final report

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Feed Demand Calculator Upgrade

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Milestone

Report received and accepted by MLA including:

- Completion of the objectives and underpinning tasks
- Draft Tips and Tools document developed, how to use the FDC, questions to ask, data available, changes to the feed-base and management timing
- Implications of the research findings for industry
- Trial changes with at least 10 researchers/advisors
- Report on issues and successes and any changes or modifications required
- Future opportunities aligned to the FDC Tool identified

Abstract

- The FDC has been upgraded to include new pasture species, new regions, new ways to show results, improved Feed On Offer calculations, supplements and includes now Environmental indicators.
- 95% of the work has been completed. Some issues that became apparent during the recent training workshops are currently being resolved. For example, fine-tuning of the wastage and senescence calculations, instructions in pop-up boxes, column labels need to be undertaken. A face to face meeting with Eric Zuker will be held on July 12 in Canberra all work is expected to be completed by July 31st.
- The revised version of the FDC has been tested at 4 workshops (Adelaide, Melbourne, Hamilton Wagga Wagga) attended by 22 private and state agency staff. Over 85% of attendees indicated that they would use the FDC tool more in the future than previously. Main use will be for to test new systems for self-learning and working with groups of farmers. Main topics studied will be changes to livestock management, use of alternative pasture species and different seasonal conditions.
- Tips and Tools document has been completed as required.
- The new pasture data, new pasture supply techniques are seen as significant improvements on previous versions of the FDC.
- The changes to the FDC will make it more useful to extend the results from projects such as EverGraze or for use with programs such as MMfS and MBfP.
- ***Limitations;*** increased security by Microsoft on Excel post 2007 has made it extremely difficult to use the FDC tool for an increasing number of users. Ways to overcome this problem are not immediate apparent but unless overcome, will limit uptake of the tool.
- ***Opportunities;*** the workshops identified a strong demand for a simple **tactical** Feed Demand Calculator (mobile phone app), ie a tool that allows calculations in the field, of the impact of feed supply and animal demand on liveweight and condition score in the next 1-2 months.

Project objectives

By June 23rd 2011, Final Report received and accepted by MLA including completion of the objectives and underpinning tasks:

- Draft a "Tips and Tools" document developed – how to use the FDC, questions to ask, data available and how to manipulate, especially changes to feedbase and management timing.

Industry Implications

The revised FDC is seen as more useful to industry and particularly valuable to people working with producer groups, for self learning and with university or college students. These groups need to be encouraged and shown how to use the program.

The revised program will be valuable to groups such as MMfS, MBfP and EverGraze and the coordinators of these industry programs need to be made aware of ways to use the FDC in their projects.

Increased use of the FDC will allow groups to consider the implications of changed pastures, stocking rates, management and genotypes on feed supply and demand and flag environmental issues such as low ground cover.

What is the market for the FDC?
Observations through the redevelopment process and at the workshops suggest that the main application for the FDC is for consultants, state agency staff and advisors to use it with producers or as self learning tool. There are several reasons for this;

- Constant use increases familiarity; as with any program, unless it is used regularly, people forget the small quirks and what to do. A consultant is likely to use the FDC monthly but a producer might use it once to compare a particular system then not use it again for 6-12 months.
- A reasonable knowledge of pasture production, quality and use is required to understand the FDC. Advisory officers are more likely to have the knowledge required to make best use of the program.
- While the program should be made available to anyone who wants to use, future marketing of the FDC should target Next Users rather than producers.

University staff are interested in using the FDC. At Wagga, both Jim Virgona and Alison Southwell expressed interest in getting students using the FDC to run simple comparisons of different species and management. It is recommended that this opportunity be pursued with other agricultural universities.

Workshops, attendance and feedback
Workshops were held in Adelaide, Melbourne, Hamilton and Wagga in June 2011 and attended by 22 consultants, state agency staff, agribusiness and academics (another 8 people registered for the events but pulled out immediately prior due to ill health, mouse plague issues or end of financial year commitments). Feedback from participants in shown in Appendix 1. Overall, the participants were much more confident in using the program following the changes and attending the workshops.

No staff from NSW DII attended the Wagga workshop despite wide advertising. However, across all events, there was significant interest by private consultants and advisors indicating a major potential user group.

