Grazing Decisions: Participant's Manual

Contents

Prepared by: Professor Lewis Kahn, Project Leader, Jaimi-lee Edwards, Principal Pasture Coach and Lisa Yorkston, Communications & Engagement Specialist.

Version: August 2024

The *Drought Resilient Pasture Landscapes Project* (2022-2024), delivered by the University of New England, GLENRAC Inc., Southern New England Landcare Ltd, and the NSW Northern Tablelands Local Land Services, received funding from the Australian Government's Future Drought Fund.

Introduction

Through this program participants will develop skills and knowledge in:

- Pasture assessment – estimating herbage mass, herbage mass green content and ground cover
- Setting herbage mass targets to maximise pasture productivity and the health of agricultural ecosystems
- Feed budgeting – having the right number of animals now and in the future
- Using climate forecasts in the feed budgeting process – probabilistic scenarios.

The program is comprised of:

- an initial group meeting,
- followed by 9 sessions over an 18-month period.

Each group will have up to 10 members from five (5) properties. Attendance from two (2) people per farm is strongly encouraged as a way to encourage adoption of new practices. Most sessions will be arranged around visiting paddocks on group member's farms to learn and practice the key skills and knowledge. Some sessions will be held indoors to work through feed budgeting and using climate forecasts in detail.

Decision making is the focus of the coaching program, recognising that most people use their gut (experience), heart (emotion, preference) and head (evidence) when making decisions. The coaching program will bolster the head aspect of making decisions to better complement the important aspects of experience and emotion.

The program skills and knowledge focus on improving the likelihood of a good decision turning into a right decision. Making a good decision relies on being sure to use all of the inputs (i.e. gut, heart, head) that are at our disposal. In reality, we can only influence whether we make a good decision or not. Whether that good decision turns into the right decision often depends on factors over which we have little information or control. For example, if after having assembled all of the information at your disposal to make a good decision, new or unexpected changes occurred (e.g. disease, market threat, legislation change, equipment failure), that decision might not turn out to be right. While that would be disappointing, it would still be considered to be a good decision (at the time). Focusing on making a good decision will improve the chances of that decision being right.

A coaching approach is taken with this program to tap into the considerable experience and knowledge that will already exist within the group, recognise that each person may have a different learning style, and to help participants to get the most enduring benefit for their farming business and family.

Pasture assessment

Herbage mass

Herbage mass is expressed as kilograms of dry matter per hectare (kg DM/ha) and is always expressed on a dry matter basis following cutting and oven drying. The dry matter content of pasture is lowest for lush new pasture and highest for dry/dead pasture and is typically in the range 20-80%. The method below is an easy way to estimate herbage mass and provides for consistency of estimates between different people on the same farm.

Step 1:

Measure pasture height (in cm) from the ground to the average height of the bulk of the leaves; do not extend leaves and do not measure to the top of seed heads.

Step 2:

Estimate pasture density in terms of kilograms of dry matter per hectare (kg DM/ha) for every centimetre (cm) of pasture height.

Guide to the estimation of pasture density

All values in this table are pasture density expressed as kg dry matter/ha per cm of pasture height

Temperate pastures			
Description	**Pasture density (kg DM/ha per cm)**		
Ground readily seen through sparse pasture	150		
Ground seen through sparse pasture	200		
Ground occasionally seen through average pasture	250		
Ground not visible through average pasture	300		
Good pasture	350		
Dense pasture	400		
Tropical pastures			
	Pasture height (cm)		
Description	**0-10cm**	**11-25cm**	**>25cm**
Ground readily seen through sparse pasture	200	150	100
Ground occasionally seen through pasture	250	200	150
Ground not visible through pasture	300	250	200

Source: Kahn and Earl, Pasture Management Checklists. Agricultural Information & Monitoring Services. *https://aimsag.com.au/software/* *www.Ag360.com.au*

Examples of various pasture density values

Step 3:

