final report

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FutureBeef Stocktake Plus app – Beyond Development: Extension and strategy

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Abstract

Undertaking regular land condition assessments and forage budgets is considered part of best management practice (BMP) for graziers in northern Australia. These management tasks can be complex and require a number of steps both in the paddock and in the office, along with supporting tools and skills to be able to answer the questions: “what is my current pasture condition” and “how long will this feed last given the stock in the paddock”?

The Stocktake Plus mobile application (the app) has been developed as a grazing land management (GLM) decision support tool for north Australian graziers, natural resource management (NRM) groups and public and private service providers. People can use the app to improve their knowledge and understanding of land condition monitoring and forage budgeting with the focus on making better land resource management decisions.

Since the app’s release in April 2013, there has been a strong extension framework based around it. Department of Agriculture and Fisheries (DAF) staff and other external deliverers have promoted the app to graziers and NRM staff as part of other contracted projects, in particular Stocktake workshops and MLA EDGE*network* workshops (Grazing Land Management EDGE, Grazing Fundamentals and Nutrition EDGE).

The app’s uptake through registrations has well exceeded the original forecast of 500 registered users. To date over 1500 users have registered and downloaded the app, and of these 61% (882) are cattle graziers, 12% (172) are mixed enterprise producers and 4% (55) are sheep producers.

Independent evaluation shows that many users are positive about the app – praising it for being intuitive, easy to use and navigate, simple and straightforward, and very user friendly.

For some people however, satisfaction and adoption levels were hampered by frustrations caused by technical, design, and learning issues.

While overall refinements of the app and adoption were progressing well, a significant technical failure in database back-up function is now stalling further progress.

Executive summary

This Stocktake Phase III project was undertaken to:
1. Continue app development and refinement based on recommendations from Phase I and II.
2. Manage the hosting role of the Stocktake Plus webpage.
3. Promote awareness, adoption and application of the app to graziers in northern Australia.

The project's objectives (Phase III) were to progress upon the research findings and recommendations of two previous MLA funded projects:

- MLA project B.NBP.0688 (Phase I): Preliminary investigation into the development of an electronic forage budget and land condition application for use on hand-held electronic devices for the northern grazing industry).
- MLA project B.NBP.0693 (Phase II): Phone app for pasture management – overview of development.

The project team collaborated with the development company (NOW Communications Pty Ltd), contracted directly by Meat & Livestock Australia (MLA), by providing necessary research, development and extension (RD&E) expertise to ensure the functionality of the app was technically correct, logical and practical for graziers in northern Australia.

Three integrated products were developed:
1. Stocktake Plus app for Apple (iOS) devices
2. Stocktake Plus app for Android devices
3. Stocktake Plus webpage (www.stocktakeplus.com.au), which includes pages on the use of the app, and support for the app, along with the 'Dashboard' application for users to securely store and manage their data (via their user account).

The app continues to mirror the widely adopted Queensland Government Stocktake monitoring software which includes an extensive range of inbuilt support tools, land type fact sheets, pasture yield and ground cover photo standards, and modelled pasture growth outputs for a range of land types and locations across northern Australia.

Project management and app testing requirements were substantially more than originally anticipated and special acknowledgement must be given to DAF colleagues and project collaborators that have assisted, mostly out of good-will, to ensure the products represented the best RD&E outcomes.

The project experienced major slippage in the final 12 to16 months, predominantly with difficulties in updating and releasing a new Android build (version 2.0 #3) and the deterioration of the app's database capacity. The decaying database's capacity severely impacted the backing-up and syncing functionalities of critical client data and relevant information (e.g. land condition photos) for both Android (version 2.0 #3) and iOS (version 2.83).

Despite these set-backs, a 2016 survey conducted by Coutts J&R (2016) of 45 app users concluded that:

- Overall, users appeared to be moderately satisfied with the Stocktake Plus app (Apple users more satisfied than Android users) and found it moderately easy to use - satisfaction and adoption levels were hampered by frustrations caused by technical issues, some design and functionality issues, and lack of understanding and skills.
- There is evidence to support the general consensus from graziers of the need for an app of this type, and an acknowledgement that it provided useful functions otherwise not available (i.e. 'out in the paddock' land condition monitoring and forage budgeting).

The Grazing Best Management Practice (Grazing BMP) program promotes the app as a useful land condition monitoring and decision support tool. Its reports have been used as evidence by graziers across Queensland being audited for accreditation under the Grazing BMP program. The Stocktake Plus app should continue to be recognised as a grazing land management decision support tool and should maintain its inclusion within the broader FutureBeef and MLA programs (especially Stocktake workshops).

It is recommended that industry and its partners:

- continue the Stocktake Plus app project
- engage a software developer to establish and support a stable operating platform for both Android and iOS builds
- develop a complementary web-based version of the app. This could potentially increase interoperability capacity of the app with other relevant industry mobile apps and software programs (e.g. FORAGE Vegmachine) where appropriate.

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1 Background

Digital applications within the agricultural sector have increased rapidly in recent years through the advancement of mobile technologies. In July 2016, MLA unveiled a visionary plan (the Value Chain Digital Strategy) to accelerate the digital future of Australia's red meat and livestock industries both on-farm and through the supply chain.

Stocktake Plus is the first production decision support app for FutureBeef and MLA, and represents the next generation in FutureBeef decision support tools. The app has been developed primarily as a grazing land management decision support tool for north Australian graziers, NRM groups and public and private sector extension providers.

This project (Phase III) was undertaken to build on the research findings and recommendations of two previous MLA funded projects:

- MLA project B.NBP.0688 (Phase I - completed in 2011): Preliminary investigation into the development of an electronic forage budget and land condition application for use on hand-held electronic devices for the northern grazing industry).
- MLA project B.NBP.0693 (Phase II – completed in 2013): Phone app for pasture management – overview of development.

The app can be used on multiple devices within the one Stocktake Plus account which permits all grazing family members access to the same account whilst on-the-go. Importantly, Stocktake Plus works without the need for mobile phone reception and is a vehicle for promoting the best management practices (BMPs) of monitoring grazing land condition, and undertaking short-term forage budgeting, for more proactive management of pasture and livestock.

The practices of forage budgeting and land condition monitoring are considered grazing BMPs and form part of the Stocktake methodology (Paton and Ainsworth 2004). A forage budget assists graziers to meet ground cover and residual yield targets at the end of the grazing period to maintain and/or improve land condition. It assists the grazier to decide:

1. if it is safe to carry more stock than planned;
2. to carry the same number for longer;
3. if there is not enough pasture to safely carry the number of stock you have for the length of time you want; and
4. in planning for wet season paddock rest to improve land condition.

The Stocktake Plus app continues to be based on the industry-recognised Stocktake program developed by DAF. Users of the app can utilise mobile devices to improve their knowledge and understanding of land condition monitoring and forage budgeting to make better resource management decisions. As a result, the app has been incorporated into FutureBeef's Stocktake workshops (a one-day training package).

Results from a 2016 survey (Coutts J&R) of 45 app users concluded that:

- 42% (19 respondents) had attended a Stocktake workshop
- 84% (38 respondents) were located in Queensland

- 73% (33 respondents) used Apple devices – of these 58% (19 respondents) used an iPhone only, 24% (8 respondents) used an iPad only, and 18% (6 respondents) used both an iPhone and iPad
- 27% (12 respondents) used Android devices – of these only two used a tablet
- 30% (14 respondents) had used the app once or twice and 29% (13 respondents) had used the app between 3 and 12 times (7 on average)
- 47% (21 respondents) used the app for both forage budgeting/carrying capacity calculations and land condition monitoring, while 20% (9 respondents) used it primarily for forage budgeting/carrying capacity calculations and 13% (6 respondents) primarily for land condition monitoring.

Feedback indicates that the Stocktake Plus app has influenced many users decisions to make property changes, with those having attended Stocktake workshops (or similar) appearing more likely to have done so. Changes to managing carrying capacity and stocking rates were the most common, while other changes included increased and improved pasture monitoring, and changes to the timing of rotations.

Some examples of the on-farm practice changes made by users of the Stocktake Plus app are detailed below:

Adjustments to carrying capacity and stocking rates:

- Helped decide carrying capacity on new agistment country we were unfamiliar with.
- I hoped to get a better understanding of carrying capacity of the land, and what the soil would cope with…we have reduced our stocking rate in one paddock as a result of the Forage Budgeting.
- It certainly allows me to identify opportunities e.g. last August it identified that I could have had more cattle, but I could not afford it at the time.
- It certainly influences the number of cattle we put in paddocks – both increases and decreases. So it has been useful. In the past we ran 1 beast per 10 acres, but now we can adjust the numbers more accurately.

Increased/improved pasture monitoring:

- Helped monitor pasture improvement through watching monitoring sites more closely.
- Helped the way that I monitor pasture growth.
- Established more monitoring sites on my property.

Changed rotation timing:

- It is exactly what I want…it is about having it in the paddock and knowing what the value of the feed is, and when to move the cattle.
- Helped in the time cows spend in paddocks.
- Helped manage the timing of rotations.

Of the producers who indicated the app had not influenced their decisions, several suggested that that it was too early to make changes and they had not been using the app

for long enough. This would suggest that if graziers adopted forage budgeting, they are more likely to make changes in the short term, as the land condition monitoring is more likely to influence (management) change in the longer term.

2 Projective objectives

The project objectives are:

1. Stocktake app embedded in relevant FutureBeef extension activities and training packages.
2. Train-the-trainer conducted with at least six FutureBeef extension staff.
3. Self-paced video tutorials developed.
4. Communicate and promote availability, features and benefits of the Stocktake Plus app for increased uptake by producers and industry. This will include a minimum of two Feedback magazine articles.
5. Manage hosting and maintenance activities with app development company (NOW Communications).
6. Timely support of the Stocktake Plus app and regular monitoring of feedback for future development and improvement.
7. Evaluation of adoption of the Stocktake Plus app and impact to producer practices over three years completed.

3 Methodology

The project team undertook the following steps to achieve the project objectives:

1. Devise an evaluation plan to measure the adoption and impact on producer practices of the Stocktake Plus app.
2. Develop a capacity building strategy detailing:
   - How the Train the Trainer will be conducted (including which staff to receive training)
   - Development of online support products
   - Communications and promotion strategy developed (including a plan for self-paced tutorials) for increased uptake of Stocktake Plus app

Final report to include analysis of financial sustainability relating to the cost of the app moving forward.

4 Results

4.1 Refinement of the Stocktake Plus app

Three interlinked products were continually refined within this project:

1. Stocktake Plus app for Apple (iOS) devices
2. Stocktake Plus app for Android devices
3. Stocktake Plus webpage, which incorporates pages on the use of the app including Frequently Asked Questions (FAQ), help video tutorials and help fact sheets, along with the ‘Dashboard’ application for users to securely store and manage their data through their user account.

The Stocktake Plus app is available on both Apple and Android app stores and continues to be a no cost product.