At the workshops, 2 immediate issues were identified (Macros, stock details) that need to be resolved. Other significant issues that participants would like changed but are outside the scope of this project are shown later in this report. A number of minor changes were also identified and have been incorporated into the revisions.

In addition to the training workshops, the revised FDC was used with 15 producers at Lucindale to look at feed supply and demand as a predisposing cause of dark cutting meat. The participants were very interested in the outputs of the program and were able to quickly understand the fundamental issues and how the FDC could be used to explore alternative management options or pasture species.

Issues that need to be resolved
The workshops brought up several issues that will limit the use of the FDC and need to be resolved. Items 1-2 are seen as essential. Items 3-6 desirable but not essential.

1. **Macros enabled in different Excel versions.** Changes to the security settings in Excel mean that it is now difficult for a novice user to change the internal settings and allow use of Macros. Excel 2003 was relatively easy to use with Macros but each subsequent version has made it harder to get the settings right. Also, there are slightly different settings required for different versions of Excel and different versions of Windows. The consultants in the training workshops struggled to make the required changes even with assistance so an unfamiliar user without support is unlikely to get this right.
   - This needs to be carefully considered as the same problem applies to all MLA tools that use Macros. The problem will get worse as more people use later versions of Excel. Note also that the Macros do not appear to work on Apple Macs. There is no immediate fix to these problems and it is strongly recommended that people with appropriate computing expertise are brought in to find a solution.
2. **Entering stock details, stock reconciliation.** Many people really struggle to get this right. It is difficult to set up a self replacing flock and get the sale times and structure right. There are two ways this could be improved;
   - Change the way the data on the base flock numbers, replacement policy, time of first joining, age when CFA, so that the user answers a series of questions and the inputs are then used to populate the Stock details page.
   - A short video presentation could be developed to demonstrate how to enter the different values and explain the various livestock categories.
3. **Intake and demand values in tabular form.** Currently these values are presented in graphs and the individual values are only available if the user hovers over a particular bar or point on the line. Users expressed the desire to be able to see all of the values in a table and then be able to compare changes in successive scenarios.
4. **Enhanced tutorial and documentation.** Given the interest from consultants and universities, there is a need to allow them to have access to the background documentation that explains how the FDC works. University staff would like students to understand the process behind the calculations rather than promote a “black box” mentality.
   - Currently a FDC tutorial is available but this needs to be updated to fit with the recent changes to the program and provide more details on the different assumptions and calculations behind the results.
   - A detailed User Guide is available (developed by CSIRO) and this needs to be updated to explain how the current version operates.
5. **Future enhancements.** The following items would make the FDC results more transferable and relevant;
   - DSE values; In the KPI results, a summary of peak and average DSE values based on peak and average ME intakes would allow users to put the results in context with other information.
   - Wool/ha; based on stock numbers and assumed wool cuts, however may be too difficult?
   - Mating ewe lambs; many prime lamb operations now join ewe lambs (lamb at 12 months) and people interested in using the FDC are likely to want this option.
6. **Help line or user assistance.** In the workshops, it was apparent that individual users often got “stuck” on a particular problem that was able to be quickly resolved by a more experienced user. A phone or email contact who could help resolve these issues would encourage people to use the tool.

Future Opportunities

The workshops identified several opportunities aligned to the FDC

1. **Tactical feed demand:supply calculator.** Consultants and state agency staff see a demand for a simple calculator that can be used in the field to look at the impact of current feed supply, future growth and animal demands live weight and condition score in 1-3 months time. This is somewhere a cross between Grazfeed and the hard copy Lifetime Ewe Management Ewe Condition Manager systems.
   - RIST at Hamilton see that this tactical tool could be used in several of their courses and are keen to be involved in its development.
   - There are several paper based systems (MLA MMfS, LTEM) currently available but these limit the number of comparisons that can be made and are seen as cumbersome especially to Gen Y people.
   - Several computerised systems are available or under development (EverGraze grazing management, at least 2 private consultant spreadsheets) but these are not specifically designed to predict animal performance and are not widely available.
   - To be a true tactical Tool it needs to be a mobile phone app so it is really used in the field and does not rely on going back to the office to solve the problem.
2. **Pasture growth rate library.** A number of people expressed a desire to have access to the Excel pasture database behind the FDC. There would seem to be no reason why this should not be made more readily available. MMfS and MBfP use hard copy data which is quickly out of date and cannot be easily copied and used in other programs.
3. **Video examples of using the FDC.** Simple videos linked to computer programs are now commonly used to explain Step by Step how to enter data and use programs. It's more likely that users will watch a video than look through written material. Production of a simple video is recommended to improve understanding in how to use the FDC.

