentions), breed selection (3 mentions)

Livestock & Other Industries

- **Pasture management** (12 mentions – e.g. rotational grazing, improved pastures/grasses)
- **Water management** (10 mentions – e.g. bore, dams, recycled water, tanks, securing water supply options)
- **Business management** (4 mentions – e.g. conversion to/from cropping/grazing, diversification, insurance coverage)
- **Strategic/flexible decision making** (4 mentions – e.g. based on weather/seasons/rainfall/forecasts)
- **Land/paddock management** (4 mentions – e.g. fencing, shade, watering points, erosion)
- **Stocking rates/carrying capacity** (4 mentions)
- **Other changes:** silage/feed storage (2 mentions), machinery selection (1 mention), breed selection (1 mention)

Other Industries

- **Water management** (16 mentions – e.g. irrigation improvements, water storage, water licences, drainage)

- **Soil/paddock management** (12 mentions – e.g. zonal tillage, increased ground cover, mulching, shade, controlled traffic, protective structures)
- **Crop selection** (6 mentions – e.g. diversification, resistant varieties)
- **Strategic/flexible decision making** (6 mentions – e.g. based on weather/seasons/rainfall/forecasts)
- **Timing of spraying/planting/fertilising** (6 mentions – e.g. in response to forecasts/outlooks)
- **Other changes:** herbicide/fertiliser management (2 mentions), solar power (1 mention)

(Note: a complete summary of comments is located in Appendix 3.2)

2.7 Final Comments

2.7.1 Other comments

Respondents were asked to provide any other comments – the most common responses included:

- **Acknowledgement of weather/climate/industry challenges** (7 mentions – e.g. *Climate has and will continue to change and as producers we continue to adapt and respond to the best of our abilities within financial restraints, legislative requirements and to maintain sustainability now and into the future... [Central Qld, Producer, Livestock & Other Industries])*
- **Importance/need for accurate/reliable (long-term) forecasts** (6 mentions – e.g. *I know forecasts are getting better but sometimes there are shortcomings on decisions I make because they change [Far North Qld, Producer, Other Industries])*

(Note: a complete summary of comments is located in Appendix 3.2)

3. APPENDIX

Appendix 3.1: Additional Data Tables

Documented plan for managing a variable climate

Table A1: Documented plan by **role** (n=285)

Response	Producer (n=202)	Service/Provider Other (n=83)
No, decisions are made as needed	52%	29%
No, but planning to	19%	20%
No, I/they don't believe this is necessary	7%	2%
Total No	**78%**	**51%**
Yes, will implement when needed	10%	20%
Yes, being implemented	11%	16%
Total Yes	**21%**	**36%**
N/A	0%	12%

Table A2: Documented plan by **industry** (n=285)

Response	Livestock (n=155)	Livestock & Other Industries (n=51)	Other Industries (n=79)
No, decisions are made as needed	41%	35%	62%
No, but planning to	17%	27%	19%
No, I/they don't believe this is necessary	5%	4%	9%
Total No	**63%**	**66%**	**90%**
Yes, will implement when needed	16%	22%	3%
Yes, being implemented	17%	10%	4%
Total Yes	**33%**	**32%**	**7%**
N/A	4%	2%	4%

Table A3: Documented plan by **region** (n=285)

Response	Central Qld (n=58)	Darling Downs (n=32)	Far North Qld (n=36)	Mackay (n=22)	North Qld (n=27)	NT/ WA (n=13)	SE Qld (n=32)	SW Qld (n=20)	Wide Bay Burnett (n=38)	Unknown (n=7)
No, decisions are made as needed	33%	44%	69%	55%	41%	54%	34%	45%	47%	57%

No, but planning to	16%	9%	11%	18%	22%	23%	34%	25%	21%	29%
No, I/they don't believe this is necessary	9%	6%	6%	0%	7%	8%	6%	5%	5%	0%
Total No	**57%**	**59%**	**86%**	**73%**	**70%**	**85%**	**75%**	**75%**	**74%**	**86%**
Yes, will implement when needed	19%	25%	6%	9%	7%	8%	9%	10%	18%	0%
Yes, being implemented	22%	13%	3%	18%	19%	8%	9%	10%	5%	0%
Total Yes	41%	38%	8%	27%	26%	15%	19%	20%	24%	0%
N/A	2%	3%	6%	0%	4%	0%	6%	5%	3%	14%

Awareness/use of tools used when planning for climate variability

Tools/Resources

Table A4: Awareness of tools/resources by **role** (n=285) Note: usage is indicated in brackets

Response	**Producer** (n=202)	**Service/Provider Other** (n=83)
BoM Website	95% (87%)	95% (89%)
Long Paddock website	49% (19%)	71% (42%)
Rainman/ClimateARM	47% (7%)	65% (25%)
Stocktake/Stocktake Plus	36% (10%)	53% (25%)
USQ Climate Outlook and Review	33% (18%)	41% (28%)
Insuring for weather and climate risks	23% (2%)	36% (7%)
CliMate	21% (3%)	39% (14%)
VegMachine	19% (4%)	38% (20%)
BBSAFe	16% (3%)	25% (6%)
Will it Rain booklet	14% (1%)	21% (7%)

Table A5: Awareness of tools/resources by **industry** (n=285) – note: usage is indicated in brackets

Response	**Livestock** (n=155)	**Livestock & Other Industries** (n=51)	**Other Industries** (n=79)
BoM Website	95% (85%)	98% (92%)	94% (89%)
Long Paddock website	64% (29%)	60% (35%)	36% (13%)
Rainman/ClimateARM	57% (15%)	55% (18%)	42% (5%)

Stocktake/Stocktake Plus	59% (25%)	39% (6%)	8% (0%)
USQ Climate Outlook and Review	26% (11%)	41% (27%)	51% (37%)
Insuring for weather and climate risks	29% (5%)	41% (8%)	16% (0%)
CliMate	24% (5%)	41% (14%)	24% (6%)
VegMachine	33% (14%)	26% (8%)	9% (0%)
BBSAFe	24% (6%)	16% (2%)	9% (0%)
Will it Rain booklet	17% (3%)	18% (6%)	14% (1%)

Other Seasonal Climate Forecasts

Table A6: Awareness of other seasonal climate forecasts by **role** (n=285) – note: usage is indicated in brackets

Response	Producer (n=202)	Service/Provider Other (n=83)
SST: Sea Surface Temperature Map	67% (27%)	62% (25%)
IOD: Indian Ocean Dipole	50% (20%)	51% (17%)
ECMWF: European Centre for Medium range Weather Forecasting	29% (8%)	28% (5%)
SAM: Southern Annular Mode	24% (5%)	21% (2%)
IRI: International Research Institute for Climate and Society	19% (1%)	19% (5%)

Table A7: Awareness other seasonal climate forecasts by **industry** (n=285) – note: usage is indicated in brackets

Response	Livestock (n=155)	Livestock & Other Industries (n=51)	Other Industries (n=79)
SST: Sea Surface Temperature Map	65% (26%)	78% (33%)	57% (23%)
IOD: Indian Ocean Dipole	51% (17%)	55% (24%)	44% (19%)
ECMWF: European Centre for Medium range Weather Forecasting	23% (3%)	34% (12%)	35% (11%)
SAM: Southern Annular Mode	25% (5%)	28% (4%)	18% (4%)
IRI: International Research Institute for Climate and Society	18% (1%)	30% (8%)	16% (1%)

Most valuable climate forecast periods

Table A8: Most valuable climate forecast periods by **role** (n=285)

Response	Producer (n=202)	Service/Provider Other (n=83)

Forthcoming Summer/Winter season	54%	73%
Rolling 3-6 months	56%	49%
Rolling 0-3 months	49%	57%
Annual 1-2 years	33%	40%
N/A	2%	2%

Table A9: Most valuable climate forecast periods by **industry** (n=285)

Response	Livestock (n=155)	Livestock & Other Industries (n=51)	Other Industries (n=79)
Forthcoming Summer/Winter season	65%	59%	49%
Rolling 3-6 months	55%	57%	49%
Rolling 0-3 months	47%	61%	52%
Annual 1-2 years	42%	35%	22%
N/A	3%	0%	3%

Table A10: Most valuable climate forecast periods by **region** (n=285)

Response	Central Qld (n=58)	Darling Downs (n=32)	Far North Qld (n=36)	Mackay (n=22)	North Qld (n=27)	NT/ WA (n=13)	SE Qld (n=32)	SW Qld (n=20)	Wide Bay Burnett (n=38)	Unknown (n=7)
Forthcoming Summer/ Winter season	71%	72%	47%	59%	41%	69%	59%	65%	50%	71%
Rolling 3-6 months	69%	63%	47%	32%	52%	38%	41%	45%	61%	86%
Rolling 0-3 months	53%	53%	50%	55%	67%	38%	41%	55%	39%	71%
Annual 1-2 years	41%	34%	33%	27%	44%	23%	28%	45%	26%	57%
N/A	3%	0%	6%	0%	0%	0%	9%	0%	0%	0%

Barriers preventing access to relevant tools/resources and/or knowledge

Table A11: Barriers preventing access to relevant tools/resources and/or knowledge by **role** (n=93)

Response	Producer (n=63)	Service/Provider Other (n=30)
Internet access	54%	67%
Lack of understanding about how to use resources	46%	77%

Lack of understanding of technologies used in the resources	33%	60%
Scepticism about usefulness of products	32%	47%
Lack of time	40%	27%
Scale and local relevance of products	21%	40%
Access/exposure to relevant technology	24%	30%
Access to specialised support for relevant technology	16%	33%
Finances	24%	10%
Access to relevant information	17%	20%
Other	10%	13%
Government support	10%	3%
Private sector support	3%	3%

Table A12: Barriers preventing access to relevant tools/resources and/or knowledge by **industry** (n=93)

Response	**Livestock** (n=52)	**Livestock & Other Industries** (n=25)	**Other Industries** (n=16)
Internet access	58%	72%	38%
Lack of understanding about how to use resources	52%	64%	56%
Lack of understanding of technologies used in the resources	44%	52%	19%
Scepticism about usefulness of products	33%	44%	38%
Lack of time	27%	44%	50%
Scale and local relevance of products	23%	32%	31%
Access/exposure to relevant technology	35%	16%	13%
Access to specialised support for relevant technology	23%	28%	6%
Finances	15%	28%	19%
Access to relevant information	13%	28%	19%
Other	12%	12%	6%
Government support	8%	8%	6%
Private sector support	2%	4%	6%

Table A13: Barriers preventing access to relevant tools/resources and/or knowledge by **region** (n=93)