The Stocktake Plus app has been designed to be easy to use, and to work in remote areas without mobile reception. The Stocktake Plus app:

- assists in monitoring grazing land condition by logically guiding the user through the process
- stores monitoring information and produces reports, including long-term carrying capacity calculations, based on user input
- guides the user through a basic or detailed forage budget
- stores rainfall records
- stores stock numbers (converts to Adult Equivalents [AEs], displays current stock on land condition reports, and can import figures to demand section of a forage budget)
- directs users to their monitoring sites using GPS functions
- helps the user identify their land type(s), using the land type mapping of Queensland and
- backs up all information securely on the internet, which is only accessible by the user.

The app is more than a digital log; it has many in-built support tools including:

- land type sheets
- pasture growth modelling tables (GRASP)
- ground cover photo standards
- pasture yield photo standards
- accessible yield calculation sheets
- dendrometer for measuring tree densities.

Regretfully, the backing up and data syncing functionality has deteriorated within the latter stages of the project and this has heavily impacted the project and over-shadowed other areas of the project's successes.

Stocktake Plus has been developed specifically for graziers and agri-advisors in northern Australia, however at this time the land condition functionality is predominantly Queensland centric due to the underpinning architecture of land type mapping and pasture growth modelling (PGM). During the project period both Northern Territory and Western Australian Government counterparts were invited to supply their respective PGM data files to engage this functionality relative to their respective state and/or territory, however declined due to other commitments.

It should be noted that the land condition functionality has use elsewhere (e.g. rangeland areas of New South Wales and South Australia), but users in these regions are limited to land type mapping available for these areas. Users in other areas can establish their own monitoring sites and produce reports in a similar manner, however the reports will not calculate region-specific pasture growth and long-term carrying capacities.

Forage budgets, rainfall records and other reports continue to have full functionality irrespective of user location. The forage budgeting component can be applied to any region provided the user can estimate a starting dry matter yield.

More detailed information on app functionality and grazing land management principles is available on the Stocktake Plus webpage www.stocktakeplus.com.au or the FutureBeef webpage www.futurebeef.com.au.

4.2 Stocktake app embedded in relevant FutureBeef extension activities and training packages

As Stocktake Plus was the first production decision support app for DAF and MLA, the FutureBeef team were cognisant of refining any technical and functional bugs uncovered following the app's official release in April 2013 to accommodate user feedback, ensuring the integrity of the app and the security of user data. In the first 12 months of release, the team worked closely with the developer to remediate multiple issues and make some cosmetic changes to the app's look and feel (e.g. changing 'Done' to 'Save').

By August 2014, the project team were confident with the impending release of a new iOS version 2.83 of the app and tentatively commenced embedding the Stocktake Plus app into the existing delivery format of all FutureBeef Stocktake workshops. The project team's tentativeness evolved from the knowledge that the existing Android build at the time (version 1.0) did not mirror the same functionalities as the impending iOS release (version 2.83). Additionally, in September 2014 the DAF project team initiated the project's communication and promotion strategy.

4.2.1 FutureBeef Stocktake workshops (training package) – one day workshop

The Stocktake workshop (Aisthorpe and Paton 2004) is a paddock-scale land condition monitoring and forage budgeting package, and is designed to provide participants with the science, skills and practical applications that underpin the app's architecture. The Stocktake package is the primary training workshop in delivering the functionalities and applications for the Stocktake Plus app. In 2014/2015, 10 Stocktake workshops were delivered; with 75 businesses and 96 individuals participating. In 2015/2016, 10 stocktake workshops were delivered, with 45 businesses and 74 individuals participating covering in excess of 128,550 hectares, 7,597 cattle and 232 sheep. All workshop participants who attended were exposed to, and up-skilled in the set-up and application of the app.

Results from a 2016 survey (GR Consulting) of 245 Burdekin and Fitzroy catchment landholders who had attended a Stocktake workshop concluded that:

- 25% of landholders changed their practices for long term carrying capacity
- 17 % of landholders changed how they manage their stocking rate after the workshop
- 22% of landholders changed how they monitor land condition
- 8% of landholders changed how they record stock numbers
- 17% of landholders improved their GLM to better manage areas of land in declining condition
- 22% of landholders improved recovery of degraded land areas
- 6% of landholders changed their practice in how they managed different land types

4.2.2 Grazing Best Management Practices (Grazing BMP) project

https://www.bmpgrazing.com.au

Grazing BMP program is a voluntary, industry led program which helps graziers to identify improved practices which can help improve the long term profitability of their enterprise. It also assists to identify opportunities for targeted follow-up extension activities and the steps a grazier needs to take to incorporate best management practices into their enterprise. Over time it will allow the grazing industry to demonstrate good environmental management to the wider community. The Grazing BMP has recently expanded to western Queensland and therefore has become an effective statewide delivery program for extension services.The Grazing Land Management (GLM) module within Grazing BMP delivery highlights the app's availability, application and functionalities, relevant to the standards within the module. Graziers and stakeholders are encouraged to undertake a Stocktake workshop to provide participants with the knowledge, skills and science that underpins the Stocktake Plus app's architecture.

4.2.3 MLA EDGEnetwork Grazing Land Management and Grazing Fundamentals workshops (training packages)

The Stocktake Plus app is cross pollinated through complementary linkages with the EDGE*network* GLM and Grazing Fundamentals workshops. These packages provide an in-depth understanding of the scientific principles underpinning the app's architecture and the functionalities of the app. Participants of these workshops are recommended to undertake a Stocktake workshop to reinforce scientific principles and provide participants with the capacity and practical applications of the app.

4.3 Train-the-Trainer sessions conducted with at least six FutureBeef extension staff with the capacity to train NRM staff and consultants (Grazing BMP project)

A 'one-on-one' training strategy was implemented within DAF ensuring a 'state-wide' coverage of trained Stocktake Plus app deliverers was achieved. Train-the-Trainer activities were built into Stocktake Workshops with deliverers being mentored by either an external grazing land management consultant or DAF scientists with grazing land management experience .

Training has been undertaken with eight DAF staff to deliver further training to other DAF staff, NRM groups and industry consultants. DAF staff have been trained in the following Queensland regions:

South-west:	David Phelps and Jenny Milson
North-west:	Emma Hegarty, Rebecca Gunther and Kiri Broad
Far-north:	Megan Willis and Kate Brown
South/South-east:	Megan Gurnett.

An additional two NRM staff were trained in the use of the app. However, these staff have moved into new positions outside their previous NRM positions. DAF considered the

requirement of training additional NRM staff, however with the technical issues impacting the app a decision was made not to progress until the app was functional, reliable and robust.

The value of the skilled DAF staff to apply the functionalities of the Stocktake Plus app cannot be underestimated. Significant resources were invested in testing, refining and retesting the different versions of the app, and the technical input of these staff was an integral part of this process. These staff formed a capable piloting team operating both Apple and Android devices to provide valuable feedback to the developer on what was working correctly and incorrectly in the app's test environment.

A significant amount of unbudgeted, in-kind support was required to manage and test the app as it was refined (for example, the full time equivalent required by the project leader was approximately 0.5 rather than the budgeted 0.3). This was done efficiently and effectively to ensure confidence that any new app build was technically correct prior to any formal release to either the Apple or Google Play stores.

The laborious and repetitive nature and extent of this process should not be underestimated for any future app development.

4.4 Self-paced video tutorials developed

The development of a suite of 18 self-paced video tutorials to assist users to register and set up the Stocktake Plus app to individual requirements was also delivered.

The following support videos were uploaded to YouTube in July 2013 and are available on the Stocktake Plus website (www.stocktakeplus.com.au). To date they have received 565 YouTube views.

- Introduction to Stocktake Plus app
- Getting started
- Setting up properties, paddocks and rain gauges
- Setting up a monitoring site
- Monitoring stock records
- Monitoring land condition
- Monitoring rainfall
- Forage budgeting
- Calculating accessible yield
- Reports – forage budget report
- Reports – property carrying capacity report
- Reports – rainfall report
- Reports – site land condition report
- Reports – stock report
- More…data back-up and syncing
- More…feedback
- Stocktake Plus dashboard overview
- Updating the Stocktake Plus app

The following GLM support videos are also available on the FutureBeef website (www.futurebeef.com.au):

- Forage budgeting: Introduction
- Forage budgeting: Feed supply
- Forage budgeting: Feed demand
- Forage budgeting: Bringing it all together
- What is Stocktake pasture monitoring
- ABCD land condition framework overview
- Land condition A
- Land condition B

- Land condition C
- Land condition D
- Rehabilitation of D land condition
- Understanding land types for forage budgeting
- Guide to pasture photo monitoring.

The DAF project team were conscious that graziers learn from different information formats. The team developed an additional 12 fact sheets to support graziers using the app. The following notes are on the Stocktake Plus website:

- Introduction to Stocktake Plus app
- Setting up a property
- Adding a paddock
- Adding a monitoring site
- Monitoring land condition
- Forage budgeting
- Adding an accessible yield sheet
- Backing up
- Adding a rain gauge
- Recording rainfall
- Adding a stock record
- Calculating sapling tree basal area

4.5 Communicate and promote availability, features and benefits of the Stocktake Plus app for increased uptake by producers and industry. This will include a minimum of two *Feedback* magazine articles.

Upon the release of the Stocktake Plus app in April 2013, the DAF project team promoted the app via ABC radio, the *Queensland Country Life* and through DAF's regional extension networks. From April 2013 to August 2014 the app underwent rigorous re-building (inside and out) to accommodate feedback from industry and an iOS platform upgrade (iOS 6 to iOS 7). Project management of communication and promotion during this timeframe adopted a passive approach whilst re-building and re-testing were being undertaken.

In September 2014, the project team developed the following communications and promotion strategy for the app to encourage awareness and adoption:

- ABC radio
- The *Queensland Country Life* (QCL)
- Beeftalk, *CQ Beef* and *Northern Muster* published articles (March and November 2014 publications)
- Northern Beef Research Update Conference 2013 (poster presentation)
- Australian Rangeland Society Conference 2015 (poster presentations)
- DAF regional extension network communication and promotional activities.

Since November 2014, the Stocktake Plus app development and extension team had commenced active communication and promotion campaigns outlining the app's purpose and functionalities. The DAF team have delivered the following promotional activities for the app:

- Northern Beef Research Update Conference 2013 – paper and poster presentation
- FutureBeef eBulletin articles:
    - 7 May 2013 – Stocktake Plus, a pasture management app for graziers

    - 6 August 2013 – A “how to…” guide for Stocktake Plus users
    - 1 April 2014 – Forage budgeting what you’ve got and what you need
    - 1 July 2014 – Sustainable grazing guide – online resource from MLA (includes reference to Stocktake App)
    - 3 March 2015 – Now is the time to assess your pastures (Stocktake related multi-media resources and the page Dry season pasture budget, a guide for stocking rates)
    - 8 February 2016 - Now is the perfect time to start planning.
    - 10 May 2016 – Dry season pasture budget, a guide for stocking rates.
- FutureBeef Stocktake workshops:
    - October 2015 (Mundubbera, Gympie and Kingaroy)
    - April 2016 (Charters Towers, Emerald and Canoona)
    - May 2016 (Aratula)
    - June 2016 (Paraway and Esk)
- The *Queensland Country Life* (QCL):
    - Beeftalk, *CQ Beef* and Northern Muster published articles (March and November 2014)
    - CQ Beef and NQ Register published articles (March 2016)
- ABC radio interview (2014)
- MLA *Feedback* magazine article (April 2015)
- Australian Rangelands Biennial Conference (Alice Springs - April 2015), paper and poster presentation
- Hot FM Network (March 2016)
- Northern Beef Expo 2016 (Charters Towers – March 2016)
- Beef Australia 2015 (Rockhampton)- joint DAF/MLA media release
- MLA Friday Feedback article (February 2016)
- Cloncurry BeefUp Forum (June 2016)
- MLA Friday Feedback article (May/June 2016)
- Northern Beef Research Update Conference 2016 – paper and poster presentation

Examples of these communication and promotional activities are attached below. Uptake of the app through the above active promotional activities has been very positive and is shown in Figures 1 and 2.

