



Pasture health kit

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Acknowledgements:

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<http://www.regional.org.au/au/asa/2001/3/d/mccormick.htm>

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Getting more effective rainfall, and protecting the soil resource

Managing ground cover to improve pasture sustainability and productivity can increase available rainfall for plant growth by up to 150mm per year.

Associated with high levels of ground cover (more than 70%) are:

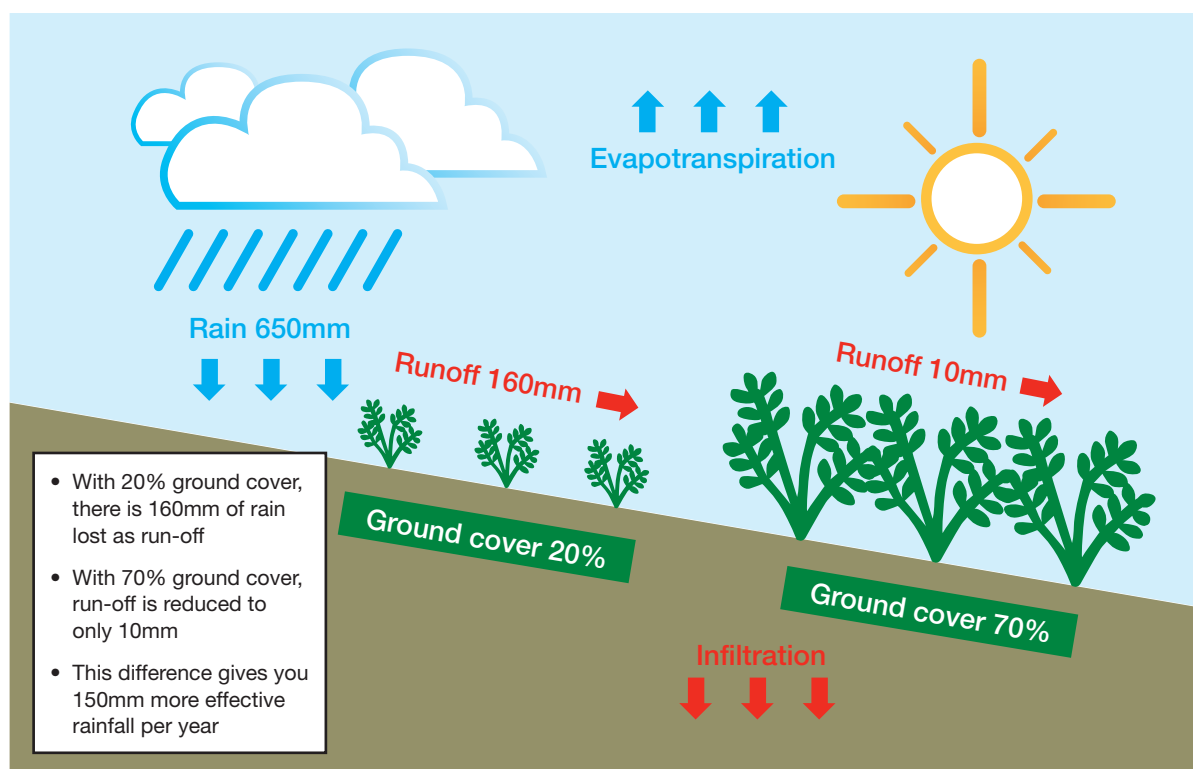
- Reduced water run-off enables higher water infiltration into the soil for plant growth
- Less soil loss by erosion
- Reduced losses of nutrients into water ways and off the site
- Reduced water loss by evaporation from the soil
- Increased pasture growth
- Reduced weed colonisation
- Increased microbial activity and nutrient cycling to develop a healthier soil
- Higher animal production through improved soil and pasture growth

At low levels of ground cover, water run-off volumes and soil losses are high. Maintain ground cover above 70% to reduce these losses.



Ground cover

Ground cover includes existing pasture, weeds and other herbage as well as litter. To estimate ground cover, stand in a representative part of the pasture with your feet half a metre apart. Picture a half metre square in front of you, and looking vertically into the pasture, estimate the percentage area covered by plant matter and litter (see pages 16–19 for visual estimates). Walk over the paddock and repeat the assessment at about 30 random sites. Record and average the results to accurately determine the percentage of ground cover.



On slopes, target 100% ground cover. Land class and ground cover greatly impact on water movement and loss of top soil. Management of ground cover on land classes of three, four and five is very important to prevent loss of top soil.

The table opposite provides some understanding of your different land classes and their features and options.

For more information, refer to Tool 3.1 in the Pasture Growth module of MLA's More Beef from Pastures online manual at www.mla.com.au/mbfp-tool3.1

Guide to mapping pasture zones and developing the capacity for different land management

Land class (LC)	Key features	Options
1-2 Arable land suited to intensive (LC 1) and regular (LC 2) cultivation	<ul style="list-style-type: none"> • Arable • Higher fertility • Minimal erosion risk • Non-acid (pH above 5)* 	<ul style="list-style-type: none"> • For pasture and crop production when rainfall is adequate • High input/high output systems work well
3 Grazing land suited to cultivation for pasture improvement and/or occasional cropping	<ul style="list-style-type: none"> • Lower to middle slopes • Semi-arable • Lower natural fertility • Moderate acidity (pH 4.5–5)* • Moderate erosion risk 	<ul style="list-style-type: none"> • Ground cover and pasture persistence is important • Maintain pasture base through direct drill options • Occasional cropping
4 Land suited to grazing but not for cultivation	<ul style="list-style-type: none"> • Middle to upper slopes • Non-arable • Low fertility shallow soils • Acidic (pH below 4.5)* • Moderate to high erosion risk 	<ul style="list-style-type: none"> • Only suited to permanent pasture • Manage to maintain pasture stability and ground cover • Best suited to lower input management systems • Generally not suited to introduced perennial grasses
5 Land suited to lighter grazing only	<ul style="list-style-type: none"> • Steep upper slopes • Non-arable • Low fertility, shallow soils • Acidic (pH below 4.5)* • Subject to erosion 	<ul style="list-style-type: none"> • Leave natural or revegetate • Lightly graze to maintain existing pasture/ground cover • Potential conservation areas

* All pH measured by CaCl_2

Soil organisms are into recycling

Plant litter on the soil surface is essential for healthy soil because it:

- Provides essential food for soil organisms
- Increases ground cover, reduces water run-off and soil loss
- Protects the soil from temperature extremes

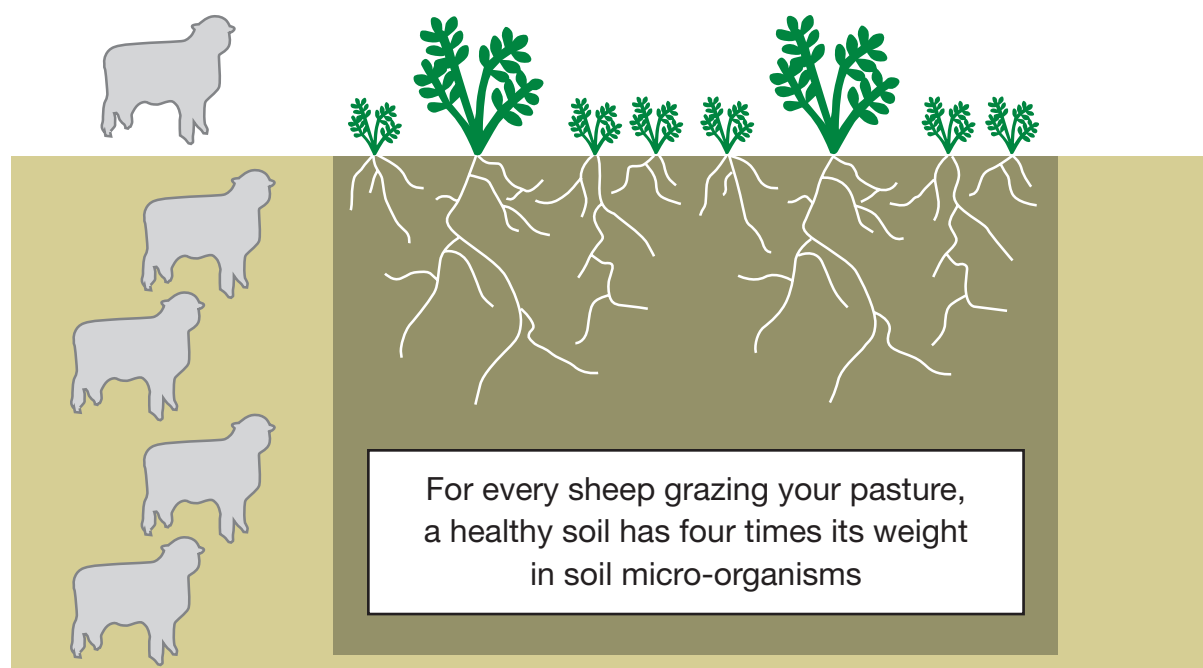
Soil organisms occur naturally, but their numbers and activity depend on having a suitable food source and environment (temperature and moisture).

There are four main groups of organisms that are vital to soil health:

- Bacteria and fungi
- Mites and collembola
- Protozoa and nematodes
- Earthworms, dung beetles and ants

Soil organisms are responsible for breaking down litter to organic matter, mineralising, transporting and recycling nutrients, improving soil structure, developing soil pores and forming stable aggregates.

However, without your help in providing litter, these organisms cannot do their job. So it is important to not only feed livestock (sheep, cattle, horses, goats) with high quality forage, but also to feed the soil organisms.



Increasing earthworms in pastures

The benefits of earthworms are well established – they can substantially improve the quality and quantity of pasture and crop production. Feeding and burrowing activities increase the cycling of soil nutrients and organic matter, and are beneficial to soil structure. Attention to some simple tactics can increase the number of these valuable soil organisms.

Tactics

Assess earthworm populations

To assess earthworm populations dig up several spadefulls (to 100mm deep) of soil and note the number of worms present. Less than 10 earthworms is considered low, 15 a moderate level and more than 20 per spadeful represents an abundant population.

Look for earthworms during the wetter months when they are most active, mature and more easily counted or identified. Carry a spade on the ute or bike and do occasional spot checks around the farm. Choose areas that have different soil types or grazing/pasture management approaches. Checking under fence lines and in areas of remnant vegetation can also be useful.

Precise monitoring of earthworm populations takes quite a bit of time and skill to do effectively, but it is quite easy to get a general indication.

Create conditions that favour earthworms

Avoid overgrazing pasture paddocks, as earthworms eat organic matter in and on the soil surface. Earthworms are likely to be most numerous when retained plant material is 1,500–2,000kg DM/ha.

Earthworms thrive in well-drained soils. Excessively waterlogged conditions can drown worms or force them to the soil surface where they risk being eaten by predators.

For more information on earthworms refer to *MLA's Tip and Tool Increasing earthworms in pastures* at www.mla.com.au/earthworms

Tactics for managing the soil surface

- Maintain growing pastures near the start of growth phase II (about 1,000kg green DM/ha) for as long as possible to aid regrowth. This has the added benefit of ensuring the highest possible pasture quality for grazing stock.
- Maintain (or increase) ground cover to manage run-off by removing stock before minimum pasture mass limits are reached (1,000kg total DM/ha).
- Aim for medium to high levels of litter (at least two or three handfuls in a 30cm x 30cm area) to increase soil organic matter, protect the soil surface, decrease evaporation and increase water-holding capacity. It is better if litter is actively decaying plant matter, not old and inert material.
- Manage grazing practice to increase litter quality and breakdown rate.
- Encourage build-up of soil biota to improve soil structure (increased porosity or aeration), the rate of litter breakdown and incorporation of surface organic matter by avoiding excessive cultivation and the application of soil biota-reducing chemicals.
- Avoid grazing when soil is waterlogged and pugging is likely to occur.
- Develop stock containment areas to remove stock from at-risk grazing areas.
- Change the pasture composition to deep rooted perennials that will improve soils with declining structure.

For more information, refer to Procedure 2 in the Pasture Growth module of MLA's More Beef from Pastures online manual at www.mla.com.au/mbfp-procedure2

Monitoring tools – assessing pasture herbage mass and species composition

Assessing available pasture mass and the composition of pasture species in a paddock can assist with grazing management decisions to improve the productivity of the soil, pastures and livestock.

Why assess pasture herbage mass?

Assessing the available pasture enables better pasture and animal management decisions to be made. Insufficient pasture will mean animal targets are not achieved, as well as potentially reducing the persistence of desirable pasture species, and exposing soil to erosion and nutrient losses. Managing the amount of pasture available to livestock is a critical tool to ensure the soil is protected, and livestock targets achieved.

Pasture herbage mass can either be assessed by cutting, drying and weighing representative pasture samples or by the use of tools of varying levels of sophistication.

How a pasture ruler can help you?

