



Australian Government
Department of Agriculture,
Fisheries and Forestry



Future
Drought
Fund



SA
DROUGHT
HUB

SOUTH AUSTRALIAN DROUGHT RESILIENCE ADOPTION AND INNOVATION HUB

TOOLS FOR PASTURE FORECASTING

January 2023



Photo: Meg Bell, MFWG

Knowledge of current pasture production and the ability to accurately predict future production helps livestock farmers with decision-making around pasture supply and feed budgeting.

Several pasture forecasting tools are freely or commercially available. This fact sheet summarises the tools that are relevant to South Australian producers.

When comparing pasture forecasting tools, it is important to understand what information the tool should be able to provide. Specifying these expectations first will make it easier to compare products or services.

Data quality

Tools for pasture forecasting often require users to supply farm data. The output of the model behind the tool can only meet its potential accuracy if quality data is supplied. In other words, the quality of what you get out of the tool will depend on the quality of the data you put in.

PASTURE FORECASTING TOOLS AVAILABLE FOR SOUTH AUSTRALIA

PASTURE.IO



Pasture.io calculates current pasture and forecasts growth rates using normalised difference vegetation index (NDVI), satellite imagery, weather data and farm records. It is applicable to sheep, beef and dairy farms. The tool is available in Australia (and other countries).

The tool is accessible online (computer, tablet and phone) through a monthly, quarterly, annual or biannual subscription.

It offers additional features, including:

- record keeping of paddock activities (grazing, harvest, fertiliser, planting and spraying)
- herd information (stock type, class, weights, and current and target production)
- nutritional information (herd requirement, supplement feed inventory and feed test results).

Reports can be downloaded for grazing plans, historic paddock activities and rations. Maps can be produced and shared with employees or contractors.

The NDVI feature can measure pasture cover of up to 2,500 kilograms of dry matter per hectare (kg DM/ha) but cannot accurately measure pasture at canopy closure.

The tool allows users to enter manually measured pasture cover data.

On average, real-time satellite measurements are taken every 3.3 days. Reliability of satellite imagery is limited on days with challenging conditions (solar illumination, cloudiness or atmospheric effects). The tool compensates for this by using local weather data and paddock activity entries to model pasture measurement.

The tool claims a regression analysis (R2) of 0.89 (scale 0-1), which describes a strong relationship between the measured and the actual pasture cover.

Considerations

- No manual labour is required for pasture recording (but the tool allows entry of manually recorded pasture data if desired).
- The satellite component of the tool does not discriminate between pasture species or land cover, and its status (fallow, sprayed, newly sown, etc.); however, the developers claim that the model combines entered farm records and satellite data to adapt to the land and weather conditions being measured. Forage crop measurements are currently under development.
- This tool is competitive with other satellite tools in terms of satellite accuracy and data integration modelling.
- There is an extensive video and blog library available, including easy access to technical support.
- The video and blog material is accessible without subscription, allowing extensive research of the tool functionality prior to subscribing.
- There are five subscriptions available with varying levels of accessibility to features and support, satellite accuracy and farm size. Customized plans are also available.
- The tool undergoes continuous development and improvement, with regular updates included in the subscriptions.

Cost

'Daily Grazer' (middle of range, most popular) for a 200ha farm costs \$309/month (billed monthly only) and 'Priority Grazer' (top of range) for a 200ha farm costs \$722/month (quarterly, annual or biannual billing available).

PASTUREKEY



PastureKey (Cibo Labs) is a remote pasture measurement tool that estimates pasture availability and monitors feedbase on a weekly basis using satellite imagery and data specific to Australian conditions. As such, it is an analytical tool that allows further decision-making based on the current situation, rather than a tool that predicts pasture cover or growth rate.

Cibo Labs collects GPS-tracked data of various total standing dry matter (TSDM) measurements. These TSDM measurements are used to calibrate the algorithm used for the satellite imagery. Combining manually measured, local data with satellite imagery of that same area allows machine learning to improve the tool's accuracy for local conditions. Clients can add to this TSDM database by collecting and submitting their own manually measured pasture cover data.

The tool captures satellite imagery every five days and provides output as TSDM and feed on offer (FOO) in total kg DM/ha, for every satellite capture, in a simple spreadsheet (CSV and XLS) format.

