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Rumen8

USER GUIDE

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INTRODUCTION

Rumen8 allows farmers and consultants to manage dairy and beef cattle diets, improving animal nutrition and production while reducing costs and enteric methane emissions. It is a software application for Microsoft Windows computers that was originally created while the developers worked with dairy research herds at the Department of Agriculture and Food, Western Australia in the early 2000's. Rumen8 is based on multiple published feeding standards and peer-reviewed journal articles and is updated regularly.

Rumen8 is a comprehensive ruminant nutrition tool with an emphasis on ease-of-use that sets it apart from others. This makes it ideal for creating and checking cattle diets on-farm from both a nutritional and economic perspective. It is based on metabolisable energy (ME), metabolisable protein (MP) and neutral detergent fibre (NDF), but also reports a range of other diet parameters. In addition, Rumen8 comes with a strong educational element, containing many detailed explanations of the nutritional concepts required to feed cattle successfully and profitably.

Rumen8 performs well in a wide range of production systems. It is used in pasture-based and stall-fed systems all over the world. Note, it does not apply to semi-arid extensive beef production systems. Rumen8 is available for free and is used by thousands of users in over 100 countries, including farmers, consultants, and in universities.

Rumen8 is owned and registered as a trademark by Rumen8 Nutrition Pty. Ltd., a Western Australian based company with Directors Martin Staines and Richard Morris.

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WHAT DOES RUMEN8 DO?

Rumen8 allows the user to design a diet from up to 15 feeds or mixes and ensure an animal's dietary needs are met. Multiple diets can be stored and compared and if feed prices income from milk or the animal's sale are entered, the difference between feed price and return is calculated. Rumen8 uses robust nutrition models that we have found accurate enough over many years using it on farms and Research Stations. Although more sophisticated models of cattle nutrition exist, these require a higher level of user knowledge, they depend on less readily available and more expensive feed analyses and require more time to become experienced with. We have found that Rumen8 provides a good balance between ease and speed of use and performance that is fitting for the pasture-dominated diets common in Australia.

Learning how to use Rumen8 safely

While Rumen8 is relatively easy to use, it still requires a good knowledge of animal nutrition to maximise the health and profitability of your herd. To begin with, we recommend using Rumen8 alongside your nutritionist so they can guide changes to diets while keeping them safe and cost effective.

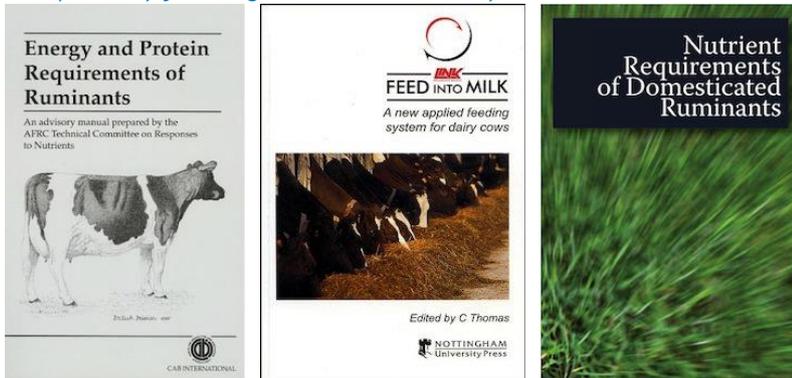
To learn how to use Rumen8 and increase your knowledge of cattle nutrition, a six part training course is provided on the Rumen8 website under Training in the menu.

This can be downloaded for free and worked through at your own pace. It also includes example diets and case studies. While tailored for conditions on East African farms, the principles remain the same wherever your business is located.

Rumen8 is based on published feed standards

The equations that allow Rumen8 to predict energy and protein supply from the diet and demand by the animal are all from published feeding standards. When creating diets for dairy animals these are primarily the British publications 'Energy and Protein Requirements of Ruminants' and 'Feed into Milk: A New Applied Feeding System for Dairy Cows'. When in beef mode, the feeding standard used by Rumen8 is the Australian publication 'Nutrient Requirements of Domesticated Ruminants'. The full reference for these publications can be found at the end of this document, along with others that are used for estimating mineral demand, daily intake and methane production for example.

The primary feeding standards used by Rumen8



WHAT RUMEN8 DOESN'T DO

Like most nutrition programs, Rumen8 works on a linear response to feeding. This means it assumes the same response to a kilogram of concentrate whether it is the first kilogram, or the tenth kilogram fed to the animal. Due to this Rumen8 can be misleading when asking questions such as 'What happens if I feed another kilogram of concentrate' as it presents the average response for the first diet, and then the average response for the second diet that includes the additional feed. Rumen8 cannot be used to predict the response to just the last kilogram of additional concentrate. Generally, we would suggest that for dairy cows, marginal responses much more than 1 litre of milk per kg of concentrates should be treated with scepticism.

A WARNING BEFORE YOU START

Like any nutrition application, Rumen8 depends on a model of an animal that is used to estimate energy and protein demand to meet maintenance and production. No model is completely accurate, and it is possible to create a balanced diet in Rumen8 that will reduce an animal's performance or even adversely affect their health. For this reason, we recommend Rumen8 is used with your nutritionist, and depending on your level of knowledge, between their visits to adjust diets.

The feed libraries provided with Rumen8 have links to other resources on the internet such as the Feedipedia website. These are provided so the user has additional information, but they are not under the control of the developers of Rumen8. This means they can change over time, and we

cannot guarantee their accuracy or relevance to your business and locally available feeds. Like any resource on the internet, please evaluate them carefully to determine their reliability and how useful to you they are.

END-USER LICENSE AGREEMENT (EULA) OF RUMEN8

This End-User License Agreement ("EULA") is a legal agreement between you and Rumen8 Nutrition Pty Ltd.

This EULA agreement governs your acquisition and use of our Rumen8 software ("Software") directly from Rumen8 Nutrition Pty Ltd or indirectly through a Rumen8 Nutrition Pty Ltd authorised reseller or distributor (a "Reseller").

Please read this EULA agreement carefully before completing the installation process and using the Rumen8 software. It provides a license to use the Rumen8 software and contains warranty information and liability disclaimers.

If you use the demonstration version of the Rumen8 software, this EULA agreement will also govern that trial. By clicking "accept" or installing and/or using the Rumen8 software, you are confirming your acceptance of the Software and agreeing to become bound by the terms of this EULA agreement.

If you are entering into this EULA agreement on behalf of a company or other legal entity, you represent that you have the authority to bind such entity and its affiliates to these terms and conditions. If you do not have such authority or if you do not agree with the terms and conditions of this EULA agreement, do not install or use the Software, and you must not accept this EULA agreement.

This EULA agreement shall apply only to the Software supplied by Rumen8 Nutrition Pty Ltd herewith regardless of whether other software is referred to or described herein. The terms also apply to any Rumen8 Nutrition Pty Ltd updates, supplements, internet-based services, and support services for the Software, unless other terms accompany those items on delivery. If so, those terms apply.

License Grant

Rumen8 Nutrition Pty Ltd hereby grants you a personal, non-transferable, non-exclusive licence to use the Rumen8 software on your devices in accordance with the terms of this EULA agreement. You are permitted to load the Rumen8 software (for example a PC, laptop, mobile or tablet) under your control. You are responsible for ensuring your device meets the minimum requirements of the Rumen8 software.

You are not permitted to:

- Edit, alter, modify, adapt, translate or otherwise change the whole or any part of the Software nor permit the whole or any part of the Software to be combined with or become incorporated in any other software, nor decompile, disassemble or reverse engineer the Software or attempt to do any such things
- Reproduce, copy, distribute, resell or otherwise use the Software for any commercial purpose
- Allow any third party to use the Software on behalf of or for the benefit of any third party
- Use the Software in any way which breaches any applicable local, national or international law
- Use the Software for any purpose that Rumen8 Nutrition Pty Ltd considers is a breach of this EULA agreement

Liability

Licensor shall not be liable to licensee for any lost profits, lost revenues or opportunities, downtime, or any consequential damages or costs, resulting from any claim or cause of action based on breach of warranty, breach of contract, negligence, or any other legal theory, even if Licensor knew or should have known of the possibility thereof. In no event shall Licensor's aggregate liability exceed the amounts actually paid by Licensor in the 12-month period immediately preceding the event giving rise to the claim.

Intellectual Property and Ownership

Rumen8 Nutrition Pty Ltd shall at all times retain ownership of the Software as originally downloaded by you and all subsequent downloads of the Software by you. The Software (and the copyright, and other intellectual property rights of whatever nature in the Software, including any modifications made thereto) are and shall remain the property of Rumen8 Nutrition Pty Ltd. Rumen8 Nutrition Pty Ltd reserves the right to grant licences to use the Software to third parties.

Termination

This EULA agreement is effective from the date you first use the Software and shall continue until terminated. You may terminate it at any time upon written notice to Rumen8 Nutrition Pty Ltd. It will also terminate immediately if you fail to comply with any term of this EULA agreement. Upon such termination, the licenses granted by this EULA agreement will immediately terminate and you agree to stop all access and use of the Software. The provisions that by their nature continue and survive will survive any termination of this EULA agreement.

Governing Law

This EULA agreement, and any dispute arising out of or in connection with this EULA agreement, shall be governed by and construed in accordance with the laws of Western Australia.

ACKNOWLEDGEMENTS

Rumen8 has remained free due to the support it has received from numerous organisations and people.



Martin Staines and Richard Morris developed Rumen8 while they were employed by the Department of Agriculture and Food, Western Australia.



SNV Kenya, Ethiopia and Uganda worked closely with the developers along with providing funding to make improvements to Rumen8 for users in East Africa.



SNV is funded by the Government of the Kingdom of the Netherlands.



Western Dairy and Dairy Australia provided significant funding to improve Rumen8 and ensure it remained free for Australian dairy farmers.



Supporting our industries to build a better future

The Victam Foundation have provided funding to make Rumen8 more suitable to users located in Africa.



Dr Steve Little provided invaluable input into the design and scope of Rumen8 version 3.0 as part of the development of the Dairy Australia Advanced Nutrition in Action course.

GETTING STARTED

Rumen8 is a Windows application so requires a desktop or laptop computer running Microsoft Windows to be used. Currently it cannot be installed on iPhones, iPads, Android phones/tablets or Apple Macintosh computers.

SYSTEM REQUIREMENTS

Rumen8 requires the version 8.1 or 10 of the Microsoft Windows operating system to run. It is recommended you have run Windows Update and installed all the updates provided by Microsoft. If your computer can run Windows adequately, it will be enough to run Rumen8. The minimum screen resolution required to run Rumen8 comfortably is 1280 x 800 pixels.

Rumen8 requires the Microsoft NET Framework version 4.8 or higher to be installed. If your computer has been fully updated this will be installed automatically.

REPORT REQUIREMENTS

To create Rumen8 reports you must also install the SAP Crystal Reports Runtime Engine for the .NET framework. The installers for this software are available from the SAP website or the Rumen8 website download page. If you are running a 32-bit (x86) version of Microsoft Windows download and install the 32-bit version of the run-time software and if your copy of Windows is 64-bit (x64) use the 64-bit run-time installer.

Rumen8 website: <https://www.rumen8.com.au/download/index.html>

SAP website: <http://www.crystalreports.com/crystal-reports-visual-studio/>

The SAP website will require your email address and country to access their downloadable files section. The files you want are the 'SAP Crystal Reports Runtime (32Bit)' or 'SAP Crystal Reports Runtime (64Bit)' depending on the version of Windows you have.

If you are unsure whether your version of Windows is 32 or 64-bit start Rumen8, load a few ingredients and then open the Report Designer from the File menu. Click on the 'Create' button and a warning will appear telling you the SAP run-time has not been installed. It will show you whether your version of Windows is 32 or 64-bit. Click on the links provided to download the correct run-time and then install it. Now the Report Preview window should appear when you create a report.

GETTING HELP

From within Rumen8 you can press the F1 key to access this User Guide. Alternatively, the User Guide is available as a PDF document from the Windows start menu applications list in the Rumen8 group.

A list of abbreviations used in this document and within Rumen8 can be found at the end of this document.

Video tutorials are provided on the Rumen8 website which cover the main parts of Rumen8 and how to use it.

Finally, for technical support and reporting bugs please contact the developers via email at support@rumen8.com.au.

When reporting problems please provide a description of what you were doing when the issue occurred. Screen shots showing an error message are extremely useful. It is also helpful to know

what version of Microsoft Windows you are using.

INSTALLATION

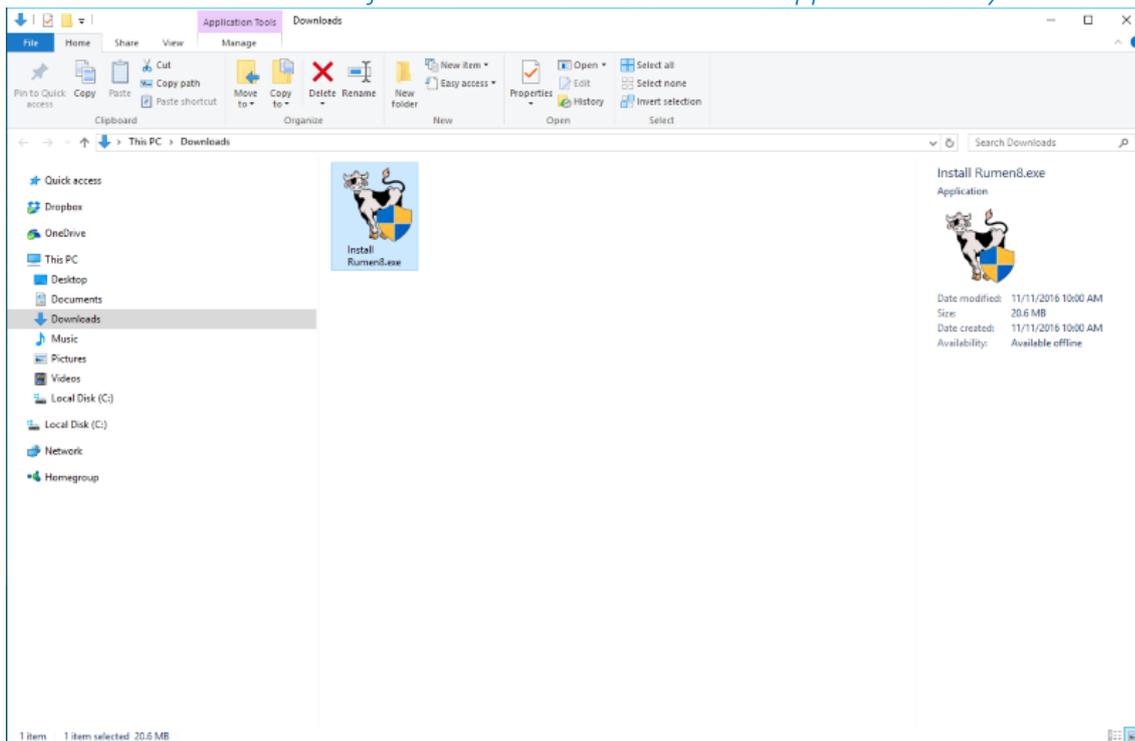
The Rumen8 set up file can be downloaded from the Downloads page of the Rumen8 website at <http://www.rumen8.com.au>

Once the executable file has been saved to your Downloads folder (the default Windows download destination) double click on the file in Windows File Explorer to commence the installation process.

Some virus scanners may prevent the download of executable files such as the Rumen8 installer. If this happens the download will appear to complete but the installer will not be present in the Downloads folder. To install Rumen8 you may need to pause your virus scanner and then complete the installation. This is often an option by right-clicking on the virus software's icon in the System Tray at the bottom right of the windows. Do not forget to re-enable it after Rumen8 is installed.

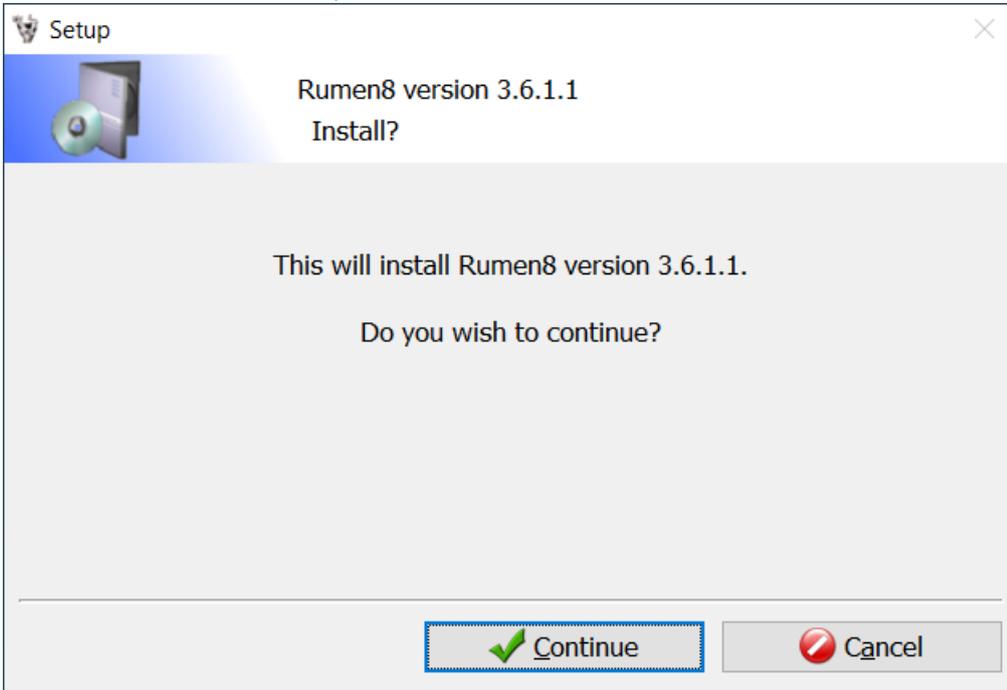
If that is not an option, you can download the Rumen8 installer inside a password protected Zip archive from the Downloads page. Once this .zip file has downloaded, open the Downloads folder in File Manager, double click on it and then enter the password which is password. The zip file will open with the Rumen8 installer inside it. You can double click on the installer to install Rumen8.

The Windows 10 Downloads folder with the 'Install Rumen8' application ready to be run.

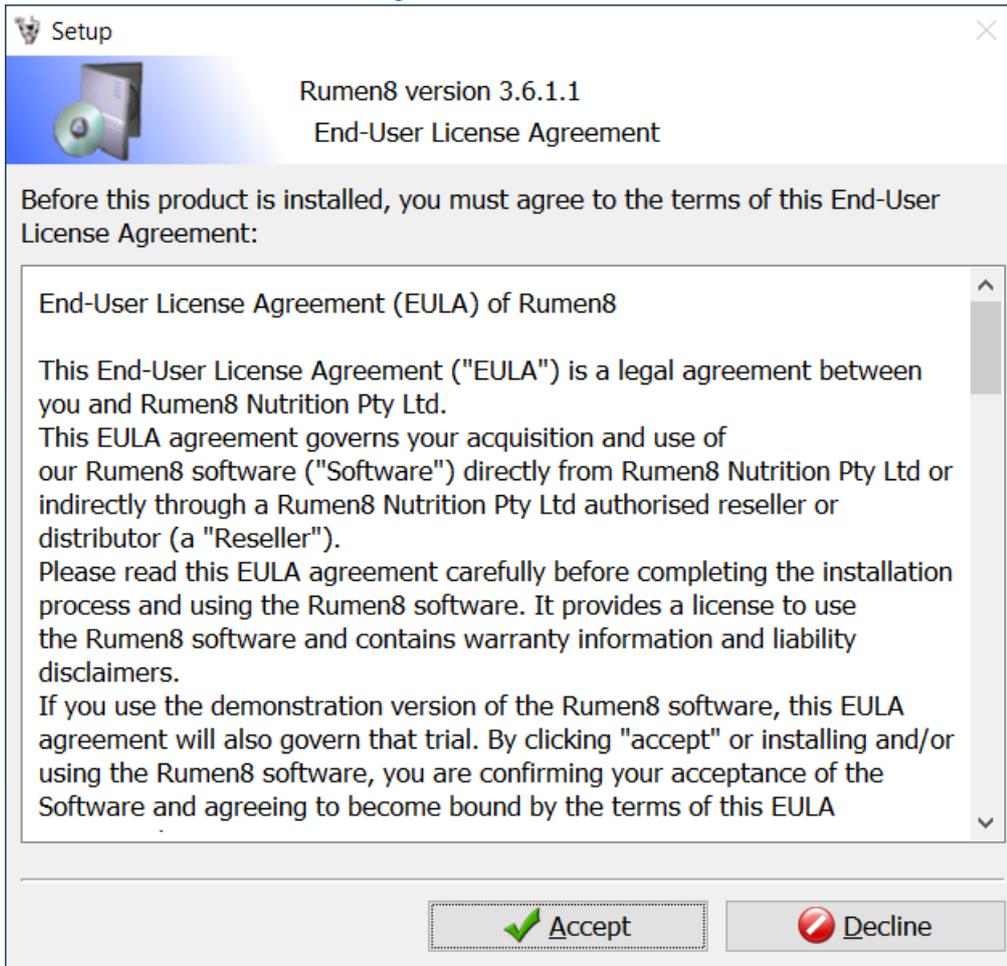


Windows will open a User Account Control window and ask for confirmation that you want to allow this app to make changes to your device? Click yes to continue and the Rumen8 Setup Wizard will appear.

The Rumen8 installer setup wizard.

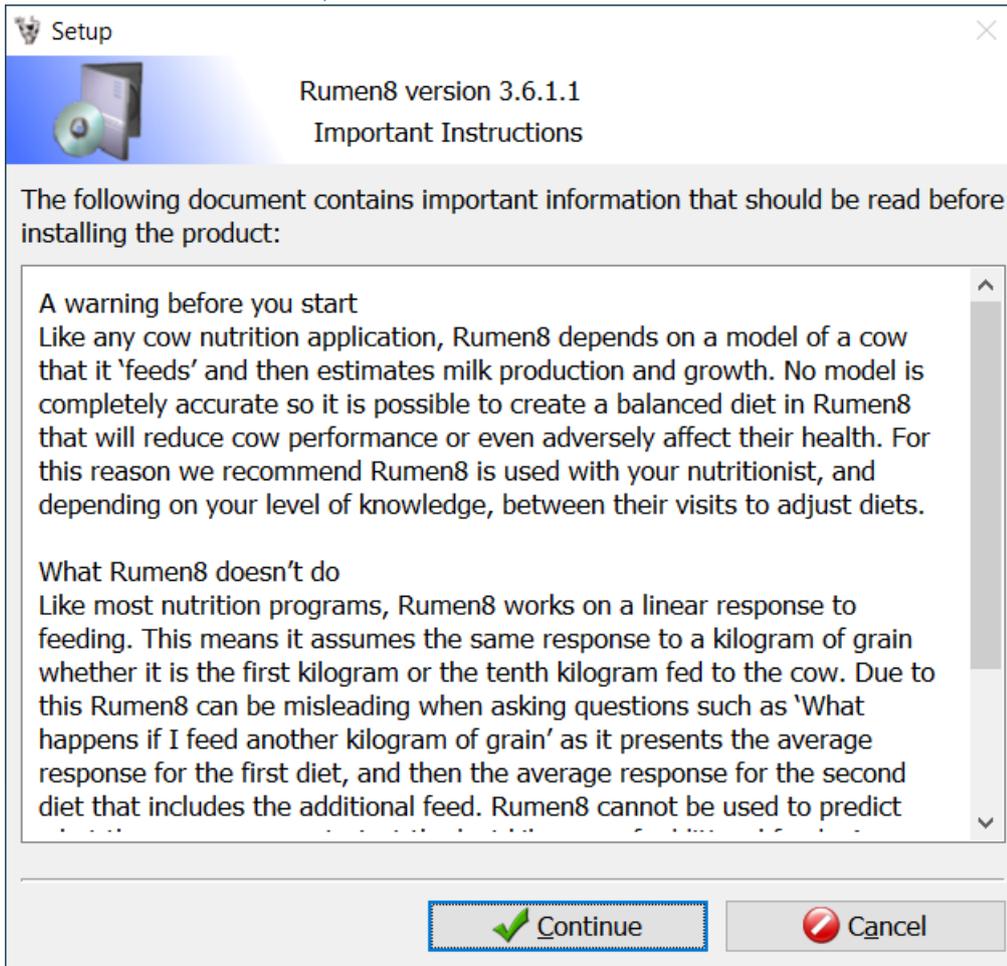


Click on the 'Continue' button to continue to the license agreement window.

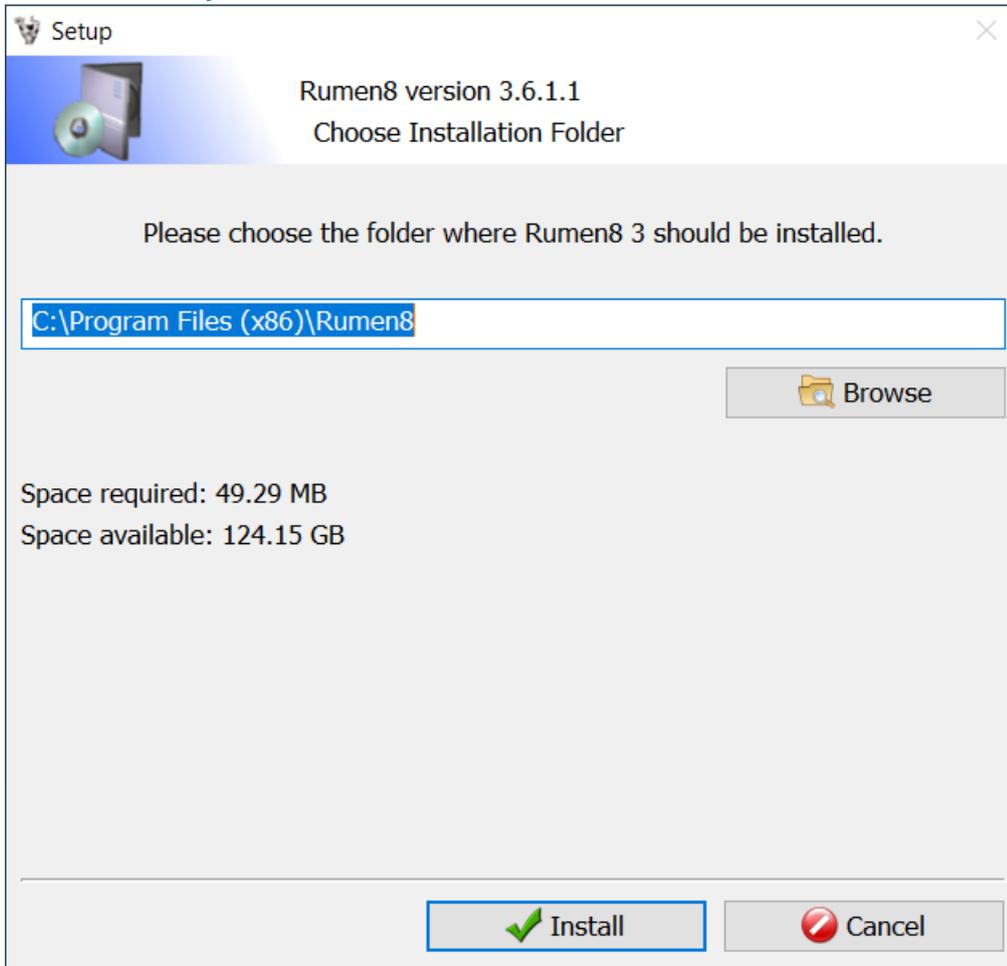
The Rumen8 installer license agreement window.

Read the End-User License Agreement and if you agree with them click on the 'Accept' button. The license agreement is also available in the previous chapter of this document. Next you move to the 'Important Instructions' window. This covers the limitations of nutrition software like Rumen8 and suggests it should be used alongside your nutritionist to ensure no cattle health or production issues arise from its use.

The Rumen8 installer 'Important Instructions' window.



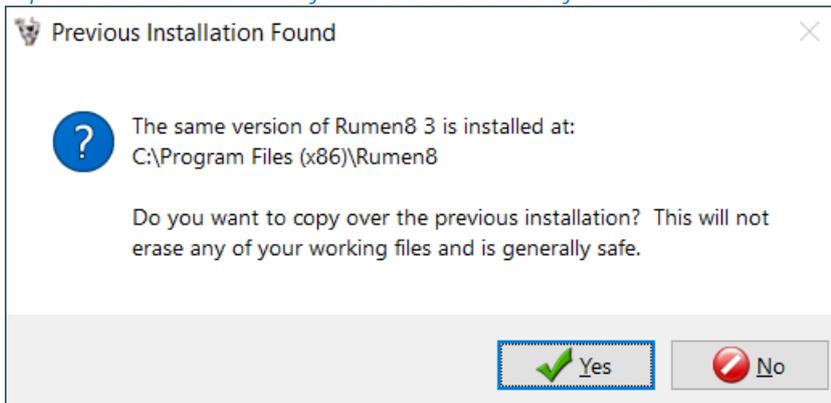
Once you are aware of the limitations of nutrition software and you agree click the 'Continue' button to choose the installation folder.

The installation folder window.

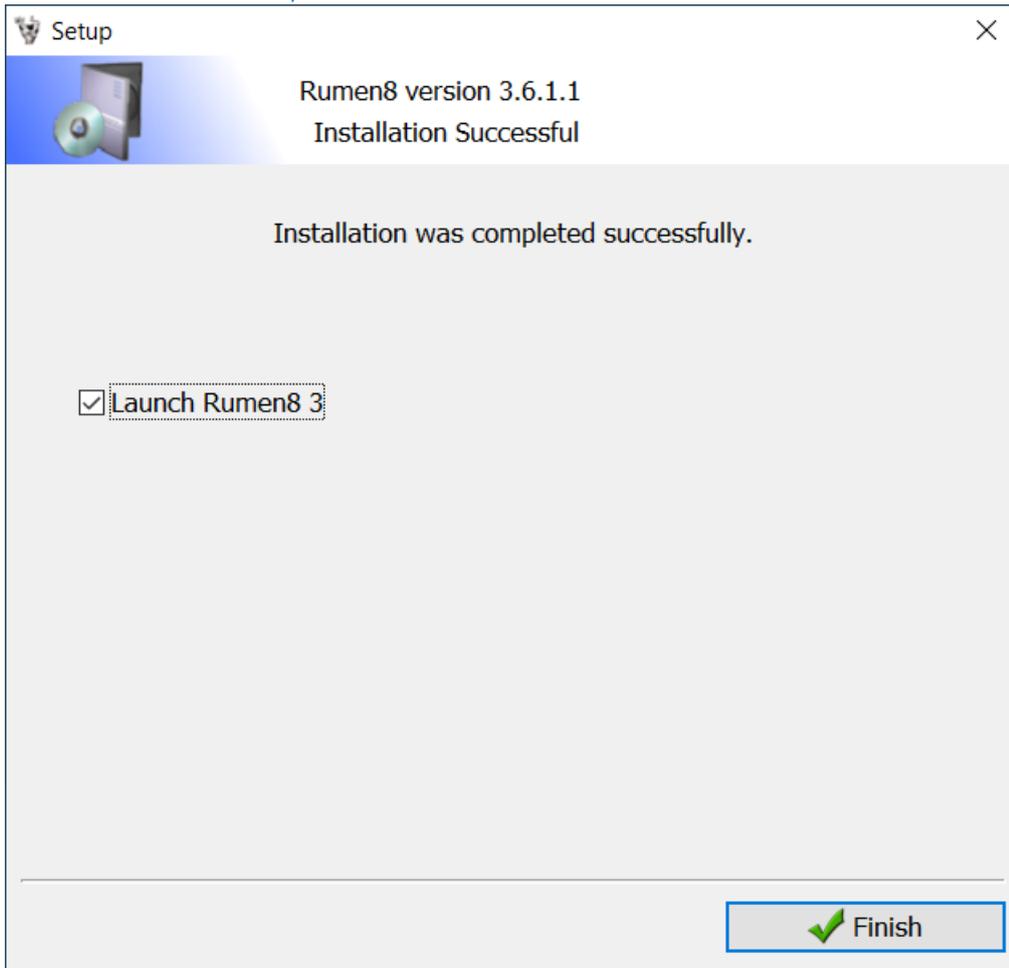
Use the 'Browse' button to change the installation folder if required. The default folder will be suitable for almost everyone.

Click on the 'Install' button to confirm installation. You may get a window open asking you to confirm the creation of the installation folder. Just click on 'Yes' to continue.

If Rumen8 is already installed on your computer, you will instead get a message informing you a previous installation has been found. This will ask you to confirm you want to copy over it. This will not cause any problems and will not overwrite any of your Rumen8 settings or feeds so click on 'Yes' to complete the installation.

A previous installation of Rumen8 has been found.

The installation is complete.



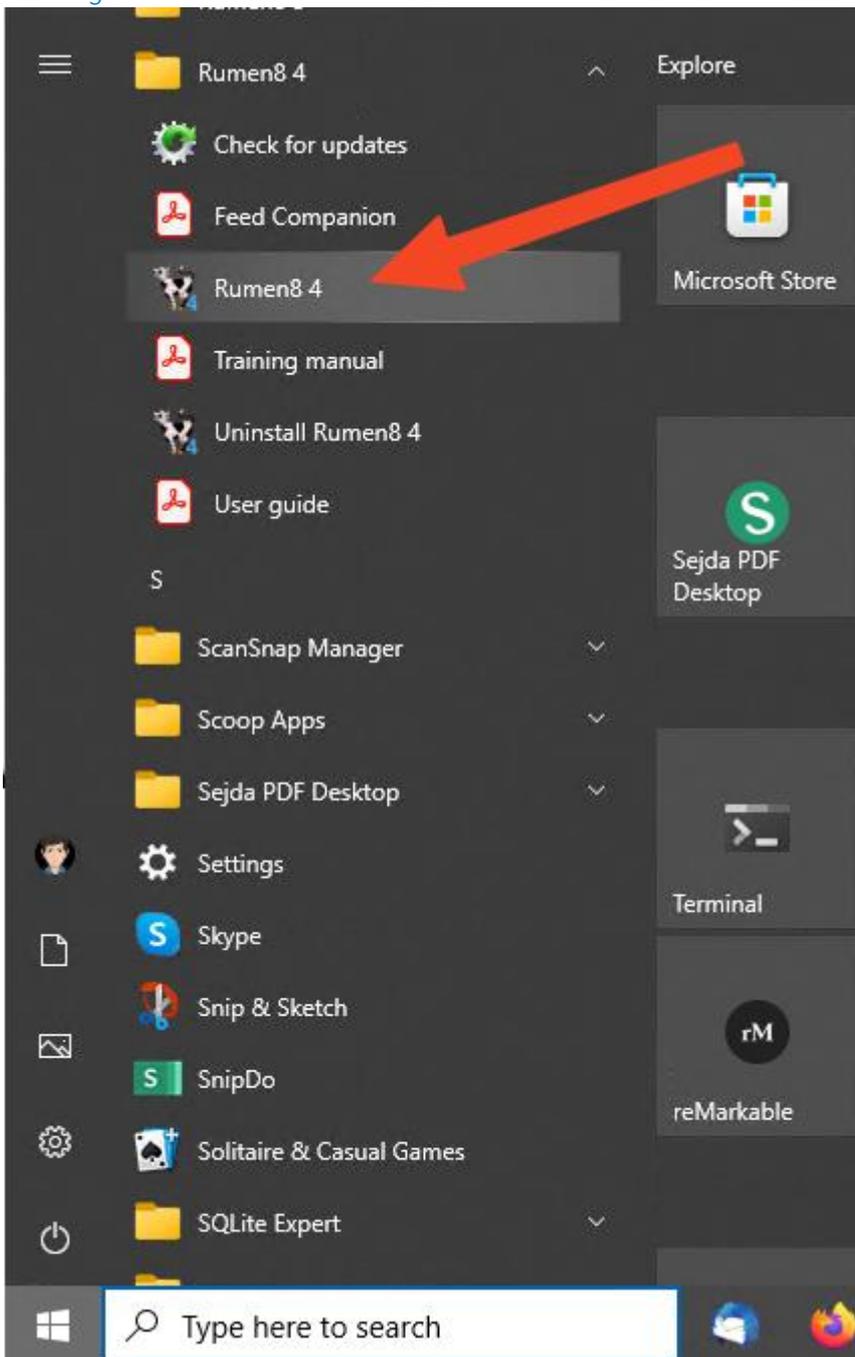
Installation of Rumen8 is complete, click on the 'Finish' button to exit the installer and run Rumen8 for the first time. The installer also creates a Rumen8 icon on the Desktop so you can start it from there or in the Applications list of the Windows Start menu.

STARTING RUMEN8 FOR THE FIRST TIME

Rumen8 will add an icon to the Desktop, and you can start it from there.

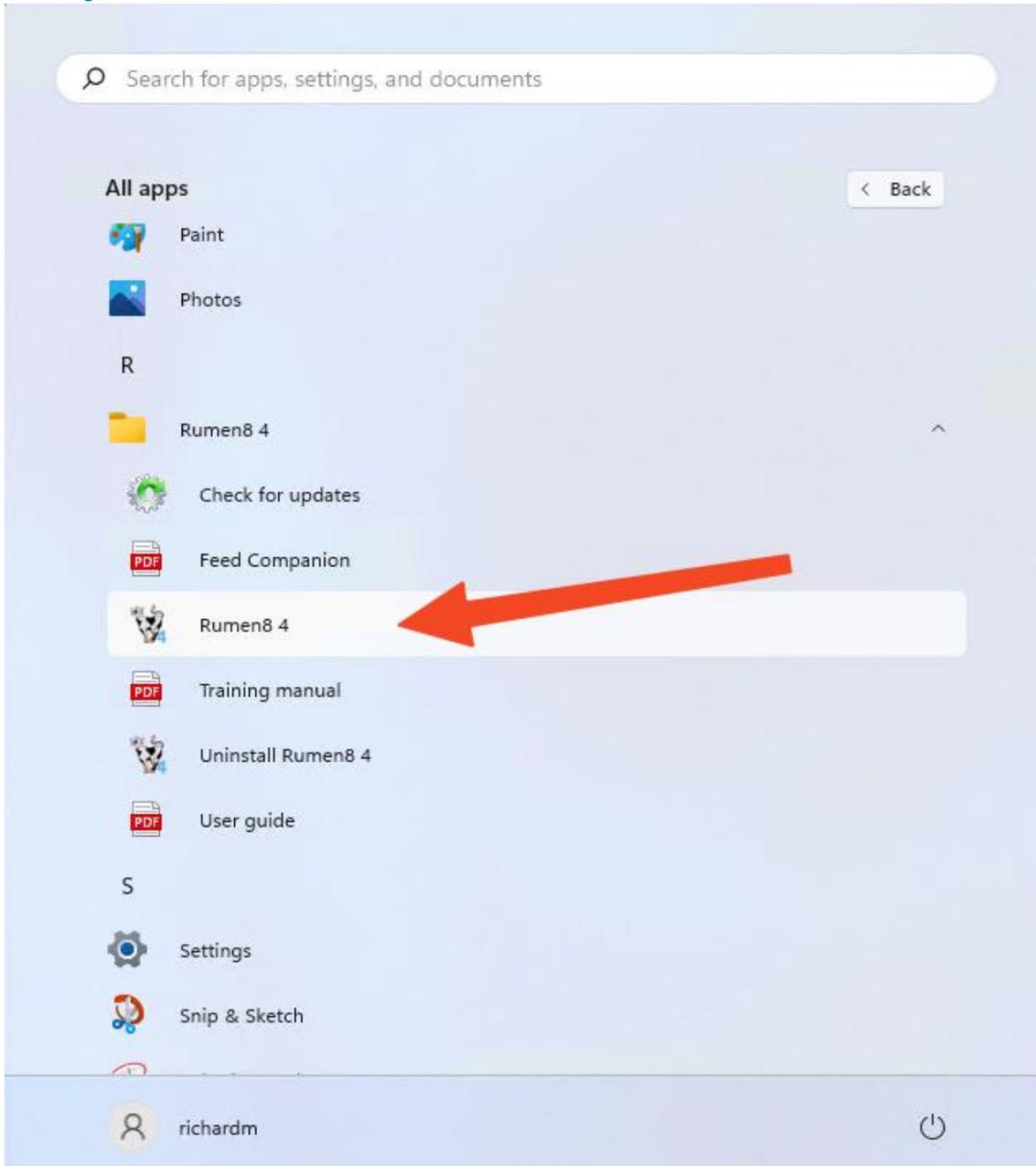
It can also be opened from the Start Menu of Windows 10 in the 'All programs' list. The Windows 10 start menu is shown below and the red arrow is pointing to the Rumen8 icon within the Rumen8 4 group in the alphabetical list of applications installed on the computer. Options to Pin the Rumen8 icon to the Taskbar, Start menu or Send a shortcut to the Desktop can be accessed by right clicking on the Rumen8 icon.