Appendix 1 Feedback from FDC workshops

Feedback Summary for 9 State Agency & University people; Vic 5, SA 2, NSW 2, and 13 private consultants; Vic 4, NSW 2, SA 7, total of 22 participants.

How have you used the FDC in the past?

With Producer groups			1 on 1 with Producers			For self learning/testing ideas		
Never	Occasionally (1-2 per year)	Regularly (Monthly)	Never	Occasionally (1-2 per year)	Regularly (Monthly)	Never	Occasionally (1-2 per year)	Regularly (Monthly)
15	6	1	16	4	0	5	14	3

How do you think you will use the FDC in the future?

With producer groups			1 on 1 with producers			For self learning		
Never	Occasionally (1-2 per year)	Regularly (Monthly)	Never	Occasionally (1-2 per year)	Regularly (Monthly)	Never	Occasionally (1-2 per year)	Regularly (Monthly)
1	17	3	1	15	4	0	13	9

How have the recent changes to the FDC influenced your future use of the tool?

Less likely to use the FDC	Will use as before	More likely to use FDC
	3	19

Comments; Need to simplify stock entry, new graphs and pasture data very good (x3), Macros major problem that must be fixed, will not work on Apple Mac's

What type of simulations are you most likely to run in the future?

Changes to management of livestock (stocking rate, lambing/calving time, sale age etc)	20
Considering the use of alternative pasture species	12
Looking at the effect of variation in seasonal conditions	12
Other; please specify (changing flock structure, lucerne on farms)	2

What other changes/information to the FDC would make it more relevant for you?

Entry of livestock and getting numbers right is very difficult (x8), Macros MUST be fixed as currently will put most people off using the tool (x5), Need tactical version to use in the paddock IPhone? (x5), Summary table of graphed results (x5), Wool output (x2),
Need a contact person who you can call to sort out problems (Help line?), More lines for trading stock 6 not enough, Lambs weaned per ewe is not right and MUST be fixed (x5), Library of pasture data to be available on MLA site (x3), Use ME values not Kg/day pasture

MLA FEED DEMAND CALCULATOR: *a tool for improving the balance of feed supply and livestock demand*

The MLA Feed Demand Calculator (FDC) is a simple tool to investigate changes to grazing systems that can improve the match between the feed requirements of sheep or beef cattle and forage supply. Recently the FDC has been upgraded to allow easier comparisons of different pastures, to include supplementary feeding and streamline reports. Also, some indicators of the effect of different management options on environmental parameters have been included.

Key benefits

- Allows simple comparisons of the effect of changing management of livestock on feed demand
- Consider the benefit of using alternative pastures to fill feed gaps
- Look at the impact of Good or Poor seasons on Feed Supply and Feed On Offer

Using the Feed Demand Calculator

To use the FDC you need to;

1. Specify the farm feed-base (i.e., the area allocated to different pastures and forage crops),
2. Describe the livestock enterprise run on the farm i.e. the number and type of animals, numbers and weights of stock purchased and sold, and reproductive management,
3. Analyze the performance of the system by comparing the Feed Supply curve to the animal Feed Demand through the year,
4. Consider if the system is productively and environmentally sustainable (pasture utilization and ground cover).

To get the most from the FDC, these steps should be repeated looking at different seasonal conditions and combinations of feed sources and livestock to determine the system that best meets your needs.

Tip - Documentation within the FDC includes 5 pages detailing “How to use the FDC”. If you are a first time user or have not used the program for some time, print off these pages and read carefully prior to running simulations.

Step 1. Specify the location and feed-base on the farm

Select the most appropriate location and the date you would like to start the simulation. You then select the pastures for the farm. Either you can put in your own pasture growth rates and pasture quality, but default values have been included for some pastures at each location.

The FDC will calculate stock details, pasture supply, feed demand for 12 months from the start date. For sheep, select a start date so that joining, lambing weaning and sale of cull ewes occur in that order after the start date. For cattle, its best to select a start date a few months before calving with weaning and sale of cull cows at the end of the 12 month period. A start date in between lambing and weaning makes stock reconciliation difficult.