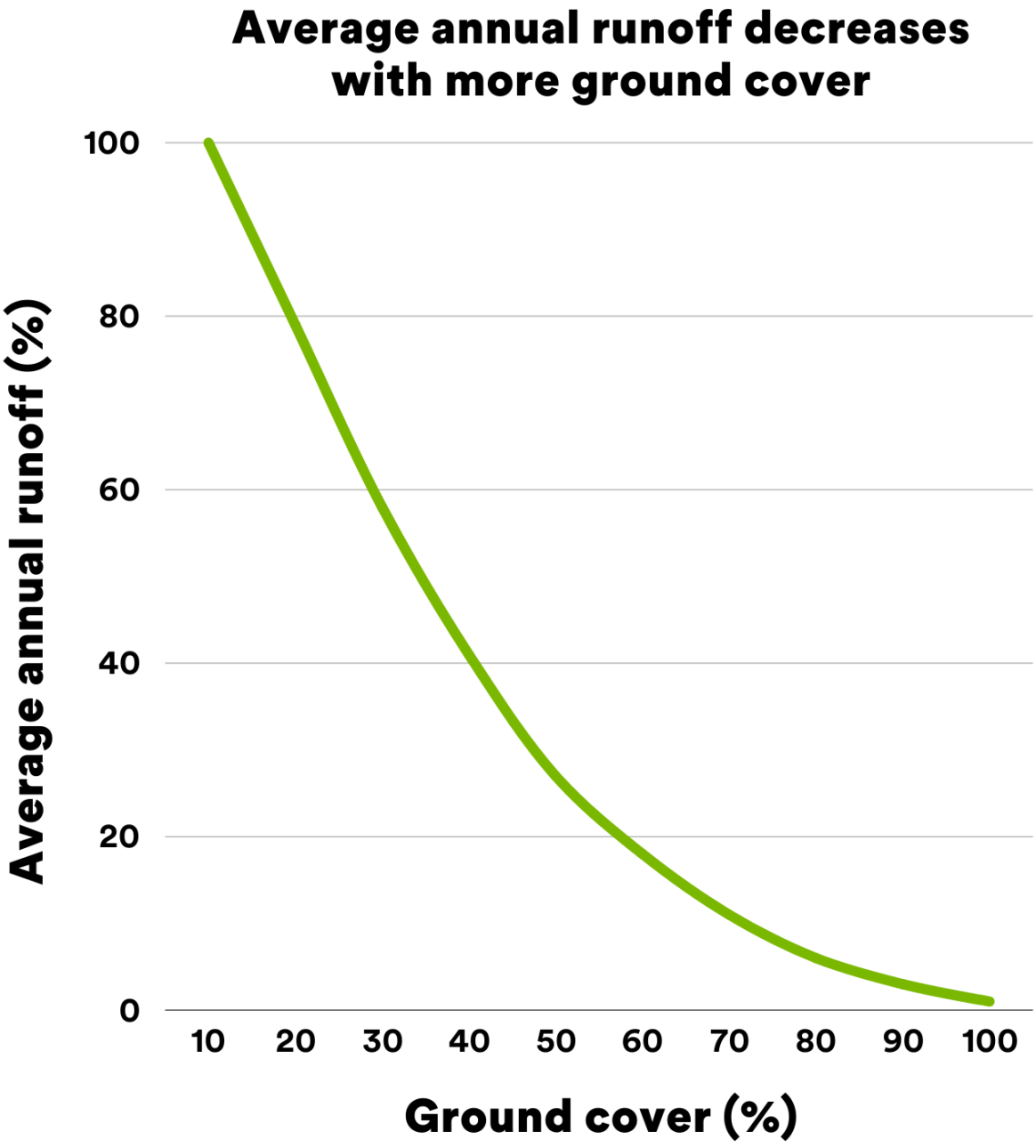
To calculate herbage mass, multiply pasture height X pasture density

(e.g. 10 cm X 250 kg DM/ha per cm = 2,500 kg DM/ha)

Ground cover

Ground cover is expressed as the percentage of ground (i.e. soil surface) that is covered and is not exposed soil. An easy way to think of this, is to consider if a raindrop could hit exposed soil. Covered ground reduces rainfall runoff, reduces weed germination, regulates soil surface temperature and conserves soil moisture.