Starting Rumen8 under Window 10.



If you are using Windows 11, click on the Start button at the left of the dock, and then the 'All apps' button at the top right of the start menu. Scroll down through the alphabetic list of all the applications installed on the computer until you find the Rumen8 4 folder. Click on that to show the Rumen8 application, documentation, updater and uninstaller.

Starting Rumen8 under Windows 11.



When Rumen8 starts for the first time it will ask you where to create a Rumen8 folder.

Choose the location of the Rumen8 folder.



Your Documents folder is the recommended location as this is easy to access and is more likely to get backed up. If you are happy with the default location, click the 'Yes' button, but if you would like another location for the Rumen8 folder click 'No'. This will take you to a folder browser where you may specify the location yourself.

Rumen8 will then create a folder called 'Rumen8' at the chosen location and within it another folder called 'Libraries'. Into this folder will be copied a feed library, preferences and milk prices file used by the application for this user. If multiple users use the computer, each user will have their own copy of the Rumen8 library files so they can individually tailor Rumen8 for their own requirements.

If a folder called 'Rumen8' already exists in the location you have chosen, it will be used and no files will be deleted. If a 'Libraries' folder already exists within the Rumen8 folder, it will also be used. If you already have the library files from a previous installation in the Libraries folder they will be left untouched and not replaced with the default files supplied with Rumen8. In this way you can remove and reinstall Rumen8 via the Windows Settings and your feed library and settings will remain.

If you wish to revert to the supplied original version of any of the library files just delete or rename them and then start Rumen8. It will offer to copy a new file as a replacement.

The Rumen8 folder is the recommended location for your saved diet files.

Once the Rumen8 and Libraries folder have been created the main Rumen8 window will open ready for use.

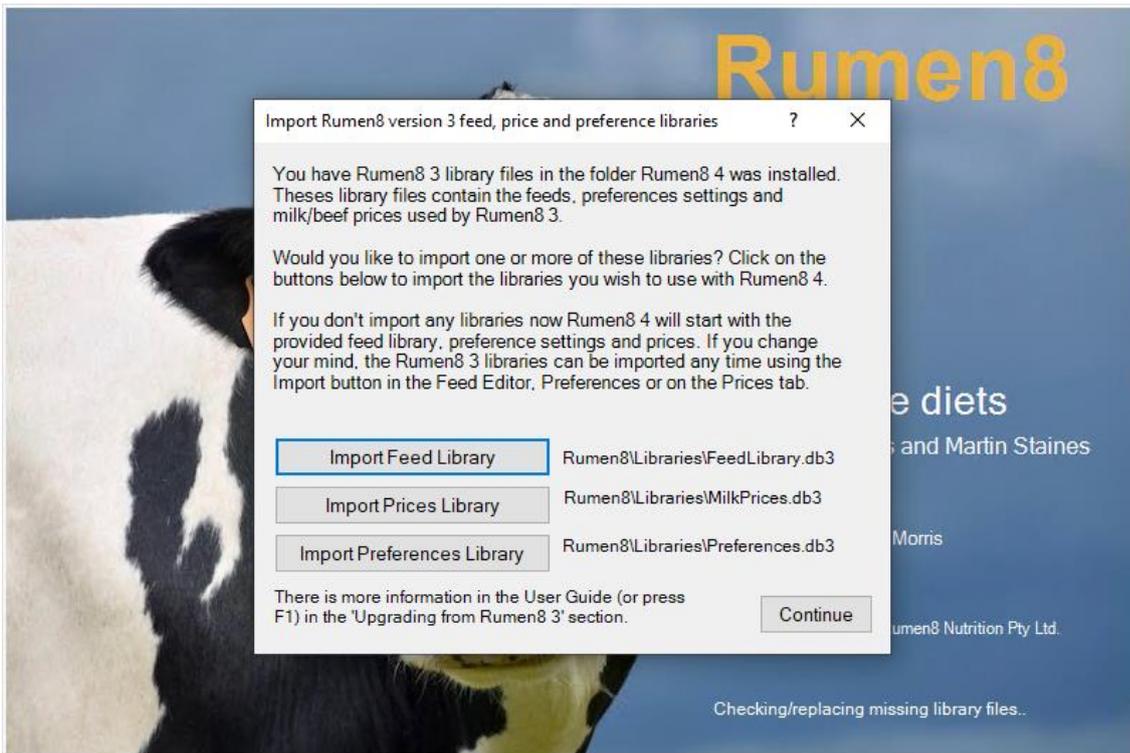
UPGRADING FROM RUMEN8 3

Rumen8 version 4 can be installed alongside an existing copy of Rumen8 version 3. Both versions can then be used and retain their individual feed libraries, preference settings and prices.

When starting Rumen8 4 for the first time it is recommended you choose the same location for the Rumen8 folder as used by Rumen8 3. This is usually the user's Documents folder.

The first time Rumen8 4 starts it will see the existing Rumen8 3 library files and offer to import them for use in Rumen8 4. This will allow the use of the existing feeds, preferences and prices in Rumen8 4.

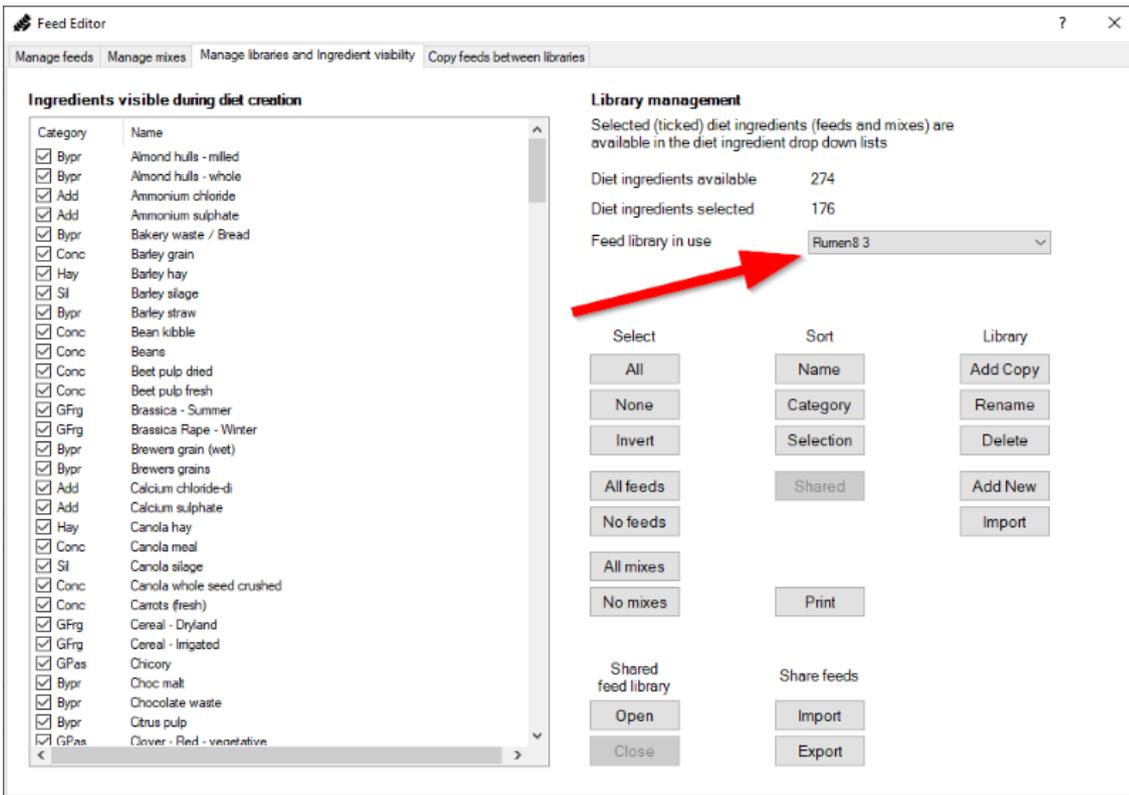
When starting Rumen8 4 for the first time, it offers to import Rumen8 3 feed, preferences and prices libraries from Rumen8.



If you do not import your Rumen8 3 libraries when starting Rumen8 4 for the first time it is not too late. It can be done manually for each one by going to the Feed Editor, Advanced Preferences and Prices tab and using the 'Import' button to import the Rumen8 3 library as a new Rumen8 4 library. The Rumen8 3 library files are usually located in the C:\Users\

If you import some or all of the Rumen8 3 libraries they will become the currently selected library and called 'Rumen8 3'. For example, if on first start-up of Rumen8 4 you decided to import the Feed Library used by Rumen8 3 go into the Feed Editor and you will see the current library is called Rumen8 3 in the drop-down list called 'Feed library in use'.

The feed library from Rumen8 version 3 is selected after importing it when starting Rumen8 4 for the first time.



If you click on the drop-down menu, you will see there is another feed library available called 'Default'. This is the feed library supplied with Rumen8 4. It is the same as the feed library supplied with Rumen8 3 except it has the ADF feed values added for each feed and links to the Feedipedia website added for many of the feeds.

You may wish to rename the feed libraries if you want to continue using your imported Rumen8 3 library as the usual feed library. For example, select the Default library in the drop-down list and then use the 'Rename' button to rename it to something like 'Default Rumen8 4 library'. Then you can select the Rumen8 3 library and rename it to 'Default'. When you use a library not called default a reminder 'FL' flag appears at the bottom of the tab section of Rumen8's main window and mousing over it will reveal a tool tip window that shows you the name of the current library. The Preferences and Prices libraries work in a similar way, so if you decided to import those when starting Rumen8 4 for the first time you will also have a 'Rumen8 3' library selected in the drop-down list in the Advanced Preferences and on the Prices tab. They can be renamed in the same way if you want the Rumen8 3 settings and prices to be your defaults.

If you have multiple sets of libraries, you can import them all and then rename them so they have meaningful names in the library selection drop-down lists.

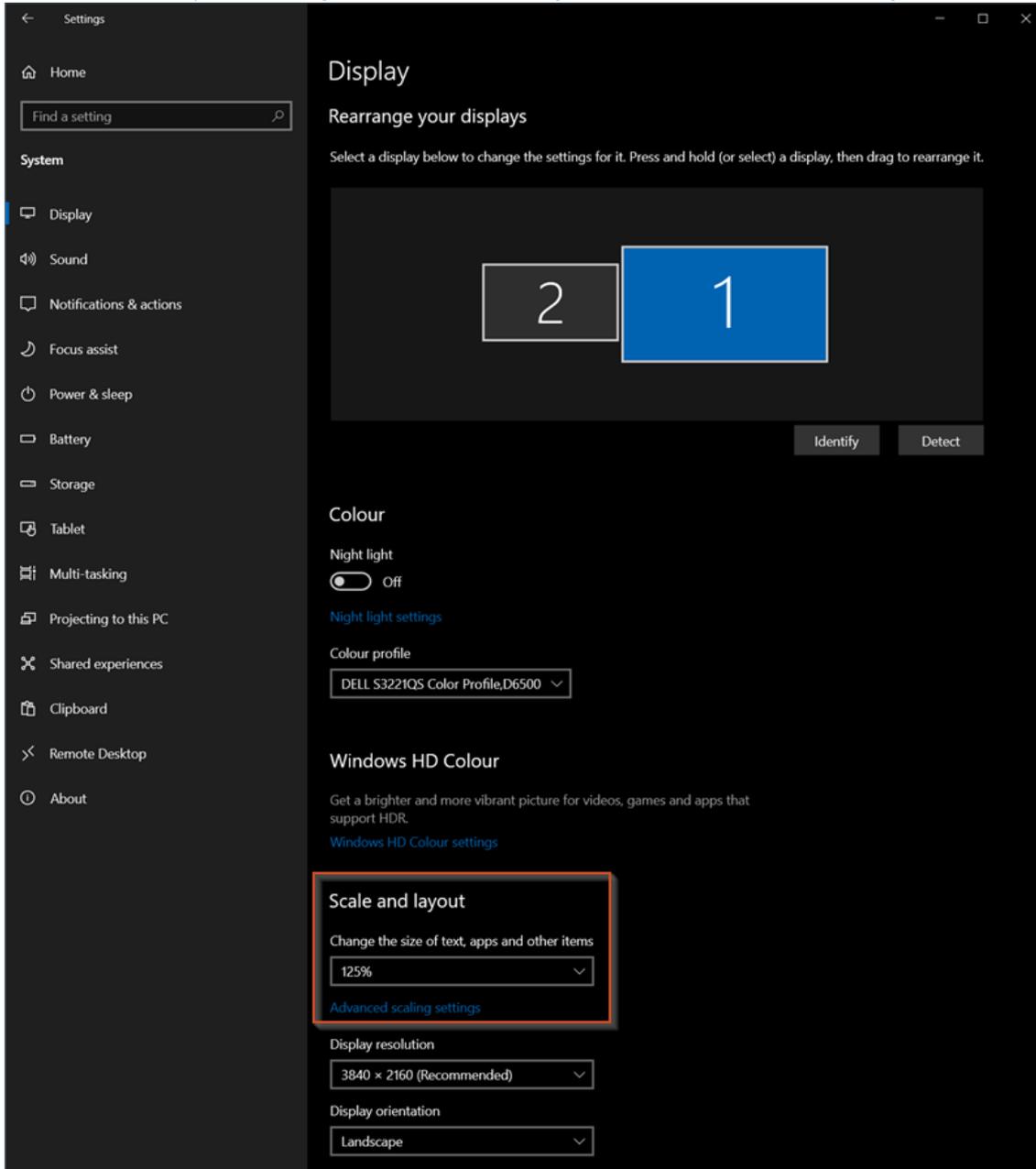
INCREASING THE SIZE OF THE RUMEN8 WINDOWS

On a high resolution screen the Rumen8 window may appear too small to comfortably read. This is often the case on laptops with high DPI 4K (3840x2160 pixels) screens. To increase the relative size of everything on the screen you can adjust the Scaling percentage in the Windows Settings.

1. Quit from Rumen8.
2. Open the Windows Settings via the Start button in Windows 10 task bar at the bottom of the screen. Click on the Start button and when the Start menu appears click on the cog icon to open the Settings window.
3. Click on the System group of settings.

4. Click on the Display sub heading in the menu to the left of the window.
5. Scroll down through the settings until you see the 'Scale and layout' setting.
6. Adjust the Scaling factor up until the Rumen8 window is a suitable size, typically to 125% or 150%. This will also increase the size of text and icons every where else within Windows.
7. Start Rumen8 to see if it is now large enough to use comfortably. If not, increase the scaling factor.

The Scale and layout setting in Windows Settings is shown in the red rectangle.



REGISTERING RUMEN8

When Rumen8 is run for the first time it will start in trial mode. This allows you to use all the functions of the application, but you are restricted to diets with only four ingredients. To get full access to all the diet ingredients please register, which is free. We ask you to register so we have an estimate of the number of people using the application. This information is used for future funding applications for further development. By not registering or if you share your registration name and number you may reduce the chance of future improvements to Rumen8.

To register send an email to support@rumen8.com.au specifying your

First name:

Last name:

Email:

Country:

Industry: Beef or dairy.

Role in industry:

Your information and email will only be used to contact you for registration purposes and very infrequently for matters concerning Rumen8 in the future. It will not be passed on to any other person or group. You should receive a registration email within 24 hours containing a registration code that is linked to your name.

If you go to the Registration option under the Help menu you can enter your name and registration number exactly as specified in the email from Rumen8 support. The best way to be sure you have entered them exactly is by using copy (control-c) and paste (control-v) to copy them from the email and then paste them into Rumen8. Click the 'Register' button and then click 'Okay' and you will return to the main window with all the feed ingredients available.

Entering registration details.

The screenshot shows a 'Registration' dialog box. The title bar includes a question mark and a close button. The main area contains two text input fields. The first field is labeled 'Enter your registration name (case sensitive)' and contains the text 'John Smith'. The second field is labeled 'Enter your registration code' and contains the text '1234567890ABCDEF'. At the bottom of the dialog, there is a status indicator that reads 'Rumen8 is not registered' and three buttons: 'Get registration', 'Register', and 'Okay'.

REMOVING YOUR RUMEN8 REGISTRATION

If you plan to give your computer to someone else, before uninstalling Rumen8 go to the Registration option under the Help menu and click the 'Deregister' button. Your name and registration code will be removed from the computer and Rumen8 will revert to trial mode.

Remove your registration details before replacing your computer.

Registration ? X

Enter your registration name (case sensitive)

Richard Morris

Enter your registration code

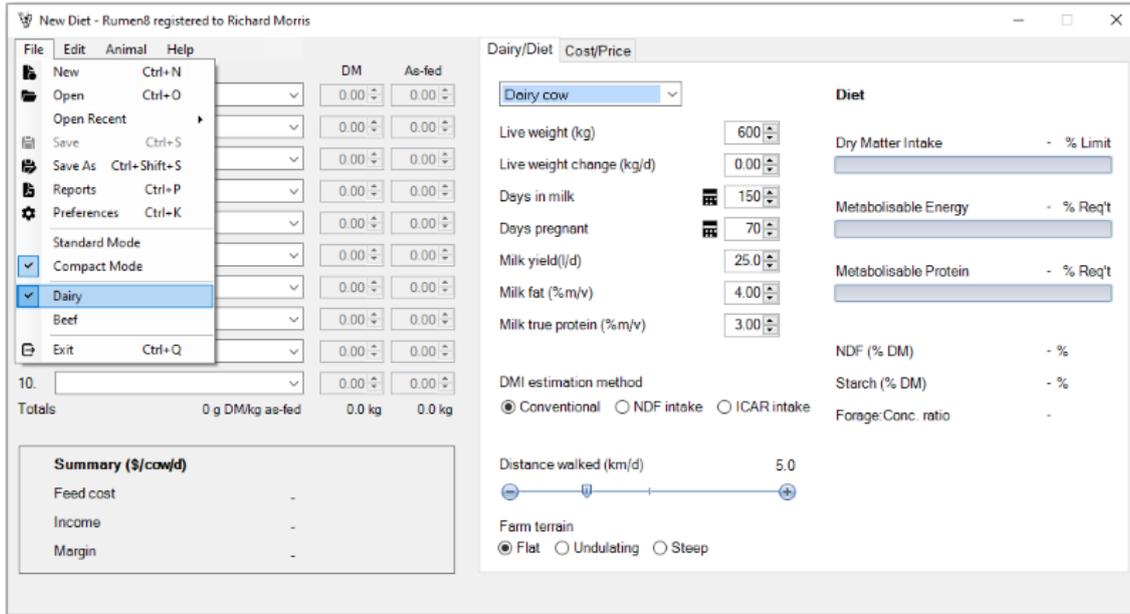
Rumen8 is registered

Deregister Okay

USING RUMEN8 WITH DAIRY CATTLE

Rumen8 can be used to create diets for beef or dairy cattle. To begin working on a diet for dairy cows select 'Dairy' from the File menu if it is not already ticked. Rumen8 will change to dairy mode.

Dairy mode is selected in the File menu.



The equations that allow Rumen8 to predict energy and protein supply from the diet and demand by the animal are all from published feeding standards. When creating diets for dairy animals Rumen8 uses equations from primarily the British publications 'Energy and Protein Requirements of Ruminants' and 'Feed into Milk: A New Applied Feeding System for Dairy Cows' from 1993 and 2004 respectively. The full reference for these publications can be found at the end of this document, along with others that are used for estimating mineral demand, feed intake and methane production for example.

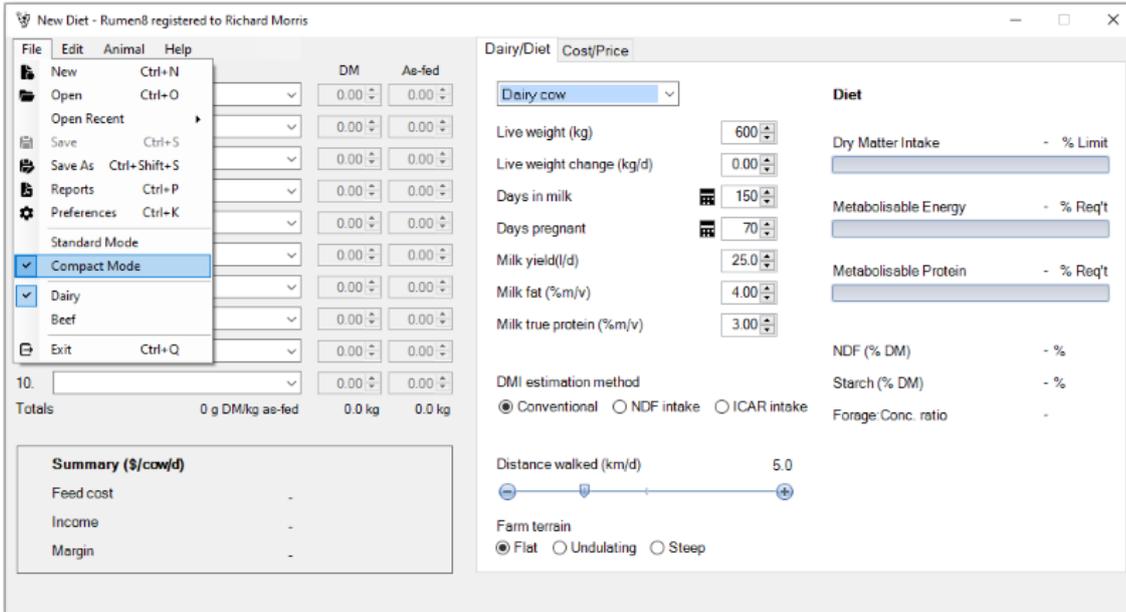
The primary feeding standards used by Rumen8 in dairy mode



QUICK START GUIDE FOR DAIRY

Rumen8 can be used in Compact or Standard mode. If this is the first time you have installed Rumen8, it will start in Compact mode which reduces the application down to the essentials. Standard mode provides access to all the functions Rumen8 provides. Compact mode is recommended for learning how to use Rumen8, and for many users, will be sufficient. Switching between modes can be done in the File menu.

Use the File menu to switch between Standard and Compact modes.



If you are unsure what something within Rumen8 is, hover your mouse over it and for most objects a tool tip will appear providing a more detailed explanation.

USING RUMEN8 IN COMPACT MODE

The main Rumen8 window when in compact mode is shown below. The Diet Ingredients section (1) is where you specify the animal diet. The tabbed section (2) is where you can provide the cow details, evaluate the current diet, adjust feed costs and milk payments. The summary section at the bottom left (3) reports feed costs, milk income and margin.

The sections of the main Rumen8 window in compact mode. Diet ingredients (1), detail tabs (2) and income and cost summary (3).

The right of the 'Dairy/Diet' tab shows how well our diet meets the cow's requirements. It doesn't show anything yet as we have not added any ingredients to the diet.

DESCRIBE A COW

Click on the 'Dairy/Diet' tab to show the cow description. Type a number in the entry box or use the up/down arrows to change the parameters of the cow you wish to feed, or the average cow that represents your herd or sub-herd. You can adjust live weight, growth rate, milk yield and components, stage of lactation and pregnancy status on the left side of the Dairy/Diet tab. You may also adjust the activity level of the cow with the distance walked slider and choose if you have a flat, undulating or steeply hilly farm. Leave the dry matter intake (DMI) estimation method set to conventional for the time being.

To quickly overwrite a value in the entry box, double-click on it. The current value will be selected and then type in the new value to replace it.

The Dairy/Diet tab.

The screenshot shows the 'New Diet - Rumen8 registered to Richard Morris' window. The 'Dairy/Diet' tab is active, displaying various parameters for a 'Dairy cow'.

	DM	As-fed
1.	0.00	0.00
2.	0.00	0.00
3.	0.00	0.00
4.	0.00	0.00
5.	0.00	0.00
6.	0.00	0.00
7.	0.00	0.00
8.	0.00	0.00
9.	0.00	0.00
10.	0.00	0.00
Totals	0 g DM/kg as-fed	0.0 kg 0.0 kg

Summary (\$/cow/d)

Feed cost	-
Income	-
Margin	-

Dairy/Diet Cost/Price

Dairy cow

Live weight (kg) 600

Live weight change (kg/d) 0.00

Days in milk 150

Days pregnant 70

Milk yield(l/d) 25.0

Milk fat (%m/v) 4.00

Milk true protein (%m/v) 3.00

DMI estimation method

Conventional NDF intake ICAR intake

Distance walked (km/d) 5.0

Farm terrain

Flat Undulating Steep

Diet

Dry Matter Intake - % Limit

Metabolisable Energy - % Req't

Metabolisable Protein - % Req't

NDF (% DM) - %

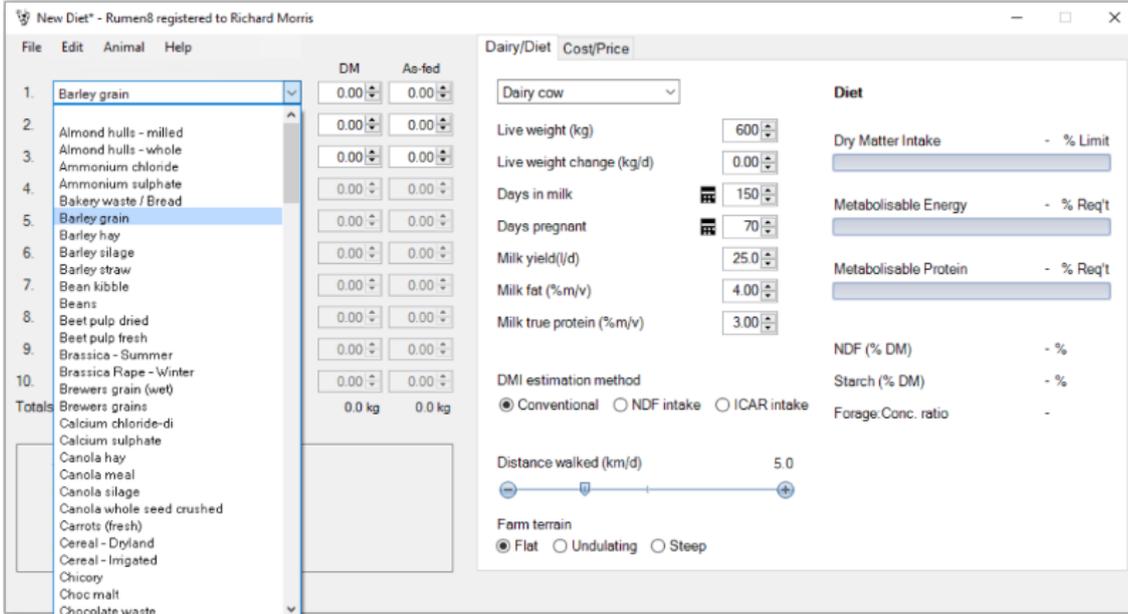
Starch (% DM) - %

Forage Conc. ratio -

ENTER A DIET

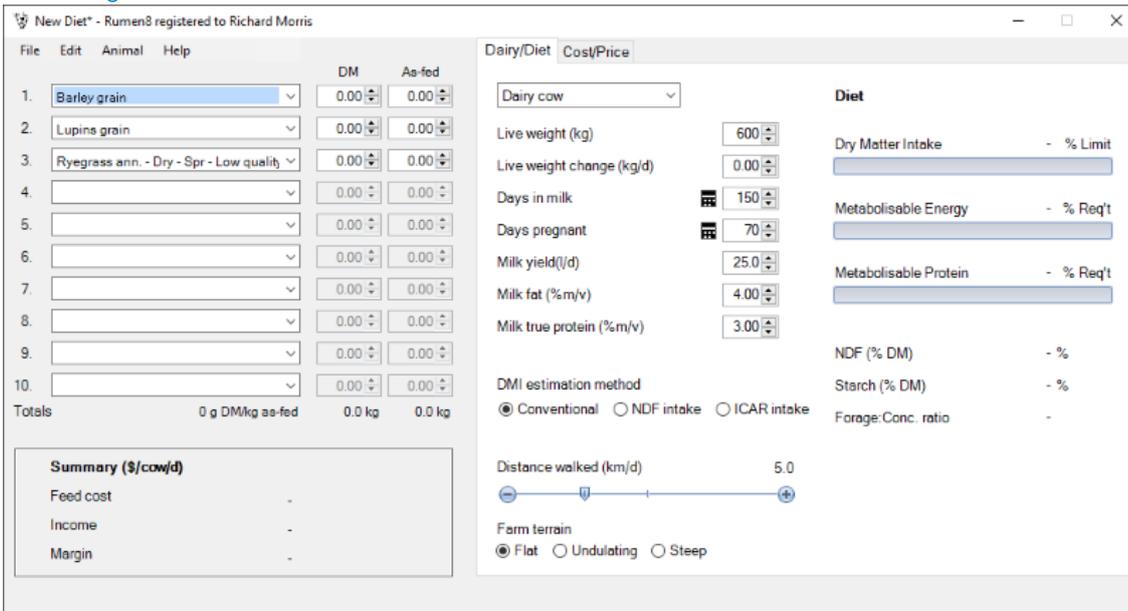
Ten ingredients can be added to a diet using the drop-down lists on the left of the window. Click on ingredient 1 and select 'Barley grain' as the first feed in the diet. To quickly jump down the list quickly type the first letter of the ingredient you wish to find.

Selecting a feed in the first diet component menu.



Select 'Lupins grain' for ingredient 2 and 'Ryegrass ann. – Dry – Spr – Low quality' in ingredient 3 (Dryland annual ryegrass of low quality). The diet should now look like the figure below.

Three ingredients in the diet.



Now let's feed our cow. Enter the amount of each ingredient fed to the cow using the 'DM' entry box to the right of their name. Enter 6 kilograms of barley grain, 1 kilograms of lupins grain and 10 kilograms of ryegrass. The window should now look like the figure below. Notice that while you

have entered the amount fed as kilograms of dry matter Rumen8 automatically shows you the amount as fed (including water) in the column to the right. You can adjust the amount with either dry or as fed quantities.

Feeding our cow.

The screenshot shows the 'New Diet' window in Rumen8. It is titled 'New Diet* - Rumen8 registered to Richard Morris'. The window is divided into several sections:

- Feed Ingredients Table:** A table with 10 rows. The first three rows are filled with 'Barley grain', 'Lupins grain', and 'Ryegrass ann. - Dry - Spr - Low quality'. The columns are 'DM' and 'As-fed'. The 'Totals' row shows 268 g DM/kg as-fed, 17.0 kg DM, and 63.5 kg as-fed.
- Summary (\$/cow/d):** A small table showing Feed cost as '-', Income as 10.03, and Margin as '-'. The title is 'Summary (\$/cow/d)'.
- Animal Parameters:** A section titled 'Dairy/Diet Cost/Price' with a dropdown menu set to 'Dairy cow'. It includes input fields for Live weight (kg) at 600, Live weight change (kg/d) at 0.00, Days in milk at 150, Days pregnant at 70, Milk yield (l/d) at 25.0, Milk fat (%m/v) at 4.00, and Milk true protein (%m/v) at 3.00. There are also radio buttons for 'DMI estimation method' (Conventional, NDF intake, ICAR intake) and 'Farm terrain' (Flat, Undulating, Steep).
- Diet Composition:** A section titled 'Diet' showing performance metrics with progress bars: Dry Matter Intake (81 % Limit), Metabolisable Energy (84 % Req't), Metabolisable Protein (95 % Req't), NDF (% DM) (41 %), Starch (% DM) (23 %), and Forage: Conc. ratio (59:41).

EVALUATE A DIET

The 'Diet' tab shows six of the parameters you need to consider when formulating a diet for dairy cows. For this example, we will consider the first three. With the current diet, we can see there is insufficient metabolisable energy (ME 84%) and protein (MP 95%) for the cow we described earlier. However, while the cows' dry matter intake progress bar is green, it is only 81% of her potential so this means she can physically eat more food if it is presented to her.

Increase the amount of barley grain to 8.4 kg, decrease the lupins to 0.5 kg and increase the ryegrass to 11.0 kg. Now you will see both ME and MP are at 100% of the cow requirement and intake potential is still below 100% so she can eat this amount of feed. Your screen should look like the figure below.

A diet balanced for energy and protein.

This brings us to an important point that is true of all nutrition models. The application tells us we have a diet that meets the ME, MP and intake requirements of our cow, but a nutritionist is unlikely to recommend this diet. The starch content is high (27%) leading to a risk of acidosis (note the warnings in red alongside the starch at the bottom of the tab). This is before we consider the cost of this diet.

Rumen8 is a tool that will assist someone with nutritional knowledge to better and more cost effectively feed their cows, but in the hands of someone without that knowledge it can create diets that appear balanced but may decrease cow performance or adversely affect their health.

We recommend Rumen8 is used with your nutritionist. Depending on your level of knowledge it can be used to adjust diets between visits by them.

This diet is now balanced for energy and protein and the cow should be able to physically eat the feed when it is presented to her. This demonstrates the start of the process when designing a diet for your cows, and you can now further refine the diet by looking at other important parameters such as starch and NDF content.

The remaining tab allows you to change milk payment and the cost of the feeds in the current

diet. With feed costs and milk price Rumen8 can show you diet costs and margins to better compare alternatives.

DIET MARGIN

Click on the Cost/Price tab. On this tab the top section allows you to enter the feed costs for each ingredient of the diet. In the bottom section you can enter the price you are paid for your milk. Enter the prices for the barley grain and lupin grain on an as fed basis as \$300 and \$350 respectively. Enter the cost of the ryegrass as \$100 per tonne of dry matter so your values should be the same as in the figure below.

Feed costs and milk payment price can be entered on the second tab called Cost/Price.

The screenshot shows the 'Cost/Price' tab in the Rumen8 software. It features a table for entering feed ingredients and their costs, a summary section for feed costs and income, and a section for milk pricing.

Dairy/Diet	Cost/Price	DM	As-fed	St DM	St as-fed	Losses (%)	St DM	St as-fed	per MJ ME	per kg CP
1. Barley grain		8.40	9.57	342	300	0	342	300	0.027	2.80
2. Lupins grain		0.50	0.56	391	350	0	391	350	0.028	1.13
3. Ryegrass ann. - Dry - Spr - Low quality		11.00	61.11	100	18	0	100	18	0.011	0.72
4.		0.00	0.00							
5.		0.00	0.00							
6.		0.00	0.00							
7.		0.00	0.00							
8.		0.00	0.00							
9.		0.00	0.00							
10.		0.00	0.00							
Totals		279 g DM/kg as-fed	19.9 kg	71.2 kg						

Summary (\$/cow/d)	
Feed cost	4.17
Income	10.03
Margin	5.86

Milk price

Fat (\$/kg) 5.10

Protein (\$/kg) 7.30

Discount (\$/L) 0.022

Payment by: Components Yield

At the bottom of the tab you can see the milk price is already entered based on a price for each kilogram of fat and protein, and a discount for volume. Changing the 'Payment by' button to 'Yield' allows you to enter a milk price per litre.

Once Rumen8 has a cost for the feeds and a milk price it can calculate a margin in the bottom left Summary section. In this example the cow is eating \$4.17 of feed each day and producing \$10.03 worth of milk giving a margin of \$5.86. This provides a simple way to compare the financial performance of different diets even when they influence milk production.

USING RUMEN8 IN STANDARD MODE

The main Rumen8 window when in standard mode is shown below. If you are currently in Compact mode you can change to Standard mode via the File menu.

The Diet Ingredients section (1) is where you specify the animal diet. The tabbed section (2) is where you can specify the cow details, evaluate the current diet, adjust feed costs and milk payments, compare alternative diets and keep notes. The costs and efficiency strip at the bottom (3) reports feed costs, milk income, feed efficiency and margins.

The sections of the main Rumen8 window. Diet ingredients (1), detail tabs (2) and diet costs and efficiencies (3).

Feed costs

\$/t DM	-
\$/MJ ME	-
\$/kg CP	-
\$/cow/d	-

Milk income

\$/L raw milk	-
\$/kg ECM	-
\$/kg MS	-
\$/cow/d	-

Feed efficiency

kg ECM/kg DM	-
g MS/kg DM	-
Feed % income	-
\$/ Milk/\$ Feed	-

Margin

\$/cow/d	-
\$/herd/d	-

Milk yield(l/d) 25.0

DESCRIBE A COW

Click on the 'Dairy' tab to edit the cow details. Using the entry sliders or typing a number in the entry box describe the cow you wish to feed, or the average cow that represents your herd or sub-herd. You can adjust live weight, growth rate, milk yield and components, stage of lactation and pregnancy status. You may also adjust the activity level of the cow with the distance walked slider and if you have a flat, undulating or steeply hilly farm.

To quickly overwrite a value in the entry box, double-click on it. The current value will be selected and then type in the new value to replace it.

The Dairy animal tab.

The screenshot shows the 'Dairy' tab in the Rumen8 software. The window title is 'New Diet* - Rumen8 registered to Richard Morris'. The interface is divided into several sections:

- Menu Bar:** File, Edit, Animal, View, Help.
- Feed List:** A list of 15 feed items, each with a dropdown menu and two input boxes for 'DM' and 'As-fed' values, all currently set to 0.00.
- Totals:** 0 g DM/kg as-fed, 0.0 kg, 0.0 kg.
- Control Panel:**
 - Species: Dairy cow, Breed: Holstein.
 - Live weight (kg): 600 (with slider).
 - Live weight change (kg/d): 0.00 (with slider).
 - Days in milk: 150 (with slider).
 - Days pregnant: 70 (with slider).
 - Number of animals in herd: 1 (with slider).
 - Milk yield (l/d): 25.0 (with slider).
 - Milk fat (%m/v): 4.00 (with slider).
 - Milk true protein (%m/v): 3.00 (with slider).
 - Fat:Protein ratio: 1.33.
 - Fat, Protein, F+P (kg/d): 1.00, 0.75, 1.75.
 - Energy corrected milk: 24.6 kg/d.
 - DMI estimation method: Conventional, NDF intake, ICAR intake.
 - Farm terrain: Flat, Undulating, Steep.
 - Distance walked (km/d): 5.0 (with slider).
- Summary Table:**

Feed costs		Milk income		Feed efficiency		Margin	
\$/t DM	-	\$/L raw milk	-	kg ECM/kg DM	-	\$/cow/d	-
\$/MJ ME	-	\$/kg ECM	-	g MS/kg DM	-	\$/herd/d	-
\$/kg CP	-	\$/kg MS	-	Feed % income	-		
\$/cow/d	-	\$/cow/d	-	\$/Milk/\$ Feed	-	Milk yield(l/d)	25.0

Now click on the 'Diet' tab to the right of the 'Dairy' tab to view how well our diet will feed the cow. It does not show anything as we have not added any ingredients to the diet yet.

The Diet tab.