Tip – Get a simple system working with one type of stock first before entering complex whole farm systems. Make sure the pasture growth rates, stocking rates, lambing times etc gives realistic feed on offer values before trying alternative scenarios.

For the farm, specify the most common soil type and topography. These values are used later to help determine the environmental sustainability of the grazing system.

Wastage of the pasture during grazing needs to be specified for the farm. Pasture growth is measured when pastures are not grazed and stock waste pasture by trampling and fouling during grazing. For short green pasture during the growing season, wastage of 15-20% of what grows each month is common.

In late spring, summer and autumn when feed on offer is high (2.0 – 5.0 t/ha), wastage is greater due to insect damage, increased fouling and trampling, wind damage and shattering of dry feed and decay. Wastage is greatest on clover dominant pastures (30-40%/month), compared to sown perennial grass-clover pastures 20-30%/month) and lowest on native perennial pastures (10-20%/month). The higher quality the herbage in the paddock (high legume content, high ME content) the higher the wastage should be selected.

Fodder crops and stubbles can also be included. For these indicate the months and the areas when these will be available. If you expect to have 3000 kg/ha available in December, the easiest way is to indicate growth of 100 kg/d for December and then indicate any additional growth over the following months. For stubbles, a similar approach can be used to generate the expected amount of herbage available for grazing in a particular month. Consider if you wish to include just the green material in the base of the stubble (1-2 t/ha of 11 ME) or all of the straw (2-7 t/ha 5 ME).

Step 2 – specify the type of stock to graze the pasture

On the Pasture page, you need to select sheep, cattle and sheep, or cattle only as the grazing animals.

Go to the appropriate livestock page and specify the type of stock for the farm.

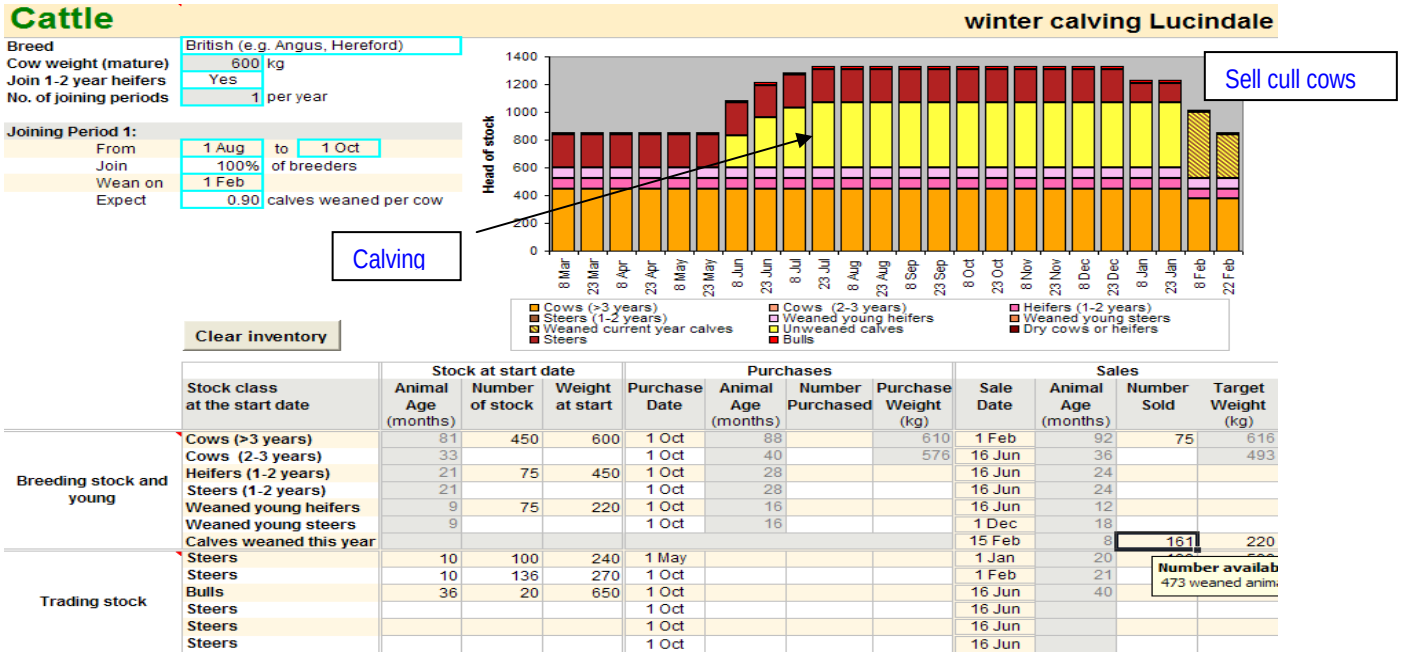
Sheep; Specify the genotype, size, mating details, weaning percentage etc for the baseline system. It's much easier to select a Start date (on Pasture page) that allows mating, lambing and weaning to occur in that order.

Cattle; Specify the genotype, size, mating details, weaning percentage etc for the baseline system. For cattle, take care to ensure that the stock inventory is appropriate as they are commonly maintained on the property for 15-24 months. If calves are weaned but not sold by the end of the 12 month period, then they need to be included as stock on hand at the start of the period.

Selling cast for age cows can cause difficulty. It's best to have a Start date at a time of year so that the all cows and heifers present calve that year and cull cows are sold at the end of the 12 month period.

236 heifers and steers carried forward sold at 18-20 mts

2 y old heifers replace culls



Sell cull cows

Calving

	Stock class at the start date	Stock at start date: Animal Age (months)	Number of stock	Weight at start	Purchases: Purchase Date	Animal Age (months)	Number Purchased	Purchase Weight (kg)	Sales: Sale Date	Animal Age (months)	Number Sold	Target Weight (kg)
Breeding stock and young	Cows (>3 years)	81	450	600	1 Oct	88		610	1 Feb	92	75	616
	Cows (2-3 years)	33			1 Oct	40		576	16 Jun	36		493
	Heifers (1-2 years)	21	75	450	1 Oct	28			16 Jun	24		
	Steers (1-2 years)	21			1 Oct	28			16 Jun	24		
	Weaned young heifers	9	75	220	1 Oct	16			16 Jun	12		
	Weaned young steers	9			1 Oct	16			1 Dec	18		
	Calves weaned this year								15 Feb	8	161	220
Trading stock	Steers	10	100	240	1 May				1 Jan	20		
	Steers	10	136	270	1 Oct				1 Feb	21		
	Bulls	36	20	650	1 Oct				16 Jun	40		
	Steers				1 Oct				16 Jun			
	Steers				1 Oct				16 Jun			
	Steers				1 Oct				16 Jun			

Number availab
473 weaned anim

TIP – Make sure the Number of Stock in the bar graph is correct; it's easy to double up.

Step 3 – Compare Feed Supply and Feed Demand

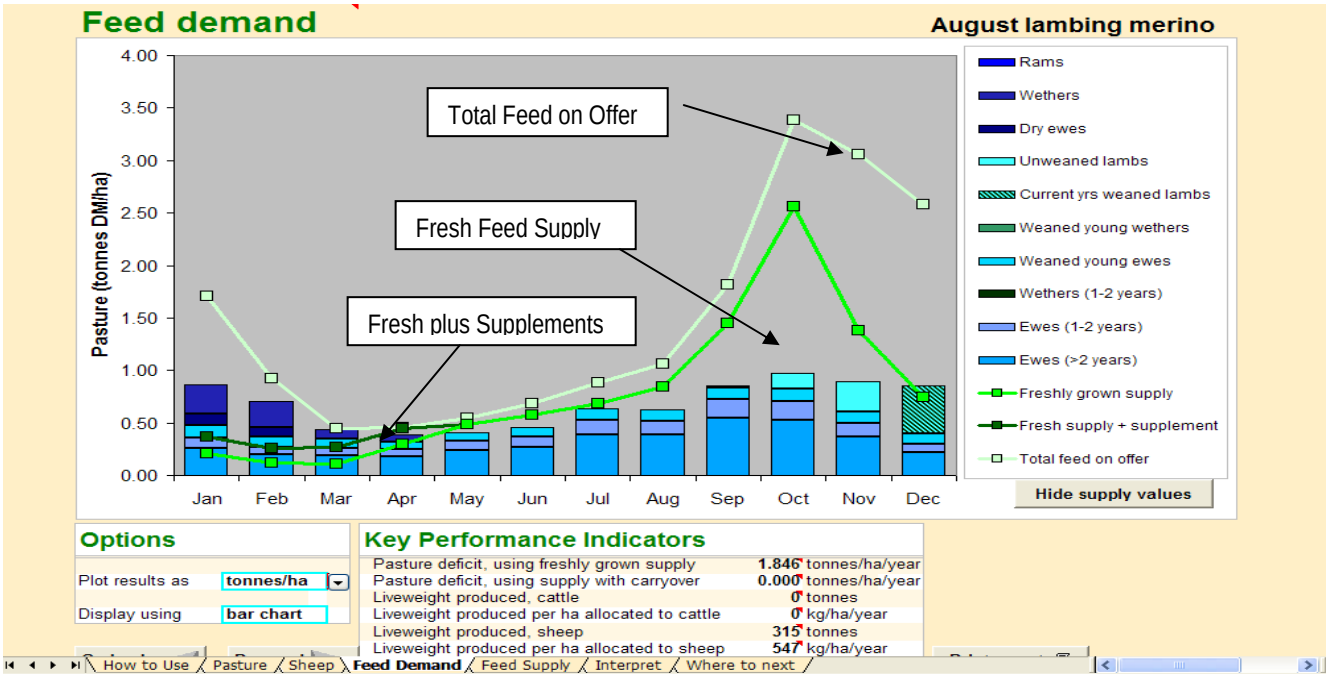
Once you have the pastures and animals specified, have a look at the Feed Supply and Feed Demand graphs. The Feed Demand graph shows the intake of the different classes of livestock compared to the Feed Supply. Feed Supply is shown as both Freshly Grown (in that month) and the Total Feed on Offer (Freshly Grown plus carryover pasture from the previous months.

Feed Demand Graph; Look at whether the overall Feed Demand line matches the fresh Feed Supply. In most scenarios, there will be some months when carryover feed will be required to meet livestock needs. An example of a Feed Supply and Demand is shown in Figure 1. Look at the times when Total Supply and Demand are not in balance?

If the Feed Demand is always less than Feed Supply, it suggests there is potential to increase Feed Demand, either by running more stock, keeping stock longer before sale, using some land for other enterprises.

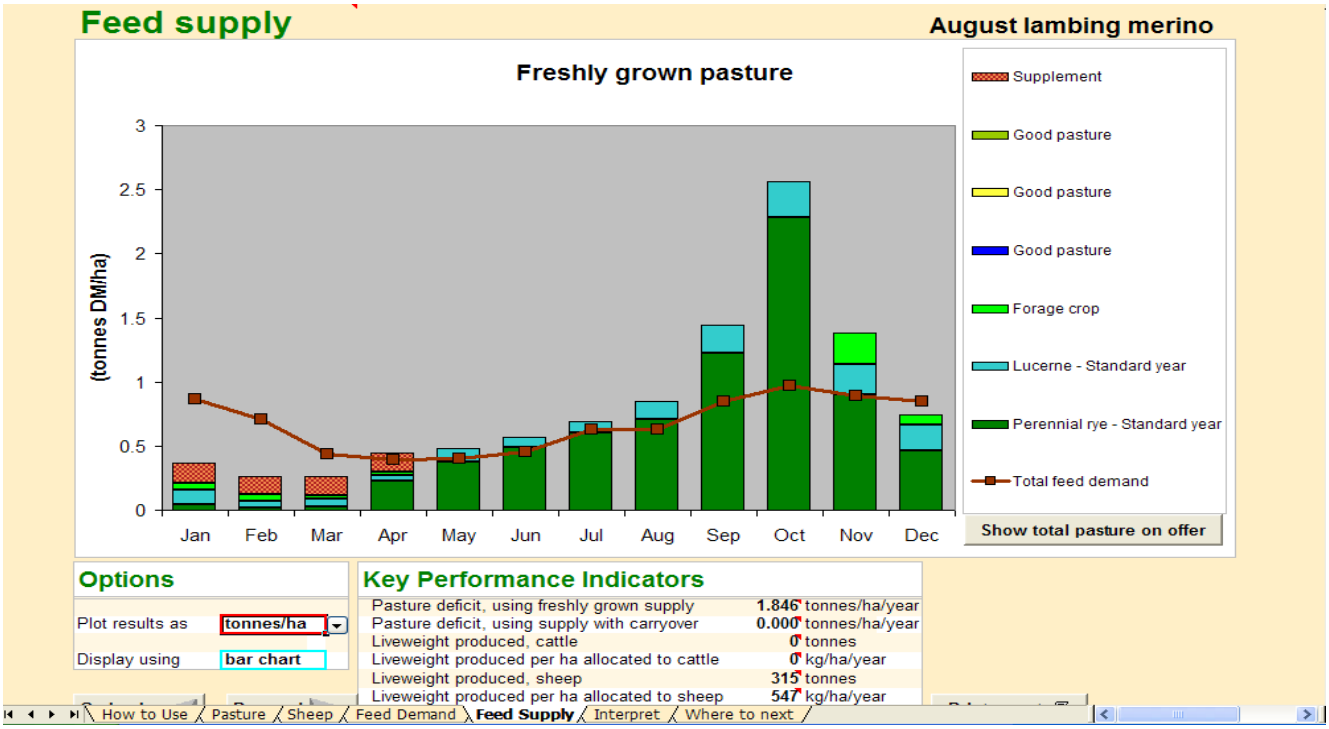
If Feed Demand is usually higher than Feed Supply, this suggests the system is not profitable or sustainable, livestock will be performing below their potential and paddocks will be over grazed leading to soil loss.

Figure 1 Feed Supply and Demand



Feed Supply graph; This graph show the same data but with the Feed Demand as 1 line and Feed Supply split into the different pasture components. This graph indicates when particular pastures are doing well or performing poorly. Consider what alternative species could be used to overcome feed gaps. Alternatively, if there is a particular season when Feed Demand exceeds Feed Supply, could sale of stock or a change of management (calving time?) overcome this deficiency?

It is a good idea to go back to the pasture page and run the scenario with a scaling setting of 0.7 to simulate a poor year. How much does this change the Feed Demand:Supply curve?



Click on the “Show total pasture on offer” button to indicate the total pasture available. Fresh supply is a good indicator of high quality herbage for growing or lactating stock while total feed on offer is more relevant to store stock.

Supplementary feeding; The FDC allows the user to include supplementary feeding in the scenarios. To include supplements, go to the Pasture page where provision is made to include the Amount (kg/hectare/day) and Quality (MJ/kg) of supplements. An example of how to work out an appropriate value is shown in the box below. Supplements need to be specified as kg per hectare per day to allow the values to be included on the Feed Supply graph in a similar way to fresh pasture growth.

Farm of 50 ha is running 450 ewes lambing in July plus 300 carryover lambs that are sold in April – May. The ewes are supplemented with barley at 0.3 kg/day from January until the autumn rains while lambs graze on stubble and lucerne. Ewes are run at 15/ha in summer while lambs graze lucerne.
*Therefore supplement per hectare per day is; 450 ewes * 0.3 kg/d = 135 kg/day, divided by the total area of the farm (50ha) = 2.7 kg/ha/day.*

The Supplement Quality can be determined from feed quality tests or standard values used; barley is commonly about 12 MJ/kg.

Key Performance Indicators; The table at the bottom of the Feed Demand and Feed Supply graphs outlines the total production, production/ha and utilization of pasture. These values can be used to compare the performance of different scenarios and with regional farm benchmarks.

Step 4 – Consider the environmental implications of the scenario
The Performance Indicators include Utilization of the pasture that can also be used as an indicator of environmental sustainability. Recommended maximum pasture utilization rates for different situations are shown in Table 1. Utilization must be lower on steeper country and with sandy soils to ensure sufficient ground cover is maintained to avoid soil loss.

Table 1. Maximum utilization rates that balance productivity and environmental sustainability

	Flat	Undulating	Steep
Clay	70	65	50
Clay loam	65	60	50
Sandy loam	60	55	45
Sand	50	45	40

Another measure of sustainability is the minimum Total Feed On Offer with recommended minimum levels shown in Table 2. If pastures are grazed below these minimum FOO targets for several months especially at times when heavy rainfall or strong winds are likely, soil erosion is likely to occur. Also, extended periods of grazing below these minimum levels will lead to loss of perennial pasture species.

Table 2. Recommended minimum FOO for different soils and topography

	Flat	Undulating	Steep
Clay Clay loam	800 kg/ha	1000 kg/ha	1200 kg/ha
Sandy loam Sand	1000 kg/ha	1200 kg/ha	1500 kg/ha

If the minimum FOO or maximum Utilization values are exceeded, a flag will appear at the bottom of the Key Performance Indicator table suggesting that the feed supply or demand needs to be reconsidered.

Common comparisons with the FDC

Changing lambing or calving time

Lambing time has a large influence on the Feed Supply, Feed Demand balance as well as sale weight, sale prices and weaning rates. Steps to compare autumn with winter lambing are shown below and can be adapted to a cow calf operation or other lambing times;

1. Select the appropriate location and customize the pasture growth and quality for the farm,
2. Setup the baseline autumn lambing system, ewe stocking rate, weaning time and rate and sale time. Specify the current supplementary feeding on the pasture page,
3. Run the system and print off the Feed Demand and Feed Supply graphs
4. Using the same pasture growth data, change the lambing time from say April to June. Note that conception rates and lamb growth rates should be higher for later lambing and will need to be included in the animal specifications.
5. Compare the Feed Demand and Supply with the baseline simulation. Questions to consider are:
   - Can supplementary feeding be reduced with later lambing?
   - Can stocking rates be increased with later lambing?
   - Will the benefits of additional lambs and lower supplementary feeding be greater than any reduction in price per lamb?
   - Will later lambing avoid environmental limitations by maintaining higher ground cover?

Comparing different animal genotypes

The FDC allows a quick comparison of the effect of changing to a different type of sheep or cattle (larger frame size, higher reproductive performance) on feed demand. To run this comparison;

1. Select the appropriate location and customize the pasture growth and quality for the farm
2. Setup the current animal genotype, stocking rate, weaning percentage, weaning weights etc
3. Run the system and print off the Feed Demand and Supply graphs
4. Change the animal characteristics to reflect the new genotype. Remember that a different animal genotype may mean changing the weight of the breeding animal, weaning percentage and weaning weights. Compare the Feed Demand and Feed Supply with the baseline simulation. Questions to consider are;
   - Do I need to change stocking rates to accommodate the change in genotype?
   - What is the tradeoff between production/ha in the different scenarios?

Using alternative species to overcome feed-gaps

Fresh feed supply may be low in summer, autumn or winter and limit stocking rates or the type of enterprises that can be run. The FDC can consider alternative species to fill gaps in supply. To run this comparison;

1. Select the appropriate location and customize the pasture growth and quality for the current situation.,
2. Setup the baseline animal system, stocking rate, weaning percentage, weaning weights etc,
3. Run the system and print off the Feed Demand and Supply Graphs. Look for where the greatest difference occurs between Supply and Demand especially periods when stock are lactating or required to grow rapidly. Consider what other species could fill these gaps, ie lucerne late spring and summer, summer forage crops in summer and autumn, cereal crops in winter.
4. Seek local information about the likely growth rates of alternative species and crops from local state agencies experts, private consultants or agronomists,
5. Modify the feed supply by including a proportion of the farm with a different pasture and enter the appropriate growth and quality values.
6. Compare the balance between Feed Supply:Feed Demand with the alternative species to the baseline comparisons. Questions to consider are;
   - Does the new species improve the overall Feed Supply:Feed Demand balance?
   - Do I need to modify livestock management to make best use of the alternative species? ie can I run a higher stocking rate, turnoff stock at a different time, sell stock at heavier weights?
   - Can I reduce supplementary feeding by using other species?
   - Does the use of an alternative species overcome previous environmental limitations?

Planning for adverse seasons

The FDC has a simple function that allows users to dial up higher or lower pasture growth. This is particularly useful to budget for a tough autumn or overall poor year. To test these options;

1. Select the appropriate location and customize the pasture growth and quality for the baseline situation. Make sure that the Scaling factor on the pasture page is set to 1.0 for the baseline situation.
2. Setup the current animal system, stocking rate, weaning percentage, weaning weights etc. Run the system and print off the Feed Demand and Feed Supply Graphs.
3. Alter the Scaling Factor for pasture growth to 0.7 (30% lower growth). This will reduce the pasture growth in all months for that pasture species by 30%.
4. Run the simulation and compare Feed Supply and Feed Demand with the baseline situation. Consider;
   - How much additional supplementary feeding will be required?
   - If I bring forward sale of trading stock, could I overcome the Feed Supply gap?
   - How many of my breeding stock would need to be sold to balance Supply and Demand?
   - What is the impact of the lower Feed Supply on environmental values?

As you become more familiar with the FDC, you will be able to build up combinations of pasture options, livestock options in varying seasons.

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