

User's guide to the MLA feed demand calculator (Beef)

Prepared for MLA by CSIRO Plant Industry, with DJM Livestock Consultants



Introduction

The feed demand calculator¹ has been developed as part of MLA More Beef from Pastures. It calculates, for each month of the year, the total feed demand of all the livestock on a property and compares the total demand to the likely supply of pasture.

The aim of the calculator is to help producers to measure

- the way in which the numbers and classes of livestock on their property drive the total demand for pasture;
- the match (or mismatch) between the supply of and demand for pasture;
- the proportion of pasture growth that is eaten by livestock, and
- the weight of beef or sheep produced per hectare.

It can be used to plan

- times when it is possible to increase stocking rate, so as to use more pasture;
- times when stocking rate may need to be reduced, or supplement fed to livestock, to avoid overgrazing pastures; and
- ways to change the structure of the herd or flock to improve the match between feed demand and pasture supply.

1. The feed demand calculator has been built for MLA by CSIRO Plant Industry, with the assistance of DJM Livestock Consultants P/L. The underlying calculations are based on CSIRO's GrazFeed and GrassGro decision support tools.



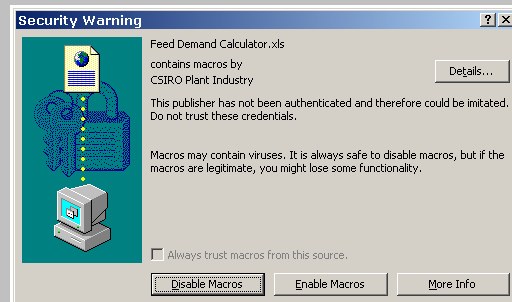
Microsoft Excel 2000™ or later must be installed on your computer before the feed demand calculator can be used.

The feed demand calculator tutorial – for beef producers

Open the feed demand calculator.

A dialog like in the box at right may appear, asking you whether you wish to enable the macros in the spreadsheet.

If so, respond by clicking the 'Enable Macros' button.



If the 'Enable Macros' button is inactive you will need to change your security settings in Excel before returning to click the Enable Macros button. To change your security settings, close the feed demand calculator and open Excel.

From the 'Tools' menu in Excel, select Macro, then Security, and then select the medium security level. Reopen the feed demand calculator and start again.

A splash screen will then appear. The first time the calculator is opened, there will be a pause while the internal calculations are set up; they have been compressed to save space while it is downloaded.

Proceed

Once you have read the introductory information on the splash screen, click the 'Proceed' button to move on to the next step.

The spreadsheet is organised into eight 'tabs', or pages. You can move from page to page using the 'Proceed' and 'Go back' buttons at the bottom of each page.

- **How to Use (Part 1), How to Use (Part 2), Interpret and Where to Next** – contain a shorter version of the information in this tutorial and some additional tips.
- The three sections – **Pasture, Cattle and Sheep** – are where you enter the information required to run the feed demand calculator.
- The next page, named **feed demand**, is where the results of the calculations are displayed.

Read through the information in the How to Use pages. Then move to the Pasture page.

How to Use information is also attached to key input and result cells in the calculator. Just click on the cell of interest and a 'pop up' comment will appear that describes the cell.

Defining the feed supply- the Pasture screen

The Pasture page allows you to describe the pattern of pasture growth on your property.

First, however, you must enter a location, a starting date and the effective grazing area of your property, and choose the livestock enterprise or enterprises that you will work with.

Location. When you select this cell, a drop-down list will appear. Select the location that is closest to your property.

Start Date. The feed demand calculator will compute pasture supply and feed demand for a 12 month period. Use the drop-down list to choose a date for the start of the forecast year.


Effective Area. Enter the total area of pasture available to livestock on your property, on average, for the 12 month period selected.

Enterprise type. If you are working with a cattle herd only, choose 'Cattle only'. This will simplify the calculator by removing the Sheep page and the sheep-related outputs on the feed demand page. Similarly, if you are working with a sheep flock only, choose 'Sheep only'. If you have both sheep and cattle on your property, select 'Both cattle and sheep'.