New Diet* - Rumen8 registered to Richard Morris

File Edit Animal View Help

Dairy Diet Diet detail Price Feed cost Compare Split herd Notes

	DM	As-fed
1.	0.00	0.00
2.	0.00	0.00
3.	0.00	0.00
4.	0.00	0.00
5.	0.00	0.00
6.	0.00	0.00
7.	0.00	0.00
8.	0.00	0.00
9.	0.00	0.00
10.	0.00	0.00
11.	0.00	0.00
12.	0.00	0.00
13.	0.00	0.00
14.	0.00	0.00
15.	0.00	0.00
Totals	0 g DM/kg as-fed	0.0 kg 0.0 kg

Dry Matter Intake - % Limit

Metabolisable Energy - % Req't

Metabolisable Protein - % Req't

Calcium - % Req't

Phosphorus - % Req't

Magnesium - % Req't

NDF (% DM) - %

Starch (% DM) - %

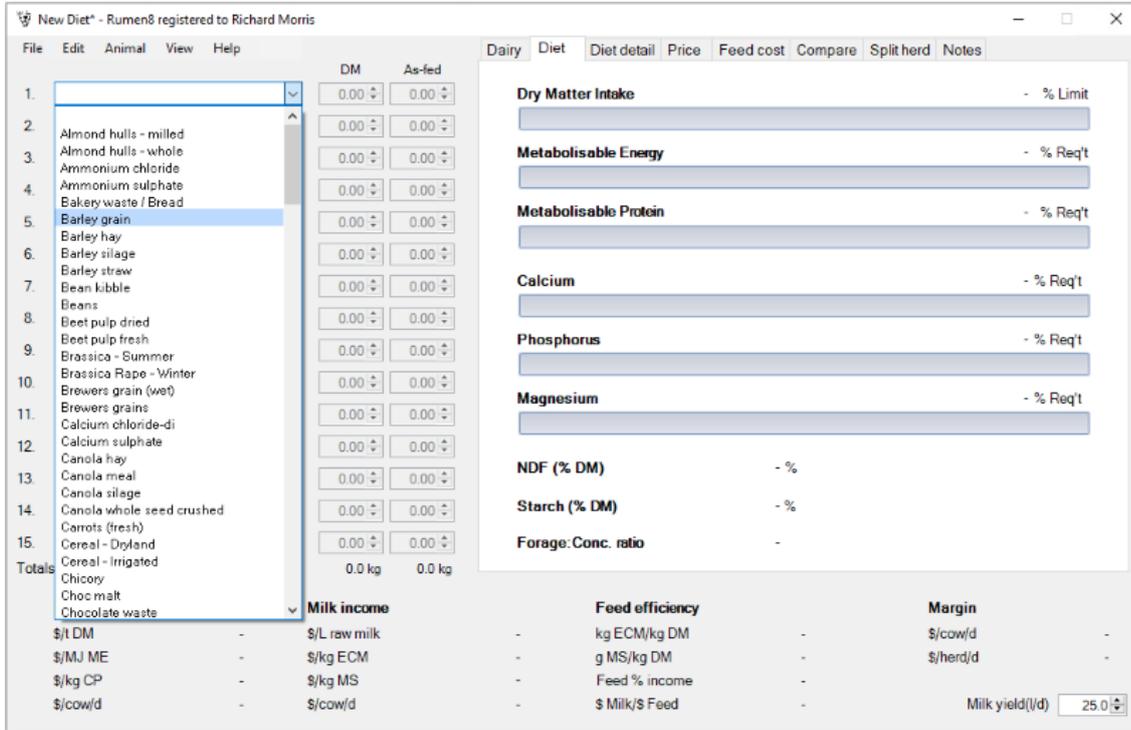
Forage.Conc. ratio -

Feed costs	Milk income	Feed efficiency	Margin
\$/t DM	\$/L raw milk	kg ECM/kg DM	\$/cow/d
\$/MJ ME	\$/kg ECM	g MS/kg DM	\$/herd/d
\$/kg CP	\$/kg MS	Feed % income	
\$/cow/d	\$/cow/d	\$/Milk/\$ Feed	Milk yield(l/d) 25.0

ENTER A DIET

Fifteen ingredients can be added to a diet using the drop-down lists on the left of the window. Click on ingredient 1 and select 'Barley grain' as our first feed in the diet. To quickly jump down the list quickly type the first letter of the ingredient you wish to find.

Selecting a feed in the first diet component menu.



Select 'Lupins grain' for ingredient 2 and 'Ryegrass ann. – Dry – Spr – Low quality' in ingredient 3 (Dryland annual ryegrass of low quality). The diet should now look like the figure below.

Three ingredients in the diet.

The screenshot shows the 'New Diet' window in Rumen8. The diet list contains three ingredients: Barley grain, Lupins grain, and Ryegrass ann. - Dry - Spr - Low quality. The 'DM' and 'As-fed' columns are currently empty. The summary panel on the right shows zero values for all metrics, including Dry Matter Intake, Metabolisable Energy, Metabolisable Protein, Calcium, Phosphorus, Magnesium, NDF (% DM), Starch (% DM), and Forage:Conc. ratio. The bottom section shows feed costs, milk income, feed efficiency, and margin, all with zero values.

Now let's feed our cow. Enter the amount of each ingredient fed to the cow using the 'DM' entry box to the right of their name. Enter 6 kilograms of barley grain, 1 kilograms of lupins grain and 10 kilograms of ryegrass. The window should now look like the figure below. Notice that while you have entered the amount fed as kilograms of dry matter Rumen8 automatically shows you the amount as fed in the column to the right and you can adjust the amounts with either quantity.

Feeding our cow.

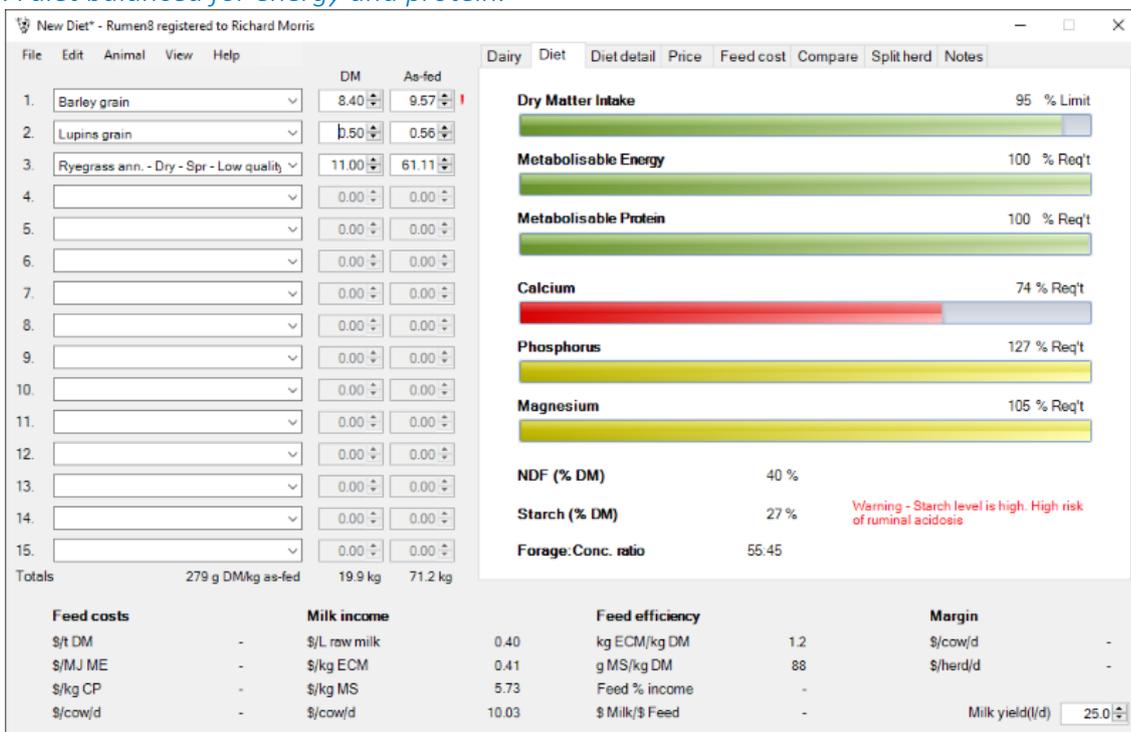
The screenshot shows the 'New Diet' window with the three ingredients. The 'DM' and 'As-fed' columns now contain values: Barley grain (8.40 DM, 9.57 As-fed), Lupins grain (1.50 DM, 0.56 As-fed), and Ryegrass ann. (11.00 DM, 61.11 As-fed). The summary panel on the right shows updated values: Dry Matter Intake (95 % Limit), Metabolisable Energy (100 % Req't), Metabolisable Protein (100 % Req't), Calcium (74 % Req't), Phosphorus (127 % Req't), Magnesium (105 % Req't), NDF (% DM) (40 %), Starch (% DM) (27 %), and Forage:Conc. ratio (55.45). A warning message is displayed: 'Warning - Starch level is high. High risk of ruminal acidosis'. The bottom section shows updated feed costs, milk income, feed efficiency, and margin.

EVALUATE A DIET

The 'Diet' tab shows nine of the parameters you need to consider when formulating a diet for dairy cows. For this example, we will consider the first three. With the current diet, we can see there is insufficient metabolisable energy (ME 84%) and protein (MP 95%) for the cow we described earlier. However, the cows' dry matter intake is only 91% of her potential so this means she can physically eat more food if it is presented to her.

Increase the amount of barley grain to 8.4 kg, decrease the lupins to 0.5 kg and increase the ryegrass to 11.0 kg. Now you will see both ME and MP are at 100% of the cow requirement and intake potential is still below 100% so she can eat this amount of feed. Your screen should look like the figure below.

A diet balanced for energy and protein.



This brings us to an important point that is true of all nutrition models. The application tells us we have a diet that meets the ME, MP and intake requirements of our cow, but a nutritionist is unlikely to recommend this diet. The starch content is high (27%) leading to a risk of acidosis (note the warnings in red alongside the starch at the bottom of the tab). This is before we consider the cost of this diet.

Rumen8 is a tool that will assist someone with nutritional knowledge to better and more cost effectively feed their cows, but in the hands of someone without that knowledge it can create diets that appear balanced on paper but may decrease cow performance or adversely affect their health.

We recommend Rumen8 is used with your nutritionist. Depending on your level of knowledge it can be used to adjust diets between visits by them.

This diet is now balanced for energy and protein and the cow should be able to physically eat the feed when it is presented to her. This demonstrates the process when designing a diet for your

cows, and you can now further refine the diet by looking at other important parameters such as starch and NDF content. Additional information about the current diet is presented in the 'Diet detail' tab to the right.

DIET MARGIN

Click on the Feed cost tab. On this tab you enter the feed costs for each ingredient of the diet. Enter the prices for the barley grain and lupin grain on an as fed basis as \$300 and \$350 respectively. Enter the cost of the ryegrass as \$100 per tonne of dry matter so your values should be the same as in the figure below. You will see the Feed costs section in the bottom left of the window show several different ways to evaluate the cost of this diet.

Feed costs can be entered on the tab called Feed cost.

The screenshot shows the 'New Diet' window with the 'Feed cost' tab selected. The interface is divided into several sections:

- Ingredient List:** A list of 15 ingredients with dropdown menus and input fields for DM and As-fed values.

	DM	As-fed
1. Barley grain	8.40	9.57
2. Lupins grain	0.50	0.56
3. Ryegrass ann. - Dry - Spr - Low quality	11.00	61.11
4.	0.00	0.00
5.	0.00	0.00
6.	0.00	0.00
7.	0.00	0.00
8.	0.00	0.00
9.	0.00	0.00
10.	0.00	0.00
11.	0.00	0.00
12.	0.00	0.00
13.	0.00	0.00
14.	0.00	0.00
15.	0.00	0.00
- Table:** A table with columns: Dairy, Diet, Diet detail, Price, Feed cost, Compare, Split herd, Notes.

Dairy	Diet	Diet detail	Price	Feed cost	Compare	Split herd	Notes
S/t DM	S/t as-fed	Losses (%)	S/t DM	S/t as-fed	per MJ ME	per kg CP	
342	300	0	342	300	0.027	2.80	
391	350	0	391	350	0.028	1.13	
100	18	0	100	18	0.011	0.72	
- Totals:** 279 g DM/kg as-fed, 19.9 kg, 71.2 kg
- Summary Section:**

Feed costs		Milk income		Feed efficiency		Margin	
\$/t DM	209	\$/L raw milk	0.40	kg ECM/kg DM	1.2	\$/cow/d	5.86
\$/MJ ME	0.019	\$/kg ECM	0.41	g MS/kg DM	88	\$/herd/d	-
\$/kg CP	1.53	\$/kg MS	5.73	Feed % income	42		
\$/cow/d	4.17	\$/cow/d	10.03	\$/Milk/\$ Feed	2.407	Milk yield(l/d)	25.0

Now click on the tab called Price. Here you can enter how much you receive for your milk. You can see the milk price is already entered based on a price for each kilogram of fat and protein, and a discount for volume. Changing the 'Payment by' button to 'Yield' allows you to enter a milk price per litre. Make sure the fat price is \$5.10, the protein price is \$7.30 and the discount is \$0.022 per litre for the first row of prices. You can enter up to 12 different prices for milk and easily switch between them.

Milk prices can be entered on the tab called Price.

The screenshot shows the 'Price' tab in the Rumen8 software. It features a list of feed ingredients on the left, a central table for selecting feed components, and a summary section at the bottom.

Ingredient	DM	As-fed	Component	Fat (\$/kg)	Protein (\$/kg)	Discount (\$/L)	Equivalent (\$/L)
1. Barley grain	8.40	9.57	<input checked="" type="radio"/> 1.	5.10	7.30	0.022	0.401
2. Lupins grain	0.50	0.56	<input type="radio"/> 2.	0.00	0.00	0.000	0.000
3. Ryegrass ann. - Dry - Spr - Low quality	11.00	61.11	<input type="radio"/> 3.	0.00	0.00	0.000	0.000
4.	0.00	0.00	<input type="radio"/> 4.	0.00	0.00	0.000	0.000
5.	0.00	0.00	<input type="radio"/> 5.	0.00	0.00	0.000	0.000
6.	0.00	0.00	<input type="radio"/> 6.	0.00	0.00	0.000	0.000
7.	0.00	0.00	<input type="radio"/> 7.	0.00	0.00	0.000	0.000
8.	0.00	0.00	<input type="radio"/> 8.	0.00	0.00	0.000	0.000
9.	0.00	0.00	<input type="radio"/> 9.	0.00	0.00	0.000	0.000
10.	0.00	0.00	<input type="radio"/> 10.	0.00	0.00	0.000	0.000
11.	0.00	0.00	<input type="radio"/> 11.	0.00	0.00	0.000	0.000
12.	0.00	0.00	<input type="radio"/> 12.	0.00	0.00	0.000	0.000
13.	0.00	0.00					
14.	0.00	0.00					
15.	0.00	0.00					
Totals	279 g DM/kg as-fed	19.9 kg					

Feed costs		Milk income		Feed efficiency		Margin	
\$/t DM	209	\$/L raw milk	0.40	kg ECM/kg DM	1.2	\$/cow/d	5.86
\$/MJ ME	0.019	\$/kg ECM	0.41	g MS/kg DM	88	\$/herd/d	-
\$/kg CP	1.53	\$/kg MS	5.73	Feed % income	42		
\$/cow/d	4.17	\$/cow/d	10.03	\$/Milk/\$ Feed	2.407		

Once Rumen8 has a cost for the feeds and a milk price it can calculate a margin in the right of the bottom section of the window. In this example the cow is eating \$4.17 of feed each day and producing \$10.03 worth of milk giving a margin of \$5.86. This provides a simple way to compare the financial performance of different diets even when they influence milk production.

The remaining tabs have various functions that make creating diets faster and easier. Use the 'Compare' tab to save and compare up to six related diets before choosing the best one. The 'Split herd' tab is used to create combined diets for herds made up of different calving groups of cows. The 'Notes' tab allows you to keep a description of the diet for reference in the future. How to use these functions is discussed in the 'Using Rumen8' section of this guide.

THE PROBLEM OF MEASURING PASTURE INTAKE

It all sounds simple, choose the ingredients your cows are being fed, enter the quantities you provide and balance the diet. Easy, but what about grazed pasture? Accurately measuring how much grazed pasture a cow eats is expensive and time consuming so may not be done on farm. To solve this problem, we 'back calculate' how much pasture the cows are predicted to eat by subtraction of all the feed ingredients you do know. It is easier than it sounds.

1. Enter the values that describe the average cow in your herd on the 'Dairy' tab. Include the current milk production and yield. Rumen8 will calculate the metabolisable energy needed for the cow and this is displayed on the 'Diet' and 'Diet detail' tabs.
2. Add all the supplementary feed provided to the cows using the ingredients drop-down lists. This includes grain fed in the dairy and forages in the paddock. Everything except grazed pasture.
3. Rumen8 now calculates the metabolisable energy provided by the supplements and the difference between this and the cow's requirement must be supplied by grazed pasture. This is shown on the 'Diet detail' tab as the 'Balance' under the 'Metabolisable energy' section and the remaining percentage of the metabolisable energy bar on the 'Diet' tab.
4. Select a suitable pasture for your farm and time of year as the next diet ingredient. Increase the quantity of this until the metabolisable energy provided by the diet is the same as the requirement of the cow.

You now have the diet that reflects the current situation with an estimate of the amount of pasture each cow is eating. With this information you can explore alternative diets that include pasture assuming you maintain the amount of pasture on offer for the herd in the future.

RUMEN8 WARNINGS

Rumen8 will sometimes display a red exclamation mark to draw your attention to something that may be wrong with a diet or parameter value you have entered. For example, if the days pregnant and days in milk values result in the cow getting back in calf within 40 days after calving a red exclamation mark appears next to the entry boxes for these parameters suggesting you should double check the values.

In the previous examples you can see a red exclamation mark alongside the ingredient barley grain. This means the quantity of barley in the diet exceeds the recommended maximum. If you hover your mouse over the exclamation mark a tool tip will appear giving you more details about the issue.

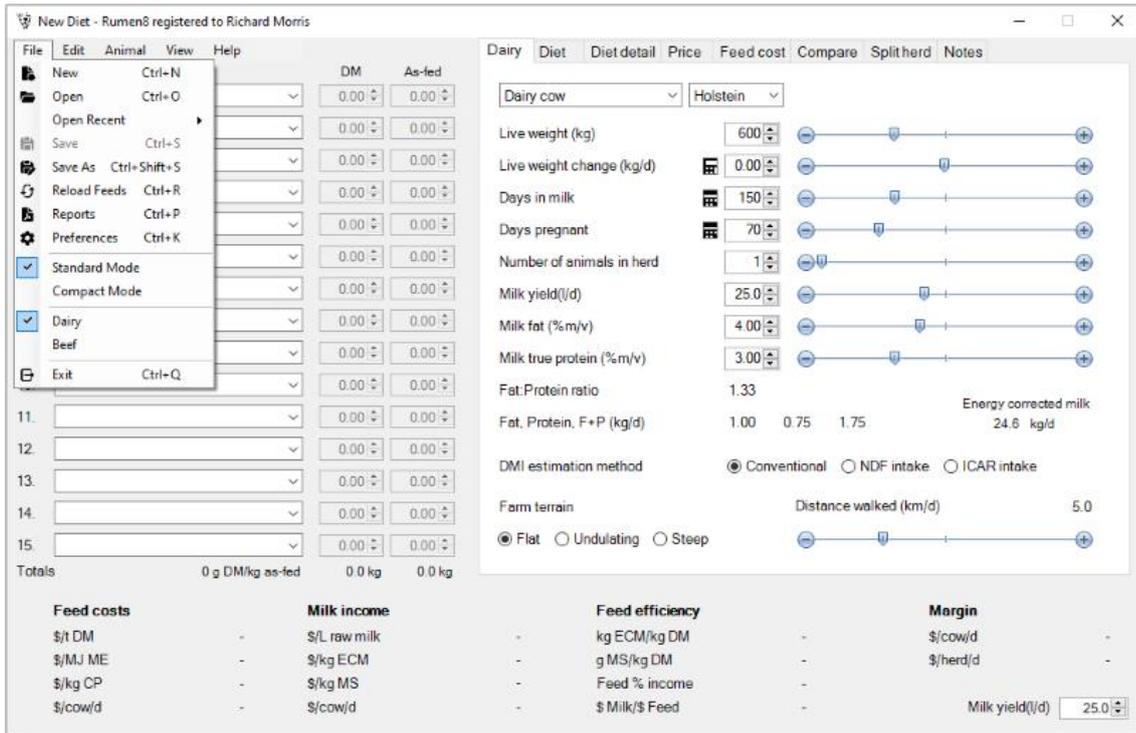
! When you see a red exclamation mark mouse over it and the tool tip will tell you what is wrong.

MENU COMMANDS FOR DAIRY

The menu is along the top of the main window and has five choices, File, Edit, Animal, View and Help.

FILE MENU

The File menu.



<i>New</i>	Start a new diet. The current diet will be cleared, the animal will revert to the default values, diets stored in the Compare tab will be cleared, split herds cleared and any notes erased. If the current diet has not been saved you will be prompted to do this before the diet is cleared.
<i>Open</i>	Allows you to load a previously saved diet. A warning will appear if the milk price or dry matter intake parameters have changed since the diet was saved. These warnings can be disabled in the Preferences. You can also import diet files from version 2 of Rumen8 by selecting the file type 'Rumen8 v2 files (*.csv)' in the Open dialog box.
<i>Open Recent</i>	The sub-menu shows a list of the previous 5 diet files to be opened. To re-open one of these select it from the list. To remove all the previous diet files from the list select the Clear option at the bottom of the sub-menu.
<i>Save</i>	Save the current diet. This is only available if the diet has been previously named and saved using the 'Save As' menu.
<i>Save As</i>	Name and then save the current diet. If changes to the current diet have not been saved an * will appear next to the diet name in the title bar.
<i>Reload feeds</i>	This updates all the feed data from the feed library. This is useful if you have multiple instances of Rumen8 running and have made a change to a feed in one of them and wish to quickly update the others.
<i>Reports</i>	Opens the report designer that creates diet reports for printing or to be saved as a PDF document.
<i>Preferences</i>	Opens the Preferences allowing you to change Rumen8 settings. A more detailed explanation is given in the Preferences section.
<i>Standard Mode</i>	When ticked all of Rumen8's functions are available.
<i>Compact Mode</i>	When ticked the Rumen8 window is reduced to the essentials required to balance a diet based on energy, protein, fibre and starch.
<i>Dairy</i>	When ticked Rumen8 is in dairy mode. Select to switch to dairy mode.
<i>Beef</i>	When ticked Rumen8 is in beef mode. Select to switch to beef mode.
<i>Exit</i>	Close Rumen8. You will be prompted to save an unsaved diet.

EDIT MENU

The Edit menu.

File Edit Animal View Help

- Edit Feeds Ctrl+F
- Search Feeds
- Copy Diet Ctrl+C
- Copy All Diets Ctrl+A
- Clear Current Diet
- Create Mix From Diet
- Feed Library
- Preferences Library
- Prices Library
- All Libraries

Totals

0 g DM/kg as-fed	0.00	0.00
DM	0.00	0.00
As-fed	0.00	0.00

Feed costs

\$/t DM	-
\$/MJ ME	-
\$/kg CP	-
\$/cow/d	-

Milk income

\$/L raw milk	-
\$/kg ECM	-
\$/kg MS	-
\$/cow/d	-

Feed efficiency

kg ECM/kg DM	-
g MS/kg DM	-
Feed % income	-
\$/Milk/\$ Feed	-

Margin

\$/cow/d	-
\$/herd/d	-
Milk yield(l/d)	25.0

Edit Feeds	Opens the Feed Editor to change feeds and mixes and the ingredients available in the ingredient drop-down lists. A more detailed explanation is given in the Feed Editor section.
Search Feeds	Opens the Search window that allows the feed library to be searched for feeds containing text entered by the user.
Copy Diet	Copy the current diet to the clipboard for later pasting into Excel or Word for example.
Copy All Diets	Copy the current diet and the three stored diets to the clipboard.
Clear Current Diet	Removes all the ingredients from the diet.
Create Mix From Diet	Opens a window that allows a new mix to be created from the current diet feeds (not mixes). See below for more information.
Feed Library	If multiple feed libraries have been created in the Feed Editor they can be selected by name using this sub-menu.
Preferences Library	If multiple Preferences libraries have been created in the Preferences they can be selected by name using this sub-menu. <i>This option is not available in Compact mode.</i>
Prices Library	If multiple Prices libraries have been created on the Price tab they can be selected by name using this sub-menu. <i>This option is not available in Compact mode.</i>
All Libraries	<p>If a feed, preferences and prices library are given the same name they are referred to as a library set and will appear in this sub-menu. Selecting one of these library sets will change all three libraries at once. <i>This option is not available in Compact mode.</i></p> <p>This is useful if you are using Rumen8 in different countries. For example, if you are based in Kenya but also consult in Uganda you can create feed, preferences and prices libraries specific to Kenya and give them all the same name, such as 'Kenya'. Also create three additional libraries specific to Uganda and make sure they are all called 'Uganda'. Now under the 'All Libraries' sub-menu you can select Kenya or Uganda and quickly switch between library sets.</p> <p>Library sets must contain all three library types and have exactly the same name before they will appear in the 'All Libraries' menu.</p>

Searching for a feed

Open the Feed Search window via the Edit menu. At the top left you can enter all or part of a feed's name (1). Click the Search button (2) to search through the current feed library for feeds that contain the entered text in their name, species name or other names. The number of feeds found is displayed at the top right of the window (3) and the feeds below in the main part of the search window (4).

By default only the selected feeds in the current feed library are displayed. To widen the search you can also include unselected feeds (5) and other feed libraries (6).

The feed search window available from the Edit menu.

Q Feed Search X

Barley Unselected All libraries Feeds found: 5

Selected	Name	Species	Other names	Library
<input checked="" type="checkbox"/>	Barley grain	Hordeum vulgare L.	Barley [English]; orge, escourgeon [French]; cebada [Spanish]; cevada [Portuguese]; Amindelig Byg [Danish]; Gerst [Dutch]; Ó [Haitian Creole]; jela [Indonesian]; orzo [Italian]; shayri [Swahili]; sebada [Tagalog]; arpa [Turkish]; Đai mach [Vietnamese]; 7-ih [Arabic]; 7-ih [Amharic]; شَعِير [Arabic]; বর [Bengali]; မုလ် [Burmese]; 大麦 [Chinese]; Κοιθόρι [Greek]; אשורון תרבותית [Hebrew]; च [Hindi]; 才ム [Japanese]; ಪರ್ಲೆ [Kannada]; 보리 [Korean]; മലയാളം [Malayalam]; جو [Persian]; ਜ [Punjabi]; Ячмень [Russian]; கரும்பெருந்தண்ட [Tamil]; బియ్యం [Telugu]; ๖๖๖๖ [Thai]	Default
<input checked="" type="checkbox"/>	Barley hay	Hordeum vulgare L.	Barley [English]; orge, escourgeon [French]; cebada [Spanish]; cevada [Portuguese]; Amindelig Byg [Danish]; Gerst [Dutch]; Ó [Haitian Creole]; jela [Indonesian]; orzo [Italian]; shayri [Swahili]; sebada [Tagalog]; arpa [Turkish]; Đai mach [Vietnamese]; 7-ih [Arabic]; 7-ih [Amharic]; شَعِير [Arabic]; বর [Bengali]; မုလ် [Burmese]; 大麦 [Chinese]; Κοιθόρι [Greek]; אשורון תרבותית [Hebrew]; च [Hindi]; 才ム [Japanese]; ಪರ್ಲೆ [Kannada]; 보리 [Korean]; മലയാളം [Malayalam]; جو [Persian]; ਜ [Punjabi]; Ячмень [Russian]; கரும்பெருந்தண்ட [Tamil]; బియ్యం [Telugu]; ๖๖๖๖ [Thai]	Default
<input checked="" type="checkbox"/>	Barley silage	Hordeum vulgare L.	Barley [English]; orge, escourgeon [French]; cebada [Spanish]; cevada [Portuguese]; Amindelig Byg [Danish]; Gerst [Dutch]; Ó [Haitian Creole]; jela [Indonesian]; orzo [Italian]; shayri [Swahili]; sebada [Tagalog]; arpa [Turkish]; Đai mach [Vietnamese]; 7-ih [Arabic]; 7-ih [Amharic]; شَعِير [Arabic]; বর [Bengali]; မုလ် [Burmese]; 大麦 [Chinese]; Κοιθόρι [Greek]; אשורון תרבותית [Hebrew]; च [Hindi]; 才ム [Japanese]; ಪರ್ಲೆ [Kannada]; 보리 [Korean]; മലയാളം [Malayalam]; جو [Persian]; ਜ [Punjabi]; Ячмень [Russian]; கரும்பெருந்தண்ட [Tamil]; బియ్యం [Telugu]; ๖๖๖๖ [Thai]	Default
<input checked="" type="checkbox"/>	Barley straw	Hordeum vulgare L.	Barley [English]; orge, escourgeon [French]; cebada [Spanish]; cevada [Portuguese]; Amindelig Byg [Danish]; Gerst [Dutch]; Ó [Haitian Creole]; jela [Indonesian]; orzo [Italian]; shayri [Swahili]; sebada [Tagalog]; arpa [Turkish]; Đai mach [Vietnamese]; 7-ih [Arabic]; 7-ih [Amharic]; شَعِير [Arabic]; বর [Bengali]; မုလ် [Burmese]; 大麦 [Chinese]; Κοιθόρι [Greek]; אשורון תרבותית [Hebrew]; च [Hindi]; 才ム [Japanese]; ಪರ್ಲೆ [Kannada]; 보리 [Korean]; മലയാളം [Malayalam]; جو [Persian]; ਜ [Punjabi]; Ячмень [Russian]; கரும்பெருந்தண்ட [Tamil]; బియ్యం [Telugu]; ๖๖๖๖ [Thai]	Default
<input checked="" type="checkbox"/>	Malted barley screenings	Hordeum vulgare L.	Malt distillers grain, malt distillers grains, malt distiller's grain, draft Barley dark grains, malt distillers dark grains, barley distillers dark grains, dried dark grains Barley distillers grain, barley distillers grains	Default

Creating a mix from the current diet

The mix creation window allows a new mix to be created from the current diet feeds (not mixes). Each ingredient can be removed from the mix by unticking the box to the left of the feed name (1). Each feed displays the quantity in the new mix on a dry matter and as fed basis, and the percentage of the mix it makes up (2).

To the right of the ingredient list you can select if the mix percentages are based on dry or as fed quantities and check the total mix dry matter content and number of ingredients (3).

Below are the normal mix parameters like those in the Feed Editor mix tab (4). The mix must have a unique name among existing feeds and mixes. The heading 'Name' will turn red if this is not the case and you will be unable to click on the 'Okay' button to create the mix.

Once you are happy with the mix definition, have given it a unique name and provided as many of the optional parameters as you wish, click on the 'Okay' button to save it to the current feed library.

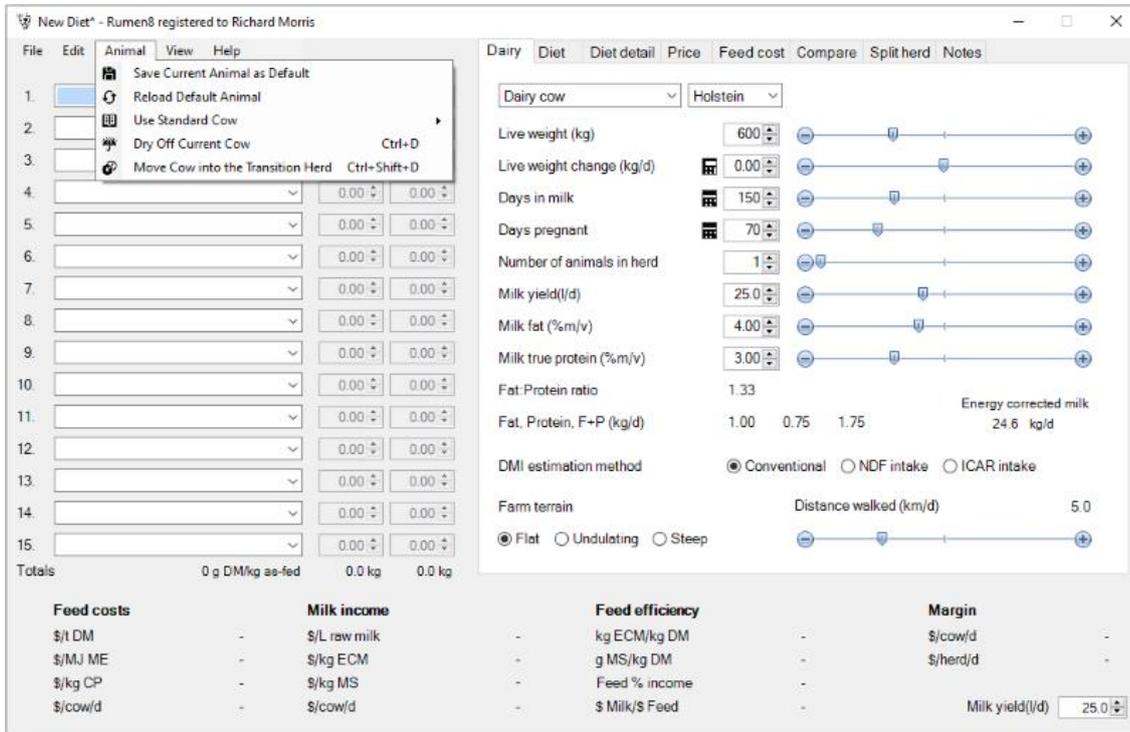
The mix creation tool available from the Edit menu.

Create a mix from the current diet

Include ingredient	DM	As-Fed	Mix (%)	Mix parameters	
1. <input checked="" type="checkbox"/> Barley grain	8.4	9.6	42.2	Mix percentages <input checked="" type="radio"/> Dry matter <input type="radio"/> As-fed	
2. <input checked="" type="checkbox"/> Lupins grain	0.5	0.6	2.5	Dry matter content: 27.9%	
3. <input checked="" type="checkbox"/> Ryegrass ann. - Dry - Spr - Low quality (Aust)	11.0	61.1	55.3	Number of ingredients: 3	
4. <input type="checkbox"/> None	-	-	-	Name <input type="text" value="A new mix"/> Max feeding rate (g/kg) <input type="text"/> Wet density (kg/m3) <input type="text"/> Mix cost (\$/t) <input type="text"/> Ingredients cost (\$/t) <input type="text"/> Losses (%) <input type="text"/> Source <input type="text"/> Comment <input type="text"/> <input type="button" value="Okay"/> <input type="button" value="Cancel"/>	
5. <input type="checkbox"/> None	-	-	-		
6. <input type="checkbox"/> None	-	-	-		
7. <input type="checkbox"/> None	-	-	-		
8. <input type="checkbox"/> None	-	-	-		
9. <input type="checkbox"/> None	-	-	-		
10. <input type="checkbox"/> None	-	-	-		
11. <input type="checkbox"/> None	-	-	-		
12. <input type="checkbox"/> None	-	-	-		
13. <input type="checkbox"/> None	-	-	-		
14. <input type="checkbox"/> None	-	-	-		
15. <input type="checkbox"/> None	-	-	-		
Total (kg)	19.9	71.2	100.0		DM <input type="text"/> as-fed <input type="text"/> 209 58

ANIMAL MENU

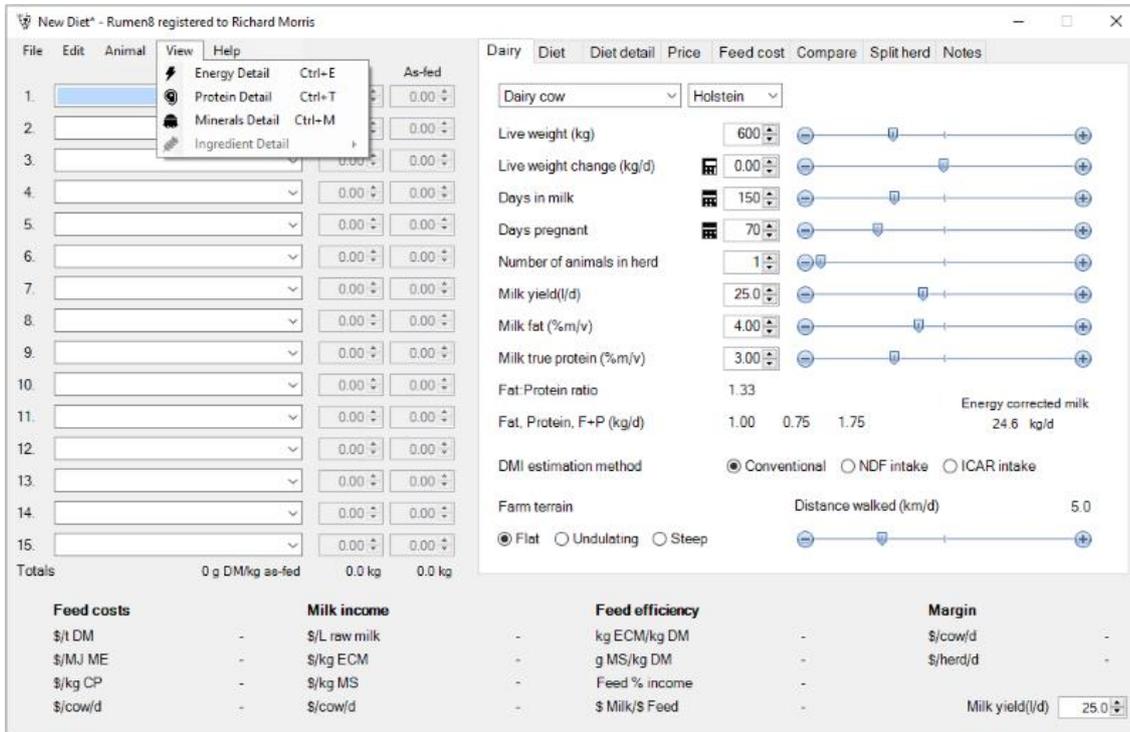
The Animal menu.



Save current animal as the default	Save the current animal as the default that will be loaded each time Rumen8 starts.
Reload default animal	Replace the current animal with the default animal.
Use standard animal	Replace the current animal with a pre-defined generic cow in early, mid or late lactation for total lactation production of 2000 to 10000 litres. These definitions should only be used for general analyses. For on-farm use actual milk production and composition for the herd of interest should be used.
Dry off the current animal	Change the parameters for the current animal as if it had been dried off and was at the start of a 60-day dry period.
Move cow into the transition herd	Changes the parameters for the current animal to one that is 3 weeks prior to calving and has entered the transition or close-up period (i.e., last 3 weeks before calving).

VIEW MENU

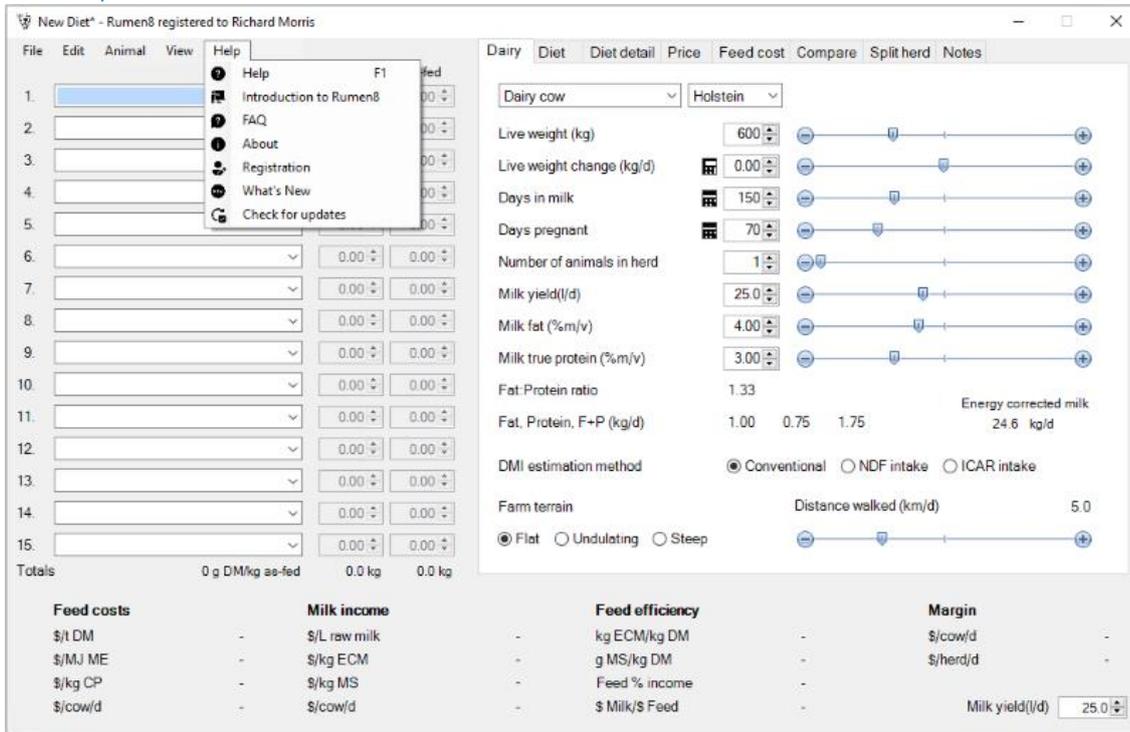
The View menu.



<i>Energy detail</i>	Displays the details of the metabolisable energy demand calculated for the animal.
<i>Protein detail</i>	Displays the details of the metabolisable protein supply and demand calculated for the animal.
<i>Minerals detail</i>	Displays the details of the calcium, phosphorus and magnesium demand and supply.
<i>Ingredient detail</i>	Displays the attributes of a of diet ingredient. The sub-menu allows you to choose from ingredient 1 to 15.

HELP MENU

The Help menu.



Help	Opens a context sensitive version of this document.
Introduction to Rumen8	Starts an introductory tutorial that explains the basics of creating a diet in Rumen8.
FAQ	Opens the default browser and displays the FAQ page on the Rumen8 website.
About	Display information about Rumen8 such as the version number, website address and email for support. You can also access the Acknowledgements, End user license agreement and a list of references of publications used to create Rumen8.
Registration	Enter your registration number and name here to unlock all the diet ingredients.
What's new	Lists all the changes to each version of Rumen8.
Check for updates	Check to see if a newer version of Rumen8 is available. This can only be done if your computer is connected to the Internet.