4.5.1 Northern Beef Research Update Conference 2016 – poster

FutureBeef

Using the Stocktake Plus app to manage grazing pressure and optimise Grazing Best Management Practices

Greg Bath, Beef Extension Officer
Department of Agriculture and Fisheries, Toowoomba

The Stocktake Plus mobile app

The Stocktake Plus app is an easy-to-use application available on Apple and Android devices that can be used to monitor land condition and calculate forage budgets out in the paddock without mobile or internet reception. Adjusting stock numbers with the assistance of a forage budget allows a grazier to predict the need to reduce stock numbers or implement other strategies to maintain livestock and land condition. Forage budgets have been undertaken on Spyglass Research Station to demonstrate the practical application of the App on a commercial size property. The generated reports can be used to manage grazing pressure within each paddock through the dry season.

The app also has a range of in-built support tools including land type factsheets, pasture yield and ground cover photo standards, and pasture growth output from the grass production model (GRASP) for a range of land types and locations across northern Australia. The user can store the location of monitoring sites and help identify their property's land types. Importantly, each utility within the app can be used autonomously, or all the information and records can be linked through to detailed reports.

Stocktake workshops

Graziers must be able to manage long-term grazing businesses to be able to optimise long-term pasture productivity. Stocktake workshops are a paddock-scale land condition monitoring and management package that 'takes stock' of your grazing resources and assists in improving grazier's management decisions. These workshops are designed to provide participants with a practical, systematic way to calculate short-term forage budgets, access land condition and understand the technical concepts underpinning these assessments, and how to apply these grazing land management practices through the functionalities of the Stocktake Plus app.

Helping graziers achieve above industry standard

The Grazing Best Management Program (BMP) is currently delivered in the Burdekin, Fitzroy, Burnett-Mary and South-East Queensland Catchments. It allows beef producers to assess their management practices against recommended industry standards permitting participants to (1) identify business strengths, weaknesses, opportunities, and threats; (2) develop plans for improved practices within their whole business; and (3) provide valuable regional data to support the grazing industry. By adopting the Stocktake Plus app as a management tool to adjust stocking rates to manage grazing pressures, graziers would exceed industry standards for best management practice within the Grazing BMP self assessment.

Best management practice in the grazing industry is about implementing practices that are most effective at achieving a productive, profitable and sustainable grazing business.

Figure 1: Applying the Stocktake Plus app in the paddock.

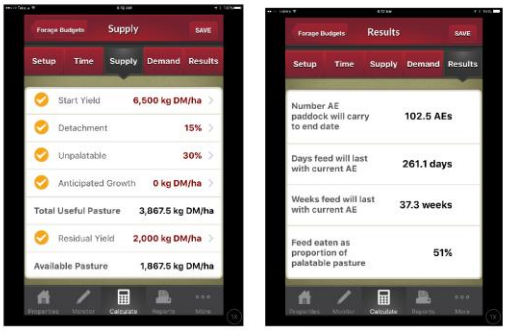

Figure 2: The app gives you the ability to make informed on-the-spot decisions about stocking rates and paddock management.

Figure 3: Grazing BMP - GLM module data by key area for the Burdekin, Fitroy, Burnett Mary and SEQ catchment areas (1/7/2015 – 30/6/2016).

More information

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www.futurebeef.com.au

GRAZING BMP
BEST MANAGEMENT PRACTICES

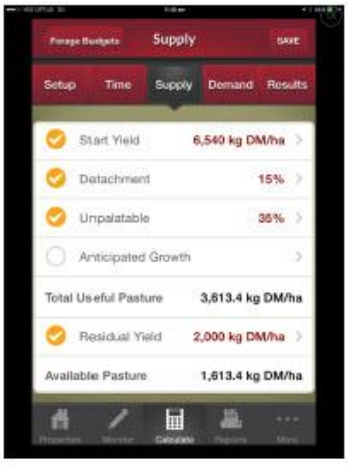
A joint initiative of:
Queensland Government
Northern Territory Government
Department of Agriculture and Food
mla

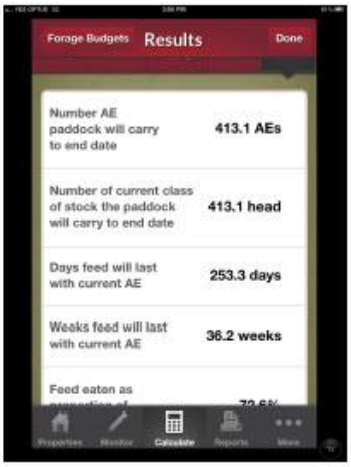
4.5.2 Australian Rangeland Society Conference – poster (April 2015)

FutureBeef

Stocktake Plus App optimises Grazing Best Management Practices (BMP) for managing grazing pressure.

Megan Willis, Beef Extension Officer
Department of Agriculture and Fisheries, PO Box 976, Charters Towers, Qld 4820





Stocktake Plus App
The Stocktake Plus App can be used to monitor land condition and calculate forage budgets out in the paddock.
Adjusting stock numbers with the assistance of a forage budget allows a grazier calculate the sustainable stocking rates of their paddocks based on current available pasture.

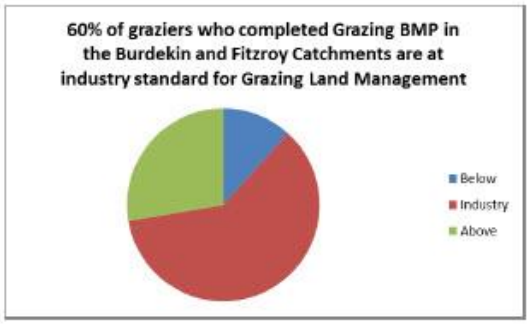
Grazing BMP Program
Adjusting stocking rates to meet current feed supply, animal requirements, and ground cover targets is considered best management practice within the grazing business.

Managing Grazing Pressure
An analysis of the data collected in the Burdekin and Fitzroy Catchments from July 2013 to June 2014 demonstrates that over 60% of the 360 plus businesses that have completed the Grazing Land Management module of Grazing BMP were at industry standard.

The app gives you the ability to make informed on-the-spot decisions about stocking rates and paddock management – these are critical to ensure longer term condition and productivity of the grazing business.

By introducing the Stocktake Plus App as a management tool to adjust stocking rates to manage grazing pressure, graziers would exceed industry standard for best management practice in the Grazing BMP self-assessment.

Could above industry standard become the new industry standard?



Grazing BMP –
GM 4.2 Adjusting stocking rates

Current Industry Standard
Stocking rates are adjusted to meet current feed supply, animal requirements, pasture residue and ground cover targets.

Above Industry Standard
Stocking rates and feed supply are assessed seasonally or more frequently. Forage budgets or grazing charts are used to set stocking rates and predict the need to reduce stock numbers or implement other strategies to maintain livestock and land condition.

More information

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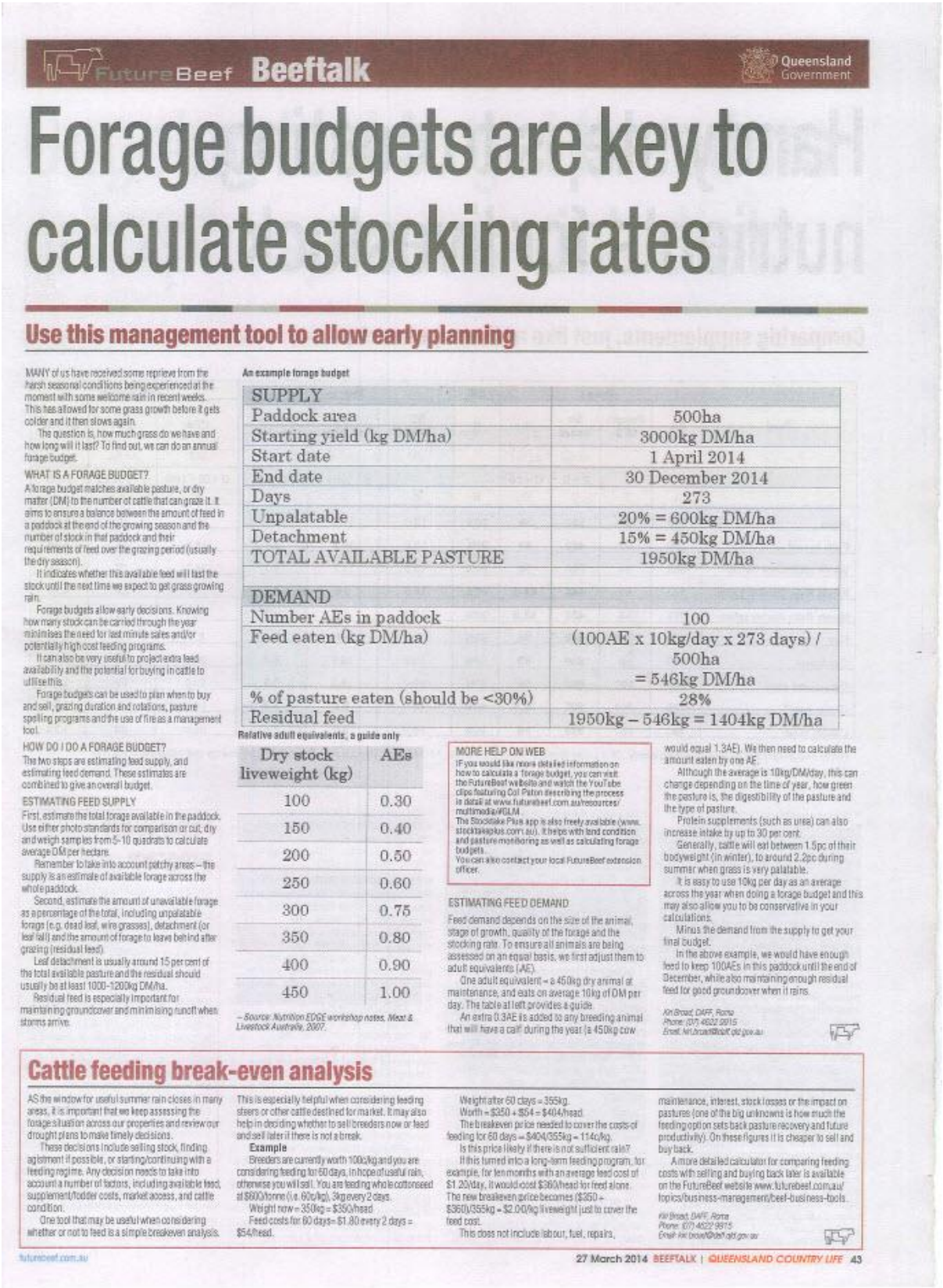
www.futurebeef.com.au

A joint initiative of:
Queensland Government | Northern Territory Government | mla

4.5.3 Beeftalk article (March 2014)



FutureBeef Beeftalk

Queensland Government

Forage budgets are key to calculate stocking rates

Use this management tool to allow early planning

MANY of us have received some reprieve from the harsh seasonal conditions being experienced at the moment with some welcome rain in recent weeks. This has allowed for some grass growth before it gets colder and it then slows again.