Automated satellite image processing systems correct challenging conditions (e.g. solar illumination, cloudiness or atmospheric effects) to provide consistent imagery within 24 hours of capturing data. The system flags any compromised satellite imagery data.

The accuracy of the program is estimated at within 200kg/ha over a range of approximately 8,000kg TSDM per hectare (R2=0.85).

The tool provides measurements to support further feed budgeting but does not forecast pasture availability or growth rates.

The Profitable Grazing Systems program developed by Meat & Livestock Australia (MLA) has previously offered a training course on Satellite Assisted Forage Budgeting, which complements PastureKEY. The training content is not readily available on the internet.

Considerations

- By default, no manual labour is required for pasture recording, however users are encouraged to contribute to the Biomass Database by measuring and submitting pasture cover via the Cibo Labs Biomass Collector App. This improves the accuracy of satellite measurements in the user's region.
- The tool informs grazing management decision-making but does not forecast pasture cover or growth.
- The tool can estimate biomass across multiple pasture species, growing seasons and growth stages but it depends on field calibrations for this information to be regionally applicable.
- The tool provides TSDM and FOO information, which can feed into farm management software such as AgriWebb and PairTree.
- The tool does not have additional functionalities (such as record keeping and inventory tracking) on its own, but this is an option when combining it with AgriWebb or PairTree.
- The tool featured in a recent MLA study (MLA project V.DIG.2022, published August 2022), which recommended several enhancements to the tool, including the need for a property-level carrying capacity analysis with functionality for long-term planning.

Cost

Annual subscription costs vary with property size and number, and level of service and support. Subscriptions start from \$1,000 (excl. GST) for properties under 1,000 ha up to \$2,000 (excl. GST) for properties under 2,000 ha. Properties over 5,000 ha must request a quote. Premium support (1-on-1 assistance and integration with AgriWebb) is available for an additional \$1,250 annually (excl. GST). A free two-month trial is available.

MAIA GRAZING

 www.maiagrazing.com

Maia Grazing is a platform that supports grazing management by forecasting stocking rates based on rainfall, paddock and livestock information. The tool can record animal health treatments, stock feed inventory, paddock history and treatments, and pasture cover.

Gross financial information and production results can be captured by keeping stock values and inventory up to date. Maia Grazing is available in Australia and the US.

In addition to forecasting stocking rates, the tool allows users to trial scenarios and better understand the potential implications of certain management decisions.

Using farm information and production data, the tool also allows for internal benchmarking (e.g. potential and actual stocking rates at various points in time).

Reports can be generated to summarise records for compliance or audit purposes, or to communicate with staff. Users can share real-time updated grazing plans with staff via a communication platform in the tool.

Maia Grazing is accessible via desktop, tablet and phone.

Details on the accuracy of recommendations and predictions are not readily available on the internet – likely because accuracy depends on the quality of data provided by the user.

Considerations

- For the platform to meet its potential, the tool relies on the user to enter high-quality data (i.e. no satellite imagery is used).
- Users can run scenarios for various farm management decisions to test the effect of assumptions in the long term.
- In addition to pasture and grazing information, the tool uses livestock and financial features for a broader farm management overview.
- In comparison to most other tools, there is limited detail available on functionality prior to signing up. However, a program tour and consultation can be requested at no cost.
- Technical support is readily available as part of the subscription. Free webinars and training events are offered and available to non-users as well.
- There is a free version available for unlimited time, but with limited functionality.

Cost

The cost involves a one-time set up fee (not specified on the website) and recurring invoicing on an annual billing cycle. Different plans offer varied access to software features and range from \$1,560 to \$3,120 excl. GST. Tailored plans are available for large-scale farms or herds (over 10,000 dry sheep equivalents).

PASTURE FORECASTING TOOLS AT A GLANCE

AVAILABLE FOR USE IN SOUTH AUSTRALIA							
TOOL	INPUTS	OUTPUTS	APPLICABLE TO	AVAILABLE IN	USER PLATFORM	COST	FREE TRIAL
Pasture.io	NDVI, satellite imagery, weather data, farm records	Current pasture cover; current pasture growth rates; forecasted pasture growth rates	Beef, sheep, dairy	Australia and internationally	Computer, tablet, phone (web-based)	'Daily Grazer' (middle of range, most popular) for a 200ha farm costs \$309/month and 'Priority Grazer' (top of range) for a 200ha farm costs \$722/month.	Free functionality available for setting up the farm in the tool
PastureKEY	Satellite imagery, data specific to Australian conditions	Pasture availability (TSDM and FOO in kg DM/ha); weekly feedbase overview	Beef, sheep, dairy	Australia	Computer (web-based), third party software apps for mobile devices (e.g. AgriWebb, Pairtree)	Subscriptions start from \$1,000 (excl. GST) for properties under 1,000ha up to \$2,000 (excl. GST) for properties under 2,000ha. Properties over 5,000ha must request a quote. Premium support available for an additional \$1,250 annually (excl. GST).	2 months
Maia Grazing	Rainfall, paddock information, livestock information, gross financial information	Stocking rate forecast; inventory overview; feed budget; livestock, paddock and rainfall analytics	Beef, sheep, dairy, goats, bison	Australia and internationally	Computer, tablet, phone (web-based)	One-time set up fee and annual billing cycle. Plans from \$1,560 to \$3,120 excl. GST based on features. Tailored plans available for large-scale farms or herds (>10,000DSE).	Unlimited free trial with limited access to features
Ag360	Livestock information, paddock information (incl. FOO estimates), BOM weather data	Weather forecast; pasture forecast (soil moisture and pasture availability); animal health risk period forecast (flystrike, worm risk, cold snaps); livestock productivity forecast (weight gains, wool growth)	Beef, sheep	Australia	Computer (web-based)	Annual subscription of \$550 (incl. GST) per property	21 days
AussieGRASS	Farm input data, NDVI, satellite imagery, SILO data	Probability-based predictions for pasture growth and rainfall	Beef, sheep	Australia	Computer (web-based)	Free	Unlimited
GrassGro	Daily weather inputs (farm record input, BOM or SILO), soil profile information, farm data input (livestock, management, costs, prices)	Animal intake predictions; animal production predictions (wool, meat, milk)	Beef, sheep, dairy	Australia	Computer (software program)	Annual subscription of \$110 (incl. GST). Training course for first-time users (\$350 incl. GST)	No free trial
Australian Feedbase Monitor	Satellite imagery, data specific to Australian conditions	Historic pasture growth and cover estimates; forecasted pasture growth	Beef, sheep	Australia	Computer (web-based)	No cost for MLA members with LPA account linked to their MyMLA profile. Non-MLA members \$90 (excl. GST) per year	Unlimited for MyMLA members with LPA account; 30 days for non-members



Photo: Meg Bell, MFMC

AG360

ag360.com.au

Ag360 is a web-based farm management software tool from the University of New England, which makes forecasts related to pasture (soil moisture and pasture availability) and livestock productivity (weight gains, wool growth, flystrike and worm risks, and cold snaps) using the user's own data in combination with weather data (within a 5km radius) from the Bureau of Meteorology (BOM). Forecasts are based on scientifically validated models. Ag360 is a new and improved version of AskBill, developed by the Cooperative Research Centre for Sheep Industry Innovation.

Farm data recording is available for rainfall, livestock health treatments, supplementary feeding, paddock movements, and average animal weight on a per-mob basis.

Forecasts are available for rain and soil moisture (which can include irrigation schedules), pasture availability (based on weather forecast and stock on hand), suggested grazing rotations, growth rates (based on current and target weight, as well as pasture growth projections), and animal health risk periods. The tool provides information that supports decisions on the best animal health treatment for the condition of concern (flystrike or worms).

Considerations

- The tool requires users to enter FOO estimates to allow its pasture features to function properly.
- A range of training and tutorial videos are available without subscription. This allows for more detailed understanding of the functionality of the tool before signing up.
- The tool is not restricted to pasture management; it also integrates livestock management features.
- The forecasting and predictive features rely on flock-based or herd-based livestock averages entered by the user.
- Further development or insights to the functionality of the tool are expected in the near future.

Cost

Ag360 has a free 21-day trial. Annual subscriptions are available at \$550 (incl. GST) per property per year.