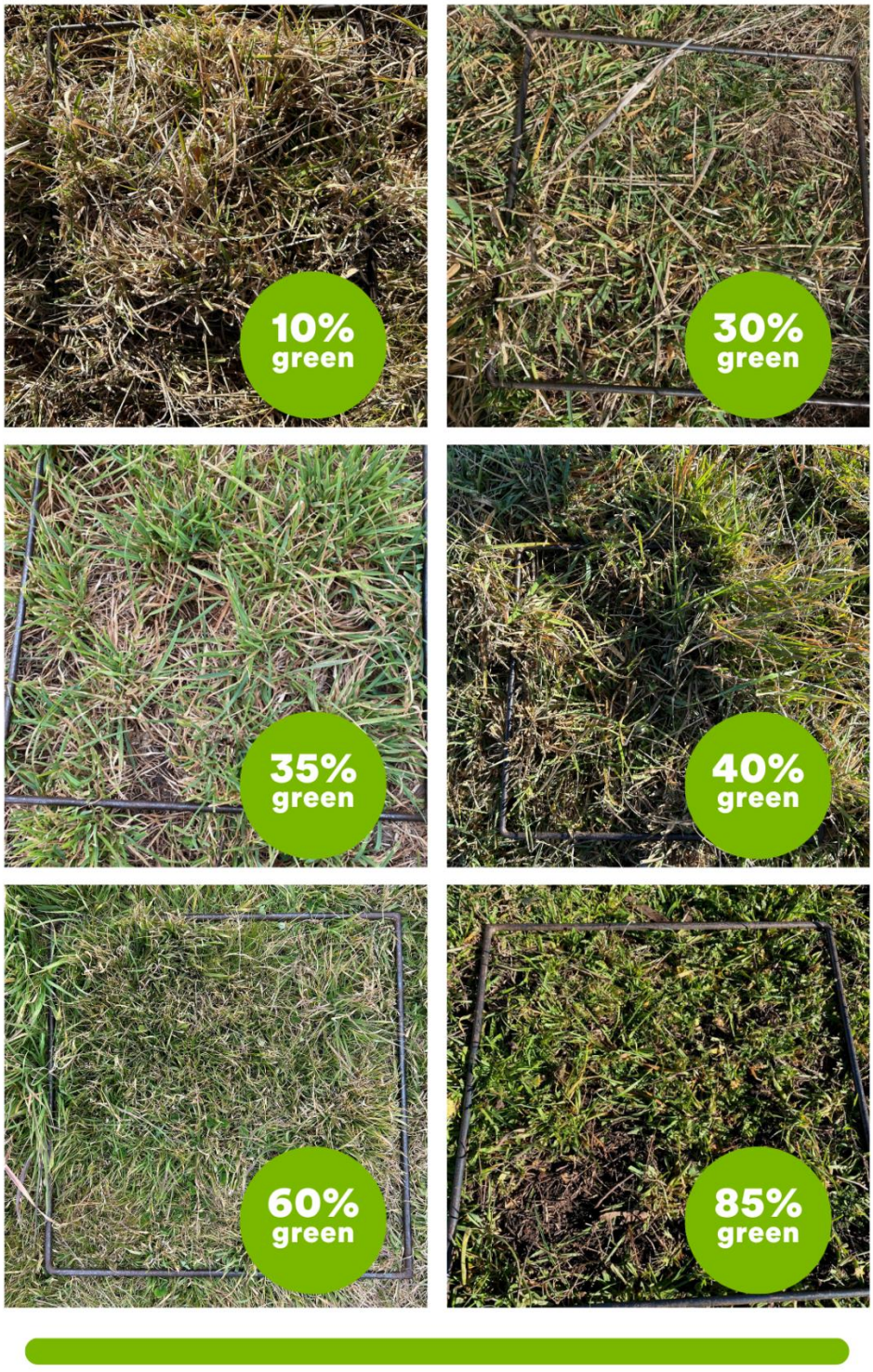
Images: Judi Earl & Lewis Kahn – Pasture & grazing management for the northern tablelands of NSW



Adapted from R.D. Lang (1979) The effect of ground cover on surface runoff from experimental plots.

Herbage mass green content

Herbage mass green content, also called green percent, is the percentage of herbage mass that is green, and is expressed on a dry matter basis following cutting and oven drying. It is easy to overestimate green percent because green leaves/stems have lower dry matter (i.e. more water) than dry/dead leaves and stems and herbage mass is expressed on a dry matter basis.



Setting herbage mass targets

There is a simple message when it comes to getting the most from your pasture — grass grows grass — but that is only true up to a point. Pasture growth rate increases as more herbage is left after grazing, until an optimum is reached, but thereafter the growth rate declines with more residual herbage mass. Changes in the plant explain this relationship:

- The ratio of shoot (above ground plant material) to root in established perennial grasses is variable and affected by various factors (e.g. soil fertility, soil water content) but is typically about 60:40. Grazing reduces the mass of shoots, and plants respond by reducing the mass of roots.
- If grazing reduces herbage mass to a very low level, plants will have few leaves to capture sunlight to fuel regrowth and instead look to draw upon their organic reserves in stem bases and roots. But the grazing will have reduced these reserves to low levels. Taken together, these changes explain the slow rate of regrowth of heavily grazed pastures.
- At high levels of herbage mass, shading of leaves by each other will reduce interception of sunlight. Access to sunlight is also typically hampered because plants will often be carrying a higher mass of dying and dead plant material. These changes explain the slow rate of regrowth of lightly grazed pastures.
- Finding the range in between these grazing extremes is key to maximising pasture growth rate, and the reason why setting minimum and maximum targets for herbage mass is an important part of grazing management and feed budgeting.

With this relationship in mind, minimum and maximum herbage mass targets can be implemented to graze pastures within the ideal envelope for optimal pasture growth. These targets may vary from region to region or with differing enterprise objectives. However, when there is a target in mind, it becomes easier to manage for ahead of time through the feed budgeting process.

Feed budgeting

Feed budgeting is the process of calculating the number of animals that can be carried on a property or paddock for a given amount of time and to achieve a desired level of herbage mass at the end of the period.

It requires:

- Being able to estimate herbage mass
- Estimating pasture growth rate
- Estimating the pasture intake of different livestock classes through Dry Sheep Equivalent (DSE) values.

Note that DSE is an acronym for Dry Sheep Equivalent, with a value (in NSW) of 1.0 DSE for a 50 kg dry sheep maintaining weight. It is based on the daily metabolizable energy requirement of that dry sheep at 50 kg maintaining weight (i.e. about 8 MJ metabolizable energy) and then all other DSE values are expressed as multiples, to account for species, live weight, growth rate, reproduction, and lactation status.

Pasture growth rates vary with species, soil type, soil fertility, time of year, seasonal conditions and management. Your coach will be able to provide estimates for your region.

Experienced property owners know how many livestock that they typically carry on their properties but feed budgets provide extra confidence in those decisions, and can also account for uncertainty in seasonal conditions.

Feed budget example:

Grazable area (ha)	500
Start of period (date)	1/04/2024
End of period (date)	1/10/2024
Length of period (days)	183
Start herbage mass (kg DM/ha)	2300
Desired end herbage mass (kg DM/ha)	1500
Pasture growth rate (kg DM/ha per day)	3.0
Available feed (kg DM/ha per day)	7.4
Total DSE	3686
DSE/head	8.5
Total number of stock	434

Available feed = (start herbage – end herbage) ÷ length of period + pasture growth rate

Total DSE = (available feed x grazable area)

Total number of stock = (total DSE ÷ DSE/head)

Think of DSE values as a pasture allowance rather than anything to do with sheep. Their value is for ease of use because feed budgeting assumes that 1.0 DSE eats 1.0 kg/day of pasture (dry matter basis). A reasonable estimation of DSE values requires knowing production level and often DSE estimates are an approximation.

Guide to DSE values

	Sheep (dry) growth rate (g/d)					
Weight (kg)	**0**	**50**	**100**	**150**	**200**	**300**
20	0.4	0.6	0.9	1.2	1.4	1.9
25	0.5	0.8	1.0	1.3	1.5	2.0
30	0.6	0.9	1.1	1.4	1.6	2.1
35	0.7	1.0	1.2	1.5	1.7	2.2
40	0.8	1.1	1.3	1.6	1.8	2.4
45	0.9	1.2	1.4	1.7	2.0	2.5
50	1.0	1.3	1.6	1.8	2.1	
55	1.1	1.4	1.7	1.9	2.2	
60	1.3	1.5	1.8	2.0		
65	1.4	1.6	1.9	2.1		

	Cattle (dry) growth rate (kg/d)						
Weight (kg)	**0**	**0.2**	**0.4**	**0.6**	**0.8**	**1**	**1.5**
150	2.4	3.4	4.4	5.4	6.4	7.4	9.8
200	3.4	4.3	5.3	6.3	7.3	8.3	10.8
250	4.3	5.3	6.3	7.3	8.3	9.2	11.7
300	4.9	5.8	6.8	7.7	8.6	9.5	11.9
350	5.8	6.7	7.6	8.6	9.5	10.4	12.8
400	6.7	7.6	8.5	9.5	10.4	11.3	13.6
450	7.4	8.3	9.2	10.1	11.0	11.9	14.2
500	8.0	8.9	9.8	10.7	11.6	12.5	

	Weight (kg)	
Ewes	**50**	**60**
pregnant–single	1.1	1.3
pregnant–twin	1.2	1.4
lactating–single	2.1	2.4
lactating–twin	2.7	3.0

Note: average values for pregnancy (day 0-150) and lactation (day 0-100) with little weight change for ewes.

	Weight (kg)	
Cows	**450**	**550**
pregnant	8.0	10.0
lactating	13.0	16.0

Note: average values for pregnancy (day 0-270) and lactation (day 0-240) with a single calf and little weight change for cows.

Climate forecasts

In this program we focus on incorporating climate forecasts into feed budgets. To do this we use the online tool Ag360® that provides 6-month climate forecasts on a 5 km^2 grid for the whole of the Australian continent. Incorporating climate forecasts relies on accepting that forecasts provide a range of likely outcomes rather than a specific outcome.

In this example (Figure 1), the rainfall forecast for the coming 6-months is shown in various bands. The bottom of the lowest band indicates there is a 95% chance of getting at least this rainfall amount. The bottom of the next band up (75%) indicates a 75% chance of getting at least that amount and so forth until the top of the upper most band indicates a 5% chance. The rainfall amounts for each of these probabilities at 3 and 6 months into the future are also shown as an example on Figure 2.

While many people will focus just on the 50% rainfall amount (also called the median), we use the 25–75% band to represent the possible range in future rainfall amount. This also reflects that forecasts provide a range of possible future outcomes, and it is too much to expect forecasts to give a single forecast value with any confidence. Accepting this approach, takes away from planning on the basis of a single median seasonal outlook, and ensures that feed budgets and grazing plans can accommodate for the level of risk that a producer wants to take with regard to the probability of rainfall.