USING RUMEN8 FOR DAIRY

This section will describe the main parts of the Rumen8 window and how you use them.

DIET INGREDIENTS

The left section of the main window is where you add ingredients to your diet and specify the quantity fed each day. In the figure below it is highlighted within a red rectangle.

The diet ingredients section of the main window shown within the red rectangle.

The screenshot shows the Rumen8 software interface. The left side of the window is a table for adding diet ingredients, with a red rectangle highlighting it. The table has columns for ingredient number, a drop-down menu, and two columns for quantity: 'DM' and 'As-fed'. The right side of the window contains various sliders and input fields for diet parameters such as Live weight (kg), Live weight change (kg/d), Days in milk, Days pregnant, Number of animals in herd, Milk yield (l/d), Milk fat (%m/v), Milk true protein (%m/v), Fat:Protein ratio, Fat, Protein, F+P (kg/d), DMI estimation method, and Farm terrain. At the bottom, there are summary statistics for Feed costs, Milk income, Feed efficiency, and Margin.

	DM	As-fed
1.	0.00	0.00
2.	0.00	0.00
3.	0.00	0.00
4.	0.00	0.00
5.	0.00	0.00
6.	0.00	0.00
7.	0.00	0.00
8.	0.00	0.00
9.	0.00	0.00
10.	0.00	0.00
11.	0.00	0.00
12.	0.00	0.00
13.	0.00	0.00
14.	0.00	0.00
15.	0.00	0.00
Totals	0 g DM/kg as-fed	0.0 kg

Feed costs	Milk income	Feed efficiency	Margin
\$/t DM	\$/L raw milk	kg ECM/kg DM	\$/cow/d
\$/MJ ME	\$/kg ECM	g MS/kg DM	\$/herd/d
\$/kg CP	\$/kg MS	Feed % income	
\$/cow/d	\$/cow/d	\$/Milk/\$ Feed	Milk yield(l/d) 25.0

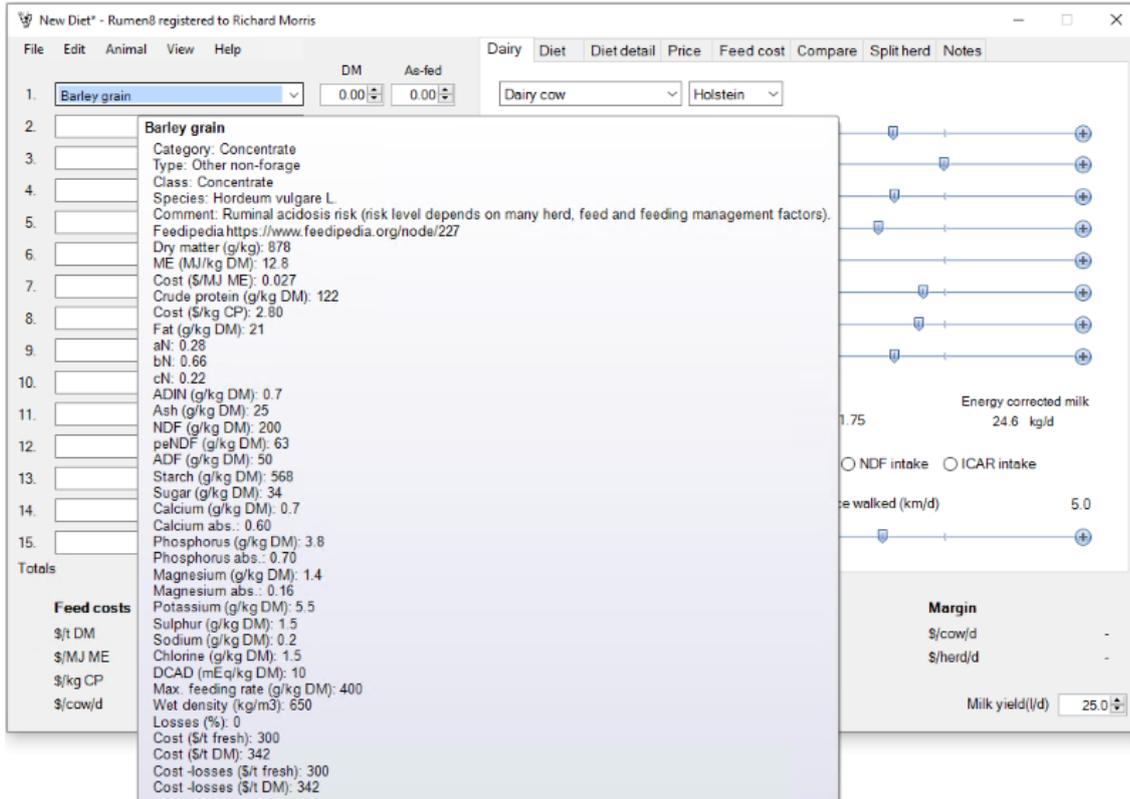
Clicking on the down arrowhead on the right side of the drop-down lists allows you to choose any of the feeds available from the feed library.

If you want an ingredient further down the list type the first letter of its name on the keyboard to jump to the first ingredient starting with that letter.

Once a feed has been selected the 'DM' and 'As-fed' entry boxes become active and you can either type the kilograms to be fed directly or click on the up and down buttons to vary the existing amount.

You can enter the value on a dry matter basis in the 'DM' column and the amount will be displayed on an as-fed basis in the 'As-fed' entry box. If you prefer to enter the amount as-fed the reverse works in the same manner. Internally Rumen8 always uses the value on a dry matter basis. Up to fifteen feeds or mixes can be added to a diet. To see the details of a selected ingredient, right-click on the ingredient number and the detail window will open. Alternatively hover the mouse over ingredient name and a tool tip will appear showing the feed or mix attributes. The total diet weight on a dry matter basis and as fed are displayed at the bottom of each of the columns. To the left the dry matter content of the diet is displayed.

The diet ingredient tool tip window displays the parameters for that feed or mix.



The diet ingredient detail window displays all the parameters for an ingredient. The window can remain open while the diet is created and you can quickly switch between ingredients using the drop down menu displaying the feed names at the top (1) or the ingredient numbers at the bottom (4). The Other names button at the top right (2) opens a window where you can see the other names for a feed. One of the feed parameters is a comment that can be entered by the user. If this comment contains a internet web address it will appear blue (3). It can be clicked on to open the default browser and display the page at that address. In the example below the link will open the Feedipedia page for the feed providing more information that may be useful for the user. As the external links are beyond the control of RUMen8, ensure they are for a safe website address before clicking on them.

The diet ingredient detail window.

Diet ingredient detail

1. Barley grain

Species: *Hordeum vulgare L.*

Management: Concentrate Comment: Ruminal acidosis risk (risk level depends on many herd, feed and feeding management factors).

Protein type: Other non-forage Feedipedia <https://www.feedipedia.org/node/227>

Particle size: Concentrate

Source

DM (g/kg)	878	Calcium (g/kg DM)	0.7	NDF (g/kg DM)	200
ME (MJ/kg DM)	12.8	Calcium absorption	0.60	peNDF (g/kg DM)	63
Cost (\$/MJ ME)	0.027	Phosphorus (g/kg DM)	3.8	ADF (g/kg DM)	50
CP (g/kg DM)	122	Phosphorus absorption	0.70	Starch (g/kg DM)	568
Cost (\$/kg DM CP)	2.80	Magnesium (g/kg DM)	1.4	Sugar (g/kg DM)	34
Fat (g/kg DM)	21	Magnesium absorption	0.16	Max feeding rate (g/kg DM)	400
aN	0.28			Wet density (m3)	650
bN	0.66	Potassium (g/kg DM)	5.5	Cost (\$/t DM)	342
cN	0.22	Sulphur (g/kg DM)	1.5	Cost (\$/t as-fed)	300
		Sodium (g/kg DM)	0.2	Losses (%)	0
ADIN (g/kg DM)	0.7	Chlorine (g/kg DM)	1.5	Cost -losses (\$/t DM)	342
Ash (g/kg DM)	25	DCAD (mEq/kg DM)	10	Cost -losses (\$/t as-fed)	300

1 2 3 4 5 6 7 8 9 10 11 12 13 14 15

As feeds are added or quantities are adjusted Rumen8 recalculates energy, protein and nutrient supply relative to demand showing how well your diet is meeting production requirements.

To quickly remove an ingredient from the diet, hold down the Shift key on the keyboard and with the mouse right click on the ingredient number.
 To quickly set the amount of an ingredient to 0.00kg, hold down the Control key on the keyboard and with the mouse right click on the ingredient number.
 To clear all the ingredients from the diet, select 'Clear current diet' from the Edit menu.

Moving ingredients in the diet

Ingredients can be dragged and dropped between the 15 feed locations to swap their positions. Amount fed is also swapped with the ingredients. To move ingredient 3 to position 8 left click and hold on the number 3 to the left of the ingredient name. The mouse pointer will change to show a small rectangle below the pointer. Still holding down the mouse button down move the pointer over the ingredient 8's name or number and release. The ingredients and their amounts fed will now be swapped. You can only drop an ingredient over the ingredient name or number, anywhere else will display a no entry symbol.

Step 1: Starting to drag Barley grain in position 1 to position 8.

Location	Ingredient	DM	As Fed
1	Barley grain	5.00	5.69
2		0.00	0.00
3		0.00	0.00
4		0.00	0.00
5		0.00	0.00
6		0.00	0.00
7		0.00	0.00
8	Ryegrass ann. - Dry - Spr - Low quality	10.00	55.56
9		0.00	0.00
10		0.00	0.00
11		0.00	0.00
12		0.00	0.00
13		0.00	0.00
14		0.00	0.00
15		0.00	0.00
Total daily intake (kg/d)		15.0	61.3

Feed costs		Milk income		Feed efficiency		Margin	
\$/t DM	181	\$/L raw milk	0.40	kg ECM/kg DM	1.6	\$/cow/d	7.32
\$/MJ ME	0.017	\$/kg ECM	0.41	g MS/kg DM	117	\$/herd/d	-
\$/kg CP	1.36	\$/kg MS	5.73	\$/Milk/\$ Feed	3.699	Feed % income	27
\$/cow/d	2.71	\$/cow/d	10.03			Milk yield (l/d)	25.0

Step 2: Drop the Barley grain over the ingredient position you want it to occupy by releasing the mouse click.

The screenshot shows the Rumen8 interface with the 'Diet' tab selected. In the ingredient list on the left, 'Barley grain' is being dragged to position 8, which currently contains 'Ryegrass ann. - Dry - Spr - Low quality'. The 'DM' and 'As Fed' values for Barley grain are 5.00 and 5.69, respectively. The Ryegrass values are 10.00 and 55.56. The right-hand panel shows various farm and animal parameters, and the bottom summary table provides financial metrics.

Feed costs		Milk income		Feed efficiency		Margin	
\$/t DM	181	\$/L raw milk	0.40	kg ECM/kg DM	1.6	\$/cow/d	7.32
\$/MJ ME	0.017	\$/kg ECM	0.41	g MS/kg DM	117	\$/herd/d	-
\$/kg CP	1.36	\$/kg MS	5.73	\$/Milk/\$ Feed	3.699	Feed % income	27
\$/cow/d	2.71	\$/cow/d	10.03			Milk yield (l/d)	25.0

Step 3: After the drag and drop the Barley grain and Ryegrass have swapped ingredient positions.

The screenshot shows the Rumen8 interface after the drag-and-drop action. 'Ryegrass ann. - Dry - Spr - Low quality' is now at position 1, and 'Barley grain' is now at position 8. The 'DM' and 'As Fed' values for Ryegrass are 10.00 and 55.56, and for Barley grain are 5.00 and 5.69. The rest of the interface, including the parameters and summary table, remains the same as in Step 2.

Feed costs		Milk income		Feed efficiency		Margin	
\$/t DM	181	\$/L raw milk	0.40	kg ECM/kg DM	1.6	\$/cow/d	7.32
\$/MJ ME	0.017	\$/kg ECM	0.41	g MS/kg DM	117	\$/herd/d	-
\$/kg CP	1.36	\$/kg MS	5.73	\$/Milk/\$ Feed	3.699	Feed % income	27
\$/cow/d	2.71	\$/cow/d	10.03			Milk yield (l/d)	25.0

ANIMAL

The Dairy animal tab is the first of the tabbed section of the main window and is used to describe the cow, or the cow that represents the herd average, for the diet that we are creating.

The Dairy animal tab highlighted within the red rectangle.

Feed costs	Milk income	Feed efficiency	Margin
\$/t DM	\$/L raw milk	kg ECM/kg DM	\$/cow/d
\$/MJ ME	\$/kg ECM	g MS/kg DM	\$/herd/d
\$/kg CP	\$/kg MS	Feed % income	
\$/cow/d	\$/cow/d	\$ Milk/\$ Feed	Milk yield(l/d) 25.0

Using the sliders adjust live weight, growth rate, milk yield and components, days pregnant and days in milk. The value can be changed quickly by moving the slider left and right or adjusted 1 unit at a time by clicking on the – and + symbols at either end. To quickly overwrite a value in the entry box double click on it. The current value will be selected and then type in the new value to replace it.

Days pregnant and days in milk can also be set by specifying the date of conception or calving by clicking on the calendar icon .

For convenience, the milk yield is also expressed as fat: protein ratio and fat plus protein kilograms per day based on the input milk yield and components. The energy corrected values display the yield in kg corrected to the international standard 4.0% m/m fat and 3.3% m/m protein.

Additional parameters let you adjust the activity level of your cows if you have a large or hilly farm. Note that a grazing cow will typically walk 4-5 km over a day in the paddock, in addition to the distance to and from the dairy for milking

Maturity

Select whether the animal is an unmated or mated heifer, or a cow from the drop-down list.

Breed

The cow breed is only used to estimate mineral demand. If the cow is not Holstein, Jersey or related, choose other.

Live weight

Mean live weight (kg) of the herd at the time of interest. Cows that are weighed on farm are the best guide, but if cow live weight is unknown, use the following as a guide.

'North American' Holstein cows are 600-650 kg live weight.

Australian Friesian cows are 550-600 kg live weight.

Cross-bred cows 450-500 kg live weight.

Jersey cows 375-425 kg.

First calvers are often 10% less than their mature counterparts.

For culled cows that are sold 'over the hooks', dairy cows typically dress out at ~40-45% of live weight. For example, a 260-290 kg dressed weight equates to ~650 kg live weight. Note that cull cows are (or should be) older cows, so these will not be representative of the average live weight of the herd.

Live weight change

This is the estimate of the amount of live weight that is being lost or gained across the herd (kg/cow/day). Some typical figures are shown below.

Possible estimates of live weight change during a lactation for a 600 kg cow.

<i>Days in milk</i>	0-30	30-60	60-90	90 - 120	120 - 150	150 - 180	180 - 210	210 - 240	240 - 270	270 - 300	Dry period
<i>LWC kg/d</i>	-0.8	-0.6	-0.2	0	0	0.05	0.15	0.3	0.4	0.5	0.1

Clicking on the calculate button  alongside the live weight change value will open a window that assists in estimating the rate of live weight change for your animal. For cows this is based on the days in milk with the option to increase the rate if the cow is required to gain BCS over the

lactation.

The live weight change calculator for cows.

Cow liveweight change calculator
?
×

Suggested liveweight change based on days in milk. This assumes liveweight and body condition score remain similar from calving to calving and the calving interval is 12 months.

Days in milk

0.07 base LWC (kg/d)

If the cow isn't meeting the recommended BCS for this stage of lactation or you wish to calve at a higher BCS than previously, you may add additional LWC over and above the base.

Additional liveweight change required to increase Australian (1-8) body condition score by

0.17 kg/d LWC from 0.2 BCS units over 65 days

0.24 total liveweight change (kg/d)

To estimate live weight change for the current cow, adjust the days in milk value and you will see the estimate change below. Hover the mouse pointer over the text at the top of the window to see a graph of how a typical cow's live weight change varies between calving **assuming she returns to the same BCS in which she started the lactation.**

If the cow isn't meeting the recommended BCS for this stage of lactation or you wish her to calve at a higher BCS than previously you may add additional live weight change over and above the base. Set the amount of additional BCS gain with the top slider and the time to achieve this with the bottom slider. This will increase the live weight change value by the appropriate amount. To see more detail on the energy requirements of BCS gain hover your mouse over the text above the unit gain slider. Once you are happy with the live weight change estimate click on the 'Okay' button to return it to the animal tab.

For heifers the calculator estimates the required rate of gain to meet mating or calving target live

weights.

The target growth rate calculator for mated heifers.

Heifer target growth rate calculator ? X

Heifers must achieve 55% mature weight at mating or 94% mature weight at calving. The calculator estimates the average daily gain required to reach these targets from a recent weigh date.

Herd's mature cow weight (kg)

Heifer birth date

Heifer weigh date

Weight (kg)

Age ≈ 11.2 months. Mature cow weight: 49% (Target 47%)

Heifer due calving date

Days to calving 413 (at age ≈ 24.8 m)

Target weight at calving (kg) 611 (94%)

Required average daily gain (kg/d) 0.70

Heifer growth rates are calculated so the herd reaches target live weight at mating or calving (55% and 94% herd mature weight respectively). Ensure the herd's mature weight is representative of a typical animal that has completed 3 lactations. By entering the heifer's birth date (or mean birth date for a group of heifers), a current weigh date and (mean) live weight you can see if the heifer (group) is on track. In the figure above the target weight is 47% of mature weight at 11.2 months and the herd is slightly above that at 49% so all is well.

To determine the target growth rate from the weigh date to mating or calving enter the date of the event. In the example above to calve on the 24th of October 2024 the heifer herd must maintain a growth rate of 0.7 kg/day to reach 611 kg live weight (94% of the mature herd weight of 650 kg live weight).

Once you are happy with the target live weight change value click on the 'Okay' button to return it to the animal tab.

Days Pregnant

Affects nutritional requirements, which becomes significant from day 140 onwards. Days pregnant should be the weighted average of the herd (see below example of Days in milk). The number of days since conception can be entered directly with the slider or click on the calendar icon to select the date of conception.

Days in milk

Days in milk is also required to estimate feed intake potential, as stage of lactation influences the amount of feed a cow can consume. Feed intake (kg DM/cow/day) is estimated as per NRC (2001). Peak dry matter intake generally occurs at 80-100 days post calving. Where cows have been exceptionally well prepared for calving and then well-fed post calving without any metabolic or health issues peak DMI may occur at 60-80 days in milk.

Where cows have had restricted energy intake through this period peak DMI is more likely to

occur at 100-120 days in milk.

Days in milk must be calculated as a **weighted average** for the herd. For example

100 cows @ 100 DIM	10,000 cow days
200 cows @ 280 DIM	56,000 cow days
30 cows @ 350 DIM	10,500 cow days
330 cows	76,500 cow days

Weighted herd average = 76,500 cow days / 330 cows = ~230 DIM

The number of days since calving can be entered directly with the slider or click on the calendar icon to select the (mean) calving date.

Alternatively, separate diets can be calculated in Rumen8 for each calving group in the above example.

Number of cows in the herd

This is used only to calculate the herd margin (daily milk income minus daily feed costs in \$/herd/day) and can be left set to 1 if you are more interested in daily milk income minus daily feed costs per cow/day.

Milk yield

(Litres or kilograms/cow/day) – if milking numbers are stable this should be the last 5-10 days average milk yield per cow. Milk yield should include all milk produced per cow, including milk that is being fed to calves and any milk not suitable for human consumption.

Milk fat and protein

Ensure you set the correct unit in the Rumen8 Preferences. In Australia this is almost always mv% (mass/volume, grams per litre), while in NZ it is mm% (mass/mass, grams per kilogram). Protein% as used in Rumen8 is true protein (in some countries milk protein is analysed as crude protein which is about 6% higher than true protein). Take the average of the latest 5 days of available factory figures. When estimating production for subgroups of cows within the milking herd the milk fat and protein percentages are likely to be significantly different to the herd average e.g. 'early lactation cows in peak production vs late lactation cows.

Below the entered milk yield and composition Rumen8 reports the Fat:Protein ratio (this can be changed to the Protein:Fat ratio in the Preferences) and the yield of fat, protein and fat + protein in kilograms per day. In addition, the yield as energy corrected milk is calculated standardised to 4% fat and 3.3% protein content (m/m).

Dry matter intake estimation method

Here you can set how to estimate the maximum dry matter intake for the cow. The conventional method is recommended as this uses the NRC 2001 intake equation for lactating cows, the AFRC 1993 intake equations for heifers and fixed intake values for dry and transition/close-up cows that can be adjusted in the Preferences.

As an alternative, the NDF intake method can be selected. This method estimates the cows predicted intake based on the amount of NDF eaten as a percentage of the cow's live weight. The percentage of live weight for lactating cow, dry and transition/close-up cows and heifers can be changed in the Preferences.

A third intake estimation method based on the Indian Council of Agricultural Research 2013 publication is available for users not in Australia and New Zealand. This method for lactating cows

may be more suitable for diets similar to those used in India.

Farm terrain

This influences the amount of energy required for maintenance. Note that walking 1 'vertical meter' requires the same energy as walking 10 'horizontal meters'.

Distance walked

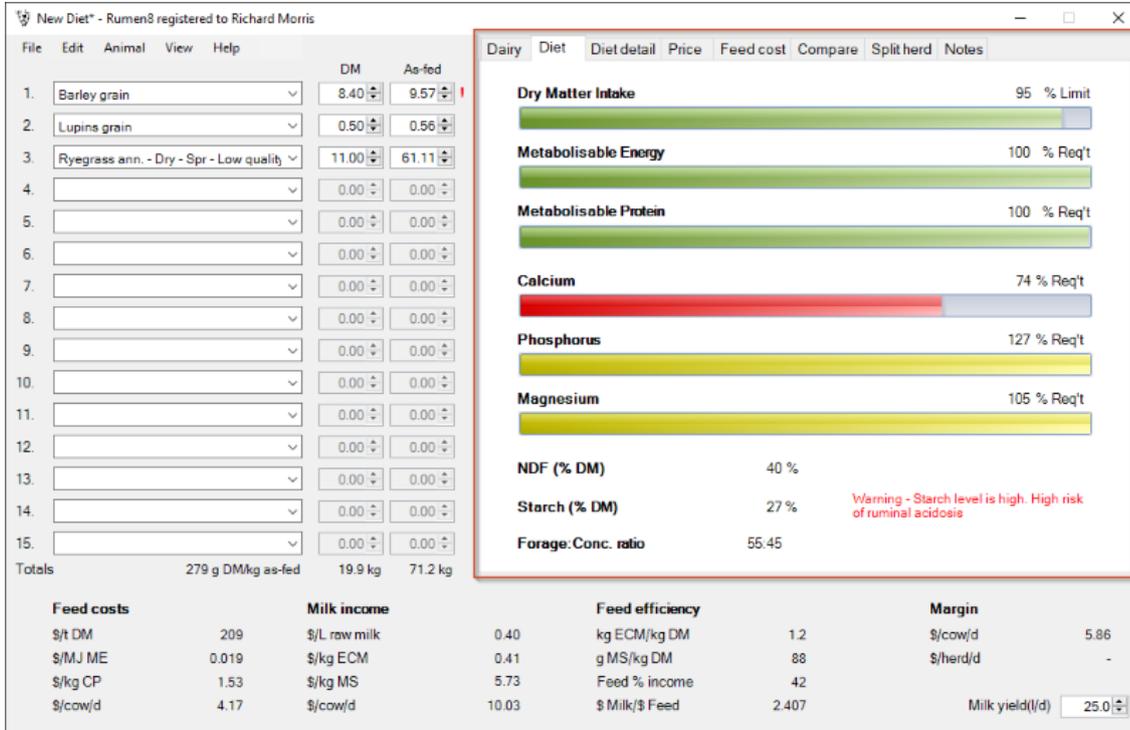
This influences the amount of energy required for maintenance.

- Cows grazing a large farm (300 Ha) with centrally located dairy will on average walk 4 km to and from the dairy plus distance walked while grazing ~5 km. Daily total 9 km.
- Cows grazing a medium sized farm (150 Ha) with centrally located dairy will on average walk 3 km to and from the dairy plus distance walked while grazing ~4 km. Daily total 7 km.
- Cows grazing a smaller sized farm (75 Ha) with centrally located dairy will on average walk 2 km to and from the dairy plus distance walked while grazing 3 km. Daily total 5 km/d.
- Cows kept in feedlots will on average walk only a few hundred meters a day plus the distance to and from the dairy. Often no more than 1 km/d.

DIET

The diet tab provides an overview of the current diet performance.

The Diet tab highlighted within the red rectangle.



The Diet tab has six horizontal bars representing the dry matter intake, metabolisable energy, metabolisable protein, calcium, phosphorus and magnesium in the diet. Below these are the neutral detergent fibre and starch percentage of the diet and the forage to concentrate ratio. Metabolisable energy, protein and minerals are expressed as a percentage of the cow’s requirement so a balanced diet should have these parameters around 100%. When the cow’s requirement is not being met the progress-bar will be red. When the diet meets the cow’s requirement the bar will be green. If there is an excess of ME, MP or minerals in the diet the corresponding bar will be yellow.

The intake bar shows the percentage of the animal’s maximum intake the current diet represents. When the cow is eating close to potential the bar will be green. If the diet contains too much feed for the cow to eat the bar will turn yellow and if the cow is being underfed the bar will be red. How close to 100% the progress bars must be to turn green is adjusted in the Preferences.

The starch and NDF sections show the percentage of the diet made up of these components. The final value shows the ratio of forage to concentrate in the diet (with the total being 100).

If ‘Recommended Levels’ are set for NDF, starch and forage: concentrate a traffic light will appear and show whether the current value is under, within or above the recommended range. See the Preferences section for how to set ‘Recommended Levels’. Independent of the ‘Recommended Levels’ a warning may appear next to each of these parameters if the dietary level suggests the cow may be in danger of ruminal acidosis.

For further information about each parameter, hover your mouse over the progress bar and a tool tip will appear showing the actual values. For example, the tool tip for the dry matter intake bar in the figure above displays ‘Supply 18.0 kg. Maximum intake 18.9 kg. Balance -0.9 kg’.

In the bottom right of the tab a red exclamation mark will appear if a monitored diet parameter

not shown on this tab is outside the recommended level set in Preferences. See the section on Recommended Levels in the Preferences for how to set suitable ranges for important diet parameters.

DIET DETAIL

The 'Diet Detail' tab is used in a similar way to the 'Diet' tab but contains much more information about the diet performance.

The Diet Detail tab shown within the red rectangle.

The screenshot shows the 'Diet Detail' tab in the Rumen8 software. The interface is divided into several sections:

- Feed List:** A list of 15 feed ingredients with their respective DM and As-fed values. The total DM is 279 g DM/kg as-fed and 19.9 kg, and the total As-fed is 71.2 kg.
- Summary Table:** A table at the bottom showing Feed costs, Milk income, Feed efficiency, and Margin.
- Diet Detail Data Table:** A central table with columns for Dairy, Diet, Diet detail, Price, Feed cost, Compare, Split herd, and Notes. It contains various nutritional metrics such as Metabolisable energy, Metabolisable protein, DM intake estimate, NDF, Starch, RDP/UDP protein, Enteric methane, Calcium, Phosphorus, and Magnesium.
- Active recommended levels:** A section in the bottom left corner with radio buttons for One, Two, Three, Four, Five, and Off.

The 'Diet Detail' tab is highlighted with a red rectangle. The data table shows the following key values:

Category	Value	Status
Metabolisable energy	218	Green
Metabolisable protein	1,715	Green
DM intake estimate	95	Green
NDF (%DM)	40.0	Green
Starch (%DM)	26.8	Red
Calcium (g)	85.3	Red
Phosphorus (g)	66.4	Yellow
Magnesium (g)	37.1	Yellow
DCAD	>250	Red

The diet detail tab is divided into several sections covering metabolisable energy, metabolisable protein, dry matter intake, fibre, rumen protein, starch, fat, enteric methane production, minerals and the dietary cation anion difference. In addition, the active set of Recommended Levels can be changed in the bottom left corner of the tab. See the Recommended levels section under the Preferences for Dairy chapter for more information.

Alongside the values for starch a red exclamation mark is visible in the figure above. If you hover your mouse over it a tool tip will appear giving more information on why these parameter values may be an issue.

Metabolisable energy

This section shows the total ME supplied by the diet, demand from the cow and the consequent balance. Below is the energy density of the diet.

The 'traffic light' to the right is red when ME from the diet is insufficient, green when it meets the cow's demand and yellow when it exceeds the cow's needs. Clicking on the title 'Metabolisable Energy' (or the menu option View, Energy detail) will bring up the detail window that provides more information about how ME demand is calculated. The detail window can remain open while the diet and cow is adjusted so the influence on components of the total ME demand can be seen.

The metabolisable energy detail window.

Efficiency Coefficients		Net and ME Demand (MJ/d)		Other (MJ/d)	
Gross energy (Qm)	0.58	Maintenance (Em)	53.4	Fasting metabolism	40.2
Maintenance (Km)	0.71	Maintenance (Mm)	75.6	Activity allowance	13.2
Lactation (KI)	0.62	Lactation (EI)	78.3	Level of feeding (L)	2.67
Growth (Kg)	0.59	Lactation (MI)	125.5	Correction (CI)	1.030
Growth dry (Kf)	0.46	Pregnancy (Ec)	0.1	Sub total MJ demand	207.7
Concepta (Kc)	0.13	Pregnancy (Mc)	0.6	ME constant	0.0
Mobilised tissue (Kt)	0.84	Growth (Eg)	0.0	Safety margin	10.4
		Growth (Mg)	0.0	Total MJ demand	218.1
		Sub total (Emp)	131.8		
		Sub total (Mmp)	201.7		

Metabolisable protein

This section shows the total MP supplied by the diet, demand by the cow and the subsequent balance. Below is the diet’s crude protein content. Crude protein content of the total diet is only provided for reference. The ‘traffic light’ to the right is red when MP from the diet is insufficient, green when it meets the cow’s requirement and yellow when it exceeds the cow’s needs. Clicking on the title ‘Metabolisable protein’ (or the menu option View, Protein detail) will bring up the MP supply and demand detail window that provides more information about how metabolisable protein supply and demand are calculated by Rumen8. The detail window can remain open while the diet and cow is adjusted so the influence on components of the total MP supply and demand can be investigated.

As with the rest of the Rumen8 application, hovering the mouse over each parameter will provide additional explanatory information. If you hover over the text ‘MP system flowchart’ on the detail window a chart will appear that shows the path protein takes through the animal that corresponds to the values Rumen8 calculates when estimating MP supply.

The metabolisable protein detail window.

Supply (g/d)					
Crude protein (CP)	2,715	Fermentable ME (FME MJ)	199.2	Metabolisable pr. (MP)	1,715
Level of feeding (L multiple)	2.67	Rumen microbial protein (y)	2,120	Limited by	ERDP+MP
Rumen outflow (r fraction/hr)	0.07	Effective rumen degrad. pr. (ERDP)	1,792	Excess protein	0
Undegradable dietary protein (UDP)	760	Microbial crude protein (MCP)	1,792	Min exc. protein cost (MJ)	0
Rumen degradable protein (RDP)	1,956	Microbial true protein (MTP)	1,344	Max exc. protein cost (MJ)	0
Quickly degradable protein (QDP)	820	Digestible microbial true pr. (DMTP)	1,142		
Slowly degradable protein (SDP)	1,136	Digestible undegraded protein (DUP)	573	<i>MP system flowchart</i>	

Demand (g/d)					
Maintenance (MPm)	615	Pregnancy (MPc)	3	Total (MPmp)	1,721
Lactation (MPI)	1,103			MP correction	0
Live weight gain (MPg)	0			Safety margin	0
<i>Efficiency coefficients</i>				Total MP demand	1,721

Intake

The 'DM intake estimate' section shows the percentage of maximum predicted intake the current intake represents for the three methods of calculating potential available on the animal tab. It is recommended you refer to the Conventional (%), as this is more reliable than determining intake potential by calculating NDF intake as a percentage of live weight for lactating cow diets that contain concentrates and medium and high-quality forages.

The 'traffic light' is red when the diet constitutes less than the cow can eat, green when the cow is eating as much as she can, and yellow when the diet exceeds the cow's ability to eat it. The current intake estimate method linked to the traffic light is shown in black text and the inactive method is shown in grey. The sensitivity of the traffic light and parameters used to adjust intake estimation can be adjusted in the Preferences.

The third intake estimation method is based on the Indian Council of Agricultural Research 2013 publication. It is not available for users not in Australia and New Zealand. This method for lactating cows may be more suitable for diets similar to those used in India.

Dry matter intake as a percentage of live weight is also provided as an alternative method to evaluate the animal's current intake potential.

Fibre, rumen protein, starch and fat

The four sections in the top right of the diet detail tab reports a range of diet parameters for the current diet. These cover things like NDF, starch and sugar through to rumen degradable protein and forage concentrate ratio. If you are unsure what one of the abbreviations means hover your mouse over the text and a tool tip will appear with a more detailed explanation.

The 'Excess protein' section shows the effect of having too much protein in the diet. There is a metabolic cost to remove excess protein and this is expressed as forgone milk production or live weight growth. The calculation can be adjusted in the Preferences.

If Recommended Levels have been set for some of these diet parameters a small traffic light appears next to the value and shows if it is below, within or above the recommended range. In addition, the NDF, starch and forage concentrate ratio may show a red exclamation mark if the current value may result in the animal being at high risk of ruminal acidosis.

Methane

The amount of methane produced by the animal from the intestines is shown as a total and as how much per unit of milk production (intensity). Methane (CH₄) is a greenhouse gas emitted from livestock mainly through enteric fermentation and manure decomposition. Methane produced in the intestine (enteric) is a natural by-product of microbial fermentation of nutrients in the digestive tract of animals.

Minerals

The bottom right section of the diet detail tab displays supply and demand for the diet's calcium, phosphorus and magnesium levels. A traffic light for each show if the current level is below (red), equal to (green) or above (yellow) the animal's requirement. If all the feed ingredients have a DCAD value the dietary DCAD is calculated and compared with a recommended level depending on whether the cow is lactating, in the early dry period or the 'transition/close-up period' (last 3 weeks before calving).

Clicking on any of the titles 'Calcium', 'Phosphorus' or 'Magnesium' (or the menu option View, Minerals detail) will bring up the Minerals supply and demand detail window that provides more information about the animal demand and diet supply of each of the minerals. The detail window can remain open while the diet and cow is adjusted so the influence on mineral supply and demand can be investigated by adjusting cow or dietary parameters.

The minerals detail window.

Calcium (g)		Phosphorus (g)		Magnesium (g)	
Maintenance	18.6	Maintenance	21.1	Maintenance	1.8
Lactation	31.4	Lactation	23.2	Lactation	3.9
Pregnancy	0.0	Pregnancy	0.0	Pregnancy	0.0
Growth	0.0	Growth	0.0	Growth	0.0
Net demand	50.0	Net demand	44.3	Net demand	5.7
Absorption	0.43	Absorption	0.67	Absorption	0.16
Dietary demand	115.2	Dietary demand	66.4	Dietary demand	35.4
Dietary supply	85.3	Dietary supply	84.3	Dietary supply	37.1
Balance	-29.9	Balance	17.9	Balance	1.7

Discovering why a diet parameter is not displayed

The feeds that are provided as part of the Rumen8 default feed library have complete information so there are no missing parameters. This may not be the case for feeds you create as some laboratory analyses may not cover all aspects of the feed. For example, a feed analysis may not provide ADF percent and this will prevent Rumen8 from calculating the ADF content of the diet as shown in the figure below (1). To find out which diet ingredient is missing the ADF information, hover your mouse pointer over the missing value and the tool tip will list the feeds without that value.

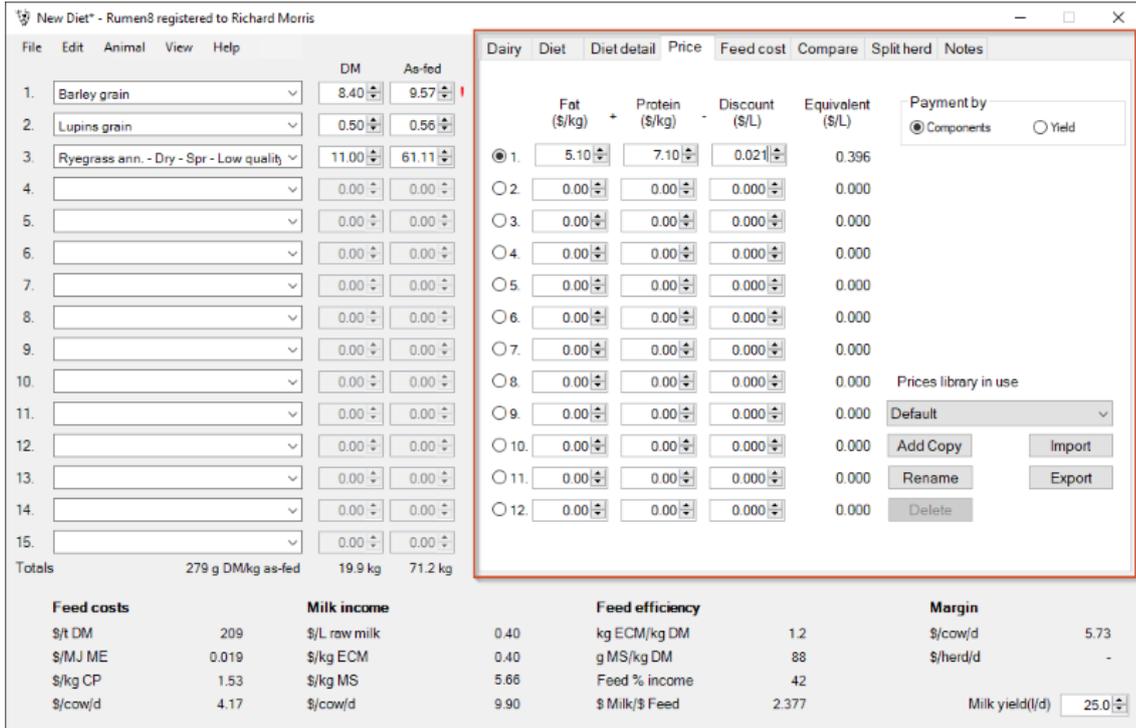
Discovering which feed is preventing the diet ADF content being calculated (1).

The screenshot shows the 'Diet detail' window in Rumen8. The 'DM' column shows values for various ingredients, with 'Barley grain' having a value of 8.59. A tooltip is displayed over the 'Barley grain' value, stating: 'This value cannot be calculated as this parameter value is missing in at least one of the ingredients. The feed(s) without this parameter value: Barley grain'. The tooltip also shows 'Intensity (g/L)' as 15.3. The main window displays various diet parameters such as Metabolisable energy, Metabolisable protein, DM intake estimate, and Mineral intake (Calcium, Phosphorus, Magnesium, DCAD). At the bottom, there are summary statistics for Feed costs, Milk income, Feed efficiency, and Margin.

Recommended levels

The section in the bottom left of the Diet detail tab shows which set of Recommended Levels has been selected, if any, and allows the user to change between sets. In the figure at the start of this section a set of Recommended Levels that applies to early lactating cows has been selected and the small traffic light adjacent to NDF (%DM) is linked to this. See the Preferences section for how to turn on and off and adjust the individual Recommended Levels. Rumen8 can also automatically switch between sets of Recommended levels based on the cow's days in milk and days pregnant depending on whether the button is set to [A]utomatic or [M]anual.

The milk price tab with payment by components selected shown within the red rectangle.



If the payment is entered by volume, the equivalent value expressed as payment for components is shown alongside it, and if by components, the equivalent shows the price calculated by volume. The calculation of equivalent price uses the current milk components entered on the animal tab. Each of the 12 prices are entered in the entry box/s alongside the numbers 1 to 12. The current price is selected with the button to the left of the number.

If you do use the 12 milk prices to represent months of the year, Rumen8 will not switch between them automatically as the date changes.