The question is, how much grass do we have and how long will it last? To find out, we can do an annual forage budget.

WHAT IS A FORAGE BUDGET?

A forage budget matches available pasture, or dry matter (DM) to the number of cattle that can graze it. It aims to ensure a balance between the amount of feed in a paddock at the end of the growing season and the number of stock in that paddock and their requirements of feed over the grazing period (usually the dry season).

It indicates whether this available feed will last the stock until the next time we expect to get grass growing rain.

Forage budgets allow early decisions. Knowing how many stock can be carried through the year minimises the need for last minute sales and/or potentially high cost feeding programs.

It can also be very useful to project extra feed availability and the potential for buying in cattle to utilise this.

Forage budgets can be used to plan when to buy and sell, grazing duration and rotations, pasture spelling programs and the use of fire as a management tool.

HOW DO I DO A FORAGE BUDGET?

The two steps are estimating feed supply, and estimating feed demand. These estimates are combined to give an overall budget.

ESTIMATING FEED SUPPLY

First, estimate the total forage available in the paddock. Use either photo standards for comparison or cut, dry and weigh samples from 5-10 quadrats to calculate average DM per hectare.

Remember to take into account patchy areas – the supply is an estimate of available forage across the whole paddock.

Second, estimate the amount of unavailable forage as a percentage of the total, including unpalatable forage (e.g. dead leaf, wire grasses), detachment (or leaf fall) and the amount of forage to leave behind after grazing (residual feed).

Leaf detachment is usually around 15 per cent of the total available pasture and the residual should usually be at least 1000–1200kg DM/ha.

Residual feed is especially important for maintaining groundcover and minimising runoff when storms arrive.

An example forage budget

SUPPLY	
Paddock area	500ha
Starting yield (kg DM/ha)	3000kg DM/ha
Start date	1 April 2014
End date	30 December 2014
Days	273
Unpalatable	20% = 600kg DM/ha
Detachment	15% = 450kg DM/ha
TOTAL AVAILABLE PASTURE	1950kg DM/ha
DEMAND	
Number AEs in paddock	100
Feed eaten (kg DM/ha)	(100AE x 10kg/day x 273 days) / 500ha = 546kg DM/ha
% of pasture eaten (should be <30%)	28%
Residual feed	1950kg – 546kg = 1404kg DM/ha

Relative adult equivalents, a guide only

Dry stock liveweight (kg)	AEs
100	0.30
150	0.40
200	0.50
250	0.60
300	0.75
350	0.80
400	0.90
450	1.00

– Source: Nutrition EDGE workshop notes, Meat & Livestock Australia, 2007.

MORE HELP ON WEB

If you would like more detailed information on how to calculate a forage budget, you can visit the FutureBeef website and watch the YouTube clips featuring Col Paton describing the process in detail at www.futurebeef.com.au/resources/multimedia/#GLM

The Stocktake Plus app is also freely available (www.stocktakeplus.com.au). It helps with land condition and pasture monitoring as well as calculating forage budgets.

You can also contact your local FutureBeef extension officer.

ESTIMATING FEED DEMAND

Feed demand depends on the size of the animal, stage of growth, quality of the forage and the stocking rate. To ensure all animals are being assessed on an equal basis, we first adjust them to adult equivalents (AE).

One adult equivalent = a 450kg dry animal at maintenance, and eats on average 10kg of DM per day. The table at left provides a guide.

An extra 0.3AE is added to any breeding animal that will have a calf during the year (a 450kg cow would equal 1.3AE). We then need to calculate the amount eaten by one AE.

Although the average is 10kg/DM/day, this can change depending on the time of year, how green the pasture is, the digestibility of the pasture and the type of pasture.

Protein supplements (such as urea) can also increase intake by up to 30 per cent.

Generally, cattle will eat between 1.5pc of their bodyweight (in winter), to around 2.2pc during summer when grass is very palatable.

It is easy to use 10kg per day as an average across the year when doing a forage budget and this may also allow you to be conservative in your calculations.

Minus the demand from the supply to get your final budget.

In the above example, we would have enough feed to keep 100AEs in this paddock until the end of December, while also maintaining enough residual feed for good groundcover when it rains.

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Cattle feeding break-even analysis

AS the window for useful summer rain closes in many areas, it is important that we keep assessing the forage situation across our properties and review our drought plans to make timely decisions.

These decisions include selling stock, finding agistment if possible, or starting/continuing with a feeding regime. Any decision needs to take into account a number of factors, including available feed, supplement/fodder costs, market access, and cattle condition.

One tool that may be useful when considering whether or not to feed is a simple breakeven analysis. This is especially helpful when considering feeding steers or other cattle destined for market. It may also help in deciding whether to sell breeders now or feed and sell later if there is not a break.

Example

Breeders are currently worth 100c/kg and you are considering feeding for 60 days, in hope of useful rain, otherwise you will sell. You are feeding whole cottonseed at $600/tonne (i.e. 60c/kg), 3kg every 2 days.

Weight now = 350kg = $350/head

Feed costs for 60 days= $1.80 every 2 days = $54/head.

Weight after 60 days = 355kg.

Worth = $350 + $54 = $404/head.

The breakeven price needed to cover the costs of feeding for 60 days = $404/355kg = 114c/kg.

Is this price likely if there is not sufficient rain?

If this turned into a long-term feeding program, for example, for ten months with an average feed cost of $1.20/day, it would cost $360/head for feed alone. The new breakeven price becomes ($350 + $360)/355kg = $2.00/kg liveweight just to cover the feed cost.

This does not include labour, fuel, repairs, maintenance, interest, stock losses or the impact on pastures (one of the big unknowns is how much the feeding option sets back pasture recovery and future productivity). On these figures it is cheaper to sell and buy back.

A more detailed calculator for comparing feeding costs with selling and buying back later is available on the FutureBeef website www.futurebeef.com.au/topics/business-management/beef-business-tools.

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4.5.4 Beeftalk article (November 2014)

FutureBeef **Beeftalk**

Queensland Government

Toxic topic: Botulism

The risk of this deadly disease increases during drought

BOTULISM is a paralysing disease caused by botulinum toxin which is produced by the bacterium *Clostridium botulinum*. Botulinum toxin is reported as one of the most potent toxins known to mankind and only a small quantity is needed to produce disease.

Clostridium botulinum spores are common in the soil, and also in the gut of healthy cattle and other animals in tropical environments (which includes most of Queensland), where they are not a problem. Spores are the dormant form of the organism.

Only actively growing *Clostridium botulinum* bacteria produce botulinum toxin. It is the toxin that causes disease. *Clostridium botulinum* spores only germinate and grow where oxygen is totally excluded, such as within rotting animal and vegetable matter. The toxin binds strongly to nerve endings, preventing nerve impulses to muscles and causing paralysis.

Seven types of toxin have been identified, designated A to G. In Australia most botulism outbreaks in cattle and sheep are due to type C or D toxin. The toxin is quite stable and may remain in contaminated feed or water for some time. Vaccination is the only effective way to prevent outbreaks.

WHERE IS IT SEEN?

Botulism is commonly seen in Queensland, especially in phosphorus-deficient areas and during droughts where it is often associated with cattle eating bones and carrion to satisfy a craving for phosphorus and/or protein. Outbreaks are also seen in intensively fed beef and dairy cattle mostly due to feedstuffs contaminated with dead animals such as snakes, birds, possums and mice. Large outbreaks have occurred in dairy cows being fed total mixed rations based on silage. In some cases, producers have lost two-thirds of their dairy herd over a two-week period.

Other outbreaks have involved dairy herds where poultry litter has been used to fertilise pastures. Cattle have eaten litter piled ready to be spread on pastures or litter that has been spread on pasture but not incorporated into the soil.

Legislation now prohibits feeding animal matter, including chicken faeces and chicken litter to livestock and livestock must be denied access to this material. Animals are only allowed to graze pasture fertilised with chicken faeces or litter if it is ploughed into the soil or given time to be incorporated into the soil first.

SYMPTOMS

Symptoms vary dramatically depending on the dose of toxin and any pre-existing immunity that may be present. Signs vary from sudden death (animals collapse and die in several hours) to a slowly progressive paralysis where death may take days. In the latter case, the first signs are cattle off their feed and water. Then they develop a wobbly gait (staggers) and eventually go down. During the staggers stage, some cattle become aggressive because they feel helpless. Not all cattle that develop botulism symptoms will die. Some mildly affected cattle will recover. Generally speaking, once cattle go down, their likelihood of recovery is poor. Cattle affected by botulism do not develop a fever. They show no response to treatment for other common causes of 'downer cow syndrome' like three-day sickness or milk fever. Cattle may progress to the stage where they have difficulty breathing and typically lie on their brisket with their hind legs stretched out behind them. Tongue paralysis may or may not be a feature of the disease (cattle cannot pull their tongue back in when it is pulled out of their mouth). At post-mortem, there are no obvious signs other than those associated with being down.

VACCINATION THE ONLY LONG-TERM PREVENTION STRATEGY

The only effective long-term prevention strategy for botulism is vaccination with bivalent botulinum vaccines. In phosphorus deficient areas where botulism risk is very high, vaccination against types C and D botulism has been widely adopted as standard industry practice.

Beef and dairy producers who feed their cattle a prepared ration, especially those based on silage or by-products such as brewer's grains, should vaccinate their cattle against botulism. Whenever possible, cattle should be vaccinated well before any suspected period of risk and before the ration is introduced.

A range of different botulism vaccines on the market are highly effective. Some newer vaccines only require a single shot where the traditional vaccine requires two shots a month apart. Both the one-shot and two-shot vaccines produce a similar end result, and the decision on which type of vaccine to use depends largely on product cost and convenience.

All vaccines require boosters to be given to maintain protective levels of immunity. Consult package information or the vaccine manufacturer for advice on the timing of booster vaccinations.

Other prevention strategies include:

- Phosphorus and/or protein supplementation may assist in reducing bone chewing
- If possible prevent stock having access to rotting animal and vegetable matter, including in water
- Ensuring that feedstuffs are not contaminated with botulinum toxin
- Vermin control during the harvest, preparation and storage of animal feedstuffs
- Prevent stock from having access to piles of chicken litter (there is a chicken litter feeding ban in Queensland)
- Incorporating chicken litter into the soil immediately after being spread

More information: www.daff.qld.gov.au/animal-industries/welfare-and-ethics/animal-welfare/natural-disasters/animal-disease-issues-after-flooding/infectious-diseases/botulism

Grazing for the climate: Sustainable grazing management

• From facing page

liveweight gain in the R/Spell has also been the highest of all strategies suggesting an emerging effect of improving pasture condition on animal production. Experience also suggests that some reduction in stocking rates will be important in drier years.