Pasture

| | |
|--|--|
| Location | <input type="text" value="NSW - South West Slopes"/> |
| Start Date | <input type="text" value="15 Feb"/> |
| Effective Area | <input type="text" value="2500"/> ha |
| Enterprise type | <input type="text" value="Cattle only"/> |
| Use your own values for pasture growth rates? | <input type="text" value="No"/> |
| Use your own values for pasture quality? | <input type="text" value="No"/> |

| Month | Pasture growth (kg DM/ha/day) | Pasture quality (MJ ME/kg DM) |
|-------|----------------------------------|----------------------------------|
| Jan | 6 | 8.85 |
| Feb | 6 | 8.08 |
| Mar | 10 | 8.16 |
| Apr | 20 | 9.19 |
| May | 20 | 10.83 |
| Jun | 11 | 11.86 |
| Jul | 9 | 11.95 |
| Aug | 18 | 12.12 |
| Sep | 33 | 12.12 |
| Oct | 49 | 12.03 |
| Nov | 33 | 10.74 |
| Dec | 11 | 9.71 |

 *Dates in the input pages are always given to the nearest half month. When entering a date, choose the date on the list that is closest to the date that you have in mind.*

You can enter your own figures for pasture growth and quality, or use default values that are supplied by the calculator for each region. To enter your own values, select 'Yes' to the corresponding question; you will then be able to edit the table of monthly values.

Pasture growth rate

Growth rates for each month is entered in units of kg dry matter per hectare per day. They are property-wide averages, so if you have pastures with very different patterns of growth you will need to calculate and enter area-weighted averages of the monthly growth rates.

Pasture quality

The quality of the pasture is expressed as the average metabolisable energy content of the animals' herbage intake during the month, in units of MJ ME/kg DM (mega joules of metabolisable energy per kilogram of dry matter). If you are not clear what this means, use the default values!

| | |
|--|-------------------------|
| Location | NSW - South West Slopes |
| Start Date | 15 Feb |
| Effective Area | 2500 ha |
| Enterprise type | Cattle only |
| Use your own values for pasture growth rates? | No |
| Use your own values for pasture quality? | No |

Set the pasture page up as shown at left.

The summary of annual pasture growth at the bottom right of the Pasture page should look like this:

| Tonnes DM/year | |
|----------------|-------|
| Per ha | 6.9 |
| Total | 17228 |

Then click the 'Proceed' button to move to the Cattle page.

Livestock management – the Cattle and Sheep pages

The Cattle page is divided into three parts:

- In the top left quarter there is an area where you enter information about the cattle breed, an average reference liveweight for the breeding females, and the management of the reproductive cycle.
- At the bottom there is a 'livestock inventory' where you enter the numbers and weights of animals that are on the property at the starting date you entered in the Pasture page, plus any purchases or sales that you plan over the coming year.

Clear inventory

Click this button to remove all the data that can be entered into the inventory. This can be useful when making a major change in herd or flock structure.

- The top right quarter contains the 'Head of Stock' chart. This shows the numbers of stock in each class at each half month during the 12 months from the start date.

Breed

Select the breed type that is closest to that of your cattle, from the drop-down list.

Cow weight (mature)

Enter the weight of a mature, empty cow of your main breed when it is in average body condition. (GrazFeed users will know this as the 'standard reference weight' of the breed.)

Join 1-2 year heifers

Select 'Yes' if your herd will include 1-2 year old heifers at joining and they are to be mated.

No. of joining periods:

You can specify either 1 or 2 distinct joining periods. For each joining period you must provide the following information:

Joining time

Enter the dates at which joining begins and ends (Entering '1 Jan' to '1 Jan' will result in completely uncontrolled mating.)

Proportion joined Enter the proportion of the cows that are joined during this joining period. If you have selected 2 joining periods, the two values must add up to no more than 100%.

Weaning date

Enter the average date on which calves born from this joining are weaned.

Calves weaned per cow

Enter the number of calves that you will expect will be born and survive until weaning.



If you are considering not joining your cows, select 1 joining period and set the proportion of breeders to join to 0%.

Cattle

| | | |
|--------------------------|--------------------------------|-----------------------|
| Breed | British (e.g. Angus, Hereford) | |
| Cow weight (mature) | 500 | kg |
| Join 1-2 year heifers | Yes | |
| No. of joining periods | 1 per year | |
| Joining Period 1: | | |
| From | 1 Nov | to 1 Jan |
| Join | 100% | of breeders |
| Wean on | 1 Mar | |
| Expect | 0.95 | calves weaned per cow |

| | | |
|--------------------------|--------------------------------|-----------------------|
| Breed | British (e.g. Angus, Hereford) | |
| Cow weight (mature) | 500 | kg |
| Join 1-2 year heifers | Yes | |
| No. of joining periods | 1 per year | |
| Joining Period 1: | | |
| From | 1 Nov | to 1 Jan |
| Join | 100% | of breeders |
| Wean on | 1 Mar | |
| Expect | 0.95 | calves weaned per cow |

Set up the breed and reproduction options as shown at left.

Then look at the livestock inventory at the bottom of the Cattle page.

The livestock inventory is set up with a row for each of several classes of stock. The first seven rows are for cows in the breeding herd and their offspring; these are followed by six rows for classes of stock that are traded more opportunistically.

| Stock class at the start date | Stock at start date | | | Purchases | | | | Sales | | | |
|-------------------------------|-------------------------|-----------------|-----------------|---------------|---------------------|------------------|----------------------|-----------|---------------------|-------------|--------------------|
| | Animal Age (months) | Number of stock | Weight at start | Purchase Date | Animal Age (months) | Number Purchased | Purchase Weight (kg) | Sale Date | Animal Age (months) | Number Sold | Target Weight (kg) |
| Breeding stock and young | Cows (>3 years) | 78 | | 1 Oct | 85 | | 547 | 16 May | 81 | | 445 |
| | Cows (2-3 years) | 30 | | 1 Oct | 37 | | 507 | 1 Jul | 34 | | 432 |
| | Heifers (1-2 years) | 18 | | 1 Oct | 25 | | | 1 Jul | 22 | | |
| | Steers (1-2 years) | 18 | | 1 Oct | 25 | | | 1 Jul | 22 | | |
| | Weaned young heifers | 6 | | 1 Oct | 13 | | | 1 Jul | 10 | | |
| | Weaned young steers | 6 | | 1 Oct | 13 | | | 1 Jul | 10 | | |
| | Calves weaned this year | | | | | | | 16 Jan | 5 | | |
| | | | | | | | | | | | |
| Trading stock | Steers | | | 1 Jul | | | | 1 Feb | | | |
| | Steers | | | 1 Oct | | | | 1 Jul | | | |
| | Steers | | | 1 Oct | | | | 1 Jul | | | |
| | Steers | | | 1 Oct | | | | 1 Jul | | | |
| | Steers | | | 1 Oct | | | | 1 Jul | | | |
| | Steers | | | 1 Oct | | | | 1 Jul | | | |

Go back Proceed

Sales from a stock class refer to animals that started the year in that class.

For each stock class, you can enter:

- the number and weight of animals on the property at the start date;
- the date of a single purchase of stock, the number and the weight of purchased animals;
- the date of a single sale of stock, the number to be sold and their weight;
- for trading stock only, the age of the animals at each of the above times and whether the animals are steers, bulls, or dry cows.

Entering livestock weights is optional.

If you leave a weight cell blank, the calculator will estimate the corresponding weight from the stock class, its age, and a locality-specific pattern of live weight change through the year. You can see the liveweights estimated by the calculator for each stock class by clicking on the liveweight cell for that stock class.

If you disagree with the liveweight estimated by the calculator you can type in your own estimate (this is with the exception of the purchase and sale weights of the breeding females, which, for simplicity, are set by the calculator). The inventory will show the age of animals in each stock class in the breeding herd at the nominated start, purchase and sale dates.



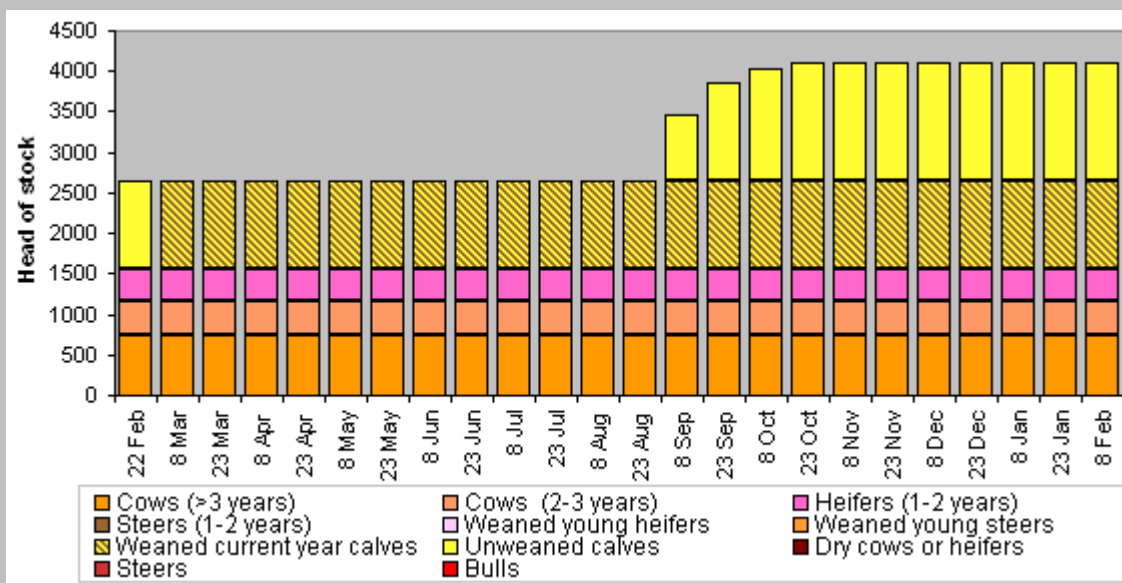
If you have a group of trading stock that is present at the start date, then you will not be able to purchase animals into this group. Use a new row of the trading stock inventory instead.



If you retain home-bred wethers or steers beyond the 1-2 years age group then enter each as a group in one of the Trading stock rows.

Set up a livestock inventory for a producer who is rebuilding their cattle herd after a drought.

Enter 750 cows (> 3 years), 400 cows (2-3 years) and 400 heifers (1-2 years) present on the start date. Leave the initial weights blank. The chart in the top-right part of the page will change to show the numbers of stock present through the year:

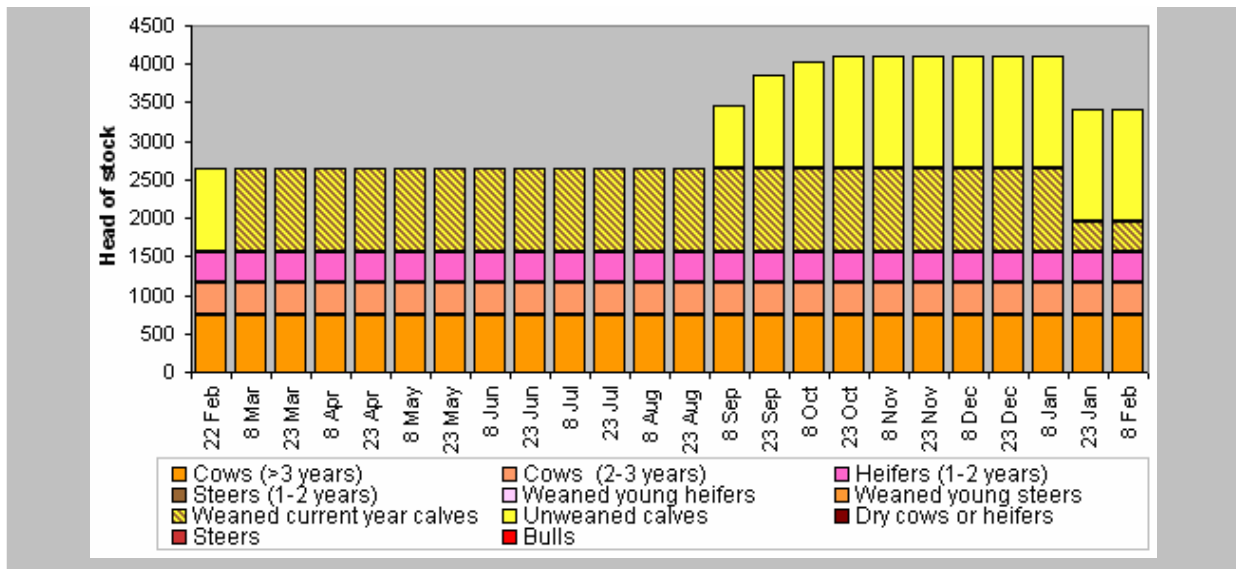


Note: that the maximum number of animals is not $750+400+400 = 1550$, but just over 4000. The calculator has used the reproductive cycle that was entered earlier to work out that the cows should have last year's calves at foot during the first part of the year (the bright yellow bar at the start of the chart). These calves are weaned at the nominated date (1 March) and appear in the chart as hatched yellow bars thereafter. During September-October a new cohort of calves should be born, so a second set of bright yellow bars appears on the chart.

- ❗ *In this example, the youngest cohort of animals at the start date is still suckling their mothers, and so the calculator accounts for them automatically. If the start date fell after weaning, the starting numbers of weaners would have to be entered manually in the rows for 'weaned young heifers' and 'weaned young steer'.*
- ❗ *If you wish to check the numbers of stock at a given date on the Head of Stock chart place the cursor on the colour representing that stock class for the bar of interest and the calculator will display the number of head in that class and confirm the name of the stock class and the date.*

Now, what if we want to sell some of the calves that were weaned on 1 March?

Select 16 Jan and enter 700 animals in the row for the stock class '**Calves weaned this year**'. You should see the 'Head of Stock' chart change to the following:



At this point, you may be wondering why the sales were entered in the row for 'Calves weaned this year'. Since the sale cattle are 17 months old when they are sold, shouldn't the sale be entered in the rows for 1-2 year old stock?

The answer is that in the feed demand calculator, **livestock are referred to by their age class at the start date, not at the time of purchase or sale.** When in doubt, use the age of the animals you are planning to purchase or sell to work out which row to select.

Complete the inventory by selling 150 cull cows on 16 May and adding a group of 1500 trade steers, bought at 13 months old on 1 July and sold seven months later on 1 February:

Breed British (e.g. Angus, Hereford)

Cow weight (mature) 500 kg

Join 1-2 year heifers Yes

No. of joining periods 1 per year

Joining Period 1:

From 1 Nov to 1 Jan

Join 100% of breeders

Wean on 1 Mar

Expect 0.95 calves weaned per cow

Clear inventory

| Stock class at the start date | Stock at start date | | | Purchases | | | Sales | | | | |
|-------------------------------|-------------------------|-----------------|-----------------|---------------|---------------------|------------------|----------------------|-----------|---------------------|-------------|--------------------|
| | Animal Age (months) | Number of stock | Weight at start | Purchase Date | Animal Age (months) | Number Purchased | Purchase Weight (kg) | Sale Date | Animal Age (months) | Number Sold | Target Weight (kg) |
| Breeding stock and young | Cows (>3 years) | 78 | 750 | 1 Oct | 85 | | 547 | 16 May | 81 | 150 | 445 |
| | Cows (2-3 years) | 30 | 400 | 1 Oct | 37 | | 507 | 1 Jul | 34 | | 432 |
| | Heifers (1-2 years) | 18 | 400 | 1 Oct | 25 | | | 1 Jul | 22 | | |
| | Steers (1-2 years) | 18 | | 1 Oct | 25 | | | 1 Jul | 22 | | |
| | Weaned young heifers | 6 | | 1 Oct | 13 | | | 1 Jul | 10 | | |
| | Weaned young steers | 6 | | 1 Oct | 13 | | | 1 Jul | 10 | | |
| | Calves weaned this year | 6 | 1093 | | | | | 16 Jan | 17 | | 700 |
| Trading stock | Steers | | | 1 Jul | 13 | 1500 | | 1 Feb | 20 | 1500 | |
| | Steers | | | 1 Oct | | | | 1 Jul | | | |
| | Steers | | | 1 Oct | | | | 1 Jul | | | |
| | Steers | | | 1 Oct | | | | 1 Jul | | | |
| | Steers | | | 1 Oct | | | | 1 Jul | | | |
| | Steers | | | 1 Oct | | | | 1 Jul | | | |

In this example, with a weaning rate of 0.95 calves weaned per cow joined, and with the calculator automatically assuming no calf deaths between calving and weaning, there are 1330 calves born September-October from 600 cows > 3 years (remember 150 of the 750 at the start were culled in May), plus 400 cows 2-3 years of age and 400 heifers = a total of 1400 females in the calving herd for this year.

Once you have entered all the values, and the numbers chart matches the one above, click the 'Proceed' button to move to the feed demand page.

If you had chosen 'Sheep only' or 'Cattle and sheep' on the Pasture page, then the Sheep page would become visible. Input options for sheep are the same as for cattle, except that the set of stock classes in the inventory is slightly different:

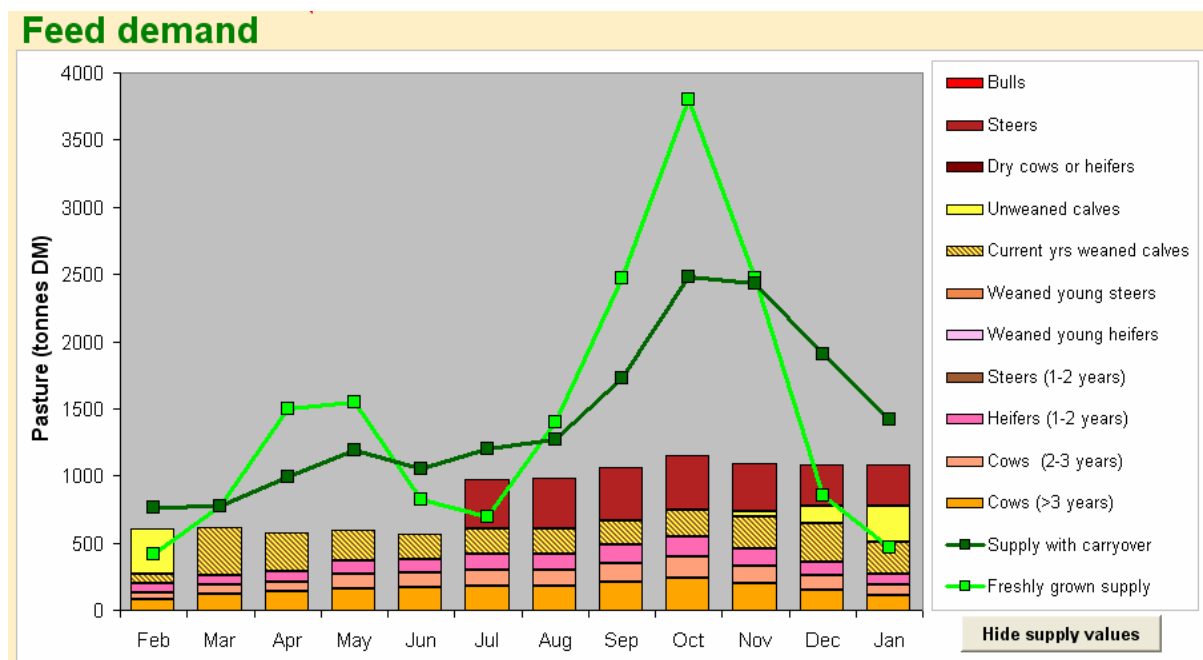
| | Stock class at the start date | Stock at start date | | | Purchases | | | Sales | | | | |
|--------------------------|-------------------------------|---------------------|-----------------|-----------------|---------------|---------------------|------------------|----------------------|-----------|---------------------|-------------|--------------------|
| | | Animal Age (months) | Number of stock | Weight at start | Purchase Date | Animal Age (months) | Number Purchased | Purchase Weight (kg) | Sale Date | Animal Age (months) | Number Sold | Target Weight (kg) |
| Breeding stock and young | Ewes (>2 years) | 55 | | | 1 Feb | 67 | | 51 | 16 Nov | 64 | | 56 |
| | Ewes (1-2 years) | 19 | | | 1 Feb | 31 | | | 16 Nov | 28 | | |
| | Wethers (1-2 years) | 19 | | | 1 Feb | 31 | | | 16 Nov | 28 | | |
| | Weaned young ewes | 7 | | | 1 Feb | 19 | | | 16 Nov | 16 | | |
| | Weaned young wethers | 7 | | | 1 Feb | 19 | | | 16 Nov | 16 | | |
| | Lambs weaned this year | | | | | | | | 16 Nov | 4 | | |
| Trading stock | Wethers | | | | 1 Feb | | | | 16 Nov | | | |
| | Wethers | | | | 1 Feb | | | | 16 Nov | | | |
| | Wethers | | | | 1 Feb | | | | 16 Nov | | | |
| | Wethers | | | | 1 Feb | | | | 16 Nov | | | |
| | Wethers | | | | 1 Feb | | | | 16 Nov | | | |
| | Wethers | | | | 1 Feb | | | | 16 Nov | | | |

Sales from a stock class refer to animals that started the year in that class.

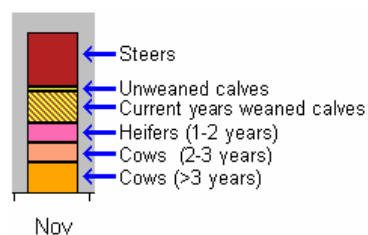
Go back Proceed

Viewing the results - the feed demand page

The feed demand page of the calculator shows the calculated demand for, and supply of, pasture based on the information that you have entered into the Pasture, Cattle and Sheep pages. At the top of the page is a chart showing the month-by-month pattern of supply and demand.



The bars show the total demand for pasture in each month, sub-divided into the demands by each stock class. For example, in November the total demand for feed is just over 1000 tonnes. The trade steers are the largest single contributor to the demand for feed; the calves born in September-October are predicted to contribute very little to the total feed demand because they are still largely milk-fed.



If sheep are included in the enterprise, the feed demand bars will include each class of sheep.

The calculation for the feed demanded by each class of livestock per month is based on how much feed the livestock need to perform, divided by the energy content of the feed, according to the equation:

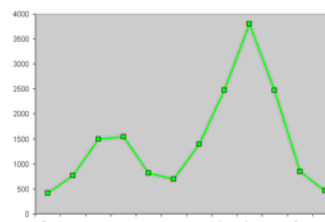
$$\text{Feed demand} = \frac{(\text{ME requirement per head per day}) \times (\text{number of animals}) \times (\text{days in period})}{(\text{ME content of pasture intake})}$$

It's important to note that in situations where feed is of particularly low quality, the calculated demand may be unrealistically high. The calculated demand may be more than the livestock can truly eat. In the interests of simplicity, the feed demand calculator makes no attempt to estimate intake in these situations.

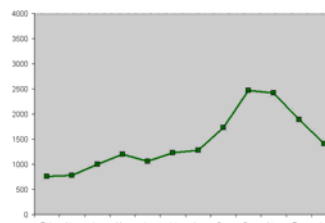
When feed quality is low, feed demand can be reduced by strategies designed to increase pasture quality.

Two pasture supply curves are also shown on the chart. When comparing feed demand with supply, choose the pasture curve that best suits your pasture management aims:

The light green supply curve shows the amounts of pasture that is grown on the property in each month.



The dark green supply curve takes account of the fact that pasture grown but not eaten in one month can be kept and used in a later month. The total pasture supply is the same as for the light green curve.



If you wish to check the amount of pasture demanded by a stock class at a given date, go to the feed demand chart and for the bar representing the date of interest, place the cursor on the colour representing that stock class. The calculator will display tonnes of pasture dry matter demanded for that stock class for that half-month.

All the values in this chart are in units of tonnes of pasture dry matter per month. What is more important than the actual values though is the relative size of the demands by different classes of stock, and the way that the balance between pasture supply and demand shifts throughout the year.

Below the chart is a set of summary values for the enterprise:

| Key Performance Indicators | |
|--|------------------|
| Pasture deficit, using freshly grown supply | 1306 tonnes/year |
| Pasture deficit, using supply with carryover | 0 tonnes/year |
| Liveweight produced, cattle | 662 tonnes |
| Liveweight produced per ha allocated to cattle | 265 kg/ha/year |
| Liveweight produced, sheep | 0 tonnes |
| Liveweight produced per ha allocated to sheep | 0 kg/ha/year |
| Pasture demand as a % of pasture grown | 60 % |

Pasture deficit

Is the sum over each month of the difference between demand and supply (zero when demand is less than supply in a month). Smaller pasture deficits mean less risk of having to provide supplementary feed. In this tutorial example, the months of greatest risk are December, January, February and July.

Approximately 1306 tonnes of supplement, in pasture DM equivalents, might be required by the herd for that year, if you have to rely on using pasture as fast as it grows. If you are able to manage 'carry-over' feed effectively then you may not need any supplementary feed at all.

Live weight produced

Is the sum of the total weight of cattle or sheep at the end of the year, plus the total weight of animals sold, less the total weight of animals present at the start and the total weight of animals that are purchased. Liveweight produced is expressed both as total tonnes per year and as kilograms per hectare.

If sheep and cattle were grazing together the kilograms per hectare calculation would be based on the hectares allocated to either sheep or cattle. That is, the effective area grazed, as entered on the Pasture page, is split by the calculator between the sheep and cattle enterprises.

The calculator works out this split. The split is based on the relative ME (metabolisable energy) intakes of the cattle compared to the sheep enterprises. For example, if sheep were added to the above example. The effective area grazed by all the sheep plus cattle on the property would total 2500 hectares.

If the calculator estimated the sheep demanded 20% of the ME consumed and the cattle 80% then the effective area allocated to the sheep enterprise by the calculator would be 20% x 2500 = 500 hectares.

Liveweight produced by sheep per hectare would then be calculated as total liveweight produced by sheep divided by 500 hectares. Similarly, liveweight produced by cattle per hectare would be calculated as total liveweight produced by cattle divided by 2000 hectares.

Pasture demand as a % of pasture grown (or 'utilisation rate') is the ratio of the annual total demand by the animals to the total supply of pasture. It is important to be realistic about how much of your pasture growth can be utilised. As a rough guide:

- ⇒ The average producer in the high rainfall zone of southern Australia uses about 30% of the pasture grown per year.
- ⇒ Using 50% of your pasture is achievable. An increase in pasture used from 30% to 50% can mean a doubling in profit.
- ⇒ If you push the enterprise well beyond 50%, you might be asking too much of your system and of the feed demand calculator!

Print report 

Click this button to print out the inputs and results of your calculation. This can be useful when you want to compare several options.

Hide supply values

Click this button to make the pasture supply curves disappear. This can be useful when supply is much greater than demand in some months and you want to look at the feed demand results more closely.

Where to next

The MLA feed demand calculator has helped you to understand the pasture supply and demand for your enterprise.



Remember, both the feed supply and demand curves are approximate. Treat them as such.

Matching feed demand to supply is a key driver of profitability. Before you implement any strategies to change feed supply, or the make-up of your herd or flock, it's strongly recommended that you:

- engage a suitably qualified advisor who can test your ideas thoroughly using more sophisticated computer tools;
- enrol in a suitable training course, such as those offered through the MLA EDGE Network and read the MLA More Beef from Pastures *producer's manual*.

Disclaimer

Whilst every possible care has been taken to ensure the accuracy of the information contained in this publication and calculator, MLA, CSIRO, and DJM Livestock Consultants cannot accept responsibility for the accuracy or completeness of the information or opinions therein. You must make your own enquiries before making decisions concerning your interests.