Prices libraries

Multiple libraries of milk prices can be defined and given a name in Rumen8 using the controls in the bottom-right side the tab. The current price library is named Default in the figure above. Switch between price libraries using the drop-down menu. *Multiple price libraries are only available in Standard mode.*

Add Copy	Create a copy of the current library. You will be prompted for the library name. Names must be unique. <i>This option is not available in Compact mode.</i>
Rename	Rename the current library. Names must be unique. <i>This option is not available in Compact mode.</i>
Delete	Delete the current library. You cannot delete the last library. <i>This option is not available in Compact mode.</i>
Import	Import as a new library from a Prices file that has previously been exported or created by Rumen8 version 3. <i>This option is not available in Compact mode.</i>
Export	Export the current prices as a library file. <i>This option is not available in Compact mode.</i>

FEED COST

The feed cost tab allows you to quickly adjust feed prices and losses for feeds in the current diet without returning to the feed library. This is useful for comparing groups of feed sources at different prices without having to create a new feed for each.

The feed costs tab shown within the blue rectangle.

Dairy	Diet	Diet detail	Price	Feed cost	Compare	Split herd	Notes
S/t DM	S/t as-fed	Losses (%)	S/t DM	S/t as-fed	per MJ ME	per kg CP	
342	300	0	342	300	0.027	2.80	
391	350	0	391	350	0.028	1.13	
100	18	0	100	18	0.011	0.72	

Feed costs		Milk income		Feed efficiency		Margin	
\$/t DM	209	\$/L raw milk	0.40	kg ECM/kg DM	1.2	\$/cow/d	5.73
\$/MJ ME	0.019	\$/kg ECM	0.40	g MS/kg DM	88	\$/herd/d	-
\$/kg CP	1.53	\$/kg MS	5.66	Feed % income	42		
\$/cow/d	4.17	\$/cow/d	9.90	\$ Milk/\$ Feed	2.377	Milk yield(l/d)	25.0

For each of the current diet ingredients you may change the cost on a dry or as-fed basis and the losses that occur before the cow eats it. The final cost is expressed on a dry matter basis, and then after losses for both dry and as-fed weights. The last two columns show the feed costs per MJ of metabolisable energy and per kilogram of crude protein. These parameters are useful for identifying the cheapest ingredients to fill an energy or protein deficit in the diet.

The values are changed in the feed library so if you are investigating the influence of feed price changes don't forget to put the actual feed cost back when you have finished.

Losses are not applied to the amount of feed eaten by the animal but represent the amount of feed lost between when it was costed (usually at delivery or harvest) and when it is eaten. This means the losses only influence the feed cost, not the feed amounts. For example, if the barley grain \$250/t DM delivered to the farm and losses are set to 2%, it means the loss occurs after the grain was delivered to the silo and before the cow eats it. The actual cost per kg of barley grain consumed is now \$255 /t DM. The cow still eats 9.0 kg/day of barley grain. The diet ingredient amounts are always the amount the animal eats, regardless of losses.

COMPARE

The 'Compare' tab allows you to build a diet and then save it for comparison with other diets. Think of it as six slots where you can store a diet while you experiment with other feeds in the main window and then compare them before recalling the best one.

The compare tab shown within the blue rectangle.

	DM	As-fed
1. Barley grain	8.40	9.57
2. Lupins grain	0.50	0.56
3. Ryegrass ann. - Dry - Spr - Low quality	11.00	61.11
4.	0.00	0.00
5.	0.00	0.00
6.	0.00	0.00
7.	0.00	0.00
8.	0.00	0.00
9.	0.00	0.00
10.	0.00	0.00
11.	0.00	0.00
12.	0.00	0.00
13.	0.00	0.00
14.	0.00	0.00
15.	0.00	0.00
Totals	279 g DM/kg as-fed	19.9 kg 71.2 kg

	Feed costs	Milk income	Feed efficiency	Margin
\$/t DM	209	\$/L raw milk	0.40	\$/cow/d
\$/MJ ME	0.019	\$/kg ECM	0.40	\$/herd/d
\$/kg CP	1.53	\$/kg MS	5.66	
\$/cow/d	4.17	\$/cow/d	9.90	
			kg ECM/kg DM	1.2
			g MS/kg DM	88
			Feed % income	42
			\$ Milk/\$ Feed	2.377
				Milk yield(l/d) 25.0

There is room for six diets numbered 1 to 6 from left to right. To store the current diet, click the 'S' button (store) for one of the diet slots. The 15 ingredients that make up the diet will appear in the slot along with important parameters below. You can make changes to the current diet, store an additional five versions, decide which offers the best solution and then recall that one to the main window by clicking the 'R' button (recall) for that slot. Clicking the 'C' button (clear) will clear the slot.

When a diet is recalled you have the option to also restore the animal parameters on the Dairy tab to the values when the diet was stored.

SPLIT HERD

The Split herd tab allows you to create a combined diet based on specific diets for sub-groups within a larger herd. For example, you may be running a single milking herd of 200 cows consisting of 150 cows that calved in autumn and 50 cows that calved in spring. While it would be preferable to run the two groups separately so they could receive a diet tailored for their requirements, logistically that may not be possible. The Split herd tab allows you to calculate an ‘average’ diet for the herd.

1. Create a diet for the 150 autumn calved cows and using the Compare tab store it in slot 1.
2. Create a diet for the 50 spring calved cows and on the Compare tab store it in slot 2.

Ensure when you create the diets for the sub-groups you set the number of cows in the herd correctly on the animal tab.

The Compare tab with diets stored for spring and autumn calving sub-herds.

The screenshot shows the 'Compare' tab in Rumen8. It features a table comparing two diets, 'Autumn calvers' (Slot 1) and 'Spring calvers' (Slot 2). The table lists ingredients and their quantities for each diet, followed by summary metrics such as Milk, DMI, ME, MP, and Margin. Below the table, there are summary statistics for Feed costs, Milk income, Feed efficiency, and Margin.

Ingredient	DM	As-fed	1. S R C	2. S R C	3. S R C
1. Barley grain	0.00	0.00	0.00kg	0.50kg	-
2. Lupins grain	0.00	0.00	0.00kg	0.00kg	-
3. Ryegrass ann. - Dry - Spr - High qualit	12.60	70.00	12.60kg	8.00kg	-
4. Wheat grain	4.00	4.52	4.00kg	7.00kg	-
5.	0.00	0.00	-	-	-
6.	0.00	0.00	-	-	-
7.	0.00	0.00	-	-	-
8.	0.00	0.00	-	-	-
9.	0.00	0.00	-	-	-
10.	0.00	0.00	-	-	-
11.	0.00	0.00	-	-	-
12.	0.00	0.00	-	-	-
13.	0.00	0.00	-	-	-
14.	0.00	0.00	-	-	-
15.	0.00	0.00	-	-	-
Totals	223 g DM/kg as-fed	16.6 kg			

Feed costs		Milk income		Feed efficiency		Margin	
\$/t DM	165	\$/L raw milk	0.42	kg ECM/kg DM	0.9	\$/cow/d	3.65
\$/MJ ME	0.015	\$/kg ECM	0.41	g MS/kg DM	68	\$/herd/d	548
\$/kg CP	0.84	\$/kg MS	5.68	Feed % income	43		
\$/cow/d	2.74	\$/cow/d	6.39	\$/ Milk/\$ Feed	2.332	Milk yield(l/d)	15.2

3. Change to the Split herd tab. You will see a column for each of the three Compare storage slots. As we are only using two slots there is only a diet name and cow numbers for columns 1 and 2.

The Split herd tab showing the two diets from the Compare tab's slot 1 and 2.

The screenshot shows the 'New Diet' window in Rumen8. The 'Split herd' tab is active, displaying three diet slots (1, 2, 3). Slot 1 is selected for comparison. The 'Include' checkbox is checked for both Diet 1 and Diet 2. The 'Number of cows' is set to 150 for Diet 1 and 50 for Diet 2. The 'Diet name' is 'Autumn calvers' for Diet 1 and 'Spring calvers' for Diet 2. The 'Combined diet ingredient' table shows the following values:

Combined diet ingredient	DM/Cow	DM/Herd	As-fed/Cow	As-fed/Herd
1	-	-	-	-
2	-	-	-	-
3	-	-	-	-
4	-	-	-	-
5	-	-	-	-
6	-	-	-	-
7	-	-	-	-
8	-	-	-	-
9	-	-	-	-
10	-	-	-	-
11	-	-	-	-
12	-	-	-	-
13	-	-	-	-
14	-	-	-	-
15	-	-	-	-

The summary section at the bottom left shows the following values:

Feed costs	Milk income	Feed efficiency	Margin
\$/t DM: 165	\$/L raw milk: 0.42	kg ECM/kg DM: 0.9	\$/cow/d: 3.65
\$/MJ ME: 0.015	\$/kg ECM: 0.41	g MS/kg DM: 68	\$/herd/d: 548
\$/kg CP: 0.84	\$/kg MS: 5.68	Feed % income: 43	
\$/cow/d: 2.74	\$/cow/d: 6.39	\$/Milk/\$ Feed: 2.332	Milk yield(l/d): 15.2

- To create an average diet weighted by cow numbers turn on the slots 1 and 2 by checking the include box under the Compare diet number as shown in the figure below.

The combined diet is now listed showing amounts fed of each ingredient per cow and per herd on a dry matter and as fed basis. To see what the 'average' cow looks like hover the mouse pointer over the text 'Note the average cow is only an approximation' at the bottom of the tab.

- If the combined diet is acceptable it needs to be 'copied back' into the ingredients list along with the new animal definition. To do this click on the 'Replace current diet and cow' button and the bottom left of the tab.

Now you can fine-tune this diet or print a report like any other Rumen8 diet.

The Split herd tab showing a combined diet about to be copied back into the main Rumen8 diet.

New Diet* - Rumen8 registered to Richard Morris

File Edit Animal View Help

	DM	As-fed
1. Barley grain	0.00	0.00
2. Lupins grain	0.00	0.00
3. Ryegrass ann. - Dry - Spr - High qualit	12.60	70.00
4. Wheat grain	4.00	4.52
5.	0.00	0.00
6.	0.00	0.00
7.	0.00	0.00
8.	0.00	0.00
9.	0.00	0.00
10.	0.00	0.00
11.	0.00	0.00
12.	0.00	0.00
13.	0.00	0.00
14.	0.00	0.00
15.	0.00	0.00
Totals	223 g DM/kg as-fed	16.6 kg 74.5 kg

Dairy	Diet	Diet detail	Price	Feed cost	Compare	Split herd	Notes	Optimise
Compare diet	1	2	3					
Include	<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>	<input type="checkbox"/>					
Number of cows	150	50	-					
Diet name	Autumn calvers	Spring calvers	-					
Combined diet ingredient		DM/Cow	DM/Herd	As-fed/Cow	As-fed/Herd			
1 Barley grain		0.13	25	0.14	29			
2 Lupins grain		0.00	0	0.00	0			
3 Ryegrass ann. - Dry - Spr - High		11.45	2,290	63.61	12,722			
4 Wheat grain		4.75	950	5.37	1,074			
5 -		-	-	-	-			
6 -		-	-	-	-			
7 -		-	-	-	-			
8 -		-	-	-	-			
9 -		-	-	-	-			
10 -		-	-	-	-			
11 -		-	-	-	-			
12 -		-	-	-	-			
13 -		-	-	-	-			
14 -		-	-	-	-			
15 -		-	-	-	-			
		16.3	3,265	69.1	13,824			
Replace current diet and cow		Note the average cow is only an approximation						

Feed costs		Milk income		Feed efficiency		Margin	
\$/t DM	165	\$/L raw milk	0.42	kg ECM/kg DM	0.9	\$/cow/d	3.65
\$/MJ ME	0.015	\$/kg ECM	0.41	g MS/kg DM	68	\$/herd/d	548
\$/kg CP	0.84	\$/kg MS	5.68	Feed % income	43		
\$/cow/d	2.74	\$/cow/d	6.39	\$ Milk/\$ Feed	2.332	Milk yield(l/d)	15.2

NOTES

The notes tab allows you to write anything about the current diet you may wish to remember when looking at it later. This is often useful if you save diets by date and then refer to them in later years for guidance. The notes can also be used to communicate with your nutritionist if you save the diet file and email it to them for comment or adjustment.

The notes tab shown within the red rectangle.

The screenshot shows the Rumen8 software interface for creating a new diet. The window title is "New Diet* - Rumen8 registered to Richard Morris". The menu bar includes File, Edit, Animal, View, and Help. The main area is divided into a diet formulation table and a summary table. A red rectangle highlights the "Notes" tab in the top right corner of the interface.

		DM	As-fed
1.	Barley grain	8.40	9.57
2.	Lupins grain	0.50	0.56
3.	Ryegrass ann. - Dry - Spr - Low quality	11.00	61.11
4.		0.00	0.00
5.		0.00	0.00
6.		0.00	0.00
7.		0.00	0.00
8.		0.00	0.00
9.		0.00	0.00
10.		0.00	0.00
11.		0.00	0.00
12.		0.00	0.00
13.		0.00	0.00
14.		0.00	0.00
15.		0.00	0.00
Totals		279 g DM/kg as-fed	19.9 kg 71.2 kg

Feed costs		Milk income		Feed efficiency		Margin	
\$/t DM	209	\$/L raw milk	0.40	kg ECM/kg DM	1.2	\$/cow/d	5.73
\$/MJ ME	0.019	\$/kg ECM	0.40	g MS/kg DM	88	\$/herd/d	-
\$/kg CP	1.53	\$/kg MS	5.66	Feed % income	42		
\$/cow/d	4.17	\$/cow/d	9.90	\$ Milk/\$ Feed	2.377	Milk yield(l/d)	25.0

OPTIMISE (ADVANCED)

The Optimise function within Rumen8 can be difficult to setup unless you have a good knowledge of Microsoft Windows and Excel. It requires Microsoft Excel and the Solver add-in to be installed (versions 2010, 2013, 2016 or 2019 or Office365) and configured for use with Rumen8. See the Optimiser Installation section for step-by-step instructions. If you use the Optimiser regularly it is recommended to use a later version of Excel as the Solver add-in optimises diets more successfully than earlier versions.

The Optimise tab and button will only be available if it is enabled in the Rumen8 Preferences. Optimising allows you to fine tune a diet to minimise cost. The Optimiser will vary the amount fed of each ingredient to find the cheapest diet that meets the constraints you have chosen. Using the Optimiser requires all feeds have costs entered in the feed library or the feed costs tab. You should first add your feeds to the diet in the approximate quantities required. These amounts are used to 'seed' the optimiser and help it find a better diet. For the first run of the Optimiser enable the ME and MP constraints to ensure it is possible to calculate a diet from the feeds selected that meets the cow's requirements. Once a feasible diet has been found progressively add additional constraints in decreasing order of importance starting with your preferred intake estimate until you have a diet that meets your needs, or the Optimiser cannot find a feasible solution. This step-by-step approach is far more likely to result in an optimised diet than simply turning on all the constraints immediately. This is because if a feasible diet cannot be found you know it was the last constraint that is the issue, and you can then either exclude that or relax constraints until a feasible diet can be found.

Remember, the Optimiser simply treats the diet as a mathematical problem to solve and has no nutritional awareness. It can find a feasible diet that minimises cost and meets the constraints but that may harm your cows. Evaluate each feasible diet carefully based on your knowledge of the animal and the diet. If in doubt consult with a qualified nutritionist!

The Optimise tab shown within the red rectangle.

The screenshot shows the 'Optimise' tab in the Rumen8 software. On the left, there is a list of 15 diet ingredients with their respective DM and As-fed values. The 'Optimise' tab on the right contains a list of constraints with checkboxes, current values, and sliders. The summary table at the bottom provides key performance indicators.

Feed costs		Milk income		Feed efficiency		Margin	
\$/t DM	209	\$/L raw milk	0.40	kg ECM/kg DM	1.2	\$/cow/d	5.73
\$/MJ ME	0.019	\$/kg ECM	0.40	g MS/kg DM	88	\$/herd/d	-
\$/kg CP	1.53	\$/kg MS	5.66	Feed % income	42		
\$/cow/d	4.17	\$/cow/d	9.90	\$/Milk/\$ Feed	2.377		

You can add constraints to control the diet content of NDF, peNDF, NDF supplied by forage, crude protein, forage concentrate ratio, kilograms of concentrate, starch, sugar and fat. For each of these constraints you must specify the minimum and maximum levels that are acceptable using the left and right sliders. The actual values will be displayed to the left of the slider. The more constraints are activated, the more expensive the diet is likely to become. Also, the narrower the range the less likely it is that a feasible diet can be found. To make the constraint active click the box to the left of the constraint name to put a tick in it.

To the left of the constraint ranges are the current diet value for each parameter. If the constraint is active (ticked) and the diet value is outside the constraint range it will turn red. A parameter such as ME or MP may be close enough to the cow demand to have a green traffic light on the Diet detail tab and still be displayed in red on the Optimiser tab. This is due to a wider margin for the traffic lights (set in the preferences, default is 2%) and rounding differences between Rumen8 and the spreadsheet calculations.

The last four ingredient constraints refer to diet ingredients 1 to 15. Using these you can restrict the amount of each of four feeds in the diet. The drop-down list allows you to select the ingredient you wish to constrain, and the two entry boxes specify the range of kg DM fed that is acceptable. The 'Current value' button lets you to quickly fix an ingredient at the amount currently entered. This is useful when the amount of pasture available has been previously determined and needs to be fixed at a certain level. Then the remainder of the diet ingredients will be changed to optimise the diet.

The light on the right of each of the ingredient constraint will turn green when that constraint is active. To be active it must be ticked, specify an ingredient number that has a feed or mix and have a valid range of DM fed.

The Optimiser has been unable to find a feasible diet.

The screenshot shows the Rumen8 software interface with the following data:

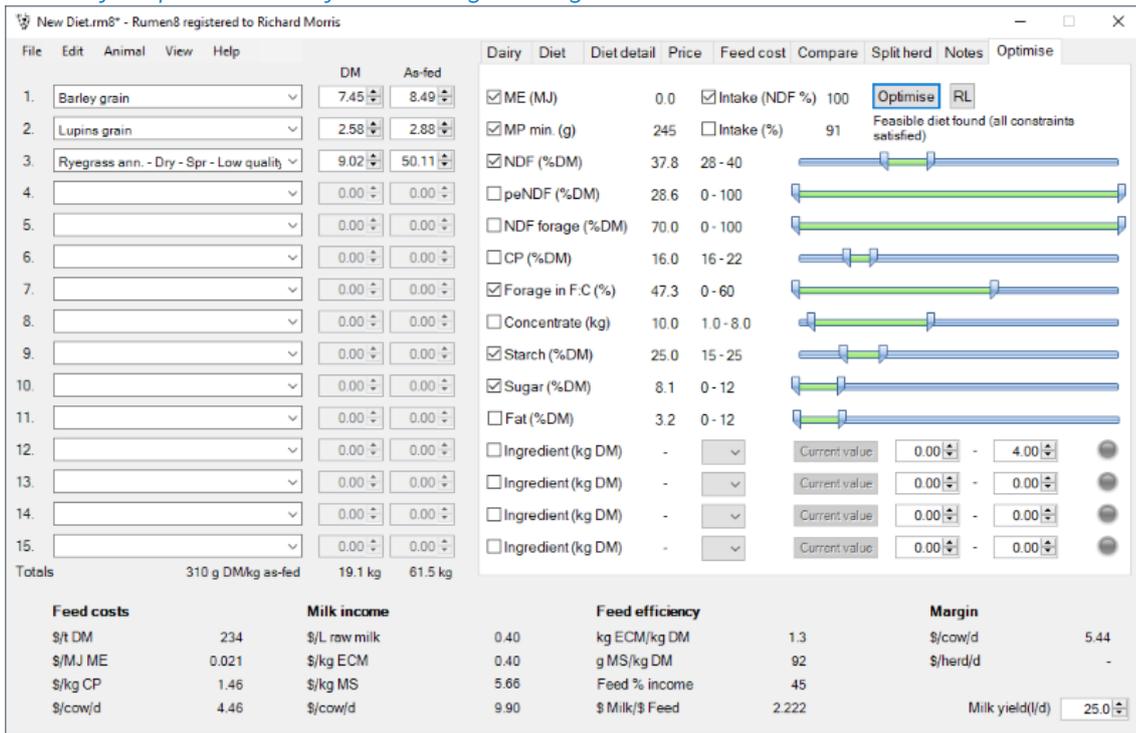
Ingredient	DM	As-fed
1. Barley grain	6.56	7.47
2. Lupins grain	7.30	8.15
3. Ryegrass ann. - Dry - Spr - Low quality	2.43	13.50
4.	0.00	0.00
5.	0.00	0.00
6.	0.00	0.00
7.	0.00	0.00
8.	0.00	0.00
9.	0.00	0.00
10.	0.00	0.00
11.	0.00	0.00
12.	0.00	0.00
13.	0.00	0.00
14.	0.00	0.00
15.	0.00	0.00
Totals	559 g DM/kg as-fed	16.3 kg 29.1 kg

Constraint	Value	Range
ME (MJ)	0.1	0 - 0.1
MP min. (g)	273	0 - 273
NDF (%DM)	28.0	28 - 40
peNDF (%DM)	13.6	0 - 100
NDF forage (%DM)	29.8	0 - 100
CP (%DM)	22.4	16 - 22
Forage in F.C (%)	14.9	0 - 60
Concentrate (kg)	13.9	1.0 - 8.0
Starch (%DM)	25.0	15 - 25
Sugar (%DM)	6.6	0 - 6
Fat (%DM)	4.5	0 - 12

Category	Value
Feed costs	
\$/t DM	328
\$/MJ ME	0.026
\$/kg CP	1.46
\$/cow/d	5.34
Milk income	
\$/L raw milk	0.40
\$/kg ECM	0.40
\$/kg MS	5.66
\$/cow/d	9.90
Feed efficiency	
kg ECM/kg DM	1.5
g MS/kg DM	107
Feed % income	54
\$/ Milk/\$ Feed	1.855
Margin	
\$/cow/d	4.56
\$/herd/d	-
Milk yield(l/d)	25.0

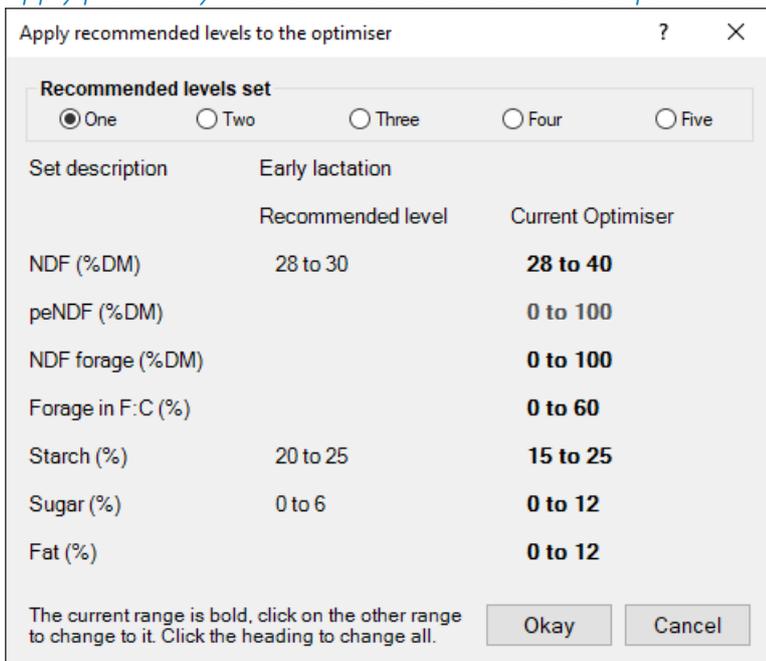
When a feasible diet cannot be found check the diet values to see how close the Optimiser was to the specified level. You can see in the figure above the ME and sugar constraints are highlighted red and are outside the desired range, preventing optimisation. The ME value can be ignored as it is only slightly greater than the cow demand, so the issue here is high sugar content in the diet. You can then either add additional feeds or relax a constraint until a feasible diet is found. The number shown in brackets at the end of the message from the Optimiser (under the 'Optimise' button in the figure above) is the return code from the Solver add-in in Excel. You can find more information about these return codes in the Solver documentation provided with Excel.

Successful optimisation after relaxing the sugar constraint.



The figure above shows a successful optimisation with a feasible diet found. The constraint ranges on the Optimiser tab can be quickly set to the recommended levels (set in preferences) by clicking on the 'RL' button which opens the 'Apply recommended levels to the optimiser' window. Up to 5 sets of recommended levels for a range of diet parameters can be set in the preferences providing quick feedback on the suitability of a diet on the Diet tabs.

Apply previously set recommended levels to the optimiser.



To set the optimiser constraint range to the same as the recommended range first select which set to use at the top of the window. In the figure above set one has values for early lactation cows

and three of the parameters are active and available to be used in the optimiser. Initially all the ranges are from the Optimiser tab so all the ranges under the 'Current Optimiser' column are in bold. To change ranges simply click on them. For example, to use the NDF% range from the recommended levels set one click on the '28 to 30' text and it will turn bold signifying it is now active.

Diet parameter ranges from recommended level set one have been selected for NDF and sugar.

Apply recommended levels to the optimiser ? X

Recommended levels set

One
 Two
 Three
 Four
 Five

Set description	Early lactation	Recommended level	Current Optimiser
NDF (%DM)		28 to 30	28 to 40
peNDF (%DM)			0 to 100
NDF forage (%DM)			0 to 100
Forage in F:C (%)			0 to 60
Starch (%)	20 to 25		15 to 25
Sugar (%)	0 to 6		0 to 12
Fat (%)			0 to 12

The current range is bold, click on the other range to change to it. Click the heading to change all.

Click 'Okay' to return to the Optimiser tab and the constraint ranges for NDF and sugar will be updated.

COSTS, INCOME, EFFICIENCIES, AND MARGINS

The bottom of the Rumen8 window displays a range of parameters that allow you to evaluate the financial performance of the current diet. All feeds in the diet must have a feed cost entered and a milk price is also required.

The costs, income, efficiency and margin measures shown within the red rectangle.

The screenshot shows the Rumen8 software interface with the 'Feed cost' tab selected. The interface includes a list of feeds on the left, animal parameters on the right, and a summary table at the bottom. A red rectangle highlights the summary table.

Feed costs		Milk income		Feed efficiency		Margin	
\$/t DM	234	\$/L raw milk	0.40	kg ECM/kg DM	1.3	\$/cow/d	5.44
\$/MJ ME	0.021	\$/kg ECM	0.40	g MS/kg DM	92	\$/herd/d	-
\$/kg CP	1.46	\$/kg MS	5.66	Feed % income	45		
\$/cow/d	4.46	\$/cow/d	9.90	\$ Milk/\$ Feed	2.222	Milk yield(l/d)	25.0

These parameters are divided into four groups. From left to right they are feed costs, milk income, feed efficiencies and margins. The first two of the feed efficiency measures and the feed as a percent of income measure may also have a recommended level set in Preferences to quickly show if they are within the recommended range via a small traffic light.

The current milk yield can also be adjusted in the bottom right of the window allowing the animal performance to be fine-tuned while the animal tab is not visible. But note our warning about marginal milk yield responses in the 'What Rumen8 doesn't do' section.

PREFERENCES FOR DAIRY

The preferences allow you to change some Rumen8 settings to suit your business and location. Access to the Preferences window is via the Preferences option in the File menu of the main Rumen8 window. The settings you can adjust in Rumen8 are divided into General and Advanced. Additionally, you can adjust Recommended levels and the Standard cows on the rightmost tabs.

GENERAL PREFERENCES

The general preferences tab contains setting most users will want to adjust. The settings shown in bold such as 'Milk yield units' and 'Currency' are common with the beef mode. This means changing the value while in dairy mode as shown in the figure below also changes it when creating a diet for a beef animal. Settings that do not have their title in bold are specific to dairy.

The General preferences tab.

Dairy preferences ? X

General | **Advanced** | Recommended levels | Standard cows

Milk yield units
 Litres Kilograms

Milk component units
 Mass/mass Mass/volume

Feed concentration units
 g/kg Percentage

Feed proportion units
 Proportion Percentage

Fat to protein ratio
 Fat:Protein Protein:Fat

Tool tips detail
 Standard Extended

Dry matter intake estimate

	Cow	Dry	Transition	Heifer
Conventional method: kg DM/d	NRC eqn.	11.0	10.0	AFRC eqn.
NDF intake: % of liveweight	1.2	1.0	0.8	1.0

Currency
 System \$
 Do not display cents Currency divisor

Load warning for milk price change Show Diet tab
 Load warning for intake estimate change Show Split herd tab

Change the Rumen8 home directory after restarting Rumen8

Restore all the preferences to their default setting

Show Optimiser tab
 The optimiser requires the Microsoft Excel spreadsheet (Optimiser4.xlsm) in the Rumen8 libraries folder to grant access to the Rumen8 application. See the User Guide for step by step set up instructions before attempting to optimise a diet for the first time.
 Excel visible during optimisation (faster if off) Excel saves diet after optimisation (faster if off)

Milk yield units	Milk yield can be entered and reported in litres or kilograms.
Milk component units	The fat, protein and lactose percentage of milk can be entered and reported in mass/volume (i.e., per litre) or mass/mass (i.e., per kg) units (mm% or mv%).
Feed concentration units	The units for concentration in feeds used by Rumen8 can be set to g/kg or percentage.
Feed proportion units	The units for parameters such as aN, bN or cN can entered and displayed as a proportion (0 to 1) or a percentage.
Fat to protein ratio	The ratio of fat and protein displayed on the animal tab can be shown as Fat: Protein or Protein: Fat.
Tool tips detail	This allows you to set the level of information provided by the tool tips. Standard displays a one-line explanation and Extended provides more detailed explanations with diagrams.
Dry matter intake estimate	The animal's feed intake potential can be estimated using the 'Standard' or 'NDF as a percentage of live weight' methods and is selected on the animal tab. For each method parameters can be modified to adjust the estimate. Animals are divided into 4 classes, lactating cows, dry cows, transition/close-up cows (dry cows in the last 4 weeks before calving) and heifers. If an animal has the standard DMI method selected lactating cows will have their maximum intake calculated using the NRC (2001) intake equation, heifers use the AFRC (1993) intake equation and dry and transition/close-up cows use fixed DM intake amounts specified by the user. If the NDF DMI method is selected for a cow, for each of the cow classes above, a predicted NDF intake amount as a percentage of liveweight can be specified by the user.
Currency – System	Check to use the currency symbol set in Windows on your computer. Uncheck to manually set the currency symbol from the drop-down list. Choose 'Custom' at the end of the drop-down list to enter you own currency symbol.
Currency – Do not display cents	When checked all prices and costs will not show cents.
Currency – Divisor	For currencies with very large values select a divisor from the drop-down list. For example, If the currency divisor is set to 1000 all feed costs and milk prices should be entered into Rumen8 already divided by 1000. For example, 100,000 Rp/t would be entered as 100 Rp. The currency divisor will be displayed on reports if it is greater than 1 and a flag appears on the main Rumen8 window below the tabbed section.
Show the Diet tab	The Diet tab can be turned off by un-ticking this box. Useful if you only use the Diet detail tab.
Show the Split Herd tab	The Split Herd tab can be turned off by un-ticking this box. Useful if you never use split calving herds

Load warning for milk price change	When checked a warning will be given if a file is opened with a different milk price to the current. See below for more details.
Load warning for intake estimate change	When checked a warning will be given if a file is opened with a different intake estimation method to the current. See below for more details.
<i>Change Rumen8 home directory after restart</i>	If you want to change where Rumen8 stores its files (usually ~\Documents\Rumen8) then clicking the 'Change home' button will cause Rumen8 to ask you where to place the Rumen8 directory next time it is started. If this is a new directory the default feed library and Preferences files will be copied across. If you wish to retain your existing library files you should copy them into the new location using Windows Explorer.
Restore all the Preferences to their defaults	This will set all the preference settings back to their default values.
Show Optimiser tab	The Optimiser tab will be available in the main window if this box is ticked. This also makes available the Optimiser Preferences below it. See the Optimiser section of this document for more information on using the Optimiser as it requires Microsoft Excel and the Solver add-in along with careful setup. It will not work if you just enable it here!
Excel visible during optimisation	Tick this to see Excel load and optimise the diet. Usually left un-ticked.
Excel saves diet after optimisation	Tick this to make Excel save the Optimiser spreadsheet after optimising the diet. This is useful for debugging and is usually left un-ticked.

Milk price changes result in a warning

Rumen8 stores the current milk price in the save file (.rm8) when the diet is saved. When the Rumen8 file is opened Rumen8 checks to see if the milk price has changed and if so, warns the user.

Rumen8 then looks for the saved milk price in three locations and if it finds it offers the user the option to switch to the previous milk price. In order of priority the 3 locations are:

1. In the previous location (set number and price number).
2. In the previous milk price set at a new price number.
3. The current milk price set.

If the previous milk price cannot be found in any of these locations the user is warned the milk price has changed but not offered the option to change it.

Checking for milk price changes when opening a Rumen save file can be disabled in the General Preferences.

Dry matter intake estimate changes result in a warning

The method and parameters to estimate the animal's dry matter intake are saved with the current diet in the save file (.rm8) and if they have changed when the file is reopened the user will be warned and given the option to revert to the value when the diet was saved.

For example, a lactating cow has the DMI estimation method set to NDF on the animal tab and in Preferences this is 1.2% of live weight. A diet is created, saved and the user moves on to other scenarios, during which the lactating cow value for NDF is changed to 1.3% of live weight in Preferences after talking to a colleague. A few months later when opening the save file it reloads the cow parameters, setting DMI method to NDF, and then prompts the user that the Preferences value for lactating cows NDF intake has changed from 1.2% when saved to the current 1.3% of live weight. The user can ignore this and continue with the 1.3% value or choose to set it back to 1.2%. **If the Preferences are set back to 1.2% this will apply to all lactating cows with DMI set to NDF method.**

Whether Rumen8 warns the user about changes to DMI parameters in the Preferences can be turned off in the General Preferences.

ADVANCED PREFERENCES

The advanced section of the Preferences contains those settings that are unlikely to need adjustment and may have a significant impact on the cow nutrition model if they are changed. Please change them only in consultation with an experienced nutritionist.

The Advanced preferences tab.

⚙ Dairy preferences
?
×

General **Advanced** Recommended levels Standard cows

Preferences library in use
Add Copy
Delete
Import

Default
Rename
Export

Acidosis (low rumen pH) warning - experimental

Subclinical pH	Acute pH
6.0	5.7
Gain	Loss
22	19
Excess protein removal cost (KJ/g N)	
15	50

Fasting metabolism correction factor	1.10	Fixed addition to ME demand (MJ)	0
Animal time standing (hrs/d)	14	Milk true protein content (of CP)	0.94
Animal position changes/day	10	Milk lactose (m/v)	5.0
Gross energy in 1 kg of dry matter (MJ)	18.8	Weight of a litre of milk (kg)	1.030

Protein demand model

 Feed into Milk (2004)
 AFRC (1993)

Metabolisable protein demand correction factor

1.00

DCAD target levels (mEq/kg DM)

Early dry cows <	200	Transition cows <	-50		Milking cows >	250
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Traffic light and progress bar accuracy

The percentage above or below the cow demand or requirement the traffic light is green. Below will show red and above yellow.

	ME	MP	DMI	Minerals
	2	2	2	2

Close

Preferences library in use	Select the Preferences library you would like to use from the drop-down menu. A preferences library contains the settings for both beef and dairy modes. <i>This option is not available in Compact mode.</i>
Add Copy	Create a copy of the current library. You will be prompted for the library name. Names must be unique. <i>This option is not available in Compact mode.</i>
Rename	Rename the current library. Names must be unique. <i>This option is not available in Compact mode.</i>
Delete	Delete the current library. You cannot delete the last library. <i>This option is not available in Compact mode.</i>
Import	Import as a new library from a Preferences file that has previously been exported or created by Rumen8 version 3. <i>This option is not available in Compact mode.</i>
Export	Export the current preferences as a library file. <i>This option is not available in Compact mode.</i>
Acidosis (low rumen pH) warning	Turning this on displays an estimate of rumen8 pH on the Diet Detail tab. The two pH levels control when warnings will appear for sub-clinical and acute acidosis. The rumen pH value is the daily average and assumes TMR feeding of grain so many other factors may result in actual rumen8 pH being lower than the prediction. See the tool tip on the Diet Detail tab for further information. This calculation is experimental so use it with caution.
Net energy for live weight change	The net energy liberated by live weight loss or required for live weight gain.
Excess protein removal cost	The range of values for the cost of removing excess protein by the cow. A range is provided as there are differing values quoted in the literature, which vary depending on the degree of N recycling via saliva.
Fasting metabolism correction factor	Rumen8 will increase the fasting metabolism energy requirement by multiplying it by this value.
Fixed addition to ME requirement	Rumen8 will add this value to the cow's energy requirement.
Animal time standing	The number of hours per day the animal is standing. Leave at 14 hours unless you have access to a better estimate.
Milk true protein content	The percentage of crude protein in milk that is true protein.
Animal position changes	The number of times a cow gets up or down during the day. Leave at 10 unless you have access to a better estimate.
Milk lactose	The lactose content (%) of the milk for your cows.

Gross energy in 1 kg of dry matter	Enter the gross energy contained in 1 kilogram of dry matter in mega joules. Used as part of the cow energy requirement calculation. Set by default to 18.8 for a diet containing significant quantities of silage. May be set to 18.5 for diets not containing silage.
Weight of a litre of milk	The weight of one litre of milk in kilograms.
Protein demand model	The feeding standard used to calculate metabolisable protein demand can be set to AFRC (1993) or Feed into Milk (2004). It is recommended you use the later Feed into Milk standard as it better estimates the animal demand. A MP requirement correction is not required when the model is set to FiM. For more information see below.
MP demand correction	The animal's total protein requirement will be multiplied by this value. For more information see below.
DCAD target levels	The DCAD targets for early dry cows (dry off to entering the transition/close-up herd), 'transition/close-up cows' (the transition/close-up period is last 4 weeks before calving) and lactating cows.
Traffic light and progress bar accuracy	These parameters set the sensitivity of the 'traffic lights' for the cow's energy, protein, intake and minerals on the Diet detail tab and the progress bars in the Diet tab. The lights will show green if the diet provides an amount of energy, protein, dry matter intake or mineral that is within this percentage of the cow demand. The exception is the DMI acceptable range, which is asymmetric, with the 'green' values below the maximum intake x10 the value entered. For the default 2% this gives a 'green' range of 80-102%.

MP requirement correction

Rumen8 originally used the AFRC (1993) feeding standard for calculating metabolisable protein (MP) demand. Years after publication, it became clear that AFRC (1993) significantly underestimated the requirement for MP in dairy cows. This underestimation has since been corrected in the successor to AFRC (1993), known as Feed into Milk (Thomas, 2004). To overcome this deficiency of the AFRC (1993) standard, Rumen8 applied a so-called "MP demand correction factor" as a pragmatic approach to bring AFRC predictions of MP requirements in line with Feed into Milk (2004). This was achieved by using a correction factor of 1.25. With the introduction in Rumen8 version 3.3.0.0., we now use Feed into Milk (2004) as the default model to estimate MP requirements which means there is no need to use the correction factor. For those users who wish to stick to the old AFRC model (not recommended) a value of 1.25 for the "MP correction factor" still applies.

The Feed into Milk (2004) feeding standard results in significantly higher requirements for MP than predicted by the AminoCow model but significantly lower than predicted by the CPM-Dairy model, two other widely used feeding standards. The Feed into Milk (2004) standard therefore results in a 'middle of the road' estimate of MP requirements for dairy cows.

Should experienced users of Rumen8 wish to increase MP requirements further to be in line with MP predictions made by CPM-Dairy, the "MP requirement correction" may be increased to a value of 1.1-1.15. However, we caution that this will lead to a significant increase in cost of the diet and risks a high rate of nitrogen loss in urine and manure, thus increasing potential loss of nitrogen into the wider environment.

For growing young stock an MP correction factor will still be required to account for higher relative MP demand in young growing heifers. Based on 2015 review by Tedeschi et. al., Rumen8 uses a polynomial function to calculate a correction factor based on the heifer's live weight. Examples are shown in the table below.

Table 4. Correction factors used to determine heifer metabolisable protein demand.

Live weight (kg)	FiM Correction factor	AFRC correction factor
100	1.00	1.00
200	1.18	1.36
300	1.30	1.55
400	1.30	1.62
500	1.30	1.62

References

- Little S., King R., Lean I., Rabiee A. and Breinhild K. (2009) A review of 11 applied dairy nutrition models used in Australia. Summary Report. Grains2Milk project, Dairy Australia.
- Thomas C. (2004) Feed into milk: a new applied feeding system for dairy cows. Nottingham University Press, UK.
- Tedeschi L.O., Fox D.G., Fonseca M.A., Cavalcanti L.F.L. (2015) Models of protein and amino acid requirements for cattle. R. Bras. Zootec., 44(3):109-132.