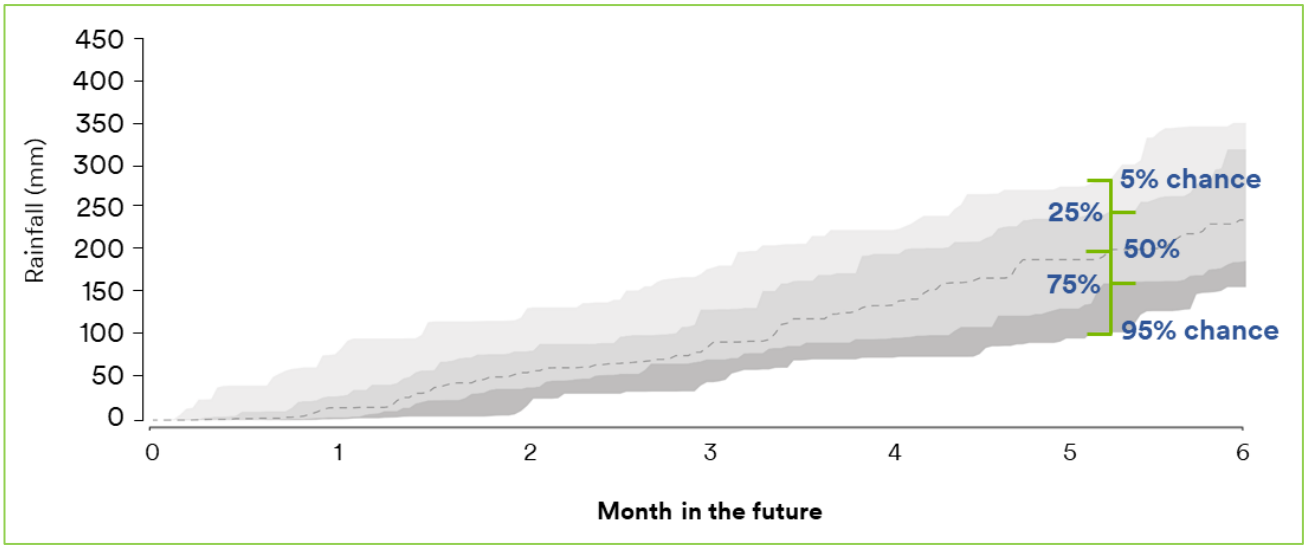


Figure 1

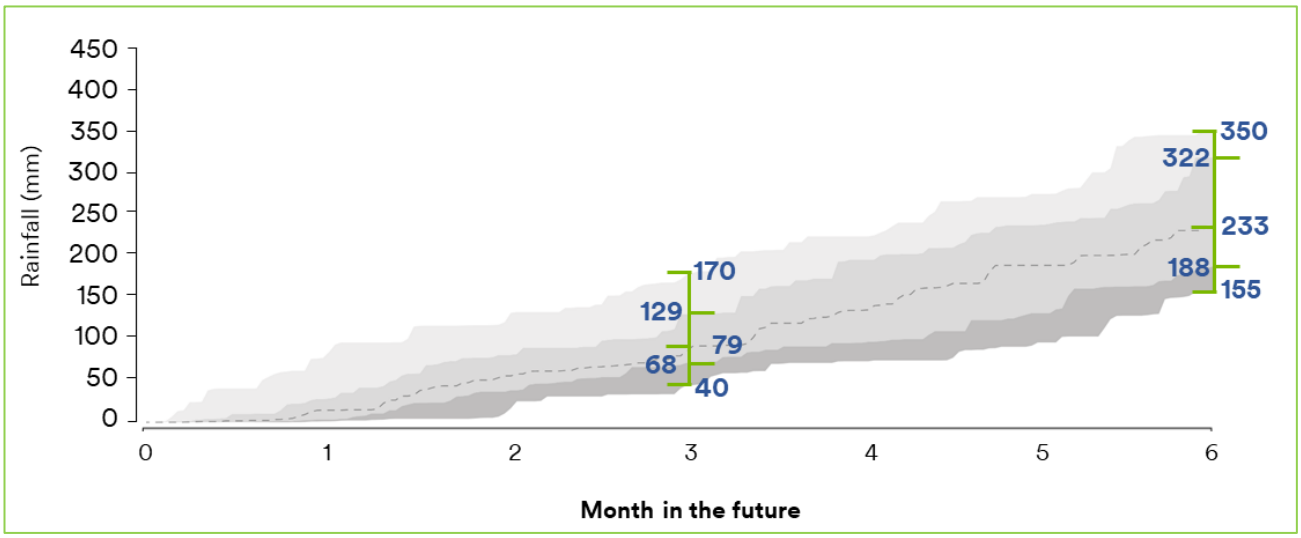


Figure 2

Ag360.com.au

Ag360 has been developed to record management information and to display forecasts for rainfall, soil moisture, herbage mass, animal performance, and animal wellbeing. It incorporates climate forecasts with existing soil moisture and information about pastures and livestock into industry-validated models. While it is useful to know the basics of feed budgeting, Ag360 calculates feed budgets for users and allows the evaluation of different risk scenarios.

Participant learning outcomes

Knowledge, skills, confidence and practice change outcomes for participants.

	Knowledge	Skills	Confidence	Practice Change
Pasture assessment				
Herbage mass (kg dry matter/ha)	Herbage mass is estimated by multiplying the height of pasture (average tops of leaves, not seed heads) by the estimated density of pasture to give a value in kg dry matter/ha • How to estimate pasture height • How to estimate pasture density	Be able to: • Estimate the average height of pasture for a paddock • Estimate the average pasture density for a paddock • Calculate average herbage mass for a paddock	High level confidence (score 4 of 5) minimum for all skills	Think in terms of herbage mass when assessing pastures and feed supply for livestock. This may be in addition to other experiential ways of assessing pastures and feed supply for livestock. Incorporate the skill in day to day activities
Herbage mass green content (% of dry herbage mass)	Herbage mass green content is a difficult subjective assessment made with the knowledge that much of the dead component of pasture is often hidden at the base of the pasture. There is tendency to overestimate green content because it is expressed on a dry matter basis and the moisture content of green leaves can be 2-4 times that of dead leaves.	Be able to: • Estimate the herbage mass green content to within 10% points of the true value • Estimate herbage mass green content for a paddock	Med-High level confidence (score 3-4 of 5) minimum for all skills	Think in terms of herbage mass and green content when assessing pastures and feed supply for livestock. This may be in addition to other experiential ways of assessing pastures and feed supply for livestock. Incorporate the skill in day-to-day activities
Ground cover (%)	Ground cover is a difficult subjective assessment and includes anything (eg. litter, dung, sticks, rocks) that prevents a raindrop from hitting bare soil. There is tendency to underestimate ground cover because of the temptation to fixate on bare patches.	Be able to: • Estimate ground cover to within 5-10% points of the true value • Estimate ground cover for a paddock	Med-High level confidence (score 3-4 of 5) minimum for all skills	Think in terms of herbage mass, herbage mass green content, and ground cover when assessing pastures and feed supply for livestock. This may be in addition to other experiential ways of assessing pastures and feed supply for livestock.

	Knowledge	Skills	Confidence	Practice Change
	Ground cover reduces rainfall runoff, weed germination and conserves soil.			Incorporate the skill in day to day activities
Forage planning				
Feed budgeting	Feed budgets are a process for determining how many livestock can be carried for a given period and with an estimated amount of herbage. Feed budgets use Dry Sheep Equivalent values (DSEs) as a means for estimating herbage consumption by livestock. Optimise animal performance and pasture recovery. Feed budgets need to be regularly reviewed as circumstances change and/or end of period is approaching.	Be able to: • Calculate feed budgets or use Ag360 for this purpose • Assess herbage mass for paddock/s • Allocate DSE values for different classes of livestock • Develop plans for changes to stocking rate to adapt to climate while achieving production objectives and herbage mass targets • Review and re-plan as required	Med-High level confidence (score 3-4 of 5) minimum for all skills	Calculate feed budgets (or obtain through Ag360) to guide decisions about stocking rate and grazing plans. This may be in addition to other experiential ways of determining carrying capacity and grazing plans. Incorporate the skill in day to day activities
Setting herbage mass targets to maximise pasture productivity and the health of agricultural ecosystems	Managing pastures requires the setting of herbage mass targets (minimum and maximum), with key times being the start and end of the growing seasons. The targeted minimum level of herbage mass should not fall below specified value or will negatively impact pasture recovery. The targeted maximum level of herbage mass should not exceed	Be able to: • Set and track progress against herbage mass targets	Med-High level confidence (score 3-4 of 5) minimum for all skills	Set herbage mass targets, track progress against the targets. This may be in addition to other experiential ways of determining carrying capacity.

	Knowledge	Skills	Confidence	Practice Change
	specified value or pasture growth rate and quality decreases. Maintaining herbage mass within the lower and upper targets will result in better ground cover which benefits the environment and local waterways.			
Using climate forecasts (scaled to farm level) in the feed budgeting process	Weather forecasts are probabilistic, meaning the forecast is in a range of possible values and is not a single value. Probabilities are directly related to the level of risk you are comfortable with and able to manage. Using a number of climate scenarios provides advance warning for development of risk management plans.	High level use of Ag360	Med-High level confidence (score 3-4 of 5) minimum for all skills	High level use of Ag360