Variable stocking was also more profitable than heavy stocking and of similar profitability to the MSR and R/Spell. However, high stocking rates in 2000-01 leading into the dry years adversely affected pasture condition. Variable stocking would thus be improved by setting upper limits to stocking rates, making stocking rate adjustments in a more risk-averse manner and some form of wet season spelling. The main stocking rate adjustment should be based on forage availability at the end of the wet season (May/June) with other secondary adjustment points in the late dry season (October/November) and possibly, in the early-mid wet season.

These long-term results indicate that the most profitable and sustainable strategy for managing climate variability will involve flexible stocking around long-term carrying capacity with stocking rates changed in a risk averse manner as rainfall varies. Periodic wet season spelling is also essential to maintain land condition. Different combinations of these strategies are currently being tested in Phase 2 of the Wambiana trial. We look forward to sharing these results with you in future Beeftalk articles and welcome inquiries from producers wishing to visit the trial.

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Introducing the FutureBeef Stocktake Plus app – the grazier's new best mate in the paddock.

Monitoring and decision support

FutureBeef STOCKTAKE PLUS

THE FutureBeef Stocktake Plus app is a grazing monitoring and management decision support tool for graziers and advisers predominantly located in northern Australia. It has partial functionality for producers in other regions.

It is a mobile tool assisting grazing best management practices by helping users to monitor land condition, stock numbers and rainfall.

It includes a forage budgeting tool for calculating the appropriate balance of stock to available pasture.

Producers set up their own properties and paddocks and the app can produce reports, including land condition monitoring and long-term benchmark carrying capacities.

The app's mobility allows users to capture data whilst in the paddock directly onto their device and then later securely sync their device (via Wi-Fi or 3G access) and upload the data to their personal account. This allows users to:

- Capture important production data for analysis
- Manage property resources
- Understand their property environment over time
- View and export their data through a personal and secure portal.

Since the app's launch its adoption has exceeded expectations with favourable feedback on its functionality and user friendliness.

Valuable feedback has also led to some recent enhancements.

You can download the app for free from either the App Store (iOS users) or Google Play (Android users).

The FutureBeef Stocktake Plus team continue to work closely with users and developers to deliver a quality product with enhanced user experience. They always appreciate your feedback.

To find out more, register an account and download the app visit the Stocktake Plus website www.stocktakeplus.com.au

Greg Bath, DAFF, Toowoomba
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BEEF DRIVING AHEAD

- TRANSPORT
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- CATTLE YARDS
- EAR TAGS
- HEALTH
- EXPORT
- PROCESSING
- STOCK FEED

ALL SYSTEMS ARE GO FOR THE BEEF INDUSTRY IN 2015

This specialised feature will focus on our innovative cattlemen and the steps they are taking to place themselves at the forefront of the marketplace today.

With Beef Australia just around the corner now is the time start preparing and put your business in front of potential clients. If you are a supplier of goods or services or have an affiliation with the beef industry don't miss the opportunity to target over 80% of Queenslands top cattle producers.

Published: February 5
Booking & Copy Deadline:
JANUARY 29

BONUS OFFER
Online advertisement on our Qld Country Life - Beef Australia site, launching February 2015 from $150

QUEENSLAND Country Life

Contact your Queensland Country Life Representative for further details

4.5.5 MLA Feedback article (March/April 2015)

Forage budgeting

Bringing down the forage budget

Megan Willis, Department of Agriculture, Forestry and Fisheries Queensland Stocktake Coordinator, demonstrating the Stocktake Plus app at Wandovale Station, Charters Towers.

Assessing pasture yield to assist with adjusting stocking rates allows producers to make informed decisions about how to manage their available pasture until the end of the dry season. One way to do this is with a forage budget.

Forage budgeting is a process for calculating sustainable stocking rates based on available pasture and animal intake over a period of days, weeks or months.

It lets producers balance forage supply (existing and anticipated pasture yield) and forage demand (how much the animals will consume) over a defined period.

To make the job easier, the MLA-supported FutureBeef program has developed the Stocktake Plus app, a grazing monitoring and management decision support tool for producers and advisors predominantly located in northern Australia.

The app calculates a forage budget to determine the appropriate balance of stock to the available pasture. The app produces reports, based on pasture estimates, including long-term carrying capacity and land condition benchmarks.

Developing a forage budget is recommended at the end of the growing season (April or May for northern Australia) or each time livestock are moved between paddocks.

A forage budget will help determine if a paddock can either sustainably carry more stock, carry the same number for longer, or if there is not enough pasture to safely carry the current number for the length of time required.

For example, a forage budget may indicate that between May and December a producer can carry 400 adult equivalents (AE) in a particular paddock based on the total pasture yield. If the paddock historically carries 300 AE, then there's an opportunity to increase your stock numbers.

On the other hand, if the paddock generally carries 500 AE, and a producer has identified forage to support only 400 AE, then there's a high risk running out of pasture, reducing livestock performance and eating into planned residual feedbase.

The app's mobility allows users to capture data while in the paddock and then later securely sync their device (via Wi-Fi or 3G access) and upload the data to their personal account. This allows users to:

FutureBeef STOCKTAKE PLUS

- → Capture important production data for analysis
- → Manage property resources
- → Understand their property environment over time
- → View and export their data through a personal and secure portal.

Leading up to April, northern producers can:

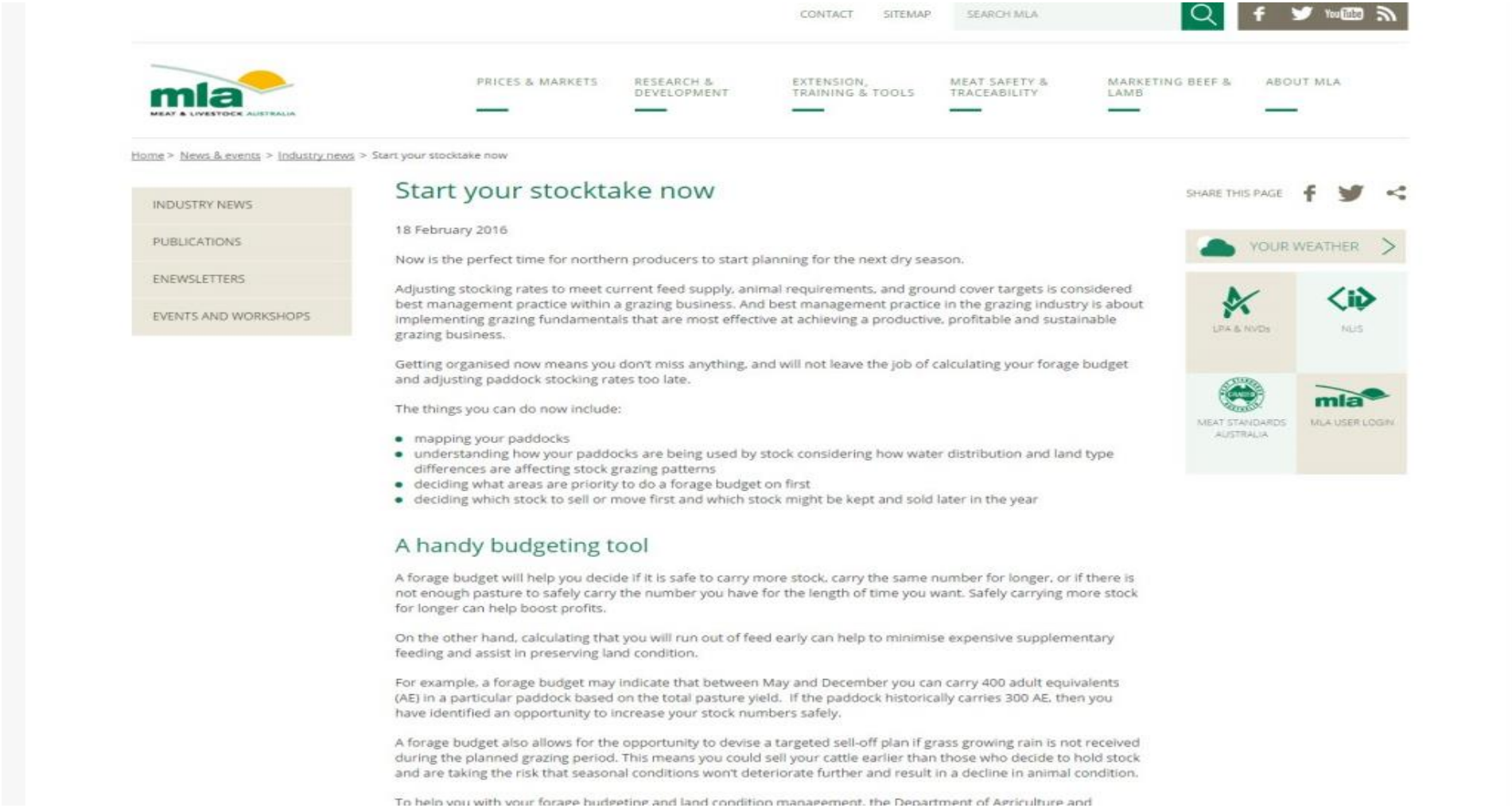
- → Map paddocks and understand how they are being used by stock, considering how water distribution and land type differences are affecting stock grazing patterns
- → Prioritise areas for forage budgeting
- → Decide which stock to sell or move first and which stock might be retained.

For more information, or to express an interest in attending a Stocktake workshop to learn more about forage budgeting and how to use the Stocktake Plus app contact
Megan Willis
E: megan.willis@daff.qld.gov.au

If you have an Apple or Android device you can download the Stocktake Plus app from
www.stocktakeplus.com.au

Turn to pages 6-7 for more on record keeping.

4.5.6 MLA Friday Feedback article (February 2016)



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Start your stocktake now

SHARE THIS PAGE

18 February 2016

Now is the perfect time for northern producers to start planning for the next dry season.

Adjusting stocking rates to meet current feed supply, animal requirements, and ground cover targets is considered best management practice within a grazing business. And best management practice in the grazing industry is about implementing grazing fundamentals that are most effective at achieving a productive, profitable and sustainable grazing business.

Getting organised now means you don't miss anything, and will not leave the job of calculating your forage budget and adjusting paddock stocking rates too late.

The things you can do now include:

- mapping your paddocks
- understanding how your paddocks are being used by stock considering how water distribution and land type differences are affecting stock grazing patterns
- deciding what areas are priority to do a forage budget on first
- deciding which stock to sell or move first and which stock might be kept and sold later in the year

YOUR WEATHER

LPA & NVDs | NLIS | MEAT STANDARDS AUSTRALIA | MLA USER LOGIN

A handy budgeting tool

A forage budget will help you decide if it is safe to carry more stock, carry the same number for longer, or if there is not enough pasture to safely carry the number you have for the length of time you want. Safely carrying more stock for longer can help boost profits.

On the other hand, calculating that you will run out of feed early can help to minimise expensive supplementary feeding and assist in preserving land condition.

For example, a forage budget may indicate that between May and December you can carry 400 adult equivalents (AE) in a particular paddock based on the total pasture yield. If the paddock historically carries 300 AE, then you have identified an opportunity to increase your stock numbers safely.

A forage budget also allows for the opportunity to devise a targeted sell-off plan if grass growing rain is not received during the planned grazing period. This means you could sell your cattle earlier than those who decide to hold stock and are taking the risk that seasonal conditions won't deteriorate further and result in a decline in animal condition.