RECOMMENDED LEVELS

Rumen8 allows the user to set a recommended level range for several important diet parameters. These provide quick feedback on the suitability of the current level of a diet measure on the Diet and Diet detail tabs with a traffic light. Five sets of Recommended Levels can be defined and quickly switched between on the Diet detail tab. These could be used for early, mid, late lactation, dry and transition/close-up cow diets for example.

The Recommended levels tab in Preferences showing example ranges for early lactation cows.

The screenshot shows the 'Dairy preferences' window with the 'Recommended levels' tab selected. The 'Recommended levels set' is set to 'One'. The description is 'Early lactation'. The 'Auto' checkbox is checked, and 'Day of lactation' is set to 0 - 60. 'Days pregnant' is set to 0 - 300. The following table lists the diet parameters and their recommended ranges as shown in the interface:

Parameter	Recommended Range	Checked
NDF (%DM)	28 - 30	Yes
peNDF (%DM)	0 - 100	No
NDF forage (%DM)	50 - 100	No
NDF forage (%LW)	0.0 - 3.0	No
Sugar (%DM)	0 - 6	Yes
Starch (%DM)	20 - 25	Yes
Fat (%DM)	0 - 6	Yes
NFC (%DM)	35 - 40	Yes
RDP (%CP)	66 - 73	Yes
UDP (%CP)	0 - 100	No
Forage % in F:C	40 - 100	Yes
FE kg ECM/ kg DMI	0.0 - 4.0	No
FE g MS/ kg DMI	0 - 400	No
Feed % income	0 - 60	Yes

Select the current Recommended Levels set by clicking on one of the buttons across the top of the tab. Describe the use of the set with a short description below.

For each of the 14 diet measures you can set an acceptable range by moving the minimum and maximum sliders left or right. The actual values are displayed to the left of the slider. So, if you wish to target NDF levels of 28-30% in early lactation activate the NDF recommended level by clicking on the check-box to the left and then move the sliders until that range is displayed. Now a traffic light will appear on the Diet and Diet detail tabs that will show you if the diet NDF level is below (red), within (green) or above (yellow) your recommended NDF level. Repeat this process for each of the diet measures for you wish to display a Recommended Level traffic light.

Linking Recommended Levels sets to cow day of lactation

Each recommended level set has an additional two auto parameters called 'Day of lactation' and 'Days pregnant'. These can be set to a range of days and turned on or off. For example, the early lactation set might have the day of lactation parameter set to days 1 to 60 as shown in the figure above.

If the 'Day of lactation' parameter is checked and 'Recommended Levels set switching' is set to automatic, when the current cow is between 1 to 60 days in milk, the first set of Recommended Levels will be activated. When the cow is outside the range 1 to 60 days the Recommended Levels will be turned off.

The Diet Detail tab with the Recommended Levels selection control highlighted in red.

The screenshot shows the 'Diet Detail' tab in Rumen8. On the left, there is a list of feed ingredients (1-15) with their respective DM and As-fed values. The main area displays various nutrient and financial metrics. A red box highlights the 'Active recommended levels' section, which includes radio buttons for 'One', 'Two', 'Three', 'Four', 'Five', and 'Off'. The 'One' radio button is selected, and a button labeled 'A' is visible next to it. Below this section, there are several financial and efficiency metrics.

Feed costs		Milk income		Feed efficiency		Margin	
\$/t DM	203	\$/L raw milk	0.40	kg ECM/kg DM	1.3	\$/cow/d	6.04
\$/MJ ME	0.019	\$/kg ECM	0.40	g MS/kg DM	92	\$/herd/d	-
\$/kg CP	1.48	\$/kg MS	5.66	Feed % income	39		
\$/cow/d	3.86	\$/cow/d	9.90	\$ Milk/\$ Feed	2.566	Milk yield(l/d)	25.0

In the figure above the Active recommended level is set to set one and Rumen8 will switch between sets automatically as the button in the bottom right corner is displaying an 'A' for automatic. The mode can be toggled between automatic and manual by clicking on the button. It will display a 'M' when in manual mode. The user can also switch to manual mode by simply selecting one of the Recommended Levels sets directly by clicking on its round button.

If no 'Recommended Levels sets' in the Preferences have the day of lactation or days pregnant parameter turned on (ticked) then the button will not appear in the active Recommended Levels section of the animal tab as automatic mode is not available.

An example of automatic switching between Recommended Levels sets:

1. Define recommended sets for early, mid and late lactation cows as well as dry and transition/close-up cows in Preferences.
2. Set the day of lactation range when each of the sets should be active and ensure each is turned on. You might choose early 1-60, mid 61-150, late 151-500 and 0 days of lactation for dry and transition/close-up cows. To match the 0 days of lactation condition the milk yield must also be 0 as the cow must be dry.

3. Set the days pregnant range off for sets one to three (early, mid and late lactation) and on for dry and transition/close-up sets. You might choose days 222- 256 for the dry cows and transition cows 257-285 days.
4. Close the Preferences and return to the Diet Detail tab. Click on the button in the bottom right of the Active Recommended Levels section until it shows (A)utomatic mode.
5. Now as the animal's Day of lactation and Days pregnant parameters are changed the relevant recommended levels will automatically become active through the cow's lactation and dry period.

Note, if none of the sets cover a particular day of lactation then the Recommended Levels set will be turned off.

Recommended level sets can have overlapping day of lactation ranges. In this instance Rumen8 switches to the set with the lowest number. For example, if set 2 is day of lactation 80 - 120 and set 3 is days 100 – 180, for an animal that is at day 110 of lactation set 2 will be selected.

If both day of lactation and days pregnant ranges are active for a set, the current animal must match **both** to automatically switch the set.

Suggested recommended levels

Listed below are some **suggested** ranges for recommended levels for dairy farms in temperate or tropical regions.

These should be considered a starting point in a discussion with a local nutritionist about suitable recommendations for your animals and feeds.

Examples of possible recommended levels for temperate dairy regions such as Australia.

	Early lactation	Mid lactation	Late lactation	Dry	Transition or Close-up
Levels set	1	2	3	4	5
Days in milk	1-100	101-200	201-end of lactation	dry	21 days before calving
NDF (%DM)	32-34	33-36	33-36	36-38	36-38
peNDF (%DM)	20-24	20-25	23-27	28-31	27-31
NDF forage (%DM)	18-23	18-23	18-23		
NDF forage (%LW)	0.7-1	0.6 to 1	0.6 to 1	0.5-1	0.5-1
Sugar (%DM)	6 to 8	6 to 8	5 to 6	2 to 4	4 to 6
Starch (%DM)	18-24**	20-22	18-21	15-18	18-22
Fat (%DM)	4 to 5	4 to 5	4 to 5	3 to 4	4 to 5
NFC (%DM)	35-40	33-37	32-35	25-26	25-28
RDP (%CP)	65-70	68-72	70-74	74-80	64-70
UDP (%CP)	30-35	26-30	22-27	20-24	24-28
Forage % in F:C	50-70	50-70	50-70	80-90	70-80
FE kg ECM/kg DMI	1.5-1.9	1.5-2.0	1.1-1.6		
FE g MS/ kg DMI	85-140	100-150	80-120		
Feed % Income	40-60	50-60	50-60		

** Safe starch levels vary inversely with speed of starch degradability.

Examples of possible recommended levels for tropical dairy regions such as East Africa.

	Early lactation	Mid lactation	Late lactation	Dry	Transit or Close
Levels set	1	2	3	4	5
Days in milk	1-100	101-200	201-end of lactation	dry	21 days b calvin
NDF (%DM)	35-45	40-50	45-55	50-60	45-55
peNDF (%DM)	21-34	26-40	32-44	35-48	32-44
NDF forage (%DM)	60-70	65-70	70-75	90-100	85-90
NDF forage (%LW)	0.7-1	0.6-1	0.6-1	0.5-1	0.5-1
Sugar (%DM)	3-8	2-8	2-6	2-4	2-5
Starch (%DM)	10-24	10-22	10-20	0-15	10-20
Fat (%DM)	2-5	2-5	2-5	2-5	2-5
NFC (%DM)	30-35	27-32	25-30	15-20	20-25
RDP (%CP)	65-70	68-72	70-74	75-80	75-80
UDP (%CP)	30-35	28-32	26-30	20-25	20-25
Forage % in F:C	40-70	45-70	50-80	80-100	75-80
Feed % Income	40-60	50-60	50-60		

STANDARD COWS

Rumen8 allows the user to quickly change the current cow from the Animal menu. From here you can select a cow based on lactation yield (2000 – 10000 litres or kilograms) and stage of lactation (early, mid or late). The provided cow definitions are a guide, and they can be modified to better suit the animal sizes and performance in your region.

The standard cow editor in the preferences.

	Early	Mid	Late	Total 305 d
Lactation yield(l)	6,000			
Live weight (kg)	550	495	550	532
Live weight change (kg/d)	-0.60	0.00	0.58	0.00
Days pregnant	0	70	160	
Days in milk	60	150	240	
Milk yield(l/d)	24.0	20.0	15.2	5,996
Milk fat (%m/v)	4.00	4.10	4.20	4.10
Milk protein (%m/v)	3.00	3.10	3.20	3.10
MS yield (kg/d)	1.68	1.44	1.12	1.41
ECM yield (kg/d)	23.6	20.1	15.6	19.7
MS total yield (kg)	168	144	118	430
ECM total yield (kg)	2,362	2,009	1,635	6,006

To adjust a standard cow definition, select the lactation yield at the top of the window and then each of the seven parameters for each stage of lactation can be edited. Lactation totals and averages are shown in the rightmost column and kilograms of fat + protein and energy corrected milk is shown below.

Restore default values

To reset the values for a standard cow of a specific lactation yield select the yield in the drop-down menu at the top of the window, and then click on the 'Reset' button to the right. All the values will be returned to their default values.

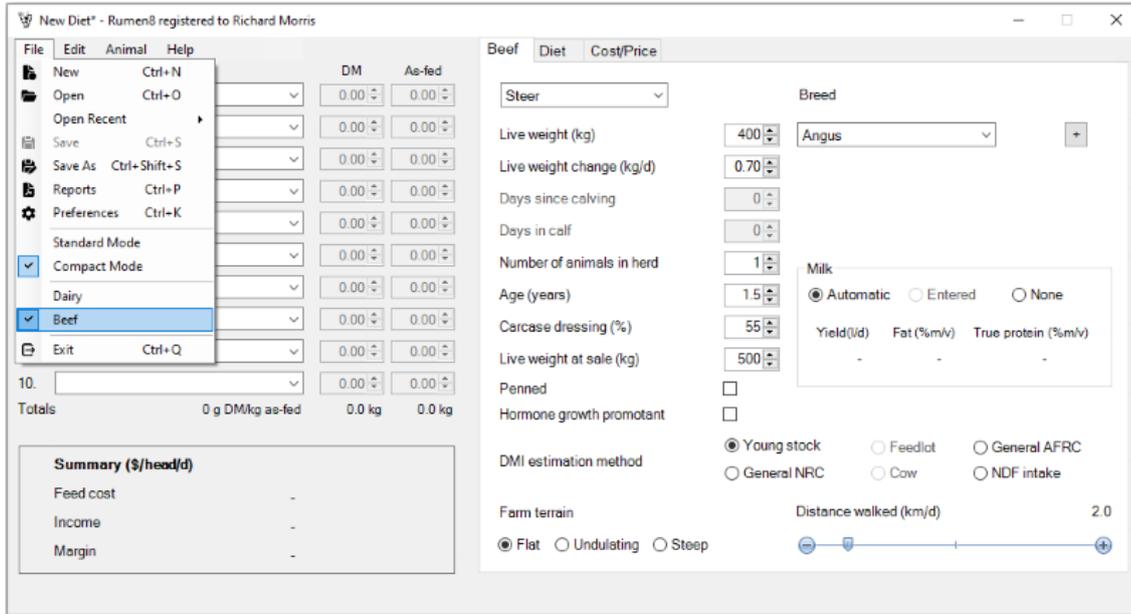
Standard cow default values

<i>Lactation Period</i>	<i>Yield (l or kg)</i>	<i>Live weight (kg)</i>	<i>Live weight change (kg/d)</i>	<i>Milk yield (l or kg/d)</i>	<i>Milk fat (%)</i>	<i>Milk protein (%)</i>	<i>Days pregnant</i>	<i>Days in milk</i>
Early	2000	450	-0.4	8.5	4.2	3.2	0	60
Mid	2000	400	0	6.8	4.3	3.3	70	150
Late	2000	450	0.39	4.5	4.4	3.4	160	240
Early	3000	450	-0.4	12.8	4.1	3.2	0	60
Mid	3000	400	0	10.3	4.2	3.3	70	150
Late	3000	450	0.39	6.6	4.3	3.4	160	240
Early	4000	500	-0.5	17	4.1	3.1	0	60
Mid	4000	450	0	13.6	4.2	3.2	70	150
Late	4000	500	0.49	8.9	4.3	3.3	160	240
Early	5000	500	-0.6	20.9	4	3.1	0	60
Mid	5000	450	0	17.1	4.1	3.2	70	150
Late	5000	500	0.58	11.4	4.2	3.3	160	240
Early	6000	550	-0.6	24	4	3	0	60
Mid	6000	495	0	20	4.1	3.1	70	150
Late	6000	550	0.58	15.2	4.2	3.2	160	240
Early	7000	600	-0.6	28	3.9	3	0	60
Mid	7000	540	0	23.3	4	3.1	70	150
Late	7000	600	0.58	17.8	4.1	3.2	160	240
Early	8000	600	-0.7	32	3.8	3	0	60
Mid	8000	540	0	26.7	4	3	70	150
Late	8000	600	0.67	20.3	4.1	3.1	160	240
Early	9000	650	-0.7	36.1	3.8	2.9	0	60
Mid	9000	585	0	30	3.9	3	70	150
Late	9000	650	0.67	22.8	4	3.1	160	240
Early	10000	700	-0.8	40.1	3.7	2.9	0	60
Mid	10000	630	0	33.3	3.8	3	70	150
Late	10000	700	0.77	25.3	4	3	160	240

USING RUMEN8 WITH BEEF CATTLE

Rumen8 can be used to create diets for beef or dairy cattle. To begin working on a diet for beef animals select 'Beef' from the File menu if it is not already ticked. Rumen8 will change to beef mode.

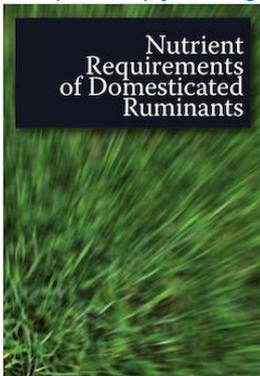
Beef mode is selected in the File menu.



The equations that allow Rumen8 to predict energy and protein supply from the diet and demand by the animal are all from published feeding standards. When creating diets for beef animals these are primarily from the Australian CSIRO 2007 publication 'Nutrient Requirements of Domesticated Ruminants'. The full reference for this publication can be found at the end of this document, along with others that are used for estimating mineral demand, feed intake and methane production for example.

Dairy breeds are included in beef mode to allow the user to create a beef x dairy cross. However, if only dairy breeds are used in beef mode Rumen8 will warn the user that they should use dairy mode as the performance predictions are likely to be more accurate.

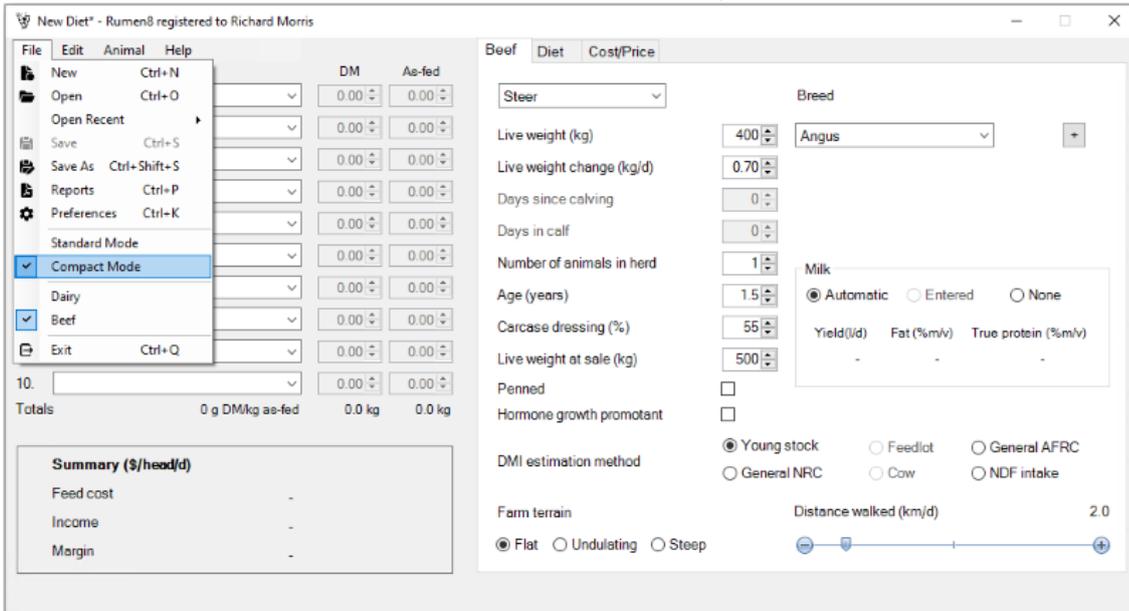
The primary feeding standard used by Rumen8 in beef mode



QUICK START GUIDE FOR BEEF

Rumen8 can be used in Compact or Standard mode. If this is the first time you have installed Rumen8, it will start in Compact mode which reduces the window down to the essentials. Standard mode provides access to all the functions Rumen8 provides. Compact mode is recommended for learning how to use Rumen8, and for many users, will be sufficient. Switching between modes can be done in the File menu.

Use the File menu to switch between Standard and Compact modes.

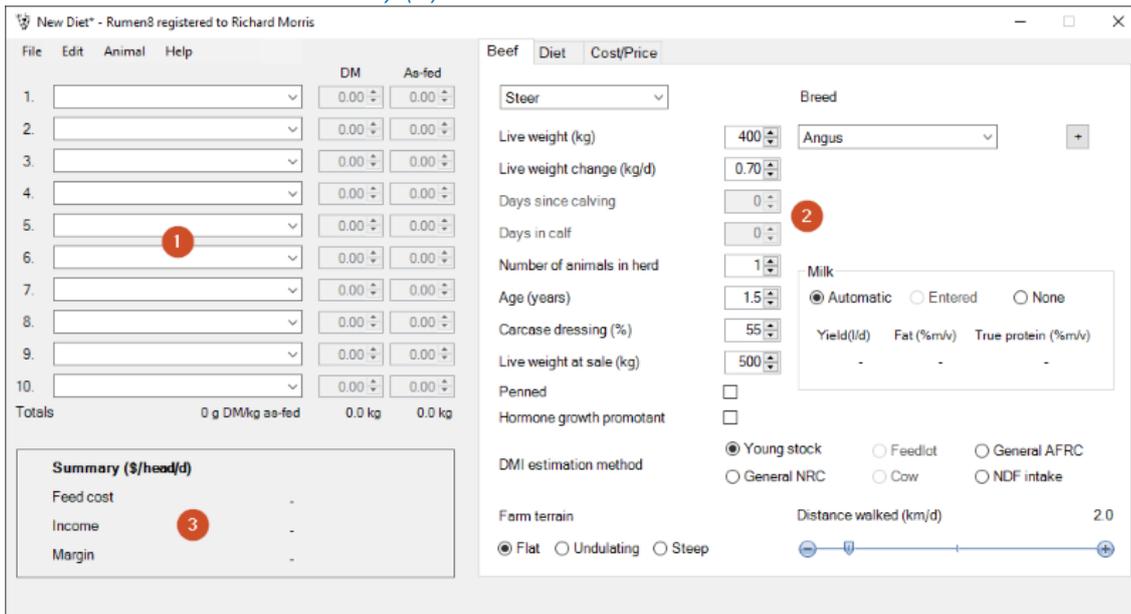


If you are unsure what something within Rumen8 is, hover your mouse over it and for most objects a tool tip will appear providing a more detailed explanation.

USING RUMEN8 IN COMPACT MODE

The main Rumen8 window when in compact mode is shown below. The Diet Ingredients section (1) is where you specify the animal diet. The tabbed section (2) is where you can provide the animal details, evaluate the current diet, adjust feed costs and sale income. The summary section at the bottom left (3) reports feed costs, income and margin.

The sections of the main Rumen8 window in compact mode. Diet ingredients (1), detail tabs (2) and income and cost summary (3).



DESCRIBE A COW

Click on the 'Beef' animal tab to show the animal description. Type a number in the entry box or use the up/down arrows to change the parameters of the animal you wish to feed, or the average animal that represents your herd or sub-herd. For this example, choose 'Steer' from the drop-down menu in the top left of the tab. To the right of the tab you can select the breed of the steer. Set this to 'Angus' for this example as shown in the figure below.

You can adjust live weight, growth rate, age, expected carcass dressing percentage and live weight at sale in the entry boxes below. You can ignore milk yield and components, days since calving and days in calf as they are not relevant for a steer. You may also adjust the activity level of the steer with the distance walked slider and choose if you have a flat, undulating or steeply hilly farm. Leave the dry matter intake (DMI) estimation method set to 'Young stock' for the time being.

To quickly overwrite a value in the entry box, double-click on it. The current value will be selected and then type in the new value to replace it.

The Beef animal tab.

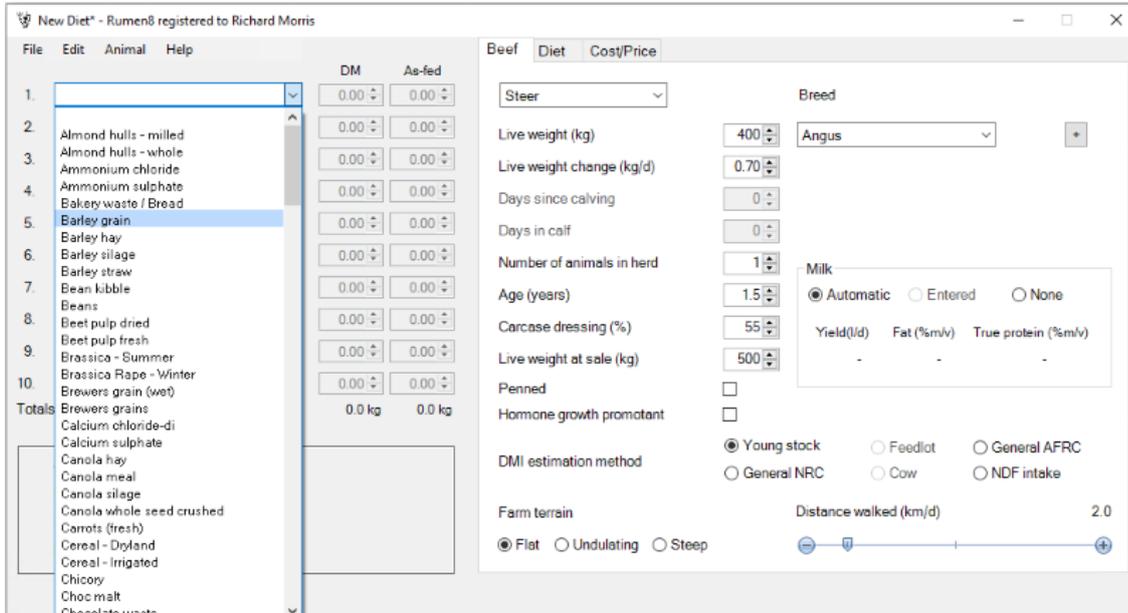
The screenshot displays the 'Beef' animal tab in the Rumen8 software. The interface is divided into several sections:

- Animal List:** A table with 10 rows, each containing a dropdown menu and two input fields for 'DM' and 'As-fed' values, all currently set to 0.00.
- Summary (\$/head/d):** A small table in the bottom left corner showing 'Feed cost', 'Income', and 'Margin', all with dashes indicating zero values.
- Beef Configuration Panel:**
 - Animal Type:** 'Steer' (selected from a dropdown).
 - Breed:** 'Angus' (selected from a dropdown).
 - Live weight (kg):** 400
 - Live weight change (kg/d):** 0.70
 - Days since calving:** 0
 - Days in calf:** 0
 - Number of animals in herd:** 1
 - Age (years):** 1.5
 - Carcass dressing (%):** 55
 - Live weight at sale (kg):** 500
 - Penned:**
 - Hormone growth promotant:**
 - DMI estimation method:** Young stock, Feedlot, General AFRC, General NRC, Cow, NDF intake
 - Farm terrain:** Flat, Undulating, Steep
 - Distance walked (km/d):** 2.0 (controlled by a slider)
 - Milk:** Automatic, Entered, None. Sub-parameters for Yield(l/d), Fat(%m/v), and True protein(%m/v) are all set to '-'.

ENTER A DIET

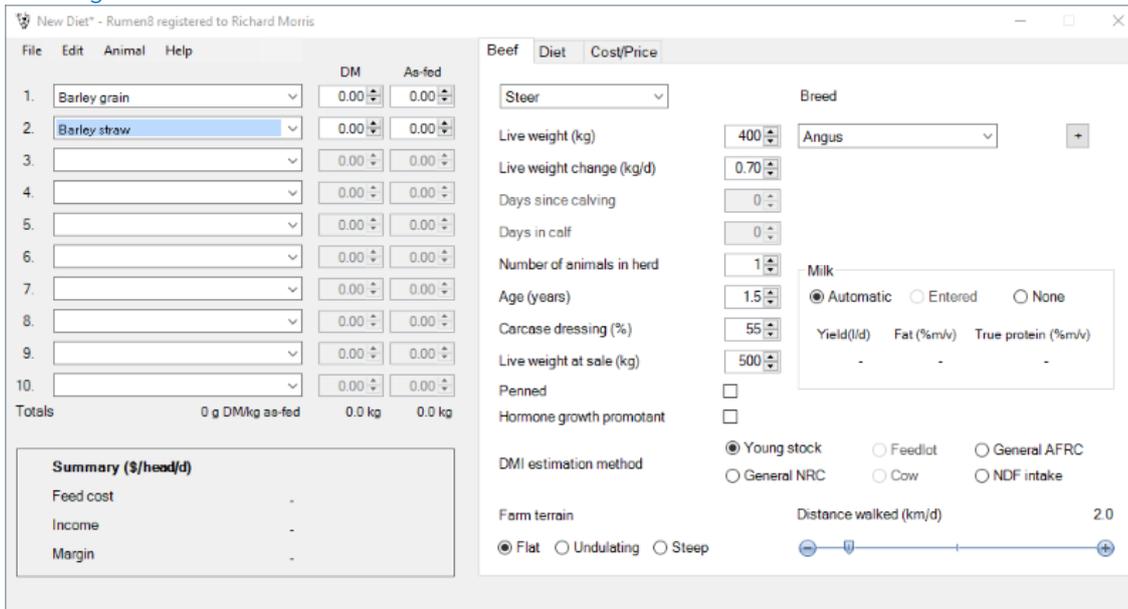
Ten ingredients can be added to a diet using the drop-down lists on the left of the window. Click on ingredient 1 and select 'Barley grain' as the first feed in the diet. To quickly jump down the list quickly type the first letter of the ingredient you wish to find.

Selecting a feed in the first diet component menu.



Select 'Barley straw' for ingredient 2 and the diet should now look like the figure below.

Two ingredients in the diet.



Now let's feed our steer. Enter the amount of each ingredient fed to the cow using the 'DM' entry box to the right of their name. Enter 5 kilograms of barley grain and 2 kilograms of barley straw. Click on the 'Diet' tab and the window should now look like the figure below. Notice that while you have entered the amount fed as kilograms of dry matter Rumen8 automatically shows you the

amount as fed (including water) in the column to the right. You can adjust the amount with either dry or as fed quantities.

Feeding our cow.

The screenshot shows the 'New Diet' window in Rumen8. The interface is divided into several sections:

- Ingredient List:** A table with 10 rows for feed ingredients. The first two rows are 'Barley grain' and 'Barley straw'. Each row has columns for 'DM' (Dry Matter) and 'As-fed' quantities.
- Totals:** A row at the bottom of the ingredient list showing '879 g DM/kg as-fed', '7.0 kg', and '8.0 kg'.
- Summary (\$/head/d):** A table showing 'Feed cost' as '-', 'Income' as '3.50', and 'Margin' as '-'.

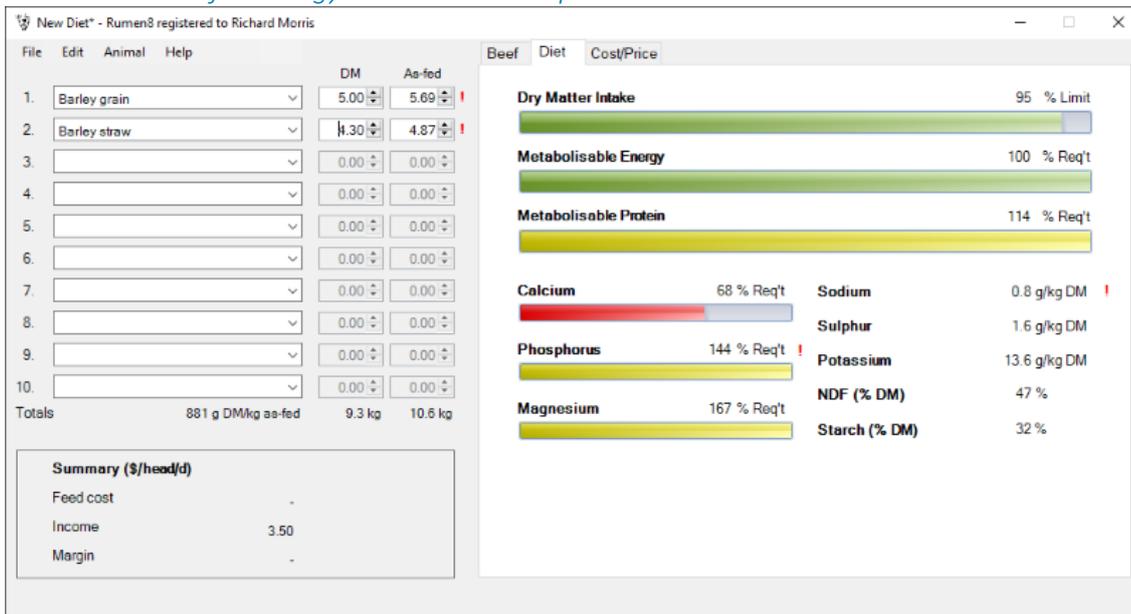
Summary (\$/head/d)	
Feed cost	-
Income	3.50
Margin	-
- Nutrient Analysis:** A section on the right with tabs for 'Beef', 'Diet', and 'Cost/Price'. It displays various nutrients with progress bars and values:
 - Dry Matter Intake:** 74 % Limit
 - Metabolisable Energy:** 89 % Req't
 - Metabolisable Protein:** 119 % Req't
 - Calcium:** 43 % Req't
 - Phosphorus:** 150 % Req't
 - Magnesium:** 115 % Req't
 - Sodium:** 0.5 g/kg DM
 - Sulphur:** 1.6 g/kg DM
 - Potassium:** 10.5 g/kg DM
 - NDF (% DM):** 37 %
 - Starch (% DM):** 41 %

EVALUATE A DIET

The 'Diet' tab shows six of the parameters you need to consider when formulating a diet for beef animals. For this example, we will consider the first three. With the current diet, we can see there is insufficient metabolisable energy (ME 89%) and plenty of protein (MP 119%) for the steer we described earlier. However, the steers' dry matter intake progress bar shows it is only 74% of its potential so this means it can physically eat more food if it is presented.

Increase the amount of barley straw to 4.3 kg. Now you will see the ME is at 100% of the steers' requirement and intake potential is still below 100% so this amount of feed can be eaten. Your screen should look like the figure below.

A diet balanced for energy and with excess protein.



This brings us to a very important point that is true of all nutrition models. The application tells us we have a diet that meets the ME, MP and intake requirements of our steer, but a nutritionist is unlikely to recommend this diet. The starch content is quite high and we are wasting protein as it is being feed in excess of what the steer needs. This is before we consider the cost of this diet.

Rumen8 is a tool that will assist someone with nutritional knowledge to better and more cost effectively feed their animals, but in the hands of someone without that knowledge it can create diets that appear balanced but may decrease cow performance or adversely affect their health.

We recommend Rumen8 is used with your nutritionist. Depending on your level of knowledge it can be used to adjust diets between visits by them.

This diet is now balanced for energy and the steer should be able to physically eat the feed when it is presented. This demonstrates the start of the process when designing a diet for your animals, and you can now further refine the diet by looking at other important parameters such as starch, fibre (NDF) and minerals.

The remaining tab allows you to change sale income payment and the cost of the feeds in the current diet. With feed costs and sale prices Rumen8 can show you diet costs and margins to better compare alternatives.

DIET MARGIN

Click on the Cost/Price tab. On this tab the top section allows you to enter the feed costs for each ingredient of the diet (1). In the bottom section you can enter the price you are expecting to be paid for the steer at sale (2). Enter the prices for the barley grain and straw on a dry matter basis as \$200 and \$110 respectively so your values should be the same as in the figure below. You will see the feed costs on an as fed basis are calculated based on the dry matter content of the feed.

Feed costs and milk payment price can be entered on the second tab called Cost/Price.

The screenshot shows the 'Cost/Price' tab for a 'Beef' diet. The interface is divided into several sections:

- Feed Ingredients Table:** A table with columns for 'DM' and 'As-fed' values. The first two rows are 'Barley grain' (DM: 5.00, As-fed: 5.69) and 'Barley straw' (DM: 4.30, As-fed: 4.87). Rows 3-10 are empty.
- Totals:** 881 g DM/kg as-fed, 9.3 kg, 10.6 kg.
- Summary (\$/head/d):** A table with three rows: 'Feed cost' (1.47), 'Income' (2.45), and 'Margin' (0.98). A red circle (3) is next to the 'Income' value.
- Sale Price Section:** Includes 'Sale price' and 'Payment by' options. The 'Payment by' section has 'Live weight' selected. Below it, there are input fields for 'Weight (kg)' (500), 'Price (\$/kg)' (3.50), and 'Price per head (\$)' (1,750). A red circle (2) is next to the 'Price per head' value.
- Beef Diet Cost/Price Table:** A table with columns: 'St DM', 'St as-fed', 'Losses (%)', 'St DM', 'St as-fed', 'per MJ ME', and 'per kg CP'. The first row has values: 200, 176, 0, 200, 176, 0.016, 1.64. The second row has values: 110, 97, 0, 110, 97, 0.017, 2.62. A red circle (1) is next to the 'Losses (%)' column.

At the bottom of the tab you can enter the expected price per kilogram of live weight for the steer at sale (2). Leave the Payment by option to Liveweight, but if you changed it to 'Carcase weight' you could enter a price based on the carcass weight based on the dressing percentage on the 'Beef' animal tab.

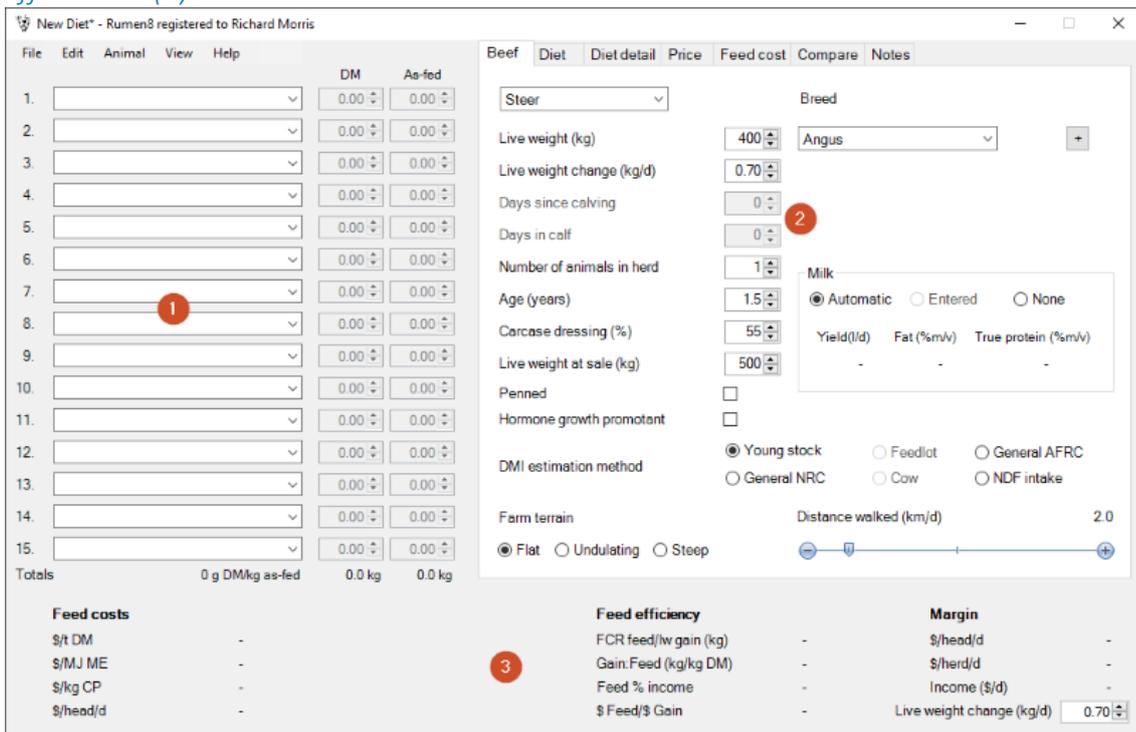
Once Rumen8 has a cost for the feeds and a live weight it can calculate a margin in the bottom left Summary section (3). In this example the steer is eating \$1.47 of feed each day and gaining a potential \$2.45 worth of live weight giving a margin of \$0.98 per day. This provides a simple way to compare the financial performance of different diets even when they influence live weight gain.

USING RUMEN8 IN STANDARD MODE

The main Rumen8 window when in standard mode is shown below. If you are currently in Compact mode you can change to Standard mode via the File menu.

The Diet Ingredients section (1) is where you specify the animal diet. The tabbed section (2) is where you can specify the animal details, evaluate the current diet, adjust feed costs and expected sale income, compare alternative diets and keep notes. The costs and efficiency strip at the bottom (3) reports feed costs, income, feed efficiency and margin.

The sections of the main Rumen8 window. Diet ingredients (1), detail tabs (2) and diet costs and efficiencies (3).



DESCRIBE A COW

Click on the 'Beef' tab to edit the animal details. Using the entry sliders or typing a number in the entry box describe the animal you wish to feed, or the average animal that represents your herd or sub-herd. For this example choose 'Steer' from the drop-down menu in the top left of the tab. To the right of the tab you can select the breed of the steer. Set this to 'Angus' for this example as shown in the figure below.

You can adjust live weight, growth rate, age, expected carcass dressing percentage and live weight at sale in the entry boxes below. You can ignore milk yield and components, days since calving and days in calf as they are not relevant for a steer. You may also adjust the activity level of the steer with the distance walked slider and choose if you have a flat, undulating or steeply hilly farm. Leave the dry matter intake (DMI) estimation method set to 'Young stock' for the time being.

To quickly overwrite a value in the entry box, double-click on it. The current value will be selected and then type in the new value to replace it.

The Beef animal tab.

	DM	As-fed
1.	0.00	0.00
2.	0.00	0.00
3.	0.00	0.00
4.	0.00	0.00
5.	0.00	0.00
6.	0.00	0.00
7.	0.00	0.00
8.	0.00	0.00
9.	0.00	0.00
10.	0.00	0.00
11.	0.00	0.00
12.	0.00	0.00
13.	0.00	0.00
14.	0.00	0.00
15.	0.00	0.00
Totals	0 g DM/kg as-fed	0.0 kg

Feed costs		
\$/t DM	-	
\$/MJ ME	-	
\$/kg CP	-	
\$/head/d	-	

Feed efficiency		
FCR feed/lw gain (kg)	-	
Gain:Feed (kg/kg DM)	-	
Feed % income	-	
\$ Feed/\$ Gain	-	

Margin		
\$/head/d	-	
\$/herd/d	-	
Income (\$/d)	-	
Live weight change (kg/d)	0.70	

Now click on the 'Diet' tab to the right of the 'Dairy' tab to view how well our diet will feed the cow. It doesn't show anything as we have not added any ingredients to the diet yet.

The Diet tab.