Pasture assessment tools save much time in collection, and are considered to be the only practical method for use when day-to-day assessments are being made.

Pasture rulers or ‘sticks’ that measure pasture height are simple, cheap and easy to use. Heights are easily converted to an estimate of kg green dry matter/ha via look-up tables.

With experience, you can use the height assessment method to gain reasonably accurate estimates of mass.

For more information refer to *MLA Tip and Tool Improving pasture use with the MLA pasture ruler* at www.mla.com.au/pastureruler

Why assess pasture composition?

Assessing species composition can determine pasture productivity, through identifying desirable species and the amount of bare ground in a paddock.

This method will assess the frequency of both individual species (eg perennial ryegrass) and species groupings (eg perennial grasses, broadleaf weed, bare ground, dead etc). Bare ground should not exceed 10% otherwise the paddock is open to weed invasion, ground cover is not reducing soil water evaporation, or reducing run-off.

- Cut a 30cm length of 1cm-thick dowel, and either point or drive a nail into both ends.
- Throw the stick ahead at random intervals while walking across the pasture being assessed.
- After each throw identify and record the pasture species or species group that is touching or immediately below the points at both ends of the throwing stick.
- Repeat 50 times (depending on the evenness of the pasture) to give 100 readings for a double-ended stick.
- Total the number of hits for each species or group and divide by 100 to give a % frequency (or percent composition).
- Normal groups used are perennial grasses, legumes, annual grasses, weeds and bare ground.
- Following is an example of a recording sheet that simplifies and speeds up the collection and recording process.

This method is best done in winter rainfall environments in early spring when plants have established their full ground cover.

A grazing and pasture management plan can then be determined to increase or decrease the occurrence of particular plant species. Monitoring a paddock's species composition and bare ground is good practice to ensure desirable species are maintained.

A worked example of a recording sheet for species composition is shown below

Species	Mark off each species below	Total
Improved grass (rygrass, phalaris, cocksfoot etc.)	<div> <div>+ 2 3 4 5 6 7 8 9 10 11 12 13 14 15 16 17 18 19 20</div> <div>21 22 23 24 25 26 27 28 29 30 31 32 33 34 35 36 37 38 39 40</div> <div>41 42 43 44 45 46 47 48 49 50 51 52 53 54 55 56 57 58 59 60</div> </div>	<div>12</div> <div>24%</div>
Clover or medic	<div> <div>+ 2 3 4 5 6 7 8 9 10 11 12 13 14 15 16 17 18 19 20</div> <div>21 22 23 24 25 26 27 28 29 30 31 32 33 34 35 36 37 38 39 40</div> <div>41 42 43 44 45 46 47 48 49 50 51 52 53 54 55 56 57 58 59 60</div> </div>	<div>6</div> <div>12%</div>
Weeds (specify) _____	<div> <div>1 2 3 4 5 6 7 8 9 10 11 12 13 14 15 16 17 18 19 20</div> <div>21 22 23 24 25 26 27 28 29 30 31 32 33 34 35 36 37 38 39 40</div> <div>41 42 43 44 45 46 47 48 49 50 51 52 53 54 55 56 57 58 59 60</div> </div>	<div>0</div>
Capeweed erodium or other broadleaf weeds	<div> <div>+ 2 3 4 5 6 7 8 9 10 11 12 13 14 15 16 17 18 19 20</div> <div>21 22 23 24 25 26 27 28 29 30 31 32 33 34 35 36 37 38 39 40</div> <div>41 42 43 44 45 46 47 48 49 50 51 52 53 54 55 56 57 58 59 60</div> </div>	<div>3</div> <div>6%</div>
Unimproved grasses (bent, onion grass etc.)	<div> <div>+ 2 3 4 5 6 7 8 9 10 11 12 13 14 15 16 17 18 19 20</div> <div>21 22 23 24 25 26 27 28 29 30 31 32 33 34 35 36 37 38 39 40</div> <div>41 42 43 44 45 46 47 48 49 50 51 52 53 54 55 56 57 58 59 60</div> </div>	<div>15</div> <div>30%</div>
Annual grasses	<div> <div>+ 2 3 4 5 6 7 8 9 10 11 12 13 14 15 16 17 18 19 20</div> <div>21 22 23 24 25 26 27 28 29 30 31 32 33 34 35 36 37 38 39 40</div> <div>41 42 43 44 45 46 47 48 49 50 51 52 53 54 55 56 57 58 59 60</div> </div>	<div>8</div> <div>16%</div>
Dead pasture	<div> <div>+ 2 3 4 5 6 7 8 9 10 11 12 13 14 15 16 17 18 19 20</div> <div>21 22 23 24 25 26 27 28 29 30 31 32 33 34 35 36 37 38 39 40</div> <div>41 42 43 44 45 46 47 48 49 50 51 52 53 54 55 56 57 58 59 60</div> </div>	<div>3</div> <div>6%</div>
No pasture, bare ground	<div> <div>+ 2 3 4 5 6 7 8 9 10 11 12 13 14 15 16 17 18 19 20</div> <div>21 22 23 24 25 26 27 28 29 30 31 32 33 34 35 36 37 38 39 40</div> <div>41 42 43 44 45 46 47 48 49 50 51 52 53 54 55 56 57 58 59 60</div> </div>	<div>3</div> <div>6%</div>

There is a blank pasture composition measurement sheet on page 19 that can be used.

Field guide -

Indicators of pasture production and sustainability

In assessing your pasture and its contribution to production and sustainability, use an assessment of the general indicators to help identify areas that could require improvement. As with botanical composition, there is benefit in monitoring these indicators to provide an understanding of how the pasture is performing for animal production and protecting the soil.

Is your pasture producing at its potential, or degrading?

This simple check list will help monitor your resource.

Assess your pasture on a paddock basis.

Assessing your results

- | | |
|---------------|--|
| Low | If you score three or more “LOWS”, then your present grazing management techniques may require changing to return the soil and pasture to a productive state. |
| Medium | If you scored mostly “MEDIUMS”, your pasture may be slowly degrading. There may be no noticeable production decline as yet. Concentrate on improving indicators with low or medium scores. |
| High | If you scored mostly “HIGHS”, your pasture is performing well. Concentrate on improving areas with low or medium scores. Keep monitoring to avoid future production losses. |

Indicators	Low	Medium	High
Ground cover A minimum of 70% ground cover is needed to prevent soil erosion and minimise run-off. Ground cover includes both plants and litter. Ground cover percentage images are on pages 16–19.	(less than 40%)	(40 to 70%)	(more than 70% on flat, 100% on slopes)
Litter Aim for 2-3 handfuls of litter per 30cm x 30cm. Litter should be actively decaying, not old and inert, but there should be some litter remaining on the surface to protect the ground.	(less than 1 handful)	(1-2 handfuls)	(3 or more handfuls)
Soil surface The soil surface should be soft and friable to allow rain to infiltrate (not hard or capped).	hard or capped (not inert)	firm (small indent)	soft and friable (easily marked)
Proportion of green Aim for 60% or more green matter (leaf or stem) in the main growing season. Seasonal and species dependent.	(less than 20%)	(20 to 60%)	(more than 60%)
Proportion of productive pasture species The proportion of desirable species should be greater than 60%. Palatable perennials with wider leaves are preferable.	(less than 45%)	(45 to 60%)	(more than 60%)
Proportion of legumes Aim for at least 5% legume in native pastures, 10% in fertilised native pastures and 30% in improved pastures. Greater than 40% legumes may lead to animal health problems, possible soil acidification and a reduction in perennial grasses. Seasonal and species dependent.			
Native pastures Fertilised native pastures Improved pastures	(less than 1%) (less than 5%) (less than 10%)	(1-5%) (5-10%) (10-30%)	(more than 5%) (more than 10%) (more than 30%)
Suitability for animal production Is pasture quality and quantity adequate to meet livestock requirements? High quality pastures are necessary for fattening or lactation.	(lose weight)	(maintain weight)	(gain weight or reproduction)

McCormick LH, Lodge GM (2001) A field kit for producers to assess pasture health in the paddock. In 'Proceedings of the tenth Australian Agronomy Conference', Hobart

There is a blank indicators of pasture production and sustainability sheet on page 21.

Nutrients and grazing management

Nutrients

Soil testing, providing adequate soil nutrients and appropriate grazing to utilise pasture are key to growing and maintaining good pastures.

Sample each soil type / paddock separately. Paddocks of similar soil type and management can be grouped together. Take separate samples from within the same paddock if there are vastly different soil types or one area has noticeably poorer pasture growth.