To help you with your forage budgeting and land condition management, the Department of Agriculture and

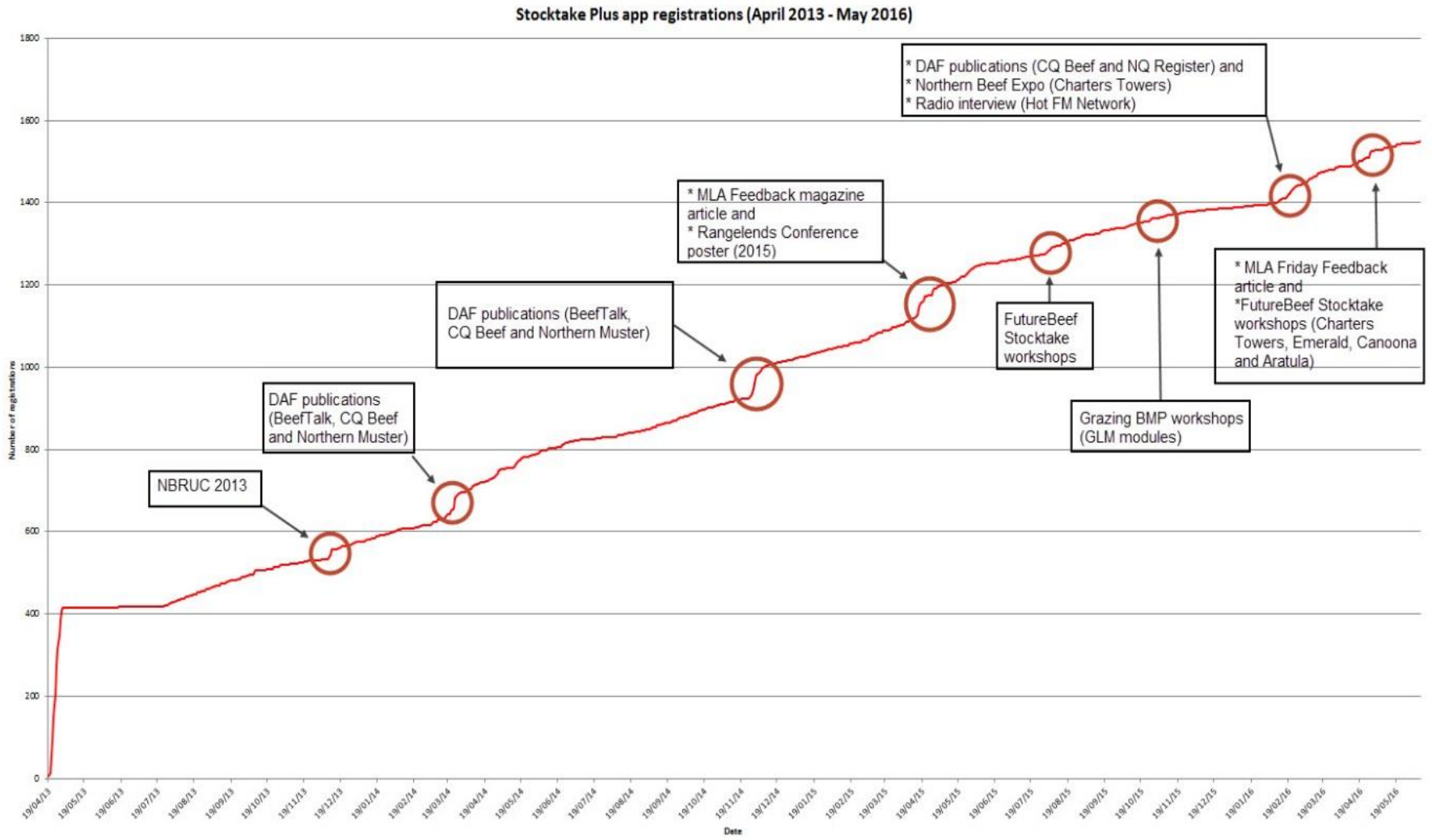

Fig.1: Stocktake Plus app registrations (April 2013 – May 2016)

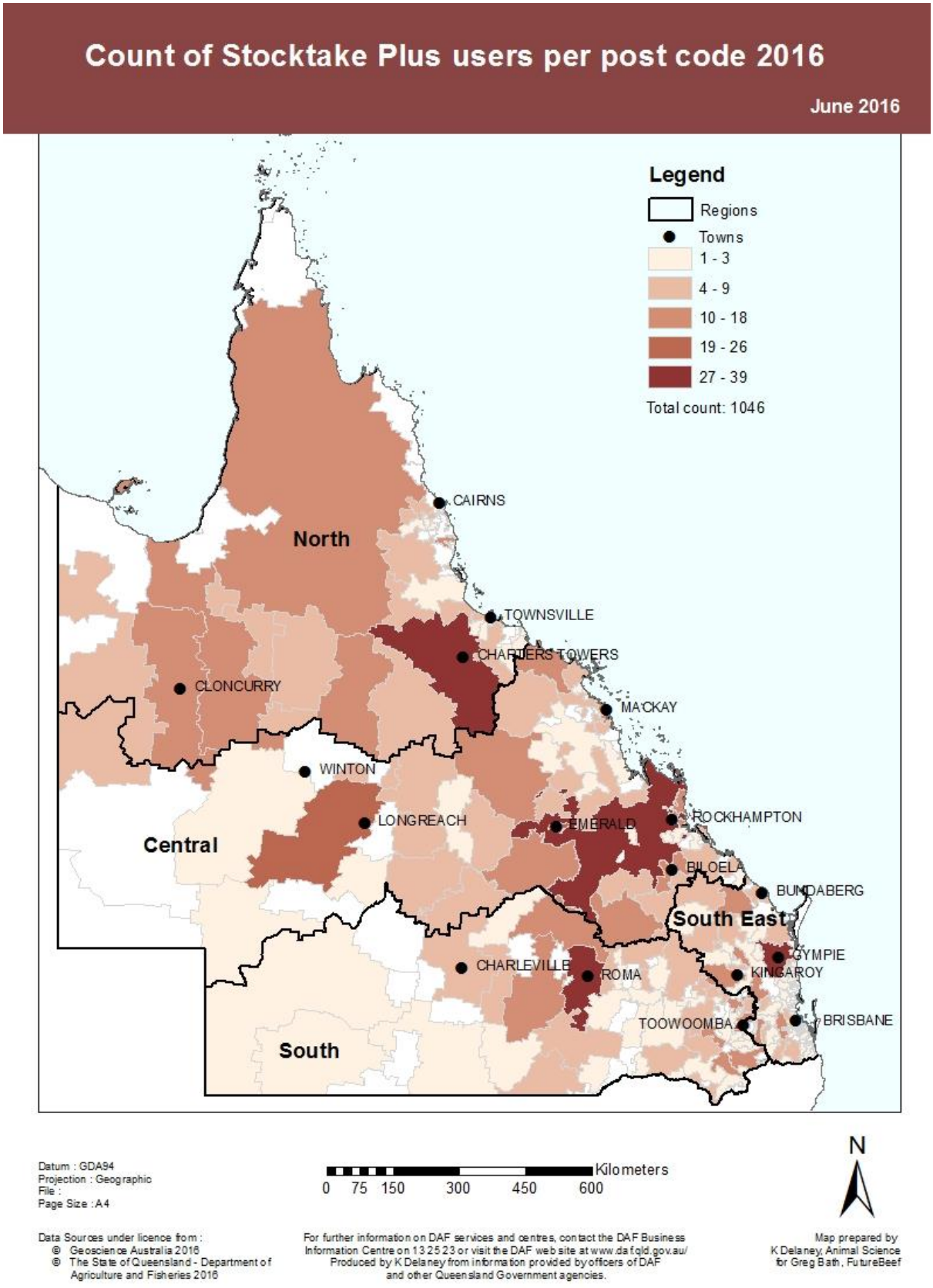

Fig. 2: Queensland registered Stocktake Plus app users (April 2013 – June 2016)

4.6 Manage hosting and maintenance activities with app development company (Fresh).

4.6.1 Hosting activities (Apple and Android versions) within the project allows for:

a) users' ability to sync and back-up their data and monitoring information to a secure location
b) hosting and updating of the Stocktake Plus website www.stocktakeplus.com.au e.g. updating the 'news', 'FAQ' section, 'Support' section, 'Feedback' section and requesting 'updates' through NOW Communications etc.
c) Managing and directing enquiries and app issues with user accounts to appropriate persons be it FutureBeef extension staff, DAF Stocktake coordinator, MLA or NOW Communications.

MLA has a separate contract with NOW Communications and is responsible for managing the technical support and hours allocated for the relevant project deliverables and outcomes associated with the app and Stocktake Plus website. MLA, NOW Communications and the DAF project leader liaise regularly on project progress.

4.6.2 Maintenance activities for Apple and Android versions of the app

A critical component for digital technology development is the ongoing maintenance to ensure the end product has full functionality and is reliable and robust. The end product should consider industry feedback and value-adding opportunities to enable the most value from the app for stakeholders.

Maintenance activities have been collaboratively managed between MLA, DAF and NOW Communications. Maintenance activities for the Apple and Android versions have been constant and, at times, demanding since its release. This is typical for app development as there will always be some need for ongoing maintenance. As such, operational management must be maintained with focus on continual fine-tuning as issues arise. The DAF project team has worked diligently with the developers in getting workable builds of the app (iOS and Android) completed.

Maintenance has two components:

a) Changes to data or structures for example:
    i. Options for new functionality (opportunities to link to other tools, etc.)
    ii. Changes in formula behind the app
    iii. Changes to the structure of supporting information within the app (e.g. pasture growth tables, land types, etc.)
    iv. Any 'errors' within the underlying calculations.

b) Changes to the operating system, for example:
   i. Changes to the app's architecture
   ii. New Apple or Android hardware or software that results in the app requiring modification to be compliant.
   iii. Central repository for maintenance or 'feedback' suggestions (coming in via the website) from users and interested third parties, then regularly raising these with the MLA/NOW Communications for discussion and/or action.

It should be noted that the project operates in two different developmental environments:

1. Production environment: These are the app builds that have been formally tested by DAF and have been officially released to the respective digital stores. The current production builds the project team are working with are:
   a. iOS (Apple): Version 2.83 (released November 2014), and
   b. Android: Version 2.0 #3 (released November 2015).

No new platform updates have been officially released since November 2015.

2. Test environment: These are the app builds that are being tested by DAF for functionality, rigour and reliability, prior to being approved for official release. The test builds the project team are using are:
   a. iOS (Apple): Version 2.99 (submitted February 2016), and
   b. Android: Version 2.0 #5 (submitted April 2016).

The major issue impacting the app has been the decaying database towards the later stage of the project. Some maintenance needs have been cosmetic (i.e. the look of the app) while others have occurred following platform updates and interface amendments within the app's architecture).

Table 1 lists hosting and maintenance activities that have been addressed with the developer from April 2013 to April 2016.

It should be noted this is not an exhaustive list and no maintenance has occurred since DAF received advice from NOW Communications regarding the database issue.

Table 1: Stocktake Plus app maintenance and hosting issues (April 2013 – April 2016)

Date received	Issue
14/05/2013	Paddock not appearing to add stock numbers
29/07/2013	Photos known to have been taken within app not appearing in reports
29/07/2013	App lost GPS recognition - location services must be set to on for app itself
29/07/2013	Setting location with GPS - error message - continual over 4 days
23/08/2013	"App not compatible with device" - error message
27/09/2013	Stocktake Dashboard freezes
5/10/2013	Issue with back up and syncing (Android in particular)
16/10/2013	Device freezing when taking photos in LC monitoring

Date received	Issue
23/10/2013	Photos not stored in camera roll or appearing on monitoring site
7/11/2013	Cannot select a region
8/11/2013	Issue with back up and syncing
12/12/2013	Southern Gulf (SG) land types do not match corresponding description sheet
12/12/2013	Forage budgeting formula incorrect
20/11/2013	Issue with back up and syncing
2014	
3/02/2014	Cannot get reports from Dashboard - freezes
10/03/2014	Cannot select a region
21/03/2014	Cannot select a region
24/03/2014	Cannot select a region
27/03/2014	Correction to forage budget formula
13/05/2014	NOTE: Major iOS 7 interface update
10/06/2014	Fixes for test pilots to download new test builds
12/06/2014	More fixes to SG land type information
June 2014	DAF GLM & Stocktake team meetings - original ST+ app wish-list generated.
03/07/2014	Cosmetic changes to app screen lay-out for forage budgeting (more intuitive layout)
27/10/2014	Fixes to deleting monitoring sites, paddocks, properties, etc. Land type sheets added to Tools page, Log-out function added, change 'Done' button to 'Save' button added, fixes to iOS camera bug.
30/10/2014	GPS location not working in iOS build
30/10/2014	Dendrometer flickering and unavailable in iOS build
Nov 2014	iOS v 2.83 officially released
10/12/2014	Unable to download Land Condition site reports from the website dashboard. No response – blank with spinning wheel icon?
2015	
April 2015	ST+ app wish-list was revised and approved
10/04/2015	Unable to download Land Condition site reports from the website dashboard. No response – blank with spinning wheel icon?
10/04/2015	When attempts are made to export the land condition report as a CSV file it brings up the headings but no details?
10/04/2015	Also having difficulties when trying to email PDFs from a device to a PC – it won't send the whole report, sometimes only one page is sent instead of two or only half of one page?

Date received	Issue
23/04/2015	Question…*Is it possible to have a default reminder appear upon opening the ST+ app that the device does not have the latest version installed and requests the user to install the latest version?*
24/04/2015	Client trying to download app and when trying nothing actually happens
27/04/2015	Forage budget page not populating fields with data
15/07/2015	Search results in the iOS App Store cannot locate the ST+ app? I have a client wishing to download the ST+ app onto their iPhone 5.
27/07/2015	ST+ dashboard not generating Carrying Capacity & Land Condition reports
12/08/2015	iOS build not generating rainfall report - android version only (?).
20/11/2015	Android test build - Col experience back-up & syncing issues. Two versions on the same phone?
23/11/2015	Android test build - TBA will not accept '0' as a value.
26/11/2015	Android test build - GPS coordinates not working.
Nov 2015	Android v 2.0 #3 officially released
2016	
20/01/2016	ST+ website blocked after malware identified
05/02/2016	New iOS test build v 2.85 incorporating wish-list items. Back-up & syncing issues
6/02/2016	New iOS test build v 2.86 – back-up & syncing issues
09/02/2016	New iOS test build v 2.87 – back-up & syncing issues
09/02/2016	Giselle sends through PG information/file for testing
12/02/2016	iOS back-up issues need major re-build of app
16/02/2016	Android test build (v 2.0 #4) - duplication of properties; Back-up and syncing issues
18/02/2016	New iOS test build v 2.91 - duplicating properties similar to Android test build? Back-up and syncing issues
18/02/2016	New iOS test build v 2.92 - Back-up and syncing issues
19/02/2016	New iOS test build v 2.93 - Back-up and syncing issues
22/02/2016	New iOS test build v 2.94 - Back-up and syncing issues
23/02/2016	New iOS test build v 2.95 - Back-up and syncing issues
25/02/2016	New iOS test build v 2.96 - Back-up and syncing issues
26/02/2016	New iOS test build v 2.98 - Back-up and syncing issues
28/02/2016	New iOS test build v 2.99 - Back-up and syncing issues
29/02/2016	New Android test build v 2.0 #4 - Back-up issues
21/03/2016	New Android test build v 2.0 #4 - Back-up issues
22/04/2016	New Android test build v 2.0 #5

Advice from NOW Communications is that the existing database within the current structural architecture supporting the app is incapable of accommodating the data storage requirements and/or data supportive demands required of it for the project to progress.

This matter severely impacts the functionality of the app which includes, but is not necessarily limited to:

- The ability of clients to securely back-up private data to their personal dashboard.
- The ability of new clients registering new user accounts.
- The ability of DAF appropriately managing any required hosting and maintenance activities of the Stocktake Plus website.

The emergence of this major technical issue has been disappointing, and is noted that it is a separate issue to the other approved wish-list items of April 2015 (Fig. 3).

		Date:12/2/16	
#	ITEM	iOS	Android
1	Have a home page – Icons for Set Up Property, Set Up monitoring site etc – several people have said its confusing the way it is and not intuitive.	Done	Done
2	Factoring in new pasture growth tables, Do updates of PGT when doing current build, Talk to programmers of app for update requirements	Done (but testing)	Oustanding
3	Update 100% groundcover photo to be more representative of pasture rather than litter cover.	Done	Done
10	Record pasture yield as a specific data collection parameter	Done (but testing)	Done by next week (19/2)
12	Whole of property forage budget	Done by next week (19/2)	Done
20	Ability to enter zero (0) as a value especially for Tree area and Anticipated Growth	Done	Done by next week (19/2)
24	Change DONE button to SAVE and include a prompt when data entered to suggest you save data	Done	Done
25	Days and weeks feed will last be changed from >300 days and >43 weeks	Done (but testing)	Done
26	Having the land type sheets available in the tools section so that they are accessible without having to be in the monitoring section	Done	Done

Fig. 3: Stocktake Plus app approved wish-list and completed items as at 12 February 2016.

DAF has reinforced the view that the app had to be functional, reliable and robust as a digital application, as these three criteria underpinned any user's initial experience using the app. Therefore, the major database issue affecting the app's functionality has affected DAF's ability in delivering contractual project objectives. This is based on the consideration that the app's target user base were graziers whom traditionally were not necessarily accustomed to using digital technologies and could become disengaged through a poor user experience.

4.7 Timely support of the Stocktake Plus app and regular monitoring of feedback for future development and improvement.

Since the app's launch, its adoption has exceeded expectations with favourable feedback and led to recent enhancements as outlined in Fig. 3. All feedback is viewed by the app's development and extension teams as valuable for gauging the app's user impact and/or as a resource in discussions for future development strategies.

In addition, following consideration of the advice from NOW Communications with regard to the major database issues impacting the app's immediate functionality and future progression, a joint partners meeting (DAF, MLA and NOW Communications) was held in April 2016 on DAF's Spyglass Beef Research Station (Charters Towers). This meeting was designed to demonstrate the functionalities of the app using practical scenarios to enable an

external MLA app specialist to conduct a comprehensive evaluation of the project. In September 2016, the following recommendations were provided:

4.7.1 Learn from The Past

- Verify that the system being implemented is robust enough to cope with human factors and error margins. If not, then cease the project and re-plan.
- Follow a software development lifecycle and development methodology.
- Revisit the analysis stage to decide whether the app needs to function standalone, or in conjunction with a desktop application or website.
- Set metrics for success: number of users, user activity, reliability, etc.

4.7.2 Re-Develop

- Create a new prototype user interface for the app and test this with real end-users in multiple environments.
- Verify the formulae, databases and approximations used in the app.
- Create formal specifications for the app and other system components to suit development methodology, based on the existing apps and historic systems.
- Create robust test scripts to confirm that any app, website and desktop tools developed work correctly and reliably.
- Select development partner using a balanced scorecard approach.
- Develop a new version of the app with a common codebase between Android and iPhone.
- If required, develop desktop or web components of the solution.

4.7.3 Test and Rollout

- Test, test and re-test.
- Rigorously document the as-implemented solution.
- Roll-out app, including communications and training plans.
- Implement post-rollout bug management and fixing.

4.7.4 Manage and Review

- Periodically Review against metrics set in recommendations.

4.7.5 Verify Robustness

Tests should be carried out to measure the variability of results for both land condition reporting and forage budgeting when executed by end-users.

The visit to Charters Towers demonstrated large variability in the results between individuals irrespective of whether they were pasture experts or novices. The variability observed was large and the figures returned, particularly for forage budgeting, did not appear comparable between users.

Conversations with both DAF staff and external experts suggest that human factors affect the variability of results. Variability can be tolerated if consistency in approach is achieved.

Accordingly, DAF staff continue to support graziers undertaking a forage budget as they build their capacity to monitor and calibrate themselves over months and years to improve accuracy of records.

With this in mind, DAF staff disagree with the final recommendation of the app specialist with regard to defining an acceptable level of variability. The app is a decision support tool and not a precision support tool, and users being upskilled in the application of the app are advised of the same and any associated limitations to consider.

4.8 Evaluation of adoption of the Stocktake Plus app and impact to producer activities over three years completed.

A deliverable for the project includes the development of an evaluation plan (Bath G, 2015) to measure and evaluate the project. The plan aimed for continual assessment and focuses on measuring and evaluating the adoption and impact of the app on producers' knowledge, skills, attitudes, aspirations and behaviour (i.e. practice change) regarding forage budgeting and grazing land management.

The ongoing monitoring and evaluation for the project has included:

- Annual electronic surveys (eSurveys) to registered users to gauge app use, adoption and practice change.
- Analytics from the project's website to identify potential improvements to accelerate adoption.

DAF has undertaken an independent survey (Coutts, J&R. 2016) of the existing Stocktake Plus user base which included external consultants, NRM staff and DAF staff. The survey was designed to measure user's adoption, application, satisfaction, impacts, barriers and suggested improvements of the app. This report is discussed further in the sections below.

4.8.1 Project progress

Year 1 (2013/14)

The project progressed well in the first 12 months of the three-year contract period, with remedial work undertaken on issues outlined above. DAF's development and extension team had six-weekly webinars with MLA and NOW Communications to discuss all work-in-progress and any current or forecast issues that may impede app development. The project had budgeted developer time (maintenance and development) for the app of 80 hours, 70 hours and 60 hours respectively for the first, second and third years of the current contract (this time is managed and budgeted separately between MLA and NOW Communications).

Year 2 (2014/15)

Due to the complex architecture in the Android version (1.3.0) of the app, the developer's second year 70 hour time allocation expired sooner than forecast. MLA secured additional funding to ensure progression of the project. A new iOS build (V 2.83) was released in November 2014 and a new Android build to mirror iOS version 2.83 was expected in the short term. Unfortunately, little progress was made on any new Android build. However, a project 'wish-list' was approved by MLA and NOW Communications in April 2015 (Fig. 3) in an attempt to prioritise all future app development based on user feedback.

Year 3 (2015/16)

DAF worked with the developer in an earnest attempt to get a new Android build delivered and released, but further technical/coding issues with the Android platform emerged. A new Android build (V 2.0 #3) was released in November 2015, but unfortunately, not long after the release the development team experienced multiple failures in the functionality of the app and the database storage capabilities as previously described. As a consequence of these major issues, DAF initiated an external review of the app to gauge:

- user satisfaction of the app
- impact of the app
- identifying the barriers for the app's adoption and application
- any suggested improvements (by users) for the app.

4.8.2 Key findings: Stocktake Plus app - Impact evaluation report

The aim of this project was to develop a user-friendly, robust and reliable app that producers can use as a grazing land management decision support tool. In April 2016, DAF engaged an external consultant (J & R Coutts) to conduct a comprehensive review of the Stocktake Plus app. "The Stocktake Plus app - Impact Evaluation Report" (Coutts, J&R. 2016) reports on the app's effectiveness, and issues to be addressed to maximise its value.

I. User satisfaction

- Overall, users appeared to be moderately satisfied with the Stocktake Plus app (Apple users more satisfied than Android users) and found it moderately easy to use - satisfaction and adoption levels were hampered by frustrations caused by technical issues, some design and functionality issues, and lack of understanding and skills.
- There was a general consensus of the need for this type of app and acknowledgement that it provided useful functions otherwise not available (i.e. 'out in the paddock' land condition monitoring and forage budgeting).

II. Impact of the app on users

- Feedback indicates that the Stocktake Plus app has influenced a number of users to make property changes, with those having attended Stocktake workshops (or similar) appearing more likely to have done so. Changes to managing carrying capacity and stocking rates were the most common, while other changes included increased and improved pasture monitoring, and changes to the timing of rotations.
- Of the producers who indicated the app had not influenced their decisions, several suggested that that it was too early to make changes and they had not been using the app for long enough – although some noted it would likely influence their decisions in the longer term. A number of others felt the app had instead reaffirmed their existing knowledge and provided validation of their current decisions. A few producers used the app as a recording device rather than a decision making tool.
- Improved record keeping, particularly the ability to digitally store photos and information all in one spot, was a benefit already observed and valued by a number of users. Other benefits observed included an increased interest and understanding

of pasture management; validation of current practices; and help meeting accreditation requirements.

- Almost half of app users from the survey had already observed or were expecting benefits from using the Stocktake Plus app.
- Although these users indicated having made changes and/or observed benefits as a result of using the Stocktake Plus app, there were few examples of these translating yet to actual impact on property profitability or sustainability. Impacts that were observed primarily related to improvements in paddock and pasture and/or livestock condition.

III. Barriers to user adoption

- Technical issues were consistently identified as one of the major factors limiting the adoption of and active use of the Stocktake Plus app. These technical issues (particularly with Android versions) were seen to have reduced producer, as well as consultant and extension officer confidence, that Stocktake Plus is a reliable and useful app.
- Examples of technical issues experienced included: freezing and crashing; lost data; layout and design glitches (e.g. flashing dendrometer, land types not displaying); accuracy of data output (e.g. inaccurate forage budgeting calculations, inconsistent calculations between Apple and Android versions); and issues caused by not having mobile reception.
- While the majority of users believed the app was fairly easy to use, some producers expressed frustrations with the app's complexity, difficulties with the basic setup, and a general lack of knowledge on how to use the app.
- There were suggestions by extension staff that a lack of resources and capacity for extension officers to provide adequate support to producers was hindering further adoption of the Stocktake Plus app.
- Some producers interviewed expressed concerns about the industry's apathy and reluctance to change, particularly older farmers who are seen by some as unwilling (or unable) to adopt new technologies.

IV. Addressing barriers to user adoption

- Technical issues: The most effective way to improve the Stocktake Plus app is to ensure that it functions completely and consistently on both Apple and Android devices without any technical issues.
- Design and functionality: The issues of the lack of accurate land type options and support locations must be addressed – even if this is through clearer communication of the app's limitations and intended target regions.
- Producer competency: Every effort must be made to ensure producers are competent and confident using the app.
- Producer attitudes and awareness: Producers need to be made (even more) aware of the benefits of using the Stocktake Plus app. Case studies of those users who

have observed positive impacts as a result of the app could be used to encourage adoption.

V. Suggested improvements from users

- Improvements to the Stocktake Plus interface: A cleaner Apple interface to reflect the new iOS operating system; displaying a map of a user's property on the dashboard showing the locations of pasture sites, paddocks, and rain gauges; less screens to navigate before entering data; including a reminder to save page information; and increasing the font size to assist older users.
- New features: More flexibility in moving stock between paddocks and recording these movements; report rolling rainfall for the previous year; increased applicability to southern systems; ability to retrieve lost usernames and passwords; ability to record each animal's tag; the ability to work in RCS methodology; adding a rotation recording system; adding a GIS property mapping feature; ability to integrate with other tools/software (e.g. iHerd, Grazfeed); and complementing dry matter yield assessments with cover assessments.
- Data exporting: 13 out of 25 (52%) users from the 2015 feedback survey would find the ability to export reports helpful, with comments suggesting this would be useful for further analysis. One interviewed extension officer explained that the app can output data to other software packages, though this function is not widely used, if at all, and does not seem to be promoted by extension officers.
- Training and support: More training and support using the app to ensure users *have confidence to use it properly on their own.* Producers interviewed tended to use only one of the two parts of the app, which may reflect their preferences or lack of a full understanding by them or their advisor.

VI. Stocktake Plus app - Impact evaluation report - recommendations

- **Recommendation 1:** The Stocktake Plus app has demonstrated that it does have practical application and is broadly supported by producers and extension officers/consultants despite some technical issues and limitations. Support for the app should continue and provisions made to quickly address the issues that have been identified.
- **Recommendation 2:** Prioritise fixing the current technical issues with the app before making any other design or functionality changes. This is key to rebuilding and continuing to build producer and extension officer confidence in the reliability and dependability of the app.
- **Recommendation 3:** Promote ongoing improvements to the app through FutureBeef communication channels as well as case studies of producers who are effectively improving their productivity through the use of the app.
- **Recommendation 4:** Ensure producers are adequately supported in using the app through a combination of one-on-one extension and Stocktake workshops (or similar). This support may need to be built into existing extension programs.
- **Recommendation 5:** Explore the options for future development that maintain the desirable simplicity of the app, while providing more information and flexibility to

account for the vast complexity and variety of land types and production contexts within which the app could be used.

- **Recommendation 6:** Ensure resources are available for continual development of the app, so that it keeps pace with technological development of the devices, both Android and Apple.
- **Recommendation 7:** Explore options to contract an app developer to remediate the existing issues impacting the app's functionality. It is noted that a good understanding of the grazing industry is preferable.
- **Recommendation 8:** Undertake case studies of those users who have observed positive impacts as a result of using the app. Use these to promote the benefits of using the Stocktake Plus app.

5 Conclusions/recommendations

Recommendations for the Stocktake Plus app project are based on the project's final report key findings and recommendations together with the project leader's personal communications with DAF beef extension officers and private consultants.

The conclusions and recommendations reported are delivered in conjunction with the agreed objectives of the project, and with due diligence relevant to the following reports:

- Mr David Swaddle (Learning Plan) – Stocktake Plus Options review (2016)
- Coutts J&R (2016) – Stocktake Plus app (impact evaluation report)

5.1 Continuing the Stocktake Plus app in all relevant FutureBeef extension activities and training packages

Continue including the Stocktake Plus app within all relevant FutureBeef extension activities, while explaining the existing limitations to the app's functionality (i.e. database) and any issues relative to these limitations whilst these remain unfixed. All technical issues currently impacting the app's functionality should be addressed as a priority and be regularly monitored and reviewed based on its future progress. There is an urgent need to prioritise the fixing of current technical issues with the app before making any other design or functionality changes. This was key to rebuilding the app and continuing to build producer and extension officer confidence in the reliability and dependability of the app.

The barriers identified in the evaluation report (Coutts J&R, 2016) included difficulties with basic set up, a general lack of user knowledge on how to use the app and the overall app's complexity. Some of these barriers can be contributed to a poor initial user experience related to the technical issues impacting it's intuitiveness.

App reviews should also be conducted as part of extension projects promoting the adoption of grazing land best management practices within the beef industry.

We are confident that the underlying mathematical architecture supporting the app and the resultant calculated outputs are accurate to undertake land condition monitoring and forage budgeting with the app.

5.2 Future extension, communication and promotion strategy: availability, features and benefits of the Stocktake Plus app

FutureBeef communication channels (eBulletins, Facebook, Twitter, etc.) will raise awareness of the app and how it is being used by producers. In addition, the timely articles will be submitted for publications (MLA *Feedback* magazine, *Beeftalk, CQ Beef, Northern Muster*, etc.) to promote the app. The incorporation of training webinars is still a communication opportunity available however, regional and remote internet capabilities hamper this approach.

The Stocktake Plus app's Impact Evaluation Report (Coutts, J&R. 2016) detailed the need (of the beef/sheep industry) for an app of this type and acknowledged that it provided useful functions otherwise not available (i.e. 'out in the paddock' land condition monitoring and forage budgeting).

Continuing communication activities with end-user groups for explaining the existing limitations of the app's functionality (i.e. database) and any issues relative to these limitations whilst these remain unfixed is required. Should the current technical issues impacting the app be remedied (to the satisfaction of Phase IV partners), then all parties can actively recommence promoting the app with confidence.

5.3 Continued evaluation of adoption of the Stocktake Plus app and impact to producer practices

Broader industry surveys as listed below also contribute to gauging producer's awareness and use of the app.

- The FutureBeef surveys on the project's communication approaches.
- The annual web survey (with efforts to encourage users to respond) provides a basis to continue to monitor the app's functionality and effectiveness.
- Case studies of producers who effectively use the app in their decision-making processes would provide further insights and extension materials.

All future monitoring and evaluation activities should follow the process outlined in the project's Milestone 4 report (Bath, G. 2015) and consider incorporating the strategies as detailed above.

Discussions beyond 2016 can explore potential Phase IV project opportunities such as MLA funding and/or other collaborative operational partnerships.

5.4 NOW Communications (the developer)

As previously stated, the last 12 months of the project has been disappointing and has impeded attempts to reach project milestones.

However, DAF are confident the current technical issues impacting the app can be resolved to the benefit of the northern beef and sheep industries.

5.5 Recommendations of purchase cost for the Stocktake Plus app

The impact of the Stocktake Plus app was measurable by the adoption of the tool and changes in producer practices and on-ground outcomes. The results from a recent survey has demonstrated the on-farm impact of the app in the three years since its launch, and need of an application of this type. Further, the integration of the app within the FutureBeef extension activities will continue to ensure industry and stakeholders get the most value from the app.

With due consideration of the technical issues impacting the app's functionality within this project period, it is recommended that the app remain free to users to restore confidence within the current user base upon remediation of all issues. This approach would additionally remove any unwillingness to pay obstacles which may limit adoption and application.

The tool is valuable for extension activities, particularly in the Grazing Land Management area.

It is proposed that the recommendations above would be formalised through a fourth phase of the Stocktake Plus app project.

6 Bibliography

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