AUSSIEGRASS

www.longpaddock.qld.gov.au/aussiegrass/about

The AussieGRASS system is a pasture tool that supports forage budgeting while taking into account bushfire risk and the impacts of drought. The tool provides long-term time series of rainfall and pasture growth information and predictions for the season ahead.

AussieGRASS uses a framework that combines various data sources, such as farm input data, NDVI, satellite imagery and Scientific Information for Land Owners (SILO) data.

It has model features for pasture growth, total standing dry matter, pasture utilisation, ground cover, rainfall and rainfall outlook, drought maps and situation reports, fire management, and water management. The tool is functional Australia-wide but not all features are available or advanced enough to be reliable in all areas.

The model produces rainfall and pasture growth maps, accessible via any internet browser. After selecting your region of interest and preferred map type (point or gridded data), AussieGRASS produces a graph displaying historic data on pasture growth, rainfall, pasture curing index, grass fire risk, available soil water, flow to stream and TSDM.

Predictions are displayed in tercile bands up to three months ahead – which forms the key information for decision-making on pasture management.

Considerations

- The tool does not directly function as a pasture forecast tool. However, it combines multiple sources of data to offer probability-type predictions for a period of up to three months ahead at a national scale.
- Extensive model information and publications are available as a result of the tool's long and ongoing development.
- There is a user guide available to aid in data interpretation.
- Detailed information is freely available on topics such as model calibration, interpretation, features, caveats, future developments, and references on all program functions.

Cost

Use of this tool is free and there is no need to register a user account.



Photo: Jane McClure, Beefik Partnership

CSIRO GRASSGRO

grazplan.csiro.au/grassgro

GrassGro (developed by CSIRO – the Commonwealth Scientific and Industrial Research Organisation) is a decision-support tool that quantifies variability in pasture and animal production for sheep and beef enterprises.

Quantifying the variability helps producers to assess the risk that variable weather can have on the biophysical and business outcomes of a grazing system.

GrassGro allows the user to test management options and interpret the potential consequences of the proposed plan on a grazing system. The tool is applicable to Australia and accessible on desktop and laptop computers.

The tool uses daily weather inputs (farm record input, BOM or SILO), soil profile information (National Soils Database or farm record input) and farm data input (livestock, management, costs and prices) to produce predictions on animal intake and production (wool, meat or milk).

Considerations

- GrassGro uses pasture information and forecasting to inform management analyses for livestock and business. As such, the tool focuses more on the livestock and business outcomes and uses the pasture information as a stepping stone in that process. Pasture forecasts are therefore not a primary output of this tool.
- There is access to extensive online help and GrassGro training courses.
- The program undergoes continuous development and improvement, with regular updates included in the subscription.

Cost

GrassGro is available for an annual subscription of \$110 (incl. GST), which includes access to ongoing training. It is also highly recommended that first-time users attend CSIRO's GrassGro training course (\$350 incl. GST).

AUSTRALIAN FEEDBASE MONITOR

www.mla.com.au/extension-training-and-tools/tools-calculators/australian-feedbase-monitor

MLA's Australian Feedbase Monitor provides monthly pasture biomass estimates at the farm level with access to growth predictions based on regional pasture growth and ground cover data. Users have access to data trends in pasture growth and ground cover dating back to 2017. The web-based tool accesses satellite measurements via Cibo Labs and therefore has some very similar features to PastureKey (see page 3).

Considerations

- This tool uses current and historic data for informative purposes and does not provide forecasts in pasture cover and growth rates.
- Pasture biomass estimates are presented at farm level rather than at paddock level.
- Pasture biomass estimates are updated once every 30 days (lower frequency than comparable programs) with updates processed every five days.
- Resolution of satellite imagery is lower than comparable programs (1ha resolution compared to 3-10m resolution).
- Currently, there is limited online information on the availability and details of the functionality of this program.

Cost

The program is free for MLA members with a Livestock Production Assurance (LPA) account linked to their myMLA profile. Non-MLA members can get started on a 30-day trial, after which there is a paid subscription available for \$90 (plus GST) per year via Cibo Labs.



Australian Government
**Department of Agriculture,
 Fisheries and Forestry**



**Future
 Drought
 Fund**



**SA
 DROUGHT
 HUB**

This project received funding from the Australian Government's Future Drought Fund