Determine if capital or maintenance application is required. Capital applications of fertiliser increase soil nutrient levels to target levels for pasture growth. Maintenance applications replace nutrients exported off the farm in produce (meat, wool, hay, silage) or that are tied up in the soil. For more information on nutrient management refer to Module 3 of MLA's More Beef from Pastures online manual. www.mla.com.au/mbfp-module3

Grazing

Strategies can be developed to maintain desirable species, and optimise their growth rates. Grazing too hard, too long, during plant establishment or reproduction, will change the species composition in a pasture. Understand pasture plant life cycles and plan a grazing system that will encourage desirable species to become more dominant. As well, consider livestock production needs.

A grazing approach must be based on what you want to achieve, which may mean 'not grazing' to allow seed set, or short term high density grazing for weed control and high utilisation, set stocking at lambing, rotational grazing to assist perennial grass persistence.

Refer to *MLA Tip and Tool Improving pasture use with the MLA pasture ruler* for a guide to grazing limits to ensure productivity of pastures and animals www.mla.com.au/pastureruler

Measuring ground cover

Use a 50cm x 50cm square quadrat to measure ground cover.

Take 30 random samples throughout the paddock and record the ground cover percentage in the quadrats.

To determine the average ground cover percentage of an area:

- add up all the percentage readings taken in the same area and divide that by 30 (the number of assessments taken)

Averaging the measurements in each area monitored will give you an overall ground cover percentage figure for that area only. These can't be compared to other areas of the farm.

The following pages have examples of ground cover at different percentages.

Instructions on ways to take samples using a quadrant are at www.mla.com.au/mbfp-tool22



20% ground cover

At 20% ground cover

- run-off water loss = 160mm per year
- soil loss = 8.5mm per year
- poor plant production and sustainability
- low green leaf and plant vigour
- low water infiltration
- plants exposed to temperature extremes
- low litter
- low microbial activity
- poor organic matter content
- poor soil structure and surface sealing of soil



40% ground cover

At 40% ground cover = average pasture

- still too low
- run-off water loss = 90mm per year
- soil loss = 4.0mm per year
- poor pasture and soil health



70% ground cover

At 70% ground cover

- run-off water loss = 10mm per year
- soil loss = 0.3mm per year
- good plant production and sustainability
- high green leaf and plant vigour
- high water infiltration
- plants bases protected from temperature extremes
- high litter
- good microbial activity
- high organic matter content
- good soil structure and soil surface



90% ground cover

At 90% ground cover

- reduced run-off water and soil loss
- on slopes ground cover should target 100% to retain top soil, nutrients and to promote stable pasture conditions
- weed colonisation will be reduced when bare ground is removed

Pasture composition

Pasture measurement sheet

Paddock name:

Date:

Species	Mark off each species below	Total
Improved grass (rygrass, phalaris, cocksfoot etc.)	1 2 3 4 5 6 7 8 9 10 11 12 13 14 15 16 17 18 19 20 21 22 23 24 25 26 27 28 29 30 31 32 33 34 35 36 37 38 39 40 41 42 43 44 45 46 47 48 49 50 51 52 53 54 55 56 57 58 59 60	
Clover or medic	1 2 3 4 5 6 7 8 9 10 11 12 13 14 15 16 17 18 19 20 21 22 23 24 25 26 27 28 29 30 31 32 33 34 35 36 37 38 39 40 41 42 43 44 45 46 47 48 49 50 51 52 53 54 55 56 57 58 59 60	
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No pasture, bare ground	1 2 3 4 5 6 7 8 9 10 11 12 13 14 15 16 17 18 19 20 21 22 23 24 25 26 27 28 29 30 31 32 33 34 35 36 37 38 39 40 41 42 43 44 45 46 47 48 49 50 51 52 53 54 55 56 57 58 59 60	

Field guide -

Indicators of pasture production and sustainability

To assess the pasture in your paddock place an “X” in the box that you feel best represents your pasture, for each of the indicators.

Use the quadrant to assist in monitoring the indicators.

Paddock name:

Date:

Indicators	Low	Medium	High
Ground cover The percentage of ground covered by plants and litter			
Litter Scrape up the unattached plant material on the soil surface within the quadrant			
Soil surface Hard or soft to the push of your finger or pen			
Proportion of green Assess on a dry matter basis			
Proportion of productive pasture species Proportion of perennials and legumes			
Proportion of legumes Assess on a dry matter basis			
Suitability for animal production Relate it to sheep or cattle requirements			
Total your scores			



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