New Diet* - Rumen8 registered to Richard Morris

File Edit Animal View Help

Beef Diet Diet detail Price Feed cost Compare Notes

	DM	As-fed
1.	0.00	0.00
2.	0.00	0.00
3.	0.00	0.00
4.	0.00	0.00
5.	0.00	0.00
6.	0.00	0.00
7.	0.00	0.00
8.	0.00	0.00
9.	0.00	0.00
10.	0.00	0.00
11.	0.00	0.00
12.	0.00	0.00
13.	0.00	0.00
14.	0.00	0.00
15.	0.00	0.00
Totals	0 g DM/kg as-fed	0.0 kg 0.0 kg

Dry Matter Intake - % Limit

Metabolisable Energy - % Req't

Metabolisable Protein - % Req't

Calcium - % Req't **Sodium** - g/kg DM

Phosphorus - % Req't **Sulphur** - g/kg DM

Magnesium - % Req't **Potassium** - g/kg DM

NDF (% DM) - %

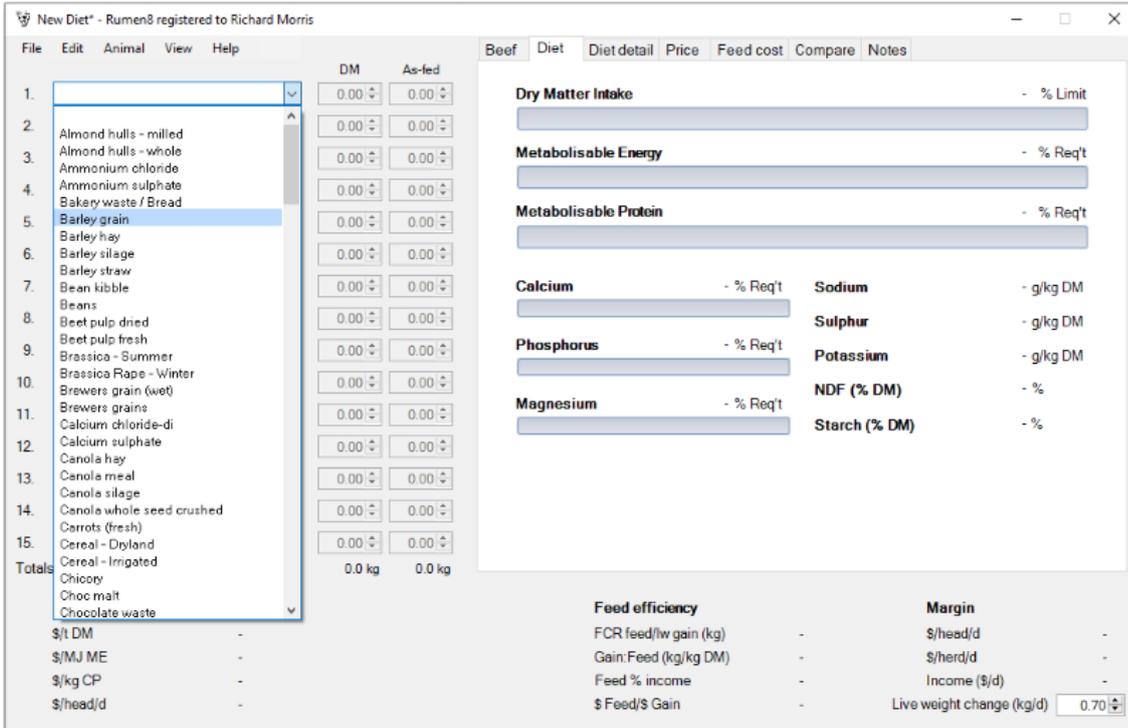
Starch (% DM) - %

Feed costs		Feed efficiency		Margin	
\$/t DM	-	FCR feed/lw gain (kg)	-	\$/head/d	-
\$/MJ ME	-	Gain:Feed (kg/kg DM)	-	\$/herd/d	-
\$/kg CP	-	Feed % income	-	Income (\$/d)	-
\$/head/d	-	\$ Feed/\$ Gain	-	Live weight change (kg/d)	0.70

ENTER A DIET

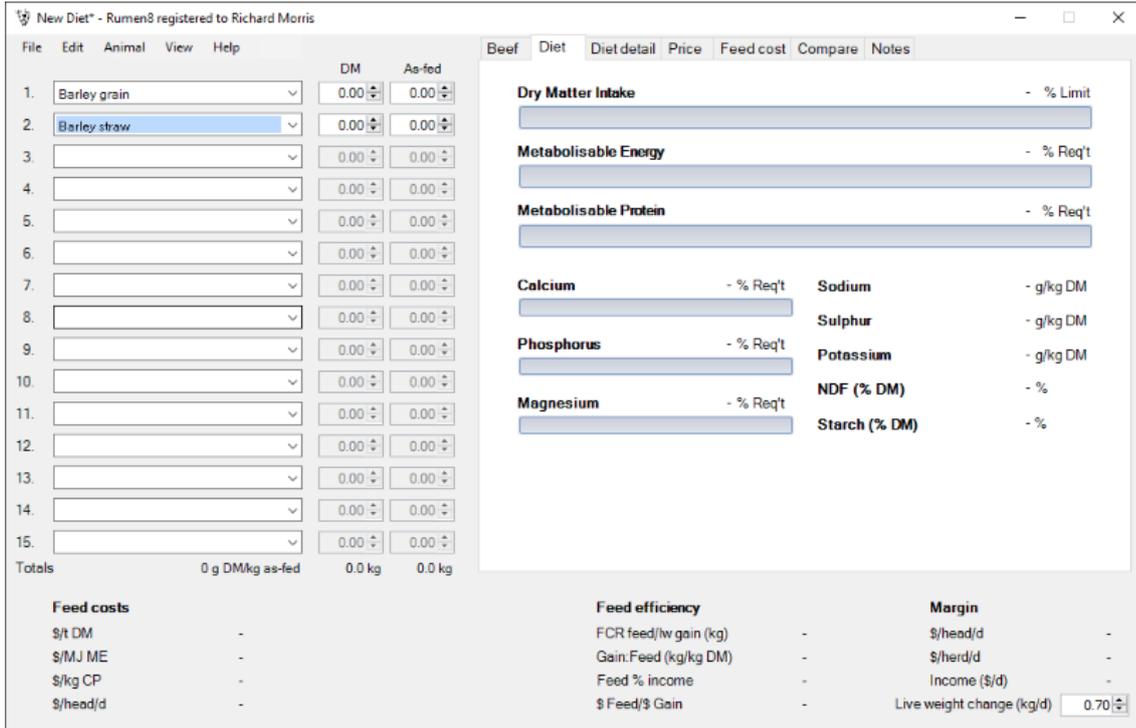
Fifteen ingredients can be added to a diet using the drop-down lists on the left of the window. Click on ingredient 1 and select 'Barley grain' as our first feed in the diet. To quickly jump down the list quickly type the first letter of the ingredient you wish to find.

Selecting a feed in the first diet component menu.



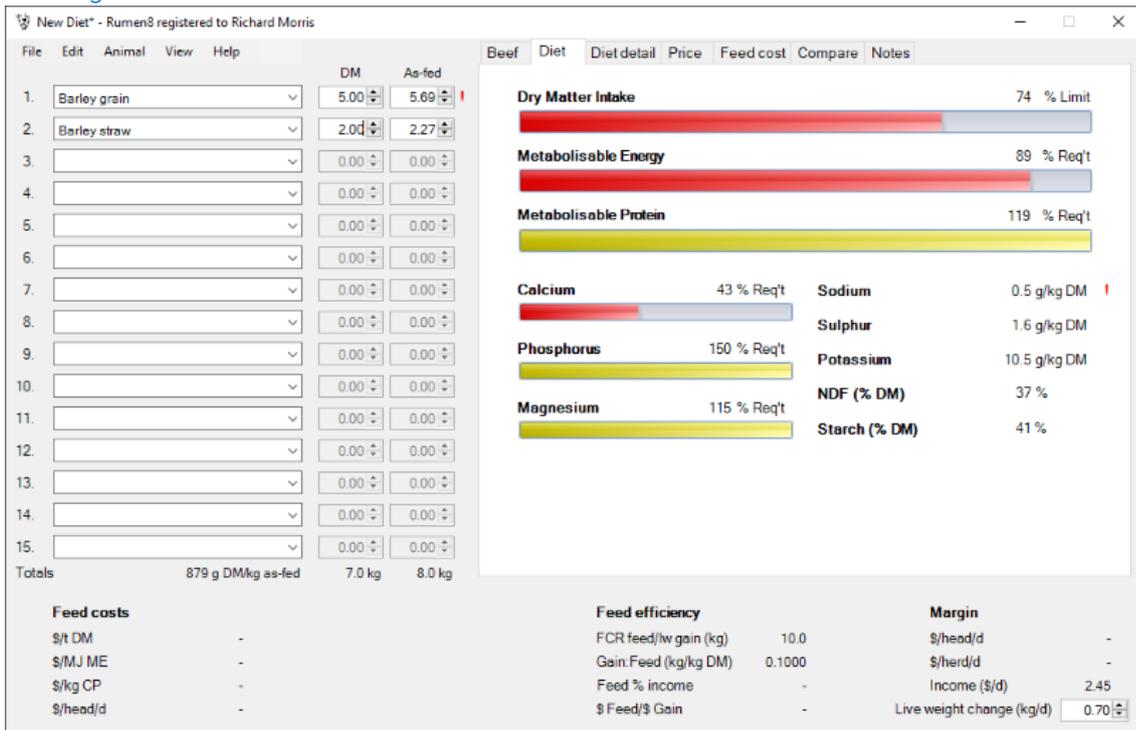
Select 'Barley straw' for ingredient 2 and the diet should now look like the figure below.

Two ingredients in the diet.



Now let's feed our steer. Enter the amount of each ingredient fed to the cow using the 'DM' entry box to the right of their name. Enter 5 kilograms of barley grain and 2 kilograms of barley straw. Click on the 'Diet' tab and the window should now look like the figure below. Notice that while you have entered the amount fed as kilograms of dry matter Rumen8 automatically shows you the amount as fed (including water) in the column to the right. You can adjust the amount with either dry or as fed quantities.

Feeding our cow.

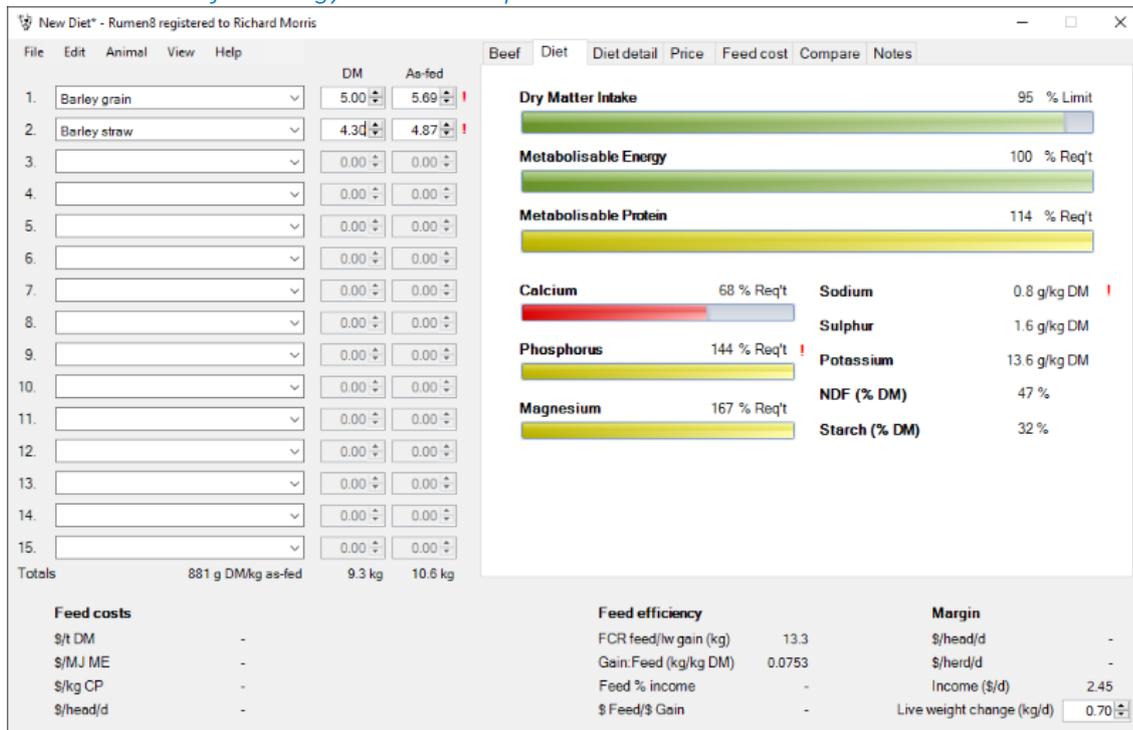


EVALUATE A DIET

The 'Diet' tab shows eleven of the parameters you need to consider when formulating a diet for dairy cows. For this example, we will consider the first three. With the current diet, we can see there is insufficient metabolisable energy (ME 89%) and plenty of protein (MP 119%) for the steer we described earlier. However, the steers' dry matter intake progress shows it is only 74% of its potential so this means it can physically eat more food if it is presented.

Increase the amount of barley straw to 4.3 kg. Now you will see the ME is at 100% of the steers' requirement and intake potential is still below 100% so this amount of feed can be eaten. Your screen should look like the figure below.

A diet balanced for energy with excess protein.



This brings us to a very important point that is true of all nutrition models. The application tells us we have a diet that meets the ME, MP and intake requirements of our steer, but a nutritionist is unlikely to recommend this diet. The starch content is quite high and we are wasting protein as it is being feed in excess of what the steer needs. This is before we consider the cost of this diet.

Rumen8 is a tool that will assist someone with nutritional knowledge to better and more cost effectively feed their animals, but in the hands of someone without that knowledge it can create diets that appear balanced on paper but may decrease animal performance or adversely affect their health.

We recommend Rumen8 is used with your nutritionist. Depending on your level of knowledge it can be used to adjust diets between visits by them.

This diet is now balanced for energy and the steer should be able to physically eat the feed when it is presented. This demonstrates the start of the process when designing a diet for your animals, and you can now further refine the diet by looking at other important parameters such as starch, fibre (NDF) and minerals. Additional information about the current diet is presented in the 'Diet

detail' tab to the right.

The remaining tabs allow you to change sale income ('Price' tab) and the cost of the feeds in the current diet ('Feed cost' tab). With feed costs and expected income Rumen8 can show you diet costs and margins to better compare alternatives. Use the 'Compare' tab to save and compare related diets before choosing the best one. The 'Notes' tab allows you to keep a description of the diet for reference in the future. How to use these functions is detailed in 'Using Rumen8' section of this guide.

DIET MARGIN

Click on the Feed cost tab. This tab allows you to enter the feed costs for each ingredient of the diet. Enter the prices for the barley grain and straw on a dry matter basis as \$200 and \$110 respectively so your values should be the same as in the figure below. You will see the feed costs on an as fed basis are calculated based on the dry matter content of the feed. You will see the Feed costs section in the bottom left of the window show several different ways to evaluate the cost of this diet.

Feed costs can be entered on the tab called Feed cost.

	DM		As-fed		Beef				
	DM	As-fed	St DM	St as-fed	Losses (%)	St DM	St as-fed	per MJ ME	per kg CP
1. Barley grain	5.00	5.69	200	176	0	200	176	0.016	1.64
2. Barley straw	4.30	4.87	110	97	0	110	97	0.017	2.62
3.	0.00	0.00							
4.	0.00	0.00							
5.	0.00	0.00							
6.	0.00	0.00							
7.	0.00	0.00							
8.	0.00	0.00							
9.	0.00	0.00							
10.	0.00	0.00							
11.	0.00	0.00							
12.	0.00	0.00							
13.	0.00	0.00							
14.	0.00	0.00							
15.	0.00	0.00							
Totals	881 g DM/kg as-fed		9.3 kg	10.6 kg					

Feed costs		Feed efficiency		Margin	
\$/t DM	158	FCR feed/lw gain (kg)	13.3	\$/head/d	0.98
\$/MJ ME	0.016	Gain:Feed (kg/kg DM)	0.0753	\$/herd/d	-
\$/kg CP	1.86	Feed % income	60	Income (\$/d)	2.45
\$/head/d	1.47	\$ Feed/\$ Gain	0.60	Live weight change (kg/d)	0.70

Now click on the tab called Price. Here you can enter the price you are expecting to be paid for the steer at sale. Leave the Payment by option to Live weight, but if you changed it to 'Carcase weight' you could enter a price based on the carcase weight based on the dressing percentage on the 'Beef' animal tab. Set the top sale price (1) to \$3.50 per kilogram of live weight. The sale weight has been copied over from the value entered on the Beef tab, but you can adjust it here if necessary.

The additional 4 sale prices are linked to the live weight calculator (2). You can read more about that in the 'Using Rumen8 for Beef' section of the guide that covers the Beef tab. For now just ignore it, so your screen should look like the one below.

The price received for animals at sale are entered on the Price tab.

Once Rumen8 has a cost for the feeds and a live weight it can calculate a margin in the bottom left Summary section. In this example the steer is eating \$1.47 of feed each day (3) and gaining a potential \$2.45 (4) worth of live weight giving a margin of \$0.98 per day (5). This provides a simple way to compare the financial performance of different diets even when they influence live weight gain.

THE PROBLEM OF MEASURING PASTURE INTAKE

It all sounds simple, choose the ingredients your animals are being fed, enter the quantities you provide and balance the diet. Easy, but what about grazed pasture? Accurately measuring how much grazed pasture an animal eats is very expensive and time consuming so may not be done on farm. To solve this problem, we 'back calculate' how much pasture the animals are predicted to eat by subtraction of all the feed ingredients you do know. It is easier than it sounds.

1. Enter the values that describe the average animal in your herd on the 'Beef' tab. Rumen8 will calculate the metabolisable energy needed for the animal and this is displayed on the 'Diet' and 'Diet detail' tabs.
2. Add all the supplementary feed provided to the animal using the ingredients drop-down lists. This includes grain fed in the shed or PMR/TMRs and forages in the paddock. Everything except grazed pasture.
3. Rumen8 now calculates the metabolisable energy provided by the supplements and the difference between this and the animal's requirement must be supplied by grazed pasture. This is shown on the 'Diet detail' tab as the 'Balance' under the 'Metabolisable energy' section and the remaining percentage of the metabolisable energy bar on the 'Diet' tab.
4. Select a suitable pasture for your farm and time of year as the next diet ingredient. Increase the quantity of this until the metabolisable energy provided by the diet is the same as the requirement of the animal.

You now have the diet that reflects the current situation with an estimate of the amount of pasture each animal is eating. With this information you can explore alternative diets that include pasture assuming you maintain the amount of pasture on offer for the herd in the future.

RUMEN8 WARNINGS

Rumen8 will sometimes display a red exclamation mark to draw your attention to something that may be wrong with a diet or parameter value you have entered. For example, if the days since calving and days in calf values result in the cow getting back in calf within 40 days after calving a red exclamation mark appears next to the entry boxes for these parameters suggesting you should double check the values.

In the previous examples you can see a red exclamation mark alongside the ingredient barley grain. This means the quantity of barley in the diet exceeds the recommended maximum. If you hover your mouse over the exclamation mark a tool tip will appear giving you more details about the issue.

! When you see a red exclamation mark mouse over it and the tool tip will tell you what is wrong.

MENU COMMANDS FOR BEEF

The menu is along the top of the main window and has five choices, File, Edit, Animal, View and Help.

File menu

The File menu.

The screenshot displays the Rumen8 software interface. The 'File' menu is open, showing options such as New, Open, Open Recent, Save, Save As, Reload Feeds, Reports, Preferences, Standard Mode, Compact Mode, Dairy, Beef, and Exit. The background window is titled 'New Diet - Rumen8 registered to Richard Morris' and contains several input fields and sections:

- Animal Details:** Species (Steer), Breed (Angus), Live weight (kg) (400), Live weight change (kg/d) (0.70), Days since calving (0), Days in calf (0), Number of animals in herd (1), Age (years) (1.5), Carcase dressing (%) (55), Live weight at sale (kg) (500).
- Milk Section:** Radio buttons for Automatic (selected), Entered, and None. A table for Milk properties: Yield(l/d), Fat(%m/v), True protein(%m/v).
- DMI estimation method:** Radio buttons for Young stock (selected), Feedlot, General AFRC, General NRC, Cow, and NDF intake.
- Farm terrain:** Radio buttons for Flat (selected), Undulating, and Steep. A slider for Distance walked (km/d) is set to 2.0.
- Totals:** 0 g DM/kg as-fed, 0.0 kg, 0.0 kg.
- Feed costs:** \$/t DM, \$/MJ ME, \$/kg CP, \$/head/d.
- Feed efficiency:** FCR feed/lw gain (kg), Gain:Feed (kg/kg DM), Feed % income, \$ Feed/\$ Gain.
- Margin:** \$/head/d, \$/herd/d, Income (\$/d), Live weight change (kg/d) (0.70).

<i>New</i>	Start a new diet. The current diet will be cleared, the animal will revert to the default, diets stored in the Compare tab will be cleared, split herds cleared and any notes erased. If the current diet has not been saved you will be prompted to do this before the diet is cleared.
<i>Open</i>	Allows you to load a previously saved diet. A warning will appear if the milk price or dry matter intake parameters have changed since the diet was saved. These warnings can be disabled in the Preferences. You can also import diet files from version 2 of Rumen8 by selecting the file type 'Rumen8 v2 files (*.csv)' in the Open dialog box.
<i>Open Recent</i>	The sub-menu shows a list of the previous 5 diet files to be opened. To re-open one of these select it from the list. To remove all the previous diet files from the list select the Clear option at the bottom of the sub-menu.
<i>Save</i>	Save the current diet. This is only available if the diet has been previously named and saved using the 'Save As' menu.
<i>Save As</i>	Name and then save the current diet. If changes to the current diet have not been saved an * will appear next to the diet name in the title bar.
<i>Reload feeds</i>	This updates all the feed data from the feed library. This is useful if you have multiple instances of Rumen8 running and have made a change to a feed in one of them and wish to quickly update the others.
<i>Reports</i>	Opens the report designer that creates diet reports for printing or to be saved as a PDF document.
<i>Preferences</i>	Opens the Preferences allowing you to change Rumen8 settings. A more detailed explanation is given in the Preferences section.
<i>Standard Mode</i>	When ticked all of Rumen8's functions are available.
<i>Compact Mode</i>	When ticked the Rumen8 window is reduced to the essentials required to balance a diet based on energy, protein, fibre and starch.
<i>Dairy</i>	When ticked Rumen8 is in dairy mode. Select to switch to dairy mode.
<i>Beef</i>	When ticked Rumen8 is in beef mode. Select to switch to beef mode.
<i>Exit</i>	Close Rumen8. You will be prompted to save an unsaved diet.

EDIT MENU

The Edit menu.

New Diet* - Rumen8 registered to Richard Morris

File Edit Animal View Help

- Edit Feeds Ctrl+F
- Search Feeds
- Copy Diet Ctrl+C
- Copy All Diets Ctrl+A
- Clear Current Diet
- Create Mix From Diet
- Feed Library
- Preferences Library
- Prices Library
- All Libraries

DM As-fed

1.		0.00	0.00
2.		0.00	0.00
3.		0.00	0.00
4.		0.00	0.00
5.		0.00	0.00
6.		0.00	0.00
7.		0.00	0.00
8.		0.00	0.00
9.		0.00	0.00
10.		0.00	0.00
11.		0.00	0.00
12.		0.00	0.00
13.		0.00	0.00
14.		0.00	0.00
15.		0.00	0.00

Totals 0 g DM/kg as-fed 0.0 kg 0.0 kg

Beef Diet Diet detail Price Feed cost Compare Notes

Steer Breed

Live weight (kg) 400 Angus

Live weight change (kg/d) 0.70

Days since calving 0

Days in calf 0

Number of animals in herd 1

Age (years) 1.5

Carcass dressing (%) 55

Live weight at sale (kg) 500

Penned

Hormone growth promotant

DMI estimation method Young stock Feedlot General AFRC General NRC Cow NDF intake

Farm terrain Distance walked (km/d) 2.0

Flat Undulating Steep

Feed costs

\$/t DM	-
\$/MJ ME	-
\$/kg CP	-
\$/head/d	-

Feed efficiency

FCR feed/lw gain (kg)	-
Gain:Feed (kg/kg DM)	-
Feed % income	-
\$ Feed/\$ Gain	-

Margin

\$/head/d	-
\$/herd/d	-
Income (\$/d)	-
Live weight change (kg/d)	0.70

Edit Feeds	Opens the Feed Editor to change feeds and mixes and the ingredients available in the ingredient drop-down lists. A more detailed explanation is given in the Feed Editor section.
Copy Diet	Copy the current diet to the clipboard for later pasting into Excel or Word for example.
Copy All Diets	Copy the current diet and the three stored diets to the clipboard.
Clear Current Diet	Removes all the ingredients from the diet.
Create Mix From Diet	<p>Opens a window that allows a new mix to be created from the current diet feeds (not mixes). Each ingredient can be removed from the mix by unticking the box to the left of the feed name. Each feed displays the quantity in the new mix on a dry matter and as fed basis, and the percentage of the mix it makes up.</p> <p>To the right of the ingredient list you can select if the mix percentages are based on dry or as fed quantities and check the total mix dry matter content and number of ingredients.</p> <p>Below are the normal mix parameters like those in the Feed Editor mix tab. The mix must have a unique name among existing feeds and mixes. The heading 'Name' will turn red if this is not the case and you will be unable to click on the 'Okay' button to create the mix.</p> <p>Once you are happy with the mix definition, have given it a unique name and provided as many of the optional parameters as you wish, click on the 'Okay' button to save it to the current feed library.</p>
Feed Library	If multiple feed libraries have been created in the Feed Editor they can be selected by name using this sub-menu.
Preferences Library	If multiple Preferences libraries have been created in the Preferences they can be selected by name using this sub-menu. <i>This option is not available in Compact mode.</i>
Prices Library	If multiple Prices libraries have been created on the Price tab they can be selected by name using this sub-menu. <i>This option is not available in Compact mode.</i>
All Libraries	<p>If a feed, preferences and prices library are given the same name they are referred to as a library set and will appear in this sub-menu. Selecting one of these library sets will change all three libraries at once. <i>This option is not available in Compact mode.</i></p> <p>This is useful if you are using Rumen8 in different countries. For example, if you are based in Kenya but also consult in Uganda you can create feed, preferences and prices libraries specific to Kenya and give them all the same name, such as 'Kenya'. Also create three additional libraries specific to Uganda and make sure they are all called 'Uganda'. Now under the 'All Libraries' sub-menu you can select Kenya or Uganda and quickly switch between library sets.</p> <p>Library sets must contain all three library types and have exactly the same name before they will appear in the 'All Libraries' menu.</p>

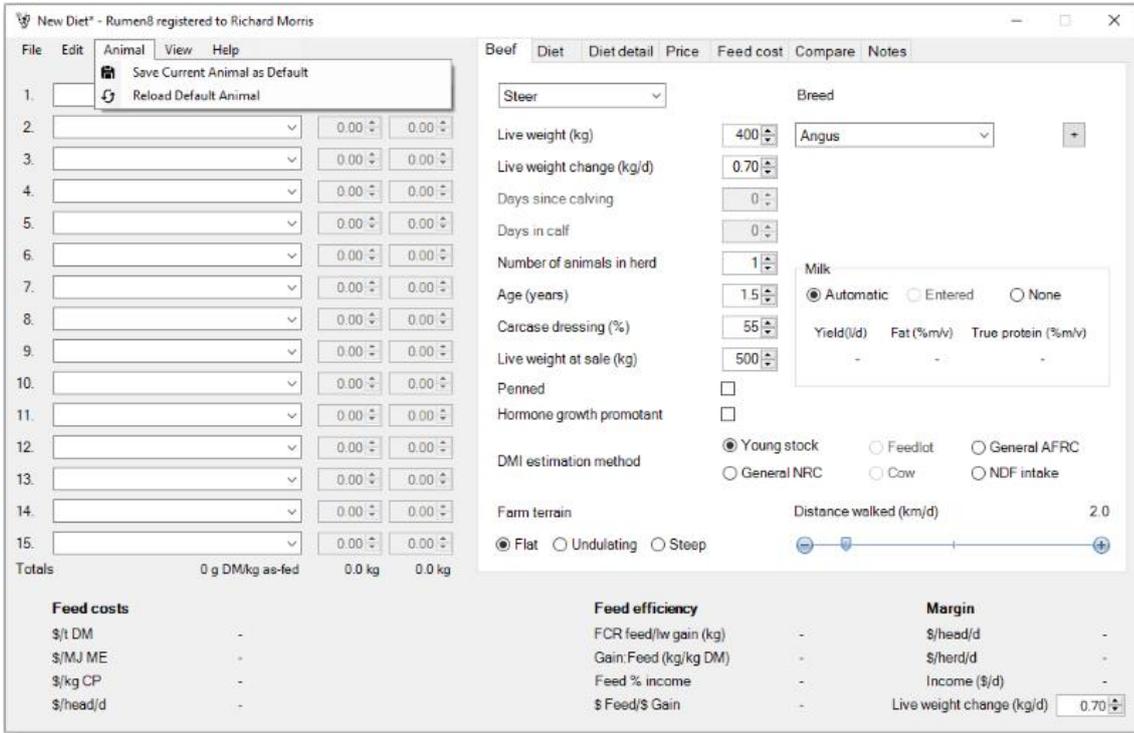
The mix creation tool available from the Edit menu.

Create a mix from the current diet
?
×

Include ingredient	DM	As-Fed	Mix (%)	Mix parameters																														
1. <input checked="" type="checkbox"/> Barley grain	8.4	9.6	42.2	Mix percentages <input checked="" type="radio"/> Dry matter <input type="radio"/> As-fed																														
2. <input checked="" type="checkbox"/> Lupins grain	0.5	0.6	2.5	Dry matter content: 27.9%																														
3. <input checked="" type="checkbox"/> Ryegrass ann. - Dry - Spr - Low quality (Aust)	11.0	61.1	55.3	Number of ingredients: 3																														
4. <input type="checkbox"/> None	-	-	-	<div style="margin-top: 10px;"> Name <input style="width: 100%;" type="text" value="A new mix"/> </div> <div style="margin-top: 10px;"> <table style="width: 100%; border: none;"> <tr> <td style="width: 20%;">Max feeding rate (g/kg)</td> <td style="width: 20%;"><input type="text"/></td> <td style="width: 20%;">Mix cost (\$/t)</td> <td style="width: 20%;"><input type="text"/></td> <td style="width: 10%; text-align: center;">DM</td> <td style="width: 10%; text-align: center;">as-fed</td> </tr> <tr> <td>Wet density (kg/m3)</td> <td><input type="text"/></td> <td>Ingredients cost (\$/t)</td> <td><input type="text"/></td> <td style="text-align: center;">209</td> <td style="text-align: center;">58</td> </tr> <tr> <td colspan="3"></td> <td>Losses (%)</td> <td colspan="2"><input type="text"/></td> </tr> <tr> <td colspan="3">Source</td> <td colspan="3"><input type="text"/></td> </tr> <tr> <td colspan="3">Comment</td> <td colspan="3"><input type="text"/></td> </tr> </table> </div>	Max feeding rate (g/kg)	<input type="text"/>	Mix cost (\$/t)	<input type="text"/>	DM	as-fed	Wet density (kg/m3)	<input type="text"/>	Ingredients cost (\$/t)	<input type="text"/>	209	58				Losses (%)	<input type="text"/>		Source			<input type="text"/>			Comment			<input type="text"/>		
Max feeding rate (g/kg)	<input type="text"/>	Mix cost (\$/t)	<input type="text"/>		DM	as-fed																												
Wet density (kg/m3)	<input type="text"/>	Ingredients cost (\$/t)	<input type="text"/>		209	58																												
			Losses (%)		<input type="text"/>																													
Source			<input type="text"/>																															
Comment			<input type="text"/>																															
5. <input type="checkbox"/> None	-	-	-																															
6. <input type="checkbox"/> None	-	-	-																															
7. <input type="checkbox"/> None	-	-	-																															
8. <input type="checkbox"/> None	-	-	-																															
9. <input type="checkbox"/> None	-	-	-																															
10. <input type="checkbox"/> None	-	-	-																															
11. <input type="checkbox"/> None	-	-	-																															
12. <input type="checkbox"/> None	-	-	-																															
13. <input type="checkbox"/> None	-	-	-																															
14. <input type="checkbox"/> None	-	-	-																															
15. <input type="checkbox"/> None	-	-	-																															
Total (kg)	19.9	71.2	100.0																															

ANIMAL MENU

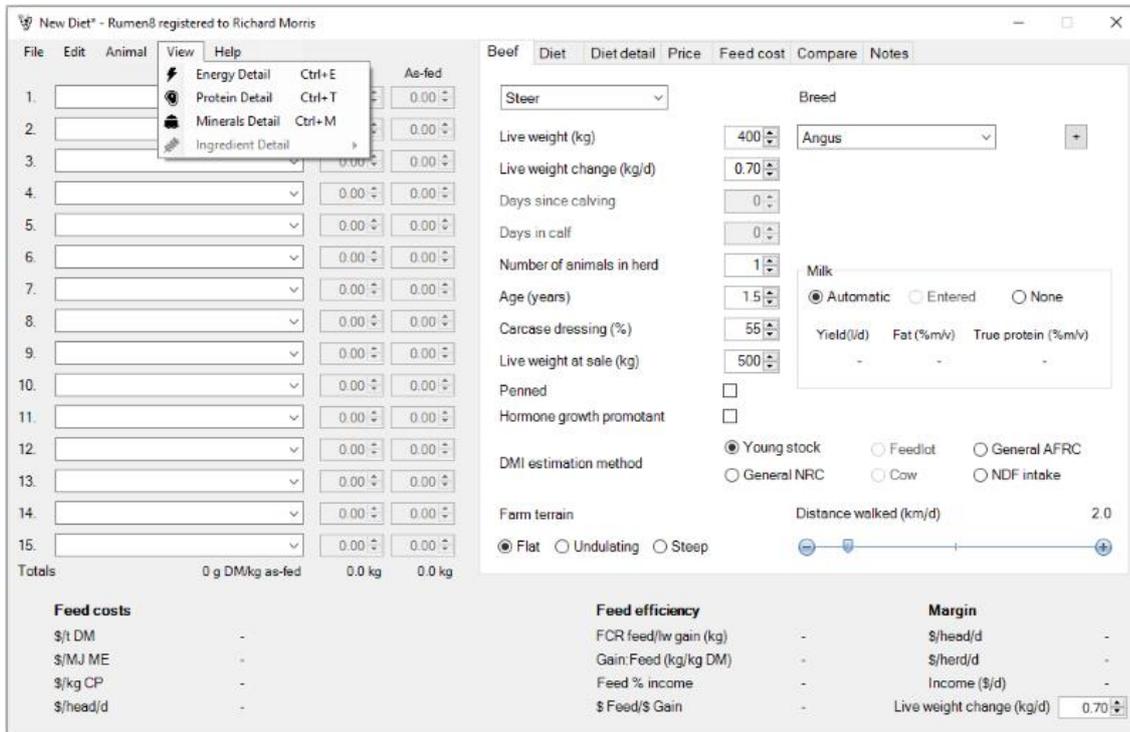
The Animal menu.



<i>Save current animal as the default</i>	Save the current animal as the default that will be loaded each time Rumen8 starts.
<i>Reload default animal</i>	Replace the current animal with the default animal.

VIEW MENU

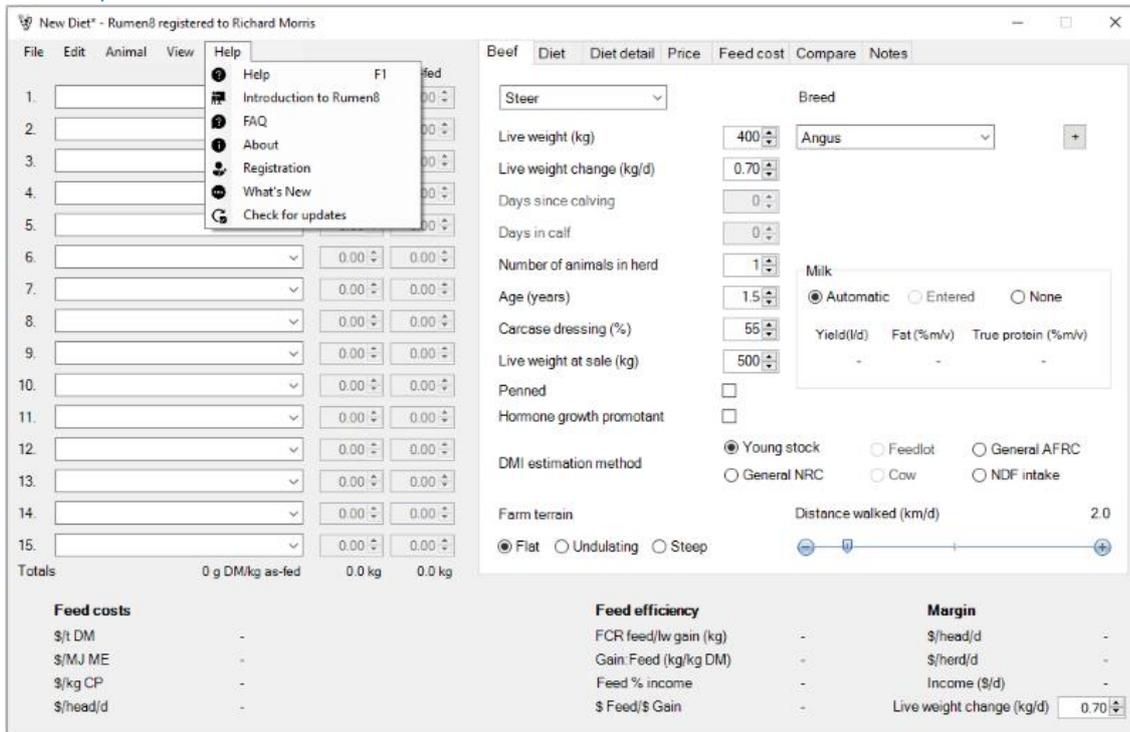
The View menu.



Energy detail	Displays the details of the metabolisable energy demand calculated for the animal.
Protein detail	Displays the details of the metabolisable protein supply and demand calculated for the animal.
Minerals detail	Displays the details of the calcium, phosphorus and magnesium demand and supply.
Ingredient detail	Displays the attributes of a of diet ingredient. The sub-menu allows you to choose from ingredient 1 to 15.

HELP MENU

The Help menu.



Help	Opens a context sensitive version of this document.
Introduction to Rumen8	Starts an introductory tutorial that explains the basics of creating a diet in Rumen8.
FAQ	Opens the default browser and displays the FAQ page on the Rumen8 website.
About	Display information about Rumen8 such as the version number, website address and email for support. You can also access the Acknowledgements, End user license agreement and a list of references of publications used to create Rumen8.
Registration	Enter your registration number and name here to unlock all the diet ingredients.
What's new	Lists all the changes to each version of Rumen8.
Check for updates	Check to see if a newer version of Rumen8 is available. This can only be done if your computer is connected to the Internet.

USING RUMEN8 FOR BEEF

This section will describe the main parts of the Rumen8 window and how you use them.

DIET INGREDIENTS

The left section of the main window is where you add ingredients to your diet and specify the quantity fed each day. In the figure below it is highlighted within a blue rectangle.

The diet ingredients section of the main window shown within the blue rectangle.