Response	Central Qld (n=23)	Darling Downs (n=12)	Far North Qld (n=12)	Mackay (n=3)	North Qld (n=6)	NT/ WA (n=7)	SE Qld (n=9)	SW Qld (n=8)	Wide Bay Burnett (n=11)	Unknown (n=2)
Internet access	65%	58%	67%	67%	17%	43%	67%	75%	45%	50%
Lack of understanding about how to use resources	57%	42%	67%	67%	67%	57%	67%	50%	45%	50%
Lack of understanding of technologies used in the resources	48%	42%	42%	67%	33%	43%	11%	50%	45%	50%
Scepticism about usefulness of products	57%	50%	42%	0%	33%	29%	44%	13%	9%	0%
Lack of time	30%	25%	42%	0%	33%	29%	67%	38%	45%	0%
Scale and local relevance of products	17%	25%	42%	67%	33%	57%	22%	13%	18%	0%
Access/ exposure to relevant technology	30%	17%	25%	0%	17%	43%	22%	38%	27%	0%
Access to specialised support for relevant technology	13%	42%	25%	33%	17%	43%	11%	25%	9%	0%
Finances	26%	33%	25%	0%	50%	0%	22%	0%	0%	0%
Access to relevant information	17%	25%	8%	0%	67%	0%	33%	13%	9%	0%
Other	13%	8%	0%	33%	33%	29%	0%	0%	0%	50%
Government support	4%	17%	8%	0%	17%	0%	0%	13%	9%	0%
Private sector support	0%	0%	0%	0%	50%	0%	0%	0%	0%	0%

Key management practices used when planning for climate variability

Table A14: Key management practices used by **role**

Response	Producer	Service/Provider Other
[Beef, Dairy or Sheep]	(n=140)	(n=66)
Adjusting stocking rates according to forage amount and quality	89%	89%
Carrying capacity	86%	77%
Adjusting stocking rates - buy, sell, agistment, etc.	76%	85%
Fencing	62%	62%
Property planning and land management	56%	65%
Pasture renovation	59%	59%
Paddock selection for livestock	58%	59%
Animal segregation, controlled joining or pregnancy testing	54%	67%
Breeder efficiency	57%	50%
Burning and woody plant management	56%	41%
Setting and analysing business goals, making good business decisions	44%	56%
Financial risk management	41%	39%
Identifying CC impacts and developing CC adaptation strategies	21%	33%
Property acquisition/sales	8%	24%
Other	8%	11%
[Sugar, Cropping or Horticulture]	(n=87)	(n=36)
Planting time/season	66%	81%
Fertilizing/spraying, weed control	60%	69%
Irrigation	53%	56%
Harvesting and product processing/management	49%	47%
Species selection	40%	56%
Identifying CC impacts and developing climate CC strategies	16%	33%
Other	6%	3%
[Other Industry]	(n=16)	(n=9)
Identifying CC impacts and developing CC adaptation strategies	56%	56%
Developing a drought management plan	50%	0%
Other	0%	22%

Table A15: Key management practices used by **region** (n=93)

Response	Central Qld	Darling Downs	Far North Qld	Mackay	North Qld	NT/ WA	SE Qld	SW Qld	Wide Bay Burnett	Unknown
[Beef, Dairy or Sheep]	(n=54)	(n=23)	(n=20)	(n=12)	(n=13)	(n=13)	(n=25)	(n=18)	(n=23)	(n=5)
Adjusting stocking rates according to forage amount and quality	83%	91%	95%	83%	92%	54%	76%	89%	87%	40%
Carrying capacity	94%	91%	95%	75%	92%	92%	80%	94%	87%	60%
Adjusting stocking rates - buy, sell, agistment, etc.	85%	91%	85%	83%	77%	54%	68%	78%	70%	80%
Fencing	56%	61%	70%	67%	69%	38%	40%	67%	65%	60%
Property planning and land management	69%	65%	50%	50%	77%	46%	40%	56%	57%	60%
Pasture renovation	67%	57%	60%	33%	77%	54%	32%	61%	43%	40%
Paddock selection for livestock	48%	74%	30%	42%	46%	46%	48%	44%	43%	40%
Animal segregation, controlled joining or pregnancy testing	44%	48%	40%	42%	38%	31%	28%	44%	43%	40%
Breeder efficiency	15%	30%	5%	17%	8%	8%	4%	22%	4%	20%
Burning and woody plant management	70%	70%	50%	67%	54%	62%	44%	50%	52%	60%
Setting and analysing business goals, making good business decisions	61%	74%	70%	58%	77%	46%	44%	67%	74%	20%
Financial risk management	57%	83%	65%	50%	77%	23%	48%	67%	61%	20%
Identifying CC impacts and developing CC adaptation strategies	54%	57%	55%	67%	46%	23%	52%	56%	48%	20%
Property acquisition/sales	17%	52%	15%	58%	31%	23%	28%	17%	9%	40%
Other	4%	9%	10%	0%	15%	8%	16%	6%	17%	0%
[Sugar, Cropping or Horticulture]	(n=14)	(n=19)	(n=21)	(n=15)	(n=14)	(n=2)	(n=13)	(n=7)	(n=15)	(n=3)
Planting time/season	64%	68%	29%	40%	29%	50%	42%	57%	40%	33%
Fertilizing/spraying, weed control	79%	74%	86%	80%	86%	100%	42%	57%	47%	33%
Irrigation	71%	74%	62%	100%	71%	100%	17%	57%	33%	67%
Harvesting and product processing/management	21%	63%	33%	87%	50%	50%	50%	29%	87%	67%
Species selection	36%	53%	48%	60%	86%	0%	33%	57%	20%	100%
Identifying CC impacts and developing climate CC strategies	21%	26%	24%	27%	14%	0%	42%	0%	7%	33%
Other	7%	0%	5%	0%	7%	0%	8%	14%	7%	0%
[Other Industry]	(n=2)	(n=2)	(n=2)	(n=4)	(n=1)	(n=0)	(n=7)	(n=3)	(n=4)	(n=0)

Identifying CC impacts and developing CC adaptation strategies	50%	0%	0%	25%	0%	-	14%	67%	75%	-
Developing a drought management plan	100%	50%	50%	100%	0%	-	43%	33%	50%	-
Other	0%	0%	50%	0%	100%	-	0%	0%	0%	-

Appendix 3.2: Comment Summaries

Confidence in preparedness to meet future climate variability

Table A16: Confidence in preparedness to meet future climate variability

Comments	Mentions
High to very high confidence (7-10 rating)	
Specific actions to prepare • We do regular pasture budgeting and are able to look at feed availability in comparison to stock on hand. Thanks to our grazing chart and benchmarking figure, we are made aware very early when we need to destock and the measures that we need to take in order to maintain our stock on hand. [Producer, Central Qld, Livestock, 10] • Have planned water supply. pasture development and maintenance, and use of fencing, vegetation management to ensure wellbeing of stock. [Producer, SE Qld, Livestock, 9] • Use browsing fodder [Producer, SW Qld, Livestock, 9] • Irrigation for horticulture pasture and soil management for stock productivity Selected appropriate species for plantation forestry [Producer, Mackay, Other Industries, 9] • Droughts are a part of life on the land. Good management practices are essential, using rotational grazing practices and not overstocking - always have spare paddocks for drought situations. Start feeding lick after first frost and use common sense when it comes to preparing for a dry season (i.e. look at the season and if not looking favourable, start weaning at an early age to give breeders a better chance through the dry/look at agistment for young dry cattle) [Producer, Central Qld, Livestock, 8] • We have increased water storage through more holding tanks and desilting of dams. A small paddock of legumes is being trailed to extend the season of native pasture and pastures are monitored. A dry lick related to soil tests and NRIS testing is fed when appropriate . Early weaning is a useful tool. [Producer, Wide Bay Burnett, Livestock, 8] • Have put more water infrastructure on farm developed more paddocks to graze [Producer, Wide Bay Burnett, Other Industries, 8] • Use tools to manage grass/feed budget good cattle husbandry processes in place [Producer, Central Qld, Livestock, 7]	**8**
Acknowledgement of the challenge of climate/seasonal variability • Climate variability is always a challenging aspect of our industry. Climate Change is Pure Fantasy. [Producer, North Qld, Livestock, 9] • Even with the best planning, our variable seasons leave producers unprepared. A season can change within a few days. [Service Provider/Other, Central Qld, Livestock, 8] • The only certainty is we do not know how dry and hot it will get [Producer, Central Qld, Livestock, 7] • Animal welfare perspective requires appreciation of variable climate influence. [Service Provider/Other, Far North Qld, Livestock, 7]	4
Need for flexibility/adaptability (e.g. due to regional differences) • Every region is different every client has different Goals. [Producer, Wide Bay Burnett, Livestock, 10] • The variable effects of climate change from region to region does affect any plan and as in all plans, plans need to be flexible. [Service Provider/Other, Darling Downs, Livestock & Other Industries, 8] • Flexibility in management very important [Producer, SW Qld, Livestock, 7] • In a region where rainfall variability occurs on property to property or even paddock to paddock basis one has to react according to short to medium term forecasts. [Producer, Unknown , Livestock, 7]	4
Experienced/dealt with variability before (i.e. life experience) • We have managed dry, wet, hot and cold in ever-changing ratios for over 40 years and will continue to be prepared and positioned to respond to the season that unfolds. [Producer, SW Qld, Other Industries, 9] • Climate has always been variable. [Producer, Mackay, Livestock, 8] • Been through drought and floods before [Producer, Wide Bay Burnett, Livestock, 7]	**3**

General confidence • As a 2012 Nuffield Scholar, the studies have provided me with the knowledge to ensure that I am prepared for future droughts. [Producer, Central Qld, Livestock, 9] • While we haven't properly assessed the risks of climate change on our business we are reasonably confident that we are able to adapt most aspects of our business to the challenges and opportunities a changing climate may present. [Producer, North Qld, Other Industries, 7] • Fortunate that this property is in the wetter part of the Whitsundays. [Producer, Mackay, Livestock & Other Industries, 8]	**3**
Other • **Issues with regulations** ○ As a food producers we need support from our government leaders to allow us to stay in business. E.g. don't stop us from drilling underground bores, don't stop us from catching overland flow water. This is what makes us climate change ready. The rules and regulations are what's hindering us, not climate. [Producer, Darling Downs, Other Industries, 7] • **Lack of funds** ○ Have plans but funds are restricted to deliver over next 5 years or more. [Producer, Central Qld, Livestock, 7] • **Need for more accurate forecasting** ○ More accurate forecasting would be an asset. [Producer, Mackay, Livestock, 9] • **Raising awareness process** ○ Still in the awareness raising process. Identifying strategies that are suited to our region. Motivate farmers to adopt to climate variability. Our region's best bet is to focus on soils to be more resilient (water scarcity). [Service Provider/Other, Mackay, Livestock & Other Industries, 7] • **Responsibility of individual producers** ○ We can advise clients of options but it is up to them to act! [Service Provider/Other, North Qld, Livestock, 8] • **Need to improve delivery of climate information** ○ I'm confident when advising producers, but climate information needs to be better packaged and delivered in a coordinated way across the State across all industries, customised where possible to industry needs. [Service Provider/Other, Mackay, Livestock & Other Industries, 10]	**6**
Moderate confidence (4-6 rating)	
Confidence affected by uncertainty surrounding severity/length of future events • Can probably withstand 2 bad seasons with current stocks of hay [Producer, Wide Bay Burnett, Livestock, 6] • Really comes down to the length of the drought. [Producer, SW Qld, Livestock, 6] • My confidence is diminished due to the unknown severity of future events. [Producer, Wide Bay Burnett, Livestock, 6] • I have felt more confident in past years, however, the recent 8 months of dry conditions has been more difficult to plan around as we have had little to no grass rain and a very hot summer. I need to follow up spatial hub NRM course attended and then we can make plans based on ground cover measurements etc. [Producer, SW Qld, Livestock, 5] • I'm not sure you can be completely prepared, floods seem to exceed previous levels & natural disasters like wind storms, fires more common...[Producer, Central Qld, Livestock, 5]	**5**
Specific actions to prepare • I believe that my methods change as climate changes, we already have changed calving times to allow for later spring rains [Producer, SE Qld, Livestock, 6] • Plan to put in a dam [Producer, Wide Bay Burnett, Livestock, 4] • Our main considerations are to investigate restructuring financial facilities using available data [Service Provider/Other, North Qld, Other Industries, 5] • Growing tree crops limits options though varietal selection is used to pre-empt possible changes [Producer, SE Qld, Other Industries, 5] • I do all that I practicably can to prepare for and manage [Producer, Central Qld, Livestock, 6]	**5**
Flexibility and increased options increases confidence • ...On the other hand we have much better access to markets and more varied markets plus a better understanding at a government level for assistance such as being able to spread income over 5yrs in droughts. So I think flexibility & more options helps in dealing with droughts & disasters. [Producer, Central Qld, Livestock, 5]	**2**

• Would prefer business model to have more climatically diverse assets to provide more options and limit impact. [Service Provider/Other, Central Qld, Livestock, 5]	
Documented plans improved confidence • I feel confident but I'd feel much more if I had a documented plan to help them to fill out to get their thoughts down and have some timings etc. around decisions. [Service Provider/Other, Central Qld, Livestock, 6] • Reef Catchments have a climate sustainability plan but need to set targets and implement the plan. Mitigation also needs targets, footprint analysis and implementation. [Service Provider/Other, Mackay, Other Industries, 5]	**2**
Other • **Accurate forecasts key to confidence** ○ Confidence in the climate outlook is the key. I need to look from August / October and see through to March / April, for our sugarcane growing season. [Service Provider/Other, North Qld, Other Industries, 6] • **High variability between regions/properties** ○ When working in SA I felt very confident to prepare for climate variability. But moving to central Qld the variability is just so much higher. My region covers over 200 km and where one grower can have 200+ mm rainfall to someone else having 5 mm is so unpredictable [Service Provider/Other, Central Qld, Other Industries, 4]	**2**
No to very low confidence (0-3 rating)	
Production severely impacted by seasonal variability • We are in an industry requiring winter chill. This is difficult to guard against [Producer, Darling Downs, Other Industries, 1] • As with any season we depend on rain to plant as we dry farm [Producer, SW Qld, Livestock & Other Industries, 1] • Changing climate can affect the ability to continue to grow our current crops [Producer, Far North Qld, Other Industries, 2] • As a feedlot, availability and price of both cattle and commodities are critical components to the business. Weather directly influences these items and we have basic skills in forecasting the weather to make both medium to long range decisions. [Service Provider/Other, Darling Downs, Livestock & Other Industries, 3]	**4**
Confidence affected by uncertainty surrounding severity/length of future events • The length and severity of weather including drought is an unknown variable [Producer, SE Qld, Livestock & Other Industries, 3] • It's likely going to depend on the year. I expect high rainfall variability. [Service Provider/Other, SE Qld, Other Industries, 3]	**2**
Lack of understanding • We don't understand the drivers of seafood productivity [Producer, SE Qld, Other Industries, 2] • I would like to better understand grazing charts as a tool [Producer, Mackay, Livestock, 3]	**2**
Financial pressure/lack of funds • I can manage the animals and the grass on low or no rain, but it's the finances with no cashflow that is the killer. [Producer, North Qld, Livestock, 2] • Inputs too expensive in contrast to income from beef [Producer, Far North Qld, Livestock, 2]	**2**
Other • Specific actions to prepare (e.g.) ○ Plan to put 3000 ton of silage down for drought, I get 1000 ton down and will have to use it because of drought before next lot is cut. [Producer, Central Qld, Livestock & Other Industries, 3] • **Lack of government policy on climate change** ○ We have been proactive on managing climate change for over 20 years, especially after doing a RCS management clarification course, which improved and streamlined our decision making. Lack of genuine government policy on climate change impacts and agricultural sustainability makes future preparedness uncertain. [Producer, Central Qld, Livestock, 3] • **Issues with current forecasts** ○ Lack of analysis e.g. by BOM of the climate variability that is being experienced. Is current variability being factored into forecasts???? It would not appear to be. [Producer, Darling Downs, Livestock, 1] • **Limited climate resilience in NT**	**6**

○ The Northern Territory has little available in the terms of climate resilience. [Service Provider/Other, NT/WA, Livestock & Other Industries, 3] • **Impact of native vegetation laws** ○ Native Vegetation laws are placing a massive impediment on the business adapt to a more variable climate [Producer, Far North Qld, Livestock & Other Industries, 2] • **Scepticism** ○ Don't try and feed me the tax generating **** about climate change! It's all a load of **** to increase the taxation ripoff by our corrupt government! [Producer, SE Qld, Livestock, N/A]	

Confidence in ability to access resources/tools/information needed to effectively make planning decisions for climate variability

Table A17: Confidence in ability to access resources/tools/information needed to effectively make planning decisions for climate variability

Comments	Mentions
High to very high confidence (7-10 rating)	
Limited confidence/don't rely on tools/resources • I am confident I have access to the tools, I don't have confidence in the tools [Producer, Central Qld, Livestock, 10] • Access does not necessarily mean the resources are all brilliant [Service Provider/Other, North Qld, Livestock, 8] • Although forecasts are used, I find they need to be taken with a grain of salt and a measure of both gut and general foresight need to be considered [Producer, Central Qld, Livestock, 7] • I don't necessarily rely on them [Service Provider/Other, NT/WA, Livestock, 7]	**4**
Specific tool/resource • I use ECMWF - the best 10 day forecast there is - all accessible for free via the Norwegian website [Producer, Mackay, Other Industries, 10] • Bom has good information... [Producer, Darling Downs, Other Industries, 8] • Reef Catchments Sustainable Climate Plan 2016 - 2020 useful source. Networking/ visit cross-regional workshops... [Service Provider/Other, Mackay, Livestock & Other Industries, 8]	**3**
Value of local expertise (e.g. local extension officers) • No matter how prepared one is nature has a way of making fools of us at times. Our local extension officer is fantastic and always willing to help with advice etc. [Producer, Wide Bay Burnett, Livestock, 7] • ...our APPLETHORPE DPI is well resourced. [Producer, Darling Downs, Other Industries, 8]	**2**
Internet • The internet is a good tool [Producer, SE Qld, Livestock, 8] • Use of the Internet [Producer, North Qld, Livestock, 8]	**2**
Other • **Too many information sources (difficulty knowing what to use)** ○ There are a plethora of tools and information out there and it isn't easy for a decision maker or an advisor/extension officer to pull together information to use [Service Provider/Other, Mackay, Livestock & Other Industries, 9] • **Limited financial capacity/incentive to apply climate change resources** ○ There is a lot of information etc. on climate change, but with all levels of government pursuing a lowest unit cost production system regardless of the impact on the environment, communities, or finances, leaves producers with a perpetual uncertain future. A massive amount of climate change resources are available, but the restricted financial capacity to apply the science stops implementation. [Producer, Central Qld, Livestock, 10] • **General awareness** ○ For a price, but I know they are there [Producer, Central Qld, Livestock, 7]	5

• **Other comments**
  ○ ...Implementing change will be tricky. Could we utilise carbon farming as an incentive/ encouragement for farmers. [Service Provider/Other, Mackay, Livestock & Other Industries, 8]
  ○ State Government needs to step out of the way to allow Producers to Develop Their Land for Better Management and Drought Resilience. [Producer, North Qld, Livestock, 9]	

Moderate confidence (4-6 rating)	
Lack of confidence in forecast reliability (need for more accurate forecasts) • More accurate weather forecasting would be a great help. [Producer, Central Qld, Livestock, 6] • more long term forecasts would be helpful [Producer, SW Qld, Livestock, 6] • The reliability of the information available is not sufficient to make long term decisions. [Producer, Wide Bay Burnett, Livestock, 6] • There are large geographic gaps in weather records for the NT, filling in these gaps to better understand patterns is necessary to improve decision making. [Service Provider/Other, NT/WA, Livestock, 6] • Weather forecasts are not reliable [Producer, Darling Downs, Other Industries, 4] • I know we don't fully utilise what is available, however, feedback from those that do tends imply the available tools are ok as general outlook indicators, but have a lot of refining required [Producer, NT/WA, Livestock, 5]	**6**
Too many information sources (difficulty knowing what to use) • So many sources of info. Hard to know which are best. Implications of variable rainfall periods can impact of weeds, toxic plants, forage production [Service Provider/Other, SE Qld, Livestock & Other Industries, 4] • Depends which scientists you listen to! Often the topic is very confusing as to real or not & what to expect to happen. [Producer, Central Qld, Livestock, 5]	**2**
Financial issues (e.g. budgeting for financial predictions) • Only resources missing are money [Producer, Far North Qld, Livestock, 6] • Plenty for managing grass and doing grass budgets, and managing stock. However, making the budgets for financial predictions and looking for ways to managing debt with no promise of income is the most difficult and least discussed. [Producer, North Qld, Livestock, 4]	**2**

Other
• **Issues with internet/mobile availability/reliability**
  ○ Internet access & poor mobile phone coverage make using a lot of technology not practical [Producer, Far North Qld, Livestock & Other Industries, 5]
• **Rely on personal intuition/experience**
  ○ As long as I ignore BOM predictions and stick to what I reckon all is well [Producer, NT/WA, Livestock, 6]
• **Desire to improve understanding of BoM climate models**
  ○ I would like to understand better the climate models used by BOM. [Producer, SW Qld, Livestock, 5]
• **Need for clearer mitigation targets**
  ○ We need clearer mitigation targets for each sector, business, house etc! We need clear direction on when people (houses) will be relocated - it probably could have been good timing for this in some areas post cyclone. [Service Provider/Other, Mackay, Other Industries, 5]
• **Specific planning used**
  ○ We match stock numbers to feed and have at least a 30% reserve beyond six months out. This gives six months to adjust numbers. [Producer, Mackay, Livestock, 5]
	5

No to very low confidence (0-3 rating)	
Lack of confidence in forecast reliability (need for more accurate forecasts) • Current long term forecasts are too inaccurate to be useful [Producer, Darling Downs, Livestock, 3] • For the Wet Tropics we need better forecasting for large rain events - BMP & Reef Regs [Producer, Far North Qld, Other Industries, 3] • I have access to reports but after I make decisions forecasts change [Producer, Far North Qld, Other Industries, 3] • The info that is provided has a too high possibility of being wrong. Cyclone deb week out big rain for whole of area day out nothing, system came through last week big rain forecast then	**7**

nothing. people look at the long term forecasts and the predicted outlook doesn't happen [Producer, Central Qld, Livestock, 0] • As above, I don't see existing climate variability being factored into the forecasts. [Producer, Darling Downs, Livestock, 1] • Climate change has mixed messages on long term events & trends [Producer, SE Qld, Livestock & Other Industries, 3] • Scale of prediction is a problem especially in south west Qld where I have many clients. We do need to be able to work at farm/property level [Service Provider/Other, Darling Downs, Livestock & Other Industries, 3]	
Other • **Issues with internet/mobile availability/reliability** ○ Lack of reliable internet access especially during extreme weather events makes planning very difficult. [Producer, SE Qld, Other Industries, 1] • **Too many information sources (difficulty knowing what to use)** ○ There are many tools available it's understanding and being familiar with the right ones for the right situation. [Service Provider/Other, Unknown, Livestock, 3] • **Lack of awareness of available resources/tools** ○ Not sure what is available [Producer, Mackay, Livestock, 3] • **Lack of resources for NT** ○ The Northern Territory has little available in the terms of climate resilience. [Service Provider/Other, NT/WA, Livestock & Other Industries, 2] • **No response strategy for prawn industry** ○ For tiger prawns we recognise temperature is a driver of recruitment strength, but we haven't developed a response strategy. [Producer, SE Qld, Other Industries, 2] • **Acknowledgement of the need to access more information** ○ I probably need to improve my ability to access information on climate variability? [Service Provider/Other, North Qld, Livestock, 3] • **Scepticism** ○ It's called seasons, not climate change! [Producer, SE Qld, Livestock, N/A]	**7**

Comments on other tools/resources/forecasts used

Table A18: Details of any other tools/resources/seasonal forecasts

Comments	Mentions
Other forecasting/rain-prediction websites	
WX Maps • wx maps .org forecasts [Wide Bay Burnett, Producer, Livestock & Other Industries] • http://wxmaps.org/pix/aus.vv.html [NT/WA, Service Provider/Other, Livestock] • ...WX maps... [Central Qld, Producer, Livestock] • ...wxmaps... [Darling Downs, Producer, Livestock]	**4**
WeatherZone • …Weatherzone plus app is the most accurate I have so far encountered and provided days hourly expectations, and a 7 day forecasting...[Central Qld, Producer, Livestock & Other Industries] • WeatherZone Forums [Far North Qld, Producer, Livestock] • ...weatherzone... [Darling Downs, Producer, Livestock]	**3**
Elders Weather • Elders weather [Darling Downs, Service Provider/Other, Livestock & Other Industries] • Elders long range weather [Mackay, Producer, Livestock & Other Industries]	**3**
Higgins Storm Chasers • On line such as Higgins Storm Chasers etc. [Far North Qld, Service Provider/Other, Livestock] • Higgins storm chasers - these guys are 10 times more accurate than bom... [Central Qld, Producer, Livestock]	**2**

Yr.no • Use of website and app yr.no for an 8 day forecast. [Central Qld, Producer, Livestock & Other Industries] • YRNO [Wide Bay Burnett, Producer, Livestock]	**2**
Other websites/forecasts (e.g. AV Weather, Wetterkarte, Hayden Walker, Oz Cyclone Chasers, DSITI Monthly Climate Statement, ECMWF, The Ringer Weather Forecasting, WeatherUndergound, GFS) • Rain prediction websites - Wetterkarte, weatherzone... We monitor the Indian Ocean Dipole as it seems to have more effect on our rainfall than El Nino. [Darling Downs, Producer, Livestock] • We subscribe to AV Weather and have so far been really happy with his climate information. [Central Qld, Producer, Livestock] • Hayden Walker [North Qld, Producer, Livestock] • Various other websites [Central Qld, Service Provider/Other, Other Industries] • ...USE MULTIPLE WEATHER SITES, LOOK AT WEATHER PATTERNS AND SIGNS IN NATURE. [Central Qld, Producer, Livestock] • I use the integration of several model tools that Oz Cyclone Chasers report on regularly to gain updated weather outlook. [North Qld, Service Provider/Other, Other Industries] • DSITI Monthly Climate Statement [Darling Downs, Service Provider/Other, Livestock & Other Industries] • ECMWF - all anyone needs - integrates climate drivers [Mackay, Producer, Other Industries] • Good Fruit & Vegetables - The Ringer Weather Forecasting (Facebook) is always spot on!...weather underground app with its mapping and charts [Central Qld, Producer, Livestock & Other Industries] • GFS In the past, this was generally more accurate than BOM. Good a week out. Past 12 months, only accurate 2or3 days out. [Mackay, Producer, Livestock] • ...Fire Maps [Central Qld, Producer, Livestock] • 10day outlook... [Central Qld, Producer, Livestock]	**12**
BOM	
BOM website and tools (e.g. 4 day rainfall forecast, monthly videos, Climate Ahead, quarterly summaries, SOI, MJO) • BOM 4 day rainfall forecast [Far North Qld, Producer, Other Industries] • Use the BOM website only to predict the amount of rain that may fall over the next 90 days. [North Qld, Producer, Livestock & Other Industries] • BOM website & BOM monthly videos [NT/WA, Service Provider/Other, Livestock] • Climate Ahead (BoM) [North Qld, Service Provider/Other, Livestock] • BOM quarterly summaries on Landline [Darling Downs, Producer, Livestock] • SOI, MJO [Mackay, Producer, Other Industries]	**6**
Other	
Personal experience / Intuition • Experience of the "feel" of how the season is shaping up has been more reliable than "climate experts" for long range forecasting. The moon gives short-term indication. [SW Qld, Producer, Other Industries] • Nature [SW Qld, Producer, Livestock & Other Industries] • "feel" for weather- if it is cool in Sept no matter what they say it will not rain until late Dec, feel the upper air temp and humidity for end of wet etc etc oh yes and one more thing -almost forgot- buy somewhere that you always get a wet season [NT/WA, Producer, Livestock] • I look at the state of my pasture [NT/WA, Producer, Livestock] • Common sense! Farmers have been using it for centuries! [SE Qld, Producer, Livestock]	**5**
Historical records • Own records and decision dates [SE Qld, Service Provider/Other, Livestock] • Historic rainfall data and trigger points/dates for effective pasture growth for perennial pasture growth [SE Qld, Service Provider/Other, Livestock] • For beekeeping we rely on knowledge passed down by older beekeepers. Most Australian species do not flower regularly. Many rely on rainfall at certain times. Need to keep own rainfall records as bom records only accessible for 12 months. Need more regional information re soil moisture. [SE Qld, Producer, Other Industries] • Historic data (local rainfall and likelihood of dry months) [Central Qld, Producer, Livestock]	**4**
Pasture Feed Budgets (e.g. RCS Grazing Chart, MaiaGrazing)	**4**

• RCS Grazing Chart [Central Qld, Service Provider/Other, Livestock] • We use the RCS grazing for profit systems and grazing charts based on the rain we have received. So per 100mm rain we base our feed budget not so much what we think will come our way. we budget the feed we have in the paddock today and match it to stocking rate. IF we have to many mouths we sell/off load. [North Qld, Producer, Livestock] • Pasture feed budgets, matching SR to CC [Central Qld, Producer, Livestock] • MaiaGrazing. Grazing management software which wraps context around my stocking rate and provides simple to build forecast for my operations. Simple feed budgeting tools also. [Central Qld, Producer, Livestock & Other Industries]	
Email updates (e.g. Neil Cliffe, Roger Stone) • Neil Cliffe's emails! [Mackay, Service Provider/Other, Other Industries] • Email update on climate and weather from USQ Roger Stone [Mackay, Service Provider/Other, Livestock & Other Industries]	**2**
Other • **Breedcow herd model** ○ Breedcow herd model to model effect of reducing cattle numbers on future structure and cash flow [NT/WA, Service Provider/Other, Livestock] • **Other comments** ○ These tools are not relevant to producers and they are not reported in a format that is relevant, I need to know if it will rain, not the median temp at hawai....it is your job to interpret [Central Qld, Producer, Livestock] ○ All wonderful if they could be relied upon. We would be in trouble now if we had made decisions based on forecasts. Question 6 is irrelevant unless the forecasts are better than they have been. [Mackay, Producer, Livestock]	**3**

Barriers preventing access to relevant tools/resources and/or knowledge

Table A19: Barriers preventing access to relevant tools/resources and/or knowledge

Comments	Mentions
Forecast accuracy/reliability • ...When forecasts all differ, it is good not to rely solely on BOM as you can get some pretty nasty surprises when you are not prepared - for big forecast rain that doesn't appear even though BOM give it 90%. And also for big rain that does appear when BOM does not predict it. BOM needs to get its 90% correct - often it should be closer to 50% with the patchy rain over the last 5 years. [Darling Downs, Producer, Livestock] • A lot people I work with don't have faith in the accuracy of forecasts and so don't use these to make good decisions, especially in the spring period where early restocking could be useful if a dry summer is expected. I have also found that people are very optimistic (which is good normally) when they read forecasts and are less likely to take them conservatively eg when the forecast is 60% of exceeding median rainfall, sometimes I hear people saying -looks like we might get some good rain this season. [Central Qld, Service Provider/Other, Livestock] • BOM can change its outlook for a wet season from optimistic to dismal in the space of a month [X Unknown, Producer, Livestock] • POAMA is useless - why do you still include it - does not indicate your familiarity with current knowledge [Darling Downs, Producer, Livestock & Other Industries] • Weather is constantly variable and regardless of forecast will do as it wishes. Best is to be prepared for majority of possibilities within usual business practices and activities. Forecasting tools assist in business decisions but still can not accurately tell me what the weather will do tomorrow let along 3 or 6 months time! [Central Qld, Producer, Livestock & Other Industries] • Lack of accuracy makes it a time wasting exercise and useful stuff like radar service at Tennant Creek gets closed by government so what makes you think funding will suddenly appear for anything relevant for the bush? [NT/WA, Producer, Livestock]	**6**
Internet speed/reliability/access • While we have internet access the reliability is appalling. [Central Qld, Producer, Livestock]	**4**

• Skymuster is too slow, excess data used trying to download. To unreliable to get in the habit of using internet required tools. [SW Qld, Producer, Livestock] • We need NBN [Darling Downs, Producer, Other Industries] • Many producers are remote from high quality internet speeds - for me its Satellite. Fix mobile black spots [Mackay, Producer, Other Industries]	
Lack of locally/industry relevant information/forecasts/tools/records • I would like a technical summary relevant to beef production in south west qld. We are using info for the sugar producing regions because can't find useful summary for our region, other than BOM… • interpretation system for combining various dynamical models/indices into useable packages, ground truth-ed with localised historical and current data [Darling Downs, Producer, Livestock] • BoM is only relevant for east coast [North Qld, Producer, Livestock]	**3**
Financial pressures • Managing finances and debt is the single most challenging thing in drought. If selling cows was just a decision to sell due to welfare that is easy but to couple welfare with financial pressures it makes it a frightening experience. When you have no inventory how do you demonstrate to the bank your viability... [North Qld, Producer, Livestock]	**1**
Other comments • Coordination, integration and customisation of products for users is critical and continuity of communication and support for producers and other decision makers advisors etc. is need to that regular climate updates support management decisions and extension programs. [Mackay, Service Provider/Other, Livestock & Other Industries] • Important that all forums and platforms are used to highlight the importance and relevance of these to their business profitability (in the short to long term) [SW Qld, Service Provider/Other, Livestock] • If you are managing for the pasture you have, you don't need prediction. [NT/WA, Producer, Livestock] • Maybe too involved and don't have the necessary skills [Far North Qld, Producer, Other Industries]	**4**

On-farm changes relating to managing for climate variability

Table A20: Changes made on farm

Comments	Mentions
Livestock	
Pasture management (e.g. rotational grazing, paddock spelling, grass budgeting, weed reduction, planting improved pastures, fertiliser selection) • We have stated to run our main breeding herd as one mob rotating between two paddocks, instead of 2 mobs set stocked between two paddocks. There are plans to split these paddocks when capital becomes available. [Central Qld, Service Provider/Other, Livestock] • Wet season spelling [Wide Bay Burnett, Producer, Livestock] • We maintain a keen awareness of our pasture and being fortunate to live in some of the best renowned cattle country comparatively close to markets... [Central Qld, Producer, Livestock] • We have been grass budgeting and rotational grazing for over eight years along with implementing new/closer watering points to utilities and preserve pasture quality. [Central Qld, Producer, Livestock] • We have implemented rotational grazing on areas developed for this... [Wide Bay Burnett, Producer, Livestock] • Removing weeds and planting improved pastures [Wide Bay Burnett, Producer, Livestock] • Use feedlots to spell pasture under certain conditions. [Central Qld, Producer, Livestock] • Pasture management. [Darling Downs, Producer, Livestock] • We have been a BOM rainfall site for many many years so have all those weather records and we also assess our pasture growth with what is happening with rainfall. This year we are drought declared but have good grass as we sold anything with any condition as soon as the	**42**

summer rains failed so steers to feedlots moving younger cattle around and as a result we are in a good position. [SE Qld, Producer, Livestock]

- Time controlled grazing and running cattle that are suitable to our region. which has seen a reduced amount of lick fed as well as more grass grown as well as been able to carry cattle longer than previously. [Central Qld, Producer, Livestock]
- ...and constantly evaluate amount of "good" usable grass - don't count the straw crap. [NT/WA, Producer, Livestock]
- Rotational Grazing --- better quality feed Controlled mating --- calf's fall when there is better feed and easier to identify non performing cows [Wide Bay Burnett, Producer, Livestock]
- ...Returning cultivation to forage due to lack of summer rainfall to provide a body of feed to endure winter so as to retain core breeding herd. [Darling Downs, Producer, Livestock]
- ...plan to have grass when nobody else does so that a big margin can be made on smaller numbers/fewer numbers [SE Qld, Producer, Livestock]
- Paddock rotation... [Central Qld, Producer, Livestock]
- ...Vegetation Control Pasture Improvement [North Qld, Producer, Livestock]
- Not planning improve pasture [Wide Bay Burnett, Producer, Livestock]
- ...and pasture types... [Far North Qld, Producer, Livestock]
- ...spelling of paddocks... [Wide Bay Burnett, Producer, Livestock]
- ...Review of pasture and fertiliser selections. [SE Qld, Producer, Livestock]
- Increase in pasture variety introduction of legumes & other grasses - better feed quality year round, more robust pastures to changes not reliant on monoculture buffel... [Central Qld, Producer, Livestock]
- Implementing holistic management practices. Varying rotational grazing practices to encourage vegetation/species to better adapt to our specific property. [Mackay, Producer, Livestock]
- ...Pasture planting has helped improve pastures both in density and variation. Controlled joining and preg testing has helped develop a more productive and profitable herd. [Wide Bay Burnett, Producer, Livestock]
- Fortnightly pasture assessment Intensified grazing systems [Darling Downs, Service Provider/Other, Livestock]
- ...Woody Weed Control...Pasture Management for Seasons [SE Qld, Producer, Livestock]
- Fencing to enable rotation [Central Qld, Producer, Livestock]
- Faecal NIRS sampling to determine pasture quality... [Central Qld, Service Provider/Other, Livestock]
- ...and more division fences in paddocks to enable cattle to be rotated to spell pastures and increase and maintain groundcover [Central Qld, Producer, Livestock]
- Ensure there is adequate ground cover coming out of a drought... [SE Qld, Service Provider/Other, Livestock]
- Encouraging mulga to grow to we have a reliable feed source [SW Qld, Producer, Livestock]
- Dividing into more paddocks for better stock rotation. [Mackay, Producer, Livestock]
- ...seasonally spelling paddocks where possible. Having management plans in place - with room for variance if seasons are unpredictable. [Central Qld, Producer, Livestock]
- ...and working on paddock renovation and weed control; allowing recovery [North Qld, Producer, Livestock]
- ...2) Improving pasture to provide good ground coverage... [Far North Qld, Producer, Livestock]
- Allowing native regrowth species to grow and removing non-native species. Noticing the return of good quality native grasses. [SE Qld, Producer, Livestock]
- ...Ground cover needs to be kept at 90% now but 20 years ago 70% was adequate...Biodiversity and a balanced ecosystem we consider important for helping to maintain grass cover, insect populations and feral animals... [Wide Bay Burnett, Producer, Livestock]
- Maintain ground cover...rain penetration and pasture response, reduce erosion/sediment, gain on drought recovery process as a result, and better able to capture market opportunities going into and out of drought. [Darling Downs, Producer, Livestock]
- Cell grazing/ paddock rotation Benefits are better grass management and less erosion [Far North Qld, Producer, Livestock]
- Challenging the pasture budgeting process currently in place - the actual accuracy of this data given the paddock variability, and how we actually apply that data to decisions made. No benefits as yet due to another more accurate method of pasture assessment not currently being available for such large areas (or tech such as drones/photos/ not suitable yet).Land condition assessment has been undertaken, unsure as to any actions resulting from this but poor conditions have been identified. [NT/WA, Service Provider/Other, Livestock]
- Changed from grain cropping to beef cattle forage production on farmed land so we are able to utilize all or more falls of rain and have ground cover for longer periods to reduce erosion and increase rainfall infiltration. [SW Qld, Producer, Livestock]

• Clearing camphor laurel and lantana and bracken to improve pastures for stock. [SE Qld, Producer, Livestock] • Critical dates on planting of forage crops and economics of such water availability pasture / forage crop selection & rotations cattle buy / sell planning [Darling Downs, Producer, Livestock]	
Stocking rates/carrying capacity • We have dropped our numbers to allow the regeneration of grasses as our seasons slowly transition from winter dominant to summer dominant. Ultimately this will increase our capacity to sustain dry seasons and drought periods. [NT/WA, Producer, Livestock] • ...we adjust our carrying capacity according to the season. [Central Qld, Producer, Livestock] • Stocking rates adjusted to pasture quality. [Far North Qld, Producer, Livestock] • Stock reductions to better match cc [Mackay, Producer, Livestock] • sell in drought [Wide Bay Burnett, Producer, Livestock] • We are a trading enterprise, backgrounding into feedlots. This year we had a dry summer, this last wet season, but due to our early destocking strategy and matching our feed availability to stocking rate, we were able to cut stock numbers back early and take advantage of higher prices, rather than waiting and flooding the market with many other producers after we had run out of feed. Also because of this we are now going into a winter carrying healthy stock (all be it less than we usually would), but also with a healthy body of feed that will carry us comfortably with the number of head with had on now, through to the next wet season. [Central Qld, Producer, Livestock] • ...Do not overstock. [SE Qld, Producer, Livestock] • Stocking rate management has achieved a major improvement in both grass and cattle live weight production [North Qld, Service Provider/Other, Livestock] • More conservative stocking and aggressive selling early meaning less livestock to cater for. [Central Qld, Producer, Livestock] • Reduce stocking numbers which reduces grazing pressure so we can manage for dry times much better. Climate variability is part of life on the land so as a business, we have to plan for more dry periods than wet. [Central Qld, Producer, Livestock] • Strip grazing... [SE Qld, Producer, Livestock] • Reduced stocking rates... [Darling Downs, Producer, Livestock] • Managing stock rates and pasture types with paddock improvements of fencing & water points should provide longer and more sustainable feed sources and easier managed cattle [Far North Qld, Producer, Livestock] • ...understocking... [Wide Bay Burnett, Producer, Livestock] • I stock conservatively always and try to be proactive with stocking. I know the daily current AE number and compare with that of similar years from a 17 year record (from the start and end of each quarter). I also look closely at the amount of feed paddock by paddock. This method is not so good as measuring the quantity of grass available at the end of summer to set stocking levels but a lot quicker. The latter method also relies on some skill as well in that you have to be good at finding average sites to do the measurements and then be good at the assessment. (A guess X a guess = a very big guess). The main benefit is that I need to worry a little less. [Central Qld, Producer, Livestock] • Holistic grazing management has helped with feed budgeting and managing appropriate stocking rates... [Wide Bay Burnett, Producer, Livestock] • Forage budgeting for carrying capacity [SW Qld, Service Provider/Other, Livestock] • ...Forage budgets Culling non-productive cattle ie. not pregnant females... [Central Qld, Service Provider/Other, Livestock] • Destocking prior to dry cycle... [Central Qld, Producer, Livestock] • Currently destocked... [North Qld, Producer, Livestock] • 1) Adjust stocking rates to suit forecast weather conditions... [Far North Qld, Producer, Livestock] • Awareness that climate has changed and we can no longer expect a late spring/summer break. Our expected growing rain is in late summer/autumn and pasture monitoring and stocking rates have changed from historic levels...We now run less cows per ha. [Wide Bay Burnett, Producer, Livestock] • Better ability to plan for destocking...[Darling Downs, Producer, Livestock]	**23**
Land/paddock management (e.g. fencing, erosion control, watering points, shade) • ...erosion measures... [SE Qld, Producer, Livestock] • ...paddock improvements of fencing & water points should provide longer and more sustainable feed sources and easier managed cattle [Far North Qld, Producer, Livestock] • More watering points for cattle so they don't have to walk so far in the hot weather and trees for cattle camps close by. Benefit increase in weight gain. [Wide Bay Burnett, Producer, Livestock]	**18**

• ...improved water points [Wide Bay Burnett, Producer, Livestock] • ...Increased fencing for stock management... [SE Qld, Producer, Livestock] • ... Better pasture utilisation through increased water points & more reliable water than relying on dams, use of solar bores & poly. [Central Qld, Producer, Livestock] • Improved fences, smaller paddocks for better management. [North Qld, Service Provider/Other, Livestock] • ...Extra fencing has helped with caring for riparian areas as well as providing pastures with extended rest and recovery times. Extra watering points have helped with care of hillsides and other erosion issues... [Wide Bay Burnett, Producer, Livestock] • Fire Management... [SE Qld, Producer, Livestock] • Fencing, water points... [Central Qld, Producer, Livestock] • Fencing to manage young breeders more effectively. Improve control and provide the opportunity for preferential management in dry times. [NT/WA, Service Provider/Other, Livestock] • Extra watering points. Added in previous drought where no rain fell for two years. These are long term capital expenses that could be used down the track. [SW Qld, Producer, Livestock] • Extra watering points installed... [Central Qld, Producer, Livestock] • Increase in the use of wire... [Wide Bay Burnett, Producer, Livestock] • ...Burning has changed from 1-2 year cycles to 5-6 year intervals and not all paddocks are burnt each time... [Wide Bay Burnett, Producer, Livestock] • ...reduce erosion/sediment... [Darling Downs, Producer, Livestock] • ...segregation... [Far North Qld, Service Provider/Other, Livestock] • Condition Scoring of Land with the aim of restore all land to a condition score of "A" to ensure the maximum benefit is achieved per mm of rain. [Darling Downs, Producer, Livestock]	
Water management (e.g. water and irrigation infrastructure, water diversion, water use efficiency, solar pumps, water storage) • Working to improve landscape function to increase water use efficiency. [NT/WA, Producer, Livestock] • ...We have also invested in major water infrastructure for watering cattle and irrigating fodder crops. All of these strategies help us manage the variations in climate and retain reasonable production. [Wide Bay Burnett, Producer, Livestock] • Water diversion across property... [SE Qld, Producer, Livestock] • Replacing windmills with solar pumps has taken an enormous pressure off, knowing that water is available regardless of weather and the reliability is there. [Darling Downs, Producer, Livestock] • ...water conservation... [SE Qld, Producer, Livestock] • ...and alteration to water storage issues and capacity [Central Qld, Producer, Livestock] • Proposed Irrigation... [North Qld, Producer, Livestock] • Increased water storage. Increased fencing for stock management. Review of pasture and fertiliser selections. [SE Qld, Producer, Livestock] • Improving water infrastructure to spread Grazing pressure to better manage pastures and ensure animal performance and longer lead time into dry periods. (This would only work if they don't then up the stocking rates a lot to match the available pasture straight away and end up without Extra pasture by end of the year) [Central Qld, Service Provider/Other, Livestock] • ...Water Storage... [SE Qld, Producer, Livestock] • Increase in the use of... water [Wide Bay Burnett, Producer, Livestock] • Built 10 ML Dam with c. 1Km Diversion Bank from Road + Cleaned out & deepened other dams designed never to go dry on past rainfall records; but all been dry 3 times since 1991. [SE Qld, Producer, Livestock]	**12**
Business management (e.g. market selection, trading, farm management deposits, strategic preparations) • Turn off weight / market selection / finishing method due to difficulty in obtaining wt from grass [Wide Bay Burnett, Producer, Livestock] • Switch from breeding focus to trading... [NT/WA, Producer, Livestock] • purchase stock when cheap and sell when expensive... [SE Qld, Producer, Livestock] • More focus on efficient small animal production [SW Qld, Producer, Livestock] • ...trading stock on quick turn-around to spell paddocks [Central Qld, Producer, Livestock] • Farm management Deposits [Central Qld, Producer, Livestock] • ...Production feeding stock for direct sale to abattoirs if effective rain has not occurred before 15th March. (SE Qld) Monitor second trigger point as 15th April and keep core breeder numbers - must be pregnant , 4 - 8 years old and within the correct calving window. Price hay and Whole cotton seed [SE Qld, Service Provider/Other, Livestock]	**8**

• Early weaning and selling all sale ready animals. [Unknown , Service Provider/Other, Livestock]	
Weening/breeding/joining • ...and early weaning when necessary... [Wide Bay Burnett, Producer, Livestock] • We completely reversed our breeding window. So instead of calves in Dec/Jan for green grass that may not be there. We have timed spring calves Aug/Sept. Cow is to carry them Oct Nov. Then if we have to radical wean in Dec/ Jan we can and we can truck everyone safely to agistment. We won't ever time our main calves to come in Dec Jan which a lot of the north do as you can't truck fresh calves and poor cows, when the rain hasn't come. [North Qld, Producer, Livestock] • ...Controlled joining and preg testing has helped develop a more productive and profitable herd. [Wide Bay Burnett, Producer, Livestock] • ...Early weaning [Central Qld, Service Provider/Other, Livestock] • Early weaning... [Unknown, Service Provider/Other, Livestock] • ... We wean early when needed instead of keeping calves on mum till weaner sales. We may have lighter calves to sell but breeders are kept in better condition and go back in calf easier... [Wide Bay Burnett, Producer, Livestock] • Breeder management, weaning strategies...identification non-breeding stock [Far North Qld, Service Provider/Other, Livestock]	**7**
Strategic/flexible decision making (e.g. based on weather/seasons/rainfall/forecasts) • Emphasis on preparedness and strategic preparations. [Central Qld, Service Provider/Other, Livestock] • ...having management plans in place - with room for variance if seasons are unpredictable. [Central Qld, Producer, Livestock] • ...gain on drought recovery process as a result, and better able to capture market opportunities going into and out of drought. [Darling Downs, Producer, Livestock] • buy ewes or wethers - look at grass and what the outlook for season ahead is, no or limited season then purchase wethers. If it looked good then buy ewes . [Central Qld, Producer, Livestock] • Common-sense management. Flexibility. Improving results in variable climatic conditions from year to year over 30 years. [Mackay, Producer, Livestock]	**5**
Property/agistment selection • Sthn Gulf (Qld) grazier who purchased another property in NT - different seasonal conditions in each area. [Darling Downs, Service Provider/Other, Livestock] • Purchasing a property in a reliable rainfall area but still stocking conservatively as a base but with room for trade/agistment cattle in good years [NT/WA, Service Provider/Other, Livestock] • include agistment as a core livestock enterprise so u can get out of the animals when it doesn't rain [Central Qld, Producer, Livestock] • ...agistment, selling... [Central Qld, Producer, Livestock] • Avoid looking for agistment in central Queensland due to lack of summer rain and unsure of rain forecast over next 3-6 months. Seeking agistment/ purchase of property closer to the coast where rain has fallen heavier, and won't need to look for more county in the next 3-6 months. [Central Qld, Producer, Livestock]	**5**
Silage storage • We currently have 1200T of silage stored for drought feeding. [Central Qld, Producer, Livestock] • We expect to start a small farming operation to store silage for dry times. [Far North Qld, Producer, Livestock] • ...silage stockpiling [SE Qld, Producer, Livestock] • making and storing hay... [Wide Bay Burnett, Producer, Livestock]	**4**
Nutrition supplementation • ... 4) Utilise high urea licks for better protein conversion of dry pasture feed [Far North Qld, Producer, Livestock] • ...or protein supplementation and costs...Grow stock on available feed and offload at good condition levels when the drought bites hard. Maintain ground cover... [Darling Downs, Producer, Livestock] • ...Phosphorus supplementation, segregation... [Far North Qld, Service Provider/Other, Livestock] • parasite control, supplementation [NT/WA, Service Provider/Other, Livestock]	**4**
Breed selection	**3**

• ...running cattle that are suitable to our region... [Central Qld, Producer, Livestock] • ...3) Choosing relevant cattle breeds to deal with dry conditions... [Far North Qld, Producer, Livestock] • ...productive species... [Darling Downs, Producer, Livestock]	
Other comments • Mainly reactive at this stage, hopefully become more proactive as graziers become more aware. [North Qld, Service Provider/Other, Livestock] • Land managers in Kimberley plan from wet season to wet season. If it is a poor wet season with little pasture growth animals will need to be sold early to conserve feed for remaining cattle. [NT/WA, Service Provider/Other, Livestock] • not yet - but expecting increased rf in North Kimberley therefore increased confidence [NT/WA, Service Provider/Other, Livestock]	**3**
Livestock & Other Industries	
Pasture management (e.g. rotational grazing, improved pastures/grasses) • ...and more paddocks for time control grazing. Better use of pasture, expected been in drought for the last 5 yrs [Central Qld, Producer, Livestock & Other Industries] • A client that we are working on has taken on board alternate stocking regimes for riparian fenced paddocks. An alternate pasture species has been introduced that performs better through drier seasons in these riparian paddocks [Central Qld, Service Provider/Other, Livestock & Other Industries] • crop rotation... [Central Qld, Service Provider/Other, Livestock & Other Industries] • ... Types of improved pasture/grasses [Mackay, Producer, Livestock & Other Industries] • Fencing to spread grazing pressure, is a management strategy being utilized. [Central Qld, Producer, Livestock & Other Industries] • Future graze planning based on countries / paddocks ability to graze under similar climate context in combination with traditional matching of anticipated stocking rates vs pasture growth prediction models [Central Qld, Producer, Livestock & Other Industries] • ...Improving pastures = more grass for longer... [Central Qld, Producer, Livestock & Other Industries] • ...Leucaena as a bit more fraught tolerant [Wide Bay Burnett, Producer, Livestock & Other Industries] • planting a variety of grass seed on improved pastures... [SW Qld, Producer, Livestock & Other Industries] • ...and having diverse pastures... [Far North Qld, Producer, Livestock & Other Industries] • Utilising different paddocks for different time of year due to grass species, frost, response to rain, soil type [Central Qld, Producer, Livestock & Other Industries] • Zero till Lueceana [Darling Downs, Producer, Livestock & Other Industries]	**12**
Water management (e.g. bore, dams, recycled water, tanks, securing water supply options) • ...Bought into share bore for reliable water. Fenced off creeks and more paddocks for time control grazing. Better use of pasture, expected been in drought for the last 5 yrs [Central Qld, Producer, Livestock & Other Industries] • Extra dams. Types of improved pasture/grasses [Mackay, Producer, Livestock & Other Industries] • Improved water facilities [SE Qld, Producer, Livestock & Other Industries] • Looking at increasing irrigation capability through recycled water [Far North Qld, Service Provider/Other, Livestock & Other Industries] • ....better water utilization by putting in tanks instead of open earth water storage=more water through less evaporation and soakage. [Central Qld, Producer, Livestock & Other Industries] • On farm storage for irrigation... [Wide Bay Burnett, Producer, Livestock & Other Industries] • Running water lines and troughs [SW Qld, Producer, Livestock & Other Industries] • Securing additional water supply options as water or land are always the limiting factor in horticultural production. All other aspects can be managed and adapted. [Central Qld, Producer, Livestock & Other Industries] • Use of bores for irrigation. Not relying upon a wet season to water the crop. Need to plan more for buying in extra temporary water allocation during the water year. [North Qld, Producer, Livestock & Other Industries] • ...Drainage work spray programs [Wide Bay Burnett, Producer, Livestock & Other Industries]	**10**
Business management (e.g. conversion to/from cropping/grazing, diversification, insurance coverage)	**4**

• Converting from predominantly cropping back to mainly grazing to focus on Merino breeding [Far North Qld, Producer, Livestock & Other Industries] • Converting section of farm from grazing to intensive seed and hay production for additional cashflow in dry times. [SE Qld, Producer, Livestock & Other Industries] • Introduction of poultry to diversify income stream [SE Qld, Producer, Livestock & Other Industries] • Modifying insurance coverage to cater for Tropical Cyclone risk. [Mackay, Service Provider/Other, Livestock & Other Industries]	
Strategic/flexible decision making (e.g. based on weather/seasons/rainfall/forecasts) • Whether to take soybean through to harvest, depends on a wet or dry autumn [Mackay, Producer, Livestock & Other Industries] • Weather directly influences the price of commodities. Delivery may also be hindered. Ie, A forecast heavy rain event with potential flooding would cause us to ensure we have plenty of grain, hay, molasses stored onsite prior. A dry forecast usually increases the cost of grain and would influence our buying strategy whereby we would purchase a larger spread instead of buying month to month. A dry forecast also suggests an increase in cattle numbers coming into feedlots, hence increased tonnage of commodities required. We also consider the weather when preparing our pen cleaning strategy. i.e. All pens are to be fully cleaned prior to rain events. [Darling Downs, Service Provider/Other, Livestock & Other Industries] • Prepare options with clients which depend on more on tactical responses rather than strategic planning e.g. regularly change cropping plans in response to rainfall amounts and intensity historical and expected. Prediction is still too large scale. Summer cropping especially where drought resistant or short run crops and better moisture holding soils are used eg Mung Beans compared with traditional sorghum. Pasture dieback is a big problem and may be climate related e.g. drought and then high intensity rainfall, needs more research. Many decisions still are made due to financial pressures especially in marginal small family farms/properties. [Darling Downs, Service Provider/Other, Livestock & Other Industries] • Managing to actual conditions and with consideration of risk and long term forecasts - results in early decisions and optimising land condition [Darling Downs, Service Provider/Other, Livestock & Other Industries]	**4**
Land/paddock management (e.g. fencing, shade, watering points, erosion) • ...Fenced off creeks... [Central Qld, Producer, Livestock & Other Industries] • Planting of shade trees for cattle...planting of mixed species in Orchard to provide shade etc, [Far North Qld, Producer, Livestock & Other Industries] • We mainly focus on soils to improve water holding capacities. Also location of off-stream watering points, heat stress - shade and/or genetics, groundcover/erosion, etc [Mackay, Service Provider/Other, Livestock & Other Industries] • ...Canopy management practices... [Wide Bay Burnett, Producer, Livestock & Other Industries]	**4**
Stocking rates/carrying capacity • ...stocking numbers [Central Qld, Service Provider/Other, Livestock & Other Industries] • Lower stocking rates... [Central Qld, Producer, Livestock & Other Industries] • Planning on a later start to growing season (ie budgeting for longer dry season). Result is getting to end of dry with feed in reserve and animals in good condition by adjusting stocking rate early. Result is salable animals if season doesn't come and country responds faster to less rain if looked after. [Central Qld, Service Provider/Other, Livestock & Other Industries] • Stocking rates [SE Qld, Producer, Livestock & Other Industries]	**4**
Silage/feed storage • Cutting silage and store for drought... [Central Qld, Producer, Livestock & Other Industries] • ...Harvesting and storing seed and grain [SW Qld, Producer, Livestock & Other Industries]	**2**

Other
• **Machinery selection**
  ○ Machinery selection... [Wide Bay Burnett, Producer, Livestock & Other Industries]
• **Breed selection (e.g. drought tolerant)**
  ○ Breed of sheep - drought tolerant Spread of industries [SW Qld, Producer, Livestock & Other Industries]
	2

Other Industries	
Water management (e.g. Irrigation improvements, water storage, water licences, drainage) • Better water storage [Wide Bay Burnett, Producer, Other Industries]	**16**

• Buying and leasing additional water licences [Far North Qld, Producer, Other Industries] • Improving water storage capacities [SE Qld, Producer, Other Industries] • Improved drainage and irrigation infrastructure [Mackay, Producer, Other Industries] • Implementing drainage systems on areas identified as requiring from EM mapping. [Wide Bay Burnett, Producer, Other Industries] • Changing irrigation systems from furrow to linear lateral move spray [Wide Bay Burnett, Producer, Other Industries] • ...Upgrading to more efficient irrigation safeguards against lower amounts of freshwater availability in the future...[Mackay, Service Provider/Other, Other Industries] • Upgrading of irrigation to meet the higher demand caused by extremes. [Far North Qld, Producer, Other Industries] • Joining all farms with a pipeline to ensure various water sources can be applied as required. [Wide Bay Burnett, Producer, Other Industries] • Several bores installed for water supply... Moisture monitoring equipment to ensure correct usage. [Darling Downs, Producer, Other Industries] • More water storage to increase tonnage through more timely irrigation. Better drainage to alleviate water logging. [Mackay, Producer, Other Industries] • ...Investigating drip irrigation and automation of flood irrigation to allow for better management of a less reliable water supply. [North Qld, Producer, Other Industries] • Increasing water storage and going to mostly winter crops to maximise water usage. [Wide Bay Burnett, Producer, Other Industries] • ...irrigation water purchase... [Central Qld, Service Provider/Other, Other Industries] • Changed much of orchard to drip irrigation from micro-sprinklers for better water efficiency. [SE Qld, Producer, Other Industries] • ...Future irrigation expansion planned. [Far North Qld, Producer, Other Industries]	
Soil/paddock management (e.g. zonal tillage, increased ground cover, mulching, shade, controlled traffic, protective structures) • In the process of implementing zonal tillage. [Far North Qld, Producer, Other Industries] • Increase ground cover to increase water holding capacity with no bare fallows [North Qld, Producer, Other Industries] • Mulching [Wide Bay Burnett, Producer, Other Industries] • laser levelling [Far North Qld, Producer, Other Industries] • ...Ground cover/mulch to reduce evaporation... [Darling Downs, Producer, Other Industries] • Planting more high shade trees to protect crops and pasture from excessive drying heat. [SE Qld, Service Provider/Other, Other Industries] • Farming system - wider rows, controlled traffic, bedforming and use of double disc opener allows planting and general operations to be done in more timely manner [Mackay, Service Provider/Other, Other Industries] • Farm programs that optimise stubble cover to maximise infiltration of rainfall and minimise runoff and erosion. Maximises crop water use efficiency and planting opportunities. [Central Qld, Service Provider/Other, Other Industries] • Fallow blocks Planting was supposed to be wet but remained dry harvested wetter blocks earlier [Far North Qld, Producer, Other Industries] • building protective structures over growing areas ... [Darling Downs, Producer, Other Industries] • building a more resilient growing system by using compost, cover cropping, controlled traffic, less cultivation, and microbe injection [SE Qld, Producer, Other Industries] • Crop rotations adjusted so that existing irrigation capacity is not exceeded.... [Far North Qld, Producer, Other Industries]	**12**
Crop selection (e.g. diversification, resistant varieties) • Crop diversification safeguards against climate variability...[Mackay, Service Provider/Other, Other Industries] • Variety selections [Darling Downs, Producer, Other Industries] • Support Plant Breeding programs that improves Frost resistance [Unknown , Service Provider/Other, Other Industries] • Selection of more drought tolerant species that can yield on hotter drier conditions, thus using less irrigation per tonne for the same yield. [Darling Downs, Producer, Other Industries] • Introducing multi-species cover/forage crops [Darling Downs, Service Provider/Other, Other Industries] • ...Cease growing crops that use excess water in the summer. Cease growing long maturity varieties. [Darling Downs, Producer, Other Industries]	**6**
Strategic/flexible decision making (e.g. based on weather/seasons/rainfall/forecasts)	**6**

• Use bom forecast for early weaning or sale of grower steers [Wide Bay Burnett, Producer, Other Industries] • When a wet harvest is predicted they get the low lying paddocks harvested early as it may not be possible later. Also planting will not be done early in the super wet zone when a wet winter is predicted as water can kill the billets in the drill. [Far North Qld, Service Provider/Other, Other Industries] • We will invest money in using Heat Stress products to ensure our Apple crop is not compromised during heat events. We spend extra money applying chemicals to our trees to ensure they have sufficient winter chill. We spend money ensuring the drainage is effective during wet events to minimise tree death from wet feet. We spend money employing extra staff to combat any adverse effect the climate is delivering. E.g. pruning trees different, thinning apples or picking. [Darling Downs, Producer, Other Industries] • More farmers are paying attention to weather forecasts before undertaking key farm activities such as fertiliser, herbicide and pesticide application as well as planting and harvesting because of the perceived increased volatility of the weather. [North Qld, Service Provider/Other, Other Industries] • If predicted cold snaps happen I cover the banana bunch earlier than normal and irrigate. When a heavy cyclone season is predicted I time my crop for less production in summer [Far North Qld, Producer, Other Industries] • Deep planting for timely planting of winter crop in May. In 2016 this was on moisture rained in February and took advantage of the June rain to get the secondary roots down ensuring a harvest without further rain, or a good harvest with further rain. [SW Qld, Producer, Other Industries]	
Timing of spraying/planting/fertilising • Whether to continue or start an application if conditions aren't right [Far North Qld, Producer, Other Industries] • When to plant and spray Harvest for high ccs [Mackay, Producer, Other Industries] • Planting timing Fertilising timing Spraying timing [Far North Qld, Producer, Other Industries] • Plan on Fertilizing and spraying timing. what planting we do for this year [Far North Qld, Producer, Other Industries] • ...timing to respond to short term 0-3 month outlook [North Qld, Service Provider/Other, Other Industries] • changing of planting timing... [Central Qld, Service Provider/Other, Other Industries]	**6**
Business management (e.g. resource allocation, full system approach) • ...allocation of resources such as labour [Central Qld, Service Provider/Other, Other Industries] • Climate only one component - take a full systems approach to maximise productivity - e.g. fencing by land type / provision of stock water / pasture enhancement / crash grazing / soil health [Mackay, Producer, Other Industries]	**2**
Herbicide/fertiliser management • More use of pre-emergent herbicides rather than knock-downs during winter due to unseasonal rain... [North Qld, Producer, Other Industries] • choosing fertiliser products... [North Qld, Service Provider/Other, Other Industries]	**2**
Power management (e.g. solar power) • ...Solar power mitigates carbon and safeguards against rising power costs. [Mackay, Service Provider/Other, Other Industries]	**1**
Other comments • Need info on impacts of climate change for Australian flora. Seeing more and more dry flowering. Flying foxes are a good guide to nectar flows and have seen spotted gums (normally an excellent honey producer) flowering but only visited by flying foxes for 1 night - a dry flowering. Rainfall data needs to be more detailed as many trees require heavy rains a certain number of months prior to flowering (varies between species). Rainfall now much more erratic. [SE Qld, Producer, Other Industries] • For my clients these changes will be driven by available funds which are generally scarce but they do take up some grant programs. [North Qld, Service Provider/Other, Other Industries]	**2**

Final Comments

Table A21: Other comments

Comments	Mentions
Acknowledgement of weather/climate/industry challenges • Weather has become more unpredictable because of the destruction of the brigalow belt in the last 40 years [Wide Bay Burnett, Producer, Livestock & Other Industries] • Too little too late. Gross over grazing and desertification of much of northern Australian pastoral land has already occurred. As long as banks value our leasehold properties based on cattle numbers then human nature is such that you will never get landcare happening for real- just feel good bullshit write ups. [NT/WA, Producer, Livestock] • Many other pressures impact: drought, debt, date of birth, (age), industry, divorce, mental health. These all and many more all make strategic planning tough. [Darling Downs, Service Provider/Other, Livestock & Other Industries] • Extreme heat in summer and lack of cold in winter are currently our biggest issues. [Darling Downs, Producer, Other Industries] • I believe climate variability is a much larger problem than climate change. producers need to keep better records on weather conditions. [Wide Bay Burnett, Producer, Livestock] • Climate has and will continue to change and as producers we continue to adapt and respond to the best of our abilities within financial restraints, legislative requirements and to maintain sustainability now and into the future... [Central Qld, Producer, Livestock & Other Industries] • Drought and heavy rainfall seem to cause us the most problems. Heavy rain, erosion and excess run off are probably the hardest things to guard against. We have stick rake rows in some areas to help and woah boys on all internal roads. [Wide Bay Burnett, Producer, Livestock]	**7**
Importance/need for accurate/reliable (long-term) forecasts • Weather forecasts are valuable to sugar millers to assist in determining the likelihood of interruption to the supply of cane to the mill. when weather interruptions are highly likely in the crush period factory management use this information to plan shutdowns for maintenance and cleaning. Longer term forecasting may also provide the ability to manage work planning and labour requirements in the off season as well as identifying the need to start the crush season earlier of later to minimise the impact of wet weather preventing the whole crop being harvested. [North Qld, Service Provider/Other, Other Industries] • We are on the cusp of higher rainfall to our south, Proserpine/Mackay and dry tropics to our North and West, Burdekin/Townsville. Dry season/Winter forecasts more than a couple of days out are extremely inaccurate. [Mackay, Producer, Livestock] • More detail in forecasts needed for critical date planning. general above average 3 month forecasts aren't timely or accurate enough to be useful. what is the chance of a planting event in each month would be much better [Darling Downs, Producer, Livestock] • I know forecasts are getting better but sometimes there are shortcomings on decisions i make because they change [Far North Qld, Producer, Other Industries] • I have had as many stuff-ups by following the long term forecasts as I would have had if I had not taken notice of them, so far. In the very long term the ratio may improve. Sometimes it seems by the time the more accurate forecast is made the change has already started. I looked at historical satellite assessment of forage levels (forgotten the site name). It rated my paddocks very poorly compared to the same type of land in the district. This is completely false. My guess is that I carry far more grass cover than anyone around and certainly more than average but it had my land at as low as 20% at times. It is very mis-leading. [Central Qld, Producer, Livestock] • ...Forecasting tools give an opinion on future weather events but are far from accurate and will never be 100%. They are just a tool or like an implement on a tractor... [Central Qld, Producer, Livestock & Other Industries]	**6**
On-farm changes made/planned/suggested • Looking at more on farm water storage. Use of soil conditioners to improve soil structure to allow for better uptake of available water by the crop, the impact being we can put less water onto the crop. [North Qld, Producer, Livestock & Other Industries] • Improved pastures, seeding. [North Qld, Service Provider/Other, Livestock] • "Sell early and be damned - but sell anyway" Wean down to young age and look after the calves well - focus the most of feed and management input on these weaners. [NT/WA, Service Provider/Other, Livestock]	**4**

• Best Drought Preparedness Help is to offer subsidized clean out & deepening dams where no available underground nor other water sources. [SE Qld, Producer, Livestock]	
Financial pressures/considerations • High land council rates procure us from making any financial decisions on the climate viability of this area. Income does not reflect the amount of work and resources needed to go into the future. [Far North Qld, Producer, Livestock] • Any change will need to be profitable to the farmer, the farmer must understand its short-term and long-term benefits (economic/ social/ environmental). Proof is needed before promoting any practice change. Interested to find out more what other regions are doing/ recommending. [Mackay, Service Provider/Other, Livestock & Other Industries] • Drought is personal and is ever ongoing it's not over in a single decision or timeframe it is a long haul. Gov need to support the spirit and mind of the farmer. Encourage early season decisions, the most difficult decisions are often the ones that are the ones that will cost you less in the long run. Making time to decide to destock and pack up and leave and do something else is horrendous but it enables you to get thru. Banks have a lot to answer for. They don't provide industry feedback saying it is personal info they can't give out. Producers need feedback to know, amongst your clients is our business tracking on average below average or better, is our debt levels sustainable in our area in our industry. What products are best suited to our situation and what finance advice would you give for us at this time. [North Qld, Producer, Livestock]	**3**
Importance of upskilling/informing producers (e.g. capacity/stocking rates) • As a grazing industry, the skills to assess carrying capacity and match stocking rate remains a major weakness and causes a lot of financial loss. The ability to assess and manage risk in cropping enterprises still needs focus. [Central Qld, Service Provider/Other, Livestock & Other Industries] • Greater uptake and use of the tools and services now available will benefit all producers [North Qld, Service Provider/Other, Other Industries] • Very important area for producers to be aware of - from business and environmental perspectives. They can also be used as a demonstration to the wider community of BMP in the pastoral industry [SW Qld, Service Provider/Other, Livestock]	**3**
Importance of proactive/reactive/flexible decision making/planning • We operate in an area of QLD where there is a lot of inherent variability in seasons both within, and between, years. Restricted joining of the breeding herd, proactive planning, flexibility, and conservative stocking rates, when required, are important for long term viability and sustainability. [Central Qld, Producer, Livestock] • Due to run of good wet seasons across Kimberley over past 10 years, leases are well stocked. When a below average wet season happens there will need to be quick decisions made re: keeping forage in front of cattle or there could be a significant number of mortalities. [NT/WA, Service Provider/Other, Livestock]	**2**
Negative view of specific tool/forecast • POAMA has been found to be useless [Darling Downs, Producer, Livestock & Other Industries] • Often use the BOM 64km Cairns radar from the tractor to see how a storm is tracking and lately (last year or two) there seems to be poor correlation between the rainfall shown on the radar and what is actually happening on the ground and where you can see the rain falling in the distance [Far North Qld, Producer, Other Industries]	**2**
Doubt in program/tool usefulness/uptake • Seriously how much taxpayer and levy money has gone to these tools to make so called tools. Why don't you use google analytics to see how many have been used [Wide Bay Burnett, Producer, Other Industries] • Sounds like a good initiative question is will most graziers take it on board or just do as they have been doing for years? [North Qld, Service Provider/Other, Livestock]	**2**
Lack of knowledge/awareness of where to find information • Lack of knowledge where to find websites on this information [Wide Bay Burnett, Producer, Livestock] • I obviously know very little on the relevant information available to make informed decisions on climate risk and have missed a lot of opportunity. I would appreciate getting a better understanding of the links from the BOM site to get to all this other information. [SW Qld, Producer, Livestock]	**2**
Importance of long term management planning	**2**

• Many producers live day to day or season to season ad don't prepare enough for the longer term, financially or in risk terms. However, as my role is more towards assisting producers in financial difficulty, there are normally more urgent issues to be dealt with first once I get involved as a Rural Financial Counsellor. Then after the urgent issues have been addressed we assist by encouraging better management practices. [Darling Downs, Service Provider/Other, Livestock & Other Industries] • We know our country and what it can do but that long term management is becoming rare now. [SE Qld, Producer, Livestock]	
Scepticism of climate change • Stop the climate change lie! It's nothing more than leverage for governments to tax us more and lock up our land! Seasons exist including weather events like drought and flood. Live with it! You can't control it! [SE Qld, Producer, Livestock] • Increased temps and CO2 should be beneficial to our region and our crops provided we manage water properly. [Wide Bay Burnett, Producer, Other Industries]	**2**
Other • **Allow carbon farming** ○ I am lobbying government to allow carbon farming in the WA rangelands. [NT/WA, Producer, Livestock] • **More freedom for landowners developing/managing land** ○ Allow Landowners to Develop and Manage Their Own Land. [North Qld, Producer, Livestock] • **Improved strategic/collaborative government planning** ○ Strategic, collaborative DAF-wide (including BQ) plans, recommendations and tools for clients in place for a) 'normal' dry seasons, b) leading into El Nino periods - each time there is a drought (roughly every 10 years) we the department run around like it's the first time it's happened. Need a dedicated team who meet to review and plan during the 'good' seasons and keep up to date strategy, tools, etc that can be implemented as soon as it looks like a prolonged dry is on the way. That is, we model what we think our clients should be doing. c) Coordinated (i.e. across and within departments) communications and extension of best prac drought management and services available to clients once the extended dry is underway. There was little to no cross communication between units this last season. [Unknown , Service Provider/Other, Livestock] • **Need for improved internet access/reliability** ○ ...But higher priority is internet access issues be addressed...[SE Qld, Producer, Other Industries] • **Improvements to BOM website** ○ More user friendly (in print form) info needed to explain information available from bom website...[SE Qld, Producer, Other Industries] • **Improved topographical information** ○ ...Australian topography and rain events. This would help with preparation for flood events. Changing landscapes for example have led to limited understanding of existence of ephemeral stream networks on floodplains. With long periods between flood events too much damage, loss of stock etc. occurring as people new to areas are unaware of the watercourses that suddenly appear during extreme weather events. Need for more practical information about waterway networks. [SE Qld, Producer, Other Industries] • **Need for drought plan template** ○ We keep asking people to have a drought plan but there are hardly any templates or resources to create one of these. I'd like to see some of these available for producers to really get them to start thinking about key decision dates and how they will work a sell down, or feeding strategy. [Central Qld, Service Provider/Other, Livestock] • **Value of a weekly email summary** ○ We need a weekly email summary of what is going on with the weather, in language we can understand, relevant to our area. We hear so much about EL Nino but the Indian Ocean Dipole seems to exhibit far more influence on our rainfall. [Darling Downs, Producer, Livestock] • **Importance of mitigation** ○ Mitigation should be the biggest focus to limit climate change. [Mackay, Service Provider/Other, Other Industries] • **Importance of acknowledging farmer achievements** ○ Need to reward and/or recognise farmers within industries/regions managing climate variability best [Darling Downs, Service Provider/Other, Other Industries] • **Importance of 'green dates'/optimum joining dates** ○ North of Tropic of Capricorn - important to establish "green date' and optimum joining dates for breeders. [SE Qld, Service Provider/Other, Livestock]	**14**

- **Benefit/difficulty of farming in two different shires**
  - Farming in different shires at the same time to be confident of continuous supply and if one farm is effected the other will continue to product. This is very expensive moving machinery etc. [Darling Downs, Producer, Other Industries]
- **High variability/differences between locations/properties**
  - Optimum practices for soil, biota, biodiversity and production sustainability vary from one area to another, one paddock to the next and even soil types within a paddock. [SW Qld, Producer, Other Industries]
- **Other comments**
  - Our stakeholding Attendees at recent DAF Climate Change Adaptability workshops have already taken on board info gained from the sessions. [Central Qld, Service Provider/Other, Livestock & Other Industries]