	DM	As-fed
1.	0.00	0.00
2.	0.00	0.00
3.	0.00	0.00
4.	0.00	0.00
5.	0.00	0.00
6.	0.00	0.00
7.	0.00	0.00
8.	0.00	0.00
9.	0.00	0.00
10.	0.00	0.00
11.	0.00	0.00
12.	0.00	0.00
13.	0.00	0.00
14.	0.00	0.00
15.	0.00	0.00
Totals	0 g DM/kg as-fed	0.0 kg

Feed costs	Feed efficiency	Margin
\$/t DM	FCR feed/lw gain (kg)	\$/head/d
\$/MJ ME	Gain:Feed (kg/kg DM)	\$/herd/d
\$/kg CP	Feed % income	Income (\$/d)
\$/head/d	\$ Feed/\$ Gain	Live weight change (kg/d) 0.70

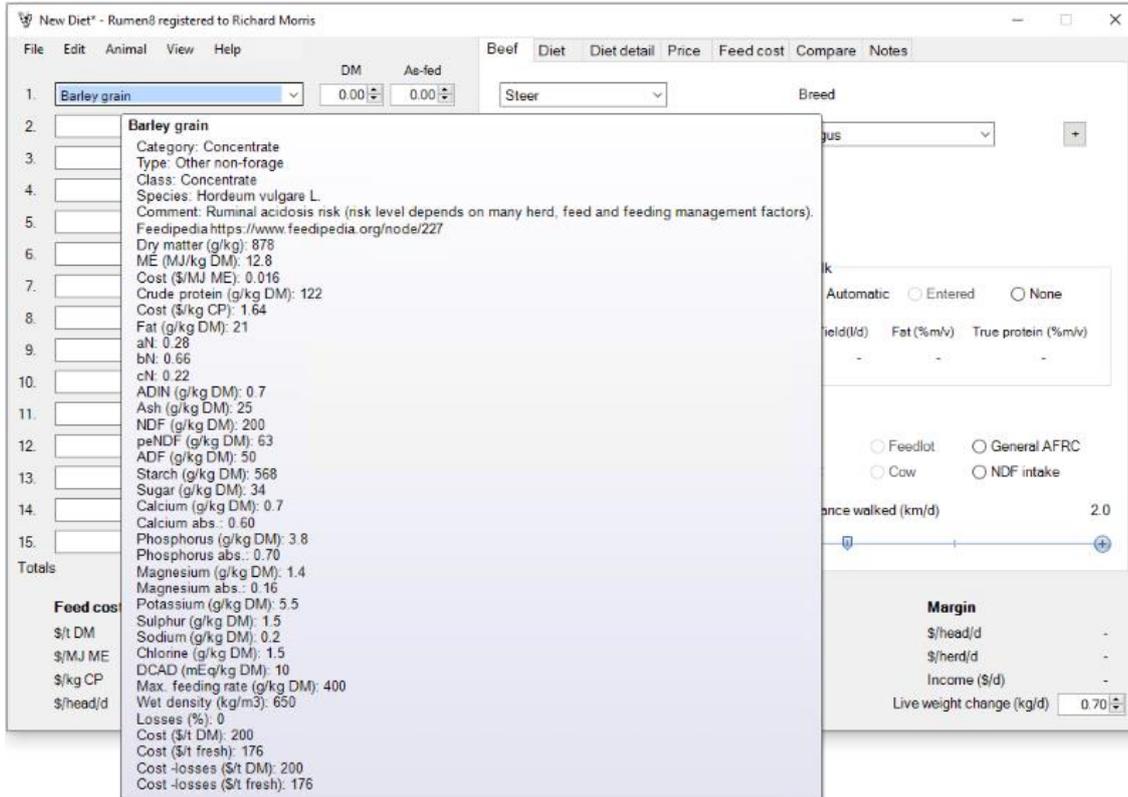
Clicking on the down arrowhead on the right side of the drop-down lists allows you to choose any of the feeds available from the feed library.

If you want an ingredient further down the list type the first letter of its name on the keyboard to jump to the first ingredient starting with that letter.

Once a feed has been selected the 'DM' and 'As-fed' entry boxes become active and you can either type the kilograms to be fed in directly or click on the up and down buttons to vary the existing amount.

You can enter the value on a dry matter basis in the 'DM' column and the amount will be displayed on an as-fed basis in the 'As-fed' entry box. If you prefer to enter the amount as-fed the reverse works in the same manner. Internally Rumen8 always uses the value on a dry matter basis. Up to fifteen feeds or mixes can be added to a diet. To see the details of a selected ingredient, right-click on the ingredient number and the detail window will open. Alternatively hover the mouse over ingredient name and a tool tip will appear showing the feed or mix attributes. The total diet weight on a dry matter basis and as fed are displayed at the bottom of each of the columns. To the left the dry matter content of the diet is displayed.

The diet ingredient tool tip window displays the parameters for that feed or mix.



The diet ingredient detail window displays all the parameters for an ingredient. The window can remain open while the diet is created and you can quickly switch between ingredients using the drop down menu displaying the feed names at the top (1) or the ingredient numbers at the bottom (4). The Other names button at the top right (2) opens a window where you can see the other names for a feed. One of the feed parameters is a comment that can be entered by the user. If this comment contains a internet web address it will appear blue (3). It can be clicked on to open the default browser and display the page at that address. In the example below the link will open the Feedipedia page for the feed providing more information that may be useful for the user. As the external links are beyond the control of RUMen8, ensure they are for a safe website address before clicking on them.

The diet ingredient detail window.

Diet ingredient detail

1. Barley grain

Species: *Hordeum vulgare L.*

Management: Concentrate Comment: Ruminal acidosis risk (risk level depends on many herd, feed and feeding management factors).

Protein type: Other non-forage Feedipedia <https://www.feedipedia.org/node/227>

Particle size: Concentrate

Source

DM (g/kg)	878	Calcium (g/kg DM)	0.7	NDF (g/kg DM)	200
ME (MJ/kg DM)	12.8	Calcium absorption	0.60	peNDF (g/kg DM)	63
Cost (\$/MJ ME)	0.027	Phosphorus (g/kg DM)	3.8	ADF (g/kg DM)	50
CP (g/kg DM)	122	Phosphorus absorption	0.70	Starch (g/kg DM)	568
Cost (\$/kg DM CP)	2.80	Magnesium (g/kg DM)	1.4	Sugar (g/kg DM)	34
Fat (g/kg DM)	21	Magnesium absorption	0.16	Max feeding rate (g/kg DM)	400
aN	0.28			Wet density (m3)	650
bN	0.66	Potassium (g/kg DM)	5.5	Cost (\$/t DM)	342
cN	0.22	Sulphur (g/kg DM)	1.5	Cost (\$/t as-fed)	300
		Sodium (g/kg DM)	0.2	Losses (%)	0
ADIN (g/kg DM)	0.7	Chlorine (g/kg DM)	1.5	Cost -losses (\$/t DM)	342
Ash (g/kg DM)	25	DCAD (mEq/kg DM)	10	Cost -losses (\$/t as-fed)	300

1 2 3 4 5 6 7 8 9 10 11 12 13 14 15

As feeds are added or quantities are adjusted Rumen8 recalculates energy, protein and nutrient supply relative to demand showing how well your diet is meeting production requirements.

To quickly remove an ingredient from the diet, hold down the Shift key on the keyboard and right click on the ingredient number. To clear all the ingredients from the diet, select 'Clear current diet' from the Edit menu.

Moving ingredients in the diet

Ingredients can be dragged and dropped between the 15 feed locations to swap their positions. Amount fed is also swapped with the ingredients. To move ingredient 3 to position 8 left click and hold on the number 3 to the left of the ingredient name. The mouse pointer will change to show a small rectangle below the pointer. Still holding down the mouse button down move the pointer over the ingredient 8's name or number and release. The ingredients and their amounts fed will now be swapped. You can only drop an ingredient over the ingredient name or number, anywhere else will display a no entry symbol.

Step 1: Starting to drag Barley grain in position 1 to position 8.

	DM	As Fed
1. Barley grain	5.00	5.69
2.	0.00	0.00
3.	0.00	0.00
4.	0.00	0.00
5.	0.00	0.00
6.	0.00	0.00
7.	0.00	0.00
8. Ryegrass ann. - Dry - Spr - Low quality	10.00	55.56
9.	0.00	0.00
10.	0.00	0.00
11.	0.00	0.00
12.	0.00	0.00
13.	0.00	0.00
14.	0.00	0.00
15.	0.00	0.00
Total daily intake (kg/d)	15.0	61.3

Feed costs	
\$/t DM	181
\$/MJ ME	0.017
\$/kg CP	1.36
\$/head/d	2.71

Feed efficiency	
FCR feed/lw gain (kg)	30.0
Gain:Feed (kg/kg DM)	0.0333
\$ Feed/\$ Gain	1.55
Income (\$/d)	1.75

Margin	
\$/head/d	-0.96
\$/herd/d	-
Feed % income	155
Live weight change (kg/d)	0.50

Step 2: Drop the Barley grain over the ingredient position you want it to occupy by releasing the mouse click.

New Diet* - Rumen8 registered to Richard Morris

File Edit Animal View Help

	DM	As Fed
1. Barley grain	5.00	5.69
2.	0.00	0.00
3.	0.00	0.00
4.	0.00	0.00
5.	0.00	0.00
6.	0.00	0.00
7.	0.00	0.00
8. Ryegrass ann. - Dry - Spr - Low quality	10.00	55.56
9.	0.00	0.00
10.	0.00	0.00
11.	0.00	0.00
12.	0.00	0.00
13.	0.00	0.00
14.	0.00	0.00
15.	0.00	0.00

Total daily intake (kg/d) 15.0 61.3

Feed costs

\$/t DM	181
\$/MJ ME	0.017
\$/kg CP	1.36
\$/head/d	2.71

Feed efficiency

FCR feed/lw gain (kg)	30.0
Gain:Feed (kg/kg DM)	0.0333
\$ Feed/\$ Gain	1.55
Income (\$/d)	1.75

Margin

\$/head/d	-0.96
\$/herd/d	-
Feed % income	155
Live weight change (kg/d)	0.50

Beef Diet Diet detail Price Feed cost Compare Notes

Cow Breed

Live weight (kg) 500 Angus

Live weight change (kg/d) 0.50

Days since calving 150

Days in calf 70

Number of cows in herd 1

Age (years) 4.0

Carcase dressing (%) 55

Live weight at sale (kg) 500

Penned

Hormone growth promotant

DMI estimation method Young stock Feedlot General AFRC General NRC Cow NDF intake

Farm terrain Distance walked (km/d) 2.0 Flat Undulating Steep

Milk Automatic Entered None

Yield (l/d)	8.1
Fat (%m/v)	4.00
True protein (%m/v)	3.00

Step 3: After the drag and drop the Barley grain and Ryegrass have swapped ingredient positions.

New Diet* - Rumen8 registered to Richard Morris

File Edit Animal View Help

	DM	As Fed
1. Ryegrass ann. - Dry - Spr - Low quality	10.00	55.56
2.	0.00	0.00
3.	0.00	0.00
4.	0.00	0.00
5.	0.00	0.00
6.	0.00	0.00
7.	0.00	0.00
8. Barley grain	5.00	5.69
9.	0.00	0.00
10.	0.00	0.00
11.	0.00	0.00
12.	0.00	0.00
13.	0.00	0.00
14.	0.00	0.00
15.	0.00	0.00

Total daily intake (kg/d) 15.0 61.3

Feed costs

\$/t DM	181
\$/MJ ME	0.017
\$/kg CP	1.36
\$/head/d	2.71

Feed efficiency

FCR feed/lw gain (kg)	30.0
Gain:Feed (kg/kg DM)	0.0333
\$ Feed/\$ Gain	1.55
Income (\$/d)	1.75

Margin

\$/head/d	-0.96
\$/herd/d	-
Feed % income	155
Live weight change (kg/d)	0.50

Beef Diet Diet detail Price Feed cost Compare Notes

Cow Breed

Live weight (kg) 500 Angus

Live weight change (kg/d) 0.50

Days since calving 150

Days in calf 70

Number of cows in herd 1

Age (years) 4.0

Carcase dressing (%) 55

Live weight at sale (kg) 500

Penned

Hormone growth promotant

DMI estimation method Young stock Feedlot General AFRC General NRC Cow NDF intake

Farm terrain Distance walked (km/d) 2.0 Flat Undulating Steep

Milk Automatic Entered None

Yield (l/d)	8.1
Fat (%m/v)	4.00
True protein (%m/v)	3.00

ANIMAL

The Beef animal tab is the first of the tabbed section of the main window and is used to describe the beef cow, or the cow that represents the herd average, for the diet that we are creating.

The Beef animal tab highlighted within the red rectangle.

	DM	As-fed
1.	0.00	0.00
2.	0.00	0.00
3.	0.00	0.00
4.	0.00	0.00
5.	0.00	0.00
6.	0.00	0.00
7.	0.00	0.00
8.	0.00	0.00
9.	0.00	0.00
10.	0.00	0.00
11.	0.00	0.00
12.	0.00	0.00
13.	0.00	0.00
14.	0.00	0.00
15.	0.00	0.00
Totals	0 g DM/kg as-fed	0.0 kg

Feed costs	Feed efficiency	Margin
\$/t DM	FCR feed/lw gain (kg)	\$/head/d
\$/MJ ME	Gain:Feed (kg/kg DM)	\$/herd/d
\$/kg CP	Feed % income	Income (\$/d)
\$/head/d	\$ Feed/\$ Gain	Live weight change (kg/d) 0.70

Using the sliders adjust live weight, growth rate, milk yield and components, days pregnant and days in milk. The value can be changed quickly by moving the slider left and right or adjusted 1 unit at a time by clicking on the – and + symbols at either end. To quickly overwrite a value in the entry box double click on it. The current value will be selected and then type in the new value to replace it.

Days in calf and days since calving can also be set by specifying the date of conception or calving by clicking on the calendar icon .

Additional parameters let you adjust the activity level of your animals if you have a large or hilly farm. Note that a grazing animal will typically walk 4-5 km over a day in the paddock.

Animal type

Select the animal type in the drop-down menu at the top left of the tab. The choices are unmated heifer, mated heifer, steer, beef cow, dual purpose cow and bull. Dual purpose cows are a crossbred cow of a dairy breed x beef breed where milk is harvested for human consumption. Dual purpose cows are typically managed less intensively than lactating dairy cows and are lower-yielding. Often a calf is suckled in addition to mechanical/hand milking. A milk price on the Price tab can be entered and milk income values are shown in the economics and efficiencies values at the bottom of the main window. The milk income along with growth rate can contribute towards the margin calculation.

If the dual purpose cow is only being used for milk sale and will not be sold at the end of the lactation on the Prices tab set the sale price per kilogram to zero so her growth rate does not

contribute to income.

Dairy breeds are included so beef dairy crosses can be used. If the breeds are set to only dairy Rumen8 will warn the user dairy mode is more suitable for the animal. Also use Dairy mode when a dual purpose cow such as Sahiwal or Simmental is managed as a dairy cow.

The first time an animal type is selected the parameters on the Beef tab will be set to standard values. After you modify these values to suit your herd and farm, if you switch to another animal type and then return, your modified values will be retained.

Breed

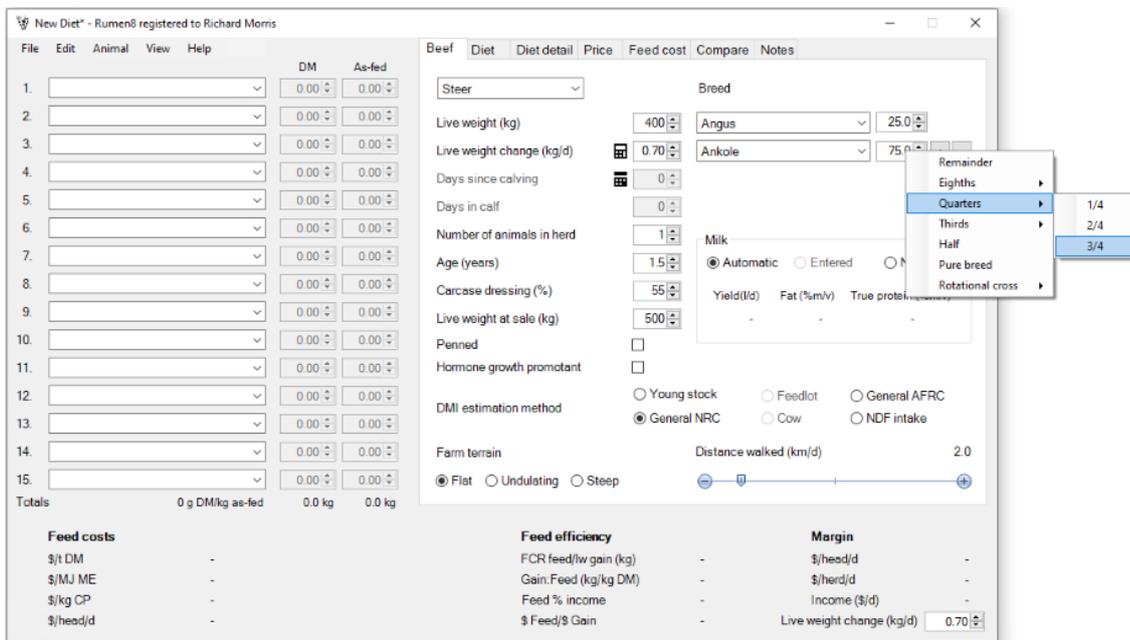
Select the breed from the drop-down list. Up to three breeds can be specified to define a cross breed animal. To add a second or third breed click on the + button to the right of the breed menu. To remove the second or third breed click on the - button.

To define a cross breed animal you must enter the percentage of each breed in the entry box to the right of the breed name. Right click on the entry box to use a menu to quickly enter commonly used fractions. Select 'Remainder' from the menu to set the current breed percentage to the amount required to bring the breed total to 100% and complete the breed definition for the animal.

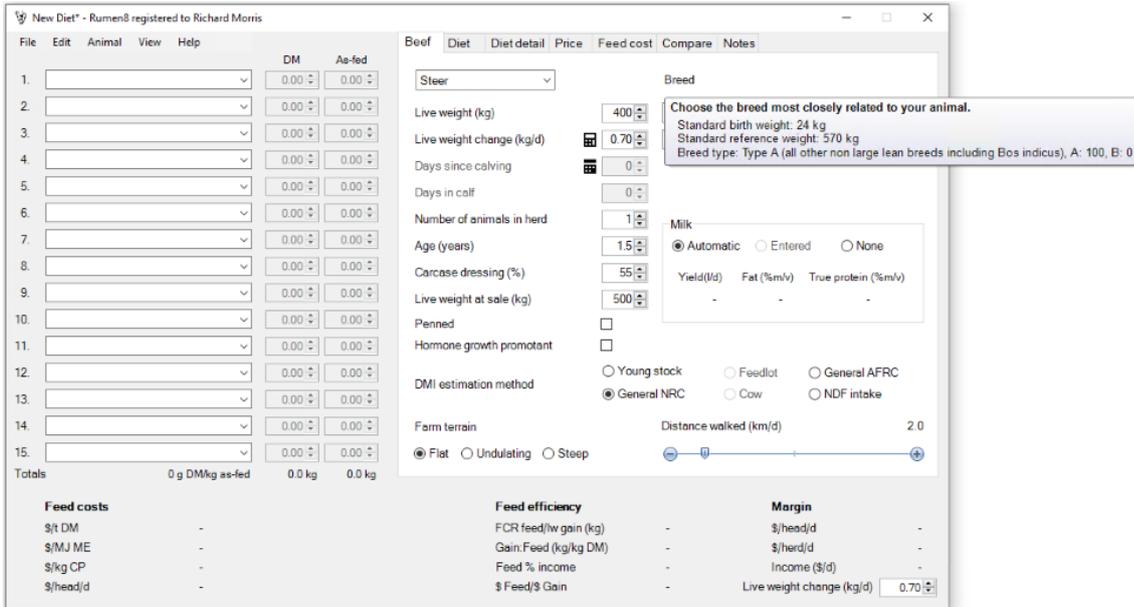
If you hover over the 'Breed' heading the standard birth and reference weights of the animal is shown in a tool tip. Hovering over each pure breed type in the drop-down menus displays their standard birth and reference weights in a tool tip.

Some dairy breeds are included to allow dairy x beef crosses (dual purpose cows). If you wish to create a diet for a pure dairy breed or dairy x dairy cross switch to Rumen8 dairy mode in the File menu as in this mode the animal model is specific to dairy animals.

Right click on the input box to use the breed percentage menu to quickly define a cross breed animal.



The Breed tool tip displaying the standard birth and reference weight for the animal.



Live weight

Mean live weight (kg) of the herd at the time of interest. Cows that are weighed on farm are the best guide, but if cow live weight is unknown, use the standard reference weight as a guide. Hover your mouse over the 'Breed' heading to see the standard reference weight of the animal in the tool tip.

Live weight change

This is the estimate of the amount of live weight that is being lost or gained across the herd (kg/cow/day).

Clicking on the calculate button  alongside the live weight change value will open a window that

assists in estimating the rate of live weight change for your animal.

The live weight change calculator.

Live weight change calculator ? X

The calculator estimates the average daily gain required to reach the target live weight at sale from the weigh date and weight.

Calculate Live weight change Sale date 3

Weigh date 1 Sunday, 1 January 2023 Today

Live weight (kg) 300 Current

	Sale date 2	Target weight (kg)	Days to sale date	Required LWC (kg/d)
1.	<input checked="" type="radio"/> Thursday, 1 June 2023	450	150	1.00
2.	<input type="radio"/> Thursday, 15 June 2023	450	164	0.91
3.	<input type="radio"/> Saturday, 1 July 2023	450	180	0.83
4.	<input type="radio"/> Saturday, 15 July 2023	450	194	0.77

Okay Cancel

To estimate live weight change for the current animal, first provide a known or estimated weight. In the figure above the steer was weighed on the 1st of January and was 300 kg (1). You can quickly set the date to today's date by clicking on the 'Today' button. The 'Current' button will set the live weight to the value previously entered on the animal tab.

Now you can enter four possible sale dates in the bottom half of the calculator. Once a target sale weight is entered the calculator will show the number of days from the weigh date until the sale date and the rate of live weight change required to meet the target sale weight. Select the sale date number that results in the LWC value you think is most likely to be achieved and click the 'Okay' button to return to the main window. The LWC value will be updated on the animal tab. Click the 'Cancel' button to return to the main window without changing the LWC value.

If you know what rate of LWC you can achieve change the 'Calculate' button at the top of the calculator to 'Sale date' (3). Now you can enter values for LWC and target weight and the sale date will be calculated.

Days in calf

Affects nutritional requirements, which becomes significant from day 140 onwards. Days in calf should be the weighted average of the herd (see below example of Days since calving). The number of days since conception can be entered directly with the slider or click on the calendar icon to select the date of conception.

Days since calving

Days since calving is required to estimate milk yield if 'Milk' is set to automatic.

Days in calf must be calculated as a **weighted average** for the herd. For example

100 cows @ 100 DSC	10,000 cow days
200 cows @ 280 DSC	56,000 cow days
30 cows @ 350 DSC	10,500 cow days
330 cows	76,500 cow days

Weighted herd average = 76,500 cow days / 330 cows = ~230 DSC

The number of days since calving can be entered directly with the slider or click on the calendar icon to select the (mean) calving date.

Alternatively, separate diets can be calculated in Rumen8 for each calving group in the above example.

Number of cows in the herd

This is used only to calculate the herd margin (daily milk income minus daily feed costs in \$/herd/day) and can be left set to 1 if you are more interested in daily milk income minus daily feed costs per cow/day.

Milk

Milk yield for cows can be set to Automatic, Entered or None.

Automatic provides an estimated milk yield based on a standard lactation for a beef cow (NRC 2016). The yield is based on days since calving and live weight of the cow relative to the standard reference weight of the breed. This provides the yield, fat and protein values shown below the selection buttons.

Entered allows the user to provide litres or kilograms/cow/day – the last 5-10 days average milk yield per cow. Milk yield should include all milk produced per cow, including milk that is being fed to calves, milk sold for dual use cows, and any disposed of. You must also enter the fat and protein content of the milk. Ensure you set the correct unit in the Rumen8 Preferences. In Australia this is almost always mv% (mass/volume, grams per litre), while in New Zealand it is mm% (mass/mass, grams per kilogram). Protein% as used in Rumen8 is true protein (in some countries milk protein is analysed as crude protein which is about 6% higher than true protein). If you know the yield but not the components, set them to 4% fat and 3% protein.

None sets the milk yield to 0 for cows that have been dried off.

Age

Provide an age estimate for the animal in years. This is used in calculating energy and protein demand and selection of the dry matter intake estimation methods.

Carcase dressing

Enter the expected dressing percentage of the animal when sold for meat. The dressing percentage is carcass weight / live weight at sale x 100. This value is used to calculate income at sale if you are paid on carcass weight.

Live weight at sale

Enter the expected live weight of the animal at sale. This is used on the Price tab to calculate

income.

Penned

Leave this un-ticked if the animal has access to grazing. If the animal is restricted within a pen and is fed tick this box. This is used as part of the dry matter intake estimation. Selecting Penned will also reduce the distance the animal walks in a day to 500m. You can still adjust this value manually if needed.

Hormone growth promotant

Leave this un-ticked if the animal does not have a HGP implant. If ticked the presence of a HGP will affect dry matter intake estimation.

Dry matter intake estimation method

Here you can set how to estimate the maximum dry matter intake for the cow. Six methods are provided as no one option is robust enough to cover all beef animals and conditions.

As explained in NRC (2016): "... there are no reasons to pick a favoured equation. Users are encouraged to assess the various equations in their own production settings to determine which equation(s) might provide a consistently superior fit to observed intake data".

Young stock is used for growing/finishing yearlings and is based on equation 10.1 from the NRC 2016 feeding standard.

General NRC is a general equation suitable for all beef cattle and is based on equation 10.2 from the NRC 2016 feeding standard.

Feedlot is suitable for steers or heifers under feedlot conditions (penned) with a diet ME content ≥ 12.5 MJ/kg DM. It is based on equation 10.4 from the NRC 2016 feeding standard

Cow is suitable for all beef cows and dual purpose cows and is based on equation 10.5 from the NRC 2016 feeding standard.

General AFRC is a general equation suitable for all beef animals and is based on equation 164 and 165 from the AFRC 1993 feeding standard.

NDF intake estimates the animal's predicted intake based on the amount of NDF eaten as a percentage of the it's live weight. The percentage of live weight for cows and young stock or bulls can be changed in the Preferences. An additional allowance for milk yield is added to the NDF estimate for lactating cows and is based on the NRC 2016 feeding standard.

NOTE: The NDF intake method was developed for lactating dairy cows fed lucerne+maize based diets, covering a limited range of dietary fibre (30-40% NDF; 20-30% peNDF).

The method has not been evaluated for predicting feed intake by beef cows (NRC 2016) nor any other class of beef cattle, especially not for low-NDF feedlot diets or high-NDF roughages.

We urge caution when using this method and encourage you to observe your animals performance carefully to evaluate the intake prediction method for yourself under the conditions on your farm.

Farm terrain

This influences the amount of energy required for maintenance. Note that walking 1 'vertical

meter' requires the same energy as walking 10 'horizontal meters'.

Distance walked

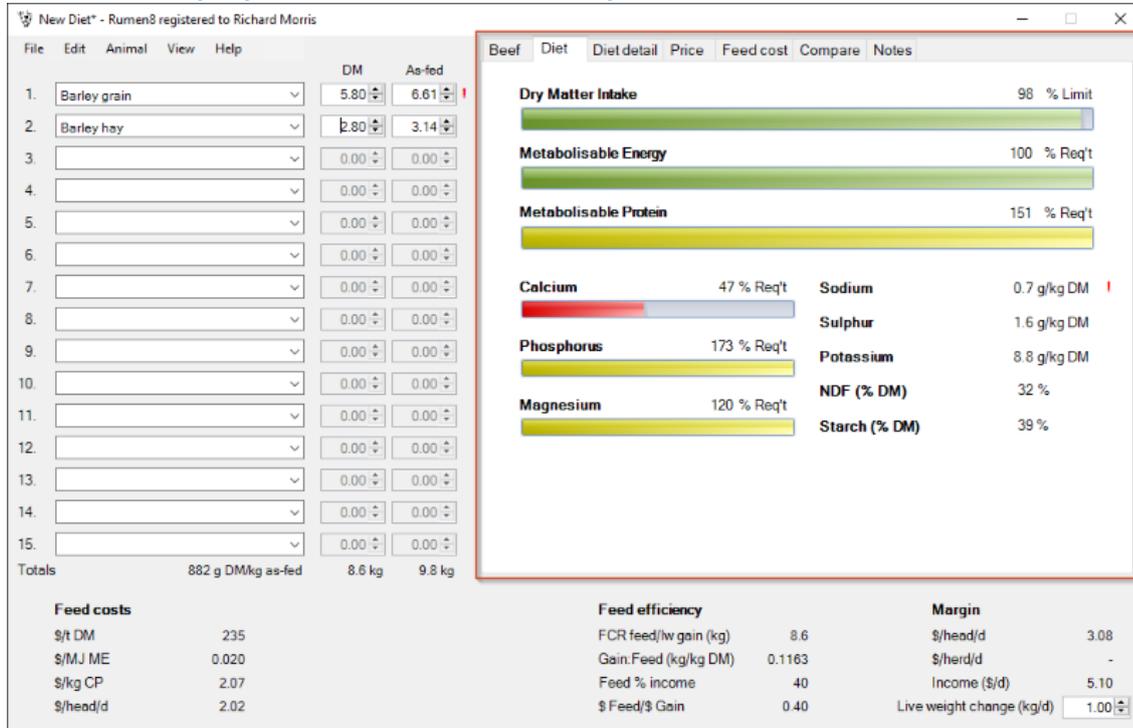
This influences the amount of energy required for maintenance. For example

- Cows grazing a large farm (300 ha) can walk while grazing ~5 km.
- Cows grazing a medium sized farm (150 Ha) can walk while grazing ~4 km.
- Cows grazing a smaller sized farm (75 Ha) can walk while grazing ~3 km.
- Cows kept in feedlots will on average walk only a few hundred meters a day.

DIET

The diet tab provides an overview of the current diet performance. It is highlighted within a blue rectangle in the figure below.

The Diet tab highlighted within the blue rectangle.



The Diet tab has six horizontal bars representing the dry matter intake, metabolisable energy, metabolisable protein, calcium, phosphorus and magnesium in the diet. Additionally, the minerals sodium, sulphur and potassium are shown as g/kg DMI along with neutral detergent fibre and the starch percentage of the diet.

Metabolisable energy, protein and minerals are expressed as a percentage of the cow's requirement so a balanced diet should have these parameters around 100%. When the cow's requirement is not being met the progress-bar will be red. When the diet meets the cow's requirement the bar will be green. If there is an excess of ME, MP or minerals in the diet the corresponding bar will be yellow.

The intake bar shows the percentage of the animal's maximum intake the current diet represents. When the cow is eating close to potential the bar will be green. If the diet contains too much feed for the cow to eat the bar will turn yellow and if the cow is being underfed the bar will be red. How close to 100% the progress bars must be to turn green is adjusted in the Preferences.

The smaller progress bars show how well the animal's calcium, phosphorus and magnesium requirements are being met by the current diet.

The NDF and starch values show the percentage of the diet made up of these components. If 'Recommended Levels' are set for NDF or starch a traffic light will appear and show whether the current value is under, within or above the recommended range. See the Preferences section for how to set 'Recommended Levels'.

For further information about each parameter, hover your mouse over the progress bar and a tool tip will appear showing the actual values. For example, the tool tip for the dry matter intake bar in the figure above displays 'Supply 8.6 kg. Maximum intake 8.8kg. Balance -0.2kg'.

In the bottom right of the tab a red exclamation mark will appear if a monitored diet parameter not shown on this tab is outside the recommended level set in Preferences. See the section on Recommended Levels in the Preferences for how to set suitable ranges for important diet parameters.

Warning red exclamation marks may also appear if minimum or maximum levels of a parameter are exceeded. For example, in the figure above a sodium warning is show. Hovering the mouse pointer over the exclamation mark provides information about the warning in the tool tip.

DIET DETAIL

The 'Diet Detail' tab is used in a similar way to the 'Diet' tab but contains much more information about the diet performance.

The Diet Detail tab shown within the red rectangle.

The screenshot displays the 'Diet Detail' window in Rumen8. The main window shows a list of ingredients (1-15) with columns for DM and As-fed values. Below this is a 'Totals' row showing 882 g DM/kg as-fed, 8.6 kg DM, and 9.8 kg As-fed. The 'Diet Detail' tab is highlighted with a red rectangle and contains several data sections:

- Metabolisable energy:** Supply (MJ) 99, Demand (MJ) 99, Balance (MJ) 0, Density (MJ/kg DM) 11.5. A green traffic light icon is shown.
- Metabolisable protein:** Supply (g) 591, Demand (g) 391, Balance (g) 200, CP (%DM) 11.3. A yellow traffic light icon is shown.
- DM intake estimate:** NDF intake (%) 69, Young stock (%) 92, General NRC (%) 98, Cow (%) -, General AFRC (%) 84, Feedlot (%) -, DMI as % liveweight 2.2. A green traffic light icon is shown.
- Enteric methane:** Total (g/head) 173, Intensity (g/kg) 172.7. A green traffic light icon is shown.
- Minerals:** Ash (%DM) 4.2, Sodium (g/kg DM) 0.7 ! (1), Sulphur (g/kg DM) 1.6, Potassium (g/kg DM) 8.8.
- Calcium:** Balance (g) -15.2. A red traffic light icon is shown.
- Phosphorus:** Balance (g) 12.6. A yellow traffic light icon is shown.
- Magnesium:** Balance (g) 2.2. A yellow traffic light icon is shown.

At the bottom, there are three summary sections:

- Feed costs:** \$/t DM 235, \$/MJ ME 0.020, \$/kg CP 2.07, \$/head/d 2.02.
- Feed efficiency:** FCR feed/lw gain (kg) 8.6, Gain:Feed (kg/kg DM) 0.1163, Feed % income 40, \$ Feed/\$ Gain 0.40.
- Margin:** \$/head/d 3.08, \$/herd/d -, Income (\$/d) 5.10, Live weight change (kg/d) 1.00.

The diet detail tab is divided into several sections covering metabolisable energy, metabolisable protein, dry matter intake, fibre, rumen protein, starch, fat, enteric methane production and minerals. In addition, the active set of Recommended Levels can be changed in the bottom left corner of the tab.

Alongside the values for sodium a red exclamation mark is visible in the figure above (1). If you hover your mouse over these a tool tip will appear giving more information on why these values may be an issue.

Metabolisable energy

This section shows the total ME supplied by the diet, demand from the animal and the consequent balance. Below is the energy density of the diet.

The 'traffic light' to the right is red when ME from the diet is insufficient, green when it meets demand and yellow when it exceeds the animal's needs. Clicking on the title 'Metabolisable Energy' (or the menu option View, Energy detail) will bring up the detail window that provides more information about how ME demand is calculated. The detail window can remain open while the diet and animal is adjusted so the influence on components of the total ME demand can be seen.

The metabolisable energy detail window.

Metabolisable energy demand detail					
Efficiency Coefficients		Net and ME Demand (MJ/d)		Other (MJ/d)	
Gross energy (Qm)	0.61	Maintenance (Em)	28.9	Activity allowance	5.5
Maintenance (Km)	0.73	Maintenance (Mm)	54.0	Level of feeding (L)	1.84
Lactation (KI)	0.63	Lactation (EI)	0.0	Sub total MJ demand	98.8
Growth (Kg)	0.50	Lactation (MI)	0.0	ME constant	0.0
Concepta (Kc)	0.13	Pregnancy (Ec)	0.0	Total MJ demand	98.8
		Pregnancy (Mc)	0.0		
		Growth (Eg)	22.2		
		Growth (Mg)	44.8		
		Sub total (Emp)	51.1		
		Sub total (Mmp)	98.8		

Metabolisable protein

This section shows the total MP supplied by the diet, demand by the cow and the subsequent balance. Below is the diet’s crude protein content. Crude protein content of the total diet is only provided for reference. The ‘traffic light’ to the right is red when MP from the diet is insufficient, green when it meets the requirement and yellow when it exceeds the animal’s needs. Clicking on the title ‘Metabolisable protein’ (or the menu option View, Protein detail) will bring up the MP supply and demand detail window that provides more information about how metabolisable protein supply and demand are calculated by Rumen8. The detail window can remain open while the diet and animal is adjusted so the influence on components of the total MP supply and demand can be investigated.

As with the rest of the Rumen8 application, hovering the mouse over each parameter will provide additional explanatory information. If you hover over the text ‘MP system flowchart’ on the detail window a chart will appear that shows the path protein takes through the animal that corresponds to the values Rumen8 calculates when estimating MP supply.

The metabolisable protein detail window.

Metabolisable protein detail					
Supply (g/d)					
Crude protein (CP)	974	Fermentable ME (FME MJ)	92.7	Metabolisable pr. (MP)	591
Level of feeding (L multiple)	1.84	Rumen microbial protein (y)	913	Limited by	ERDP
Rumen outflow (r fraction/hr)	0.05	Effective rumen degrad. pr. (ERDP)	714	Excess protein	200
Undegradable dietary protein (UDP)	196	Microbial crude protein (MCP)	714	Min exc. protein cost (MJ)	0
Rumen degradable protein (RDP)	778	Microbial true protein (MTP)	535	Max exc. protein cost (MJ)	2
Quickly degradable protein (QDP)	320	Digestible microbial true pr. (DMTP)	455		
Slowly degradable protein (SDP)	457	Digestible undegraded protein (DUP)	136	<i>MP system flowchart</i>	
Demand (g/d)					
Maintenance (MPm)	271	Pregnancy (MPc)	0	Total (MPmp)	391
Lactation (MPI)	0			MP correction	0
Live weight gain (MPg)	121			Total MP demand	391
<i>Efficiency coefficients</i>					

Intake

The 'DM intake estimate' section shows the percentage of maximum predicted intake the current intake represents for the six methods of calculating potential available on the animal tab.

The 'traffic light' is red when the diet constitutes less than the animal can eat, green when the animal is eating as much as she can, and yellow when the diet exceeds the animal's ability to eat it. The current intake estimate method linked to the traffic light is shown in black text and the inactive methods are shown in grey. The sensitivity of the traffic light and parameters used to adjust intake estimation can be adjusted in the Preferences.

Dry matter intake as a percentage of live weight is also provided as an alternative method to evaluate the animal's current intake potential.

Fibre, rumen protein, starch and fat

The sections in the top middle and right of the diet detail tab reports a range of diet parameters for the current diet. These cover things like NDF, starch and sugar through to rumen degradable protein and forage concentrate ratio. If you are unsure what one of the abbreviations means hover your mouse over the text and a tool tip will appear with a more detailed explanation.

If there is too much protein in the diet a warning will appear in the RDP/UDP section. There is a metabolic cost to remove excess protein that will reduce live weight gain (2).

If Recommended Levels have been set for some of these diet parameters a small traffic light appears next to the value and shows if it is below, within or above the recommended range. In the figure above a small green traffic light can be seen next to the NDF % value showing the NDF content of the diet is within the previously set recommended levels in the Rumen8 preferences (3).

Methane

The amount of methane produced by the animal from the intestines is shown as a total and as how much per unit of live weight gain (intensity). Methane (CH₄) is a greenhouse gas emitted from livestock mainly through enteric fermentation and manure decomposition. Methane produced in the intestine (enteric) is a natural by-product of microbial fermentation of nutrients in the digestive tract of animals.

Minerals

The minerals section on the middle right of the tab shows the amount of sodium, sulphur and potassium in the diet. If these are too low or high a warning exclamation mark will appear next to them with details in its tool tip. In the figure above you can see a warning for low sodium in the diet.

The bottom right section of the diet detail tab displays supply and demand for the diet's calcium, phosphorus and magnesium levels. A traffic light for each show if the current level is below (red), equal to (green) or above (yellow) the animal's requirement.

Clicking on any of the titles 'Calcium', 'Phosphorus' or 'Magnesium' (or the menu option View, Minerals detail) will bring up the Minerals supply and demand detail window that provides more information about the animal demand and diet supply of each of the minerals. The detail window can remain open while the diet and cow is adjusted so the influence on mineral supply and demand can be investigated by adjusting cow or dietary parameters.

The minerals detail window.

Calcium (g)		Phosphorus (g)		Magnesium (g)	
Maintenance	8.8	Maintenance	5.9	Maintenance	1.2
Lactation	0.0	Lactation	0.0	Lactation	0.0
Pregnancy	0.0	Pregnancy	0.0	Pregnancy	0.0
Growth	10.6	Growth	6.2	Growth	0.5
Net demand	19.4	Net demand	12.1	Net demand	1.7
Absorption	0.68	Absorption	0.70	Absorption	0.15
Dietary demand	28.5	Dietary demand	17.3	Dietary demand	11.0
Dietary supply	13.3	Dietary supply	29.9	Dietary supply	13.2
Balance	-15.2	Balance	12.6	Balance	2.2

Discovering why a diet parameter is not displayed

The feeds that are provided as part of the Rumen8 default feed library have complete information so there are no missing parameters. This may not be the case for feeds you create as some laboratory analyses may not cover all aspects of the feed. For example, a feed analysis may not provide ADF percent and this will prevent Rumen8 from calculating the ADF content of the diet as shown in the figure below (1). To find out which diet ingredient is missing the ADF information, hover your mouse pointer over the missing value and the tool tip will list the feeds without that value.

Discovering which feed is preventing the diet ADF content being calculated (1).

The screenshot shows the 'Diet detail' window in Rumen8. The 'Ingredients' list on the left includes Barley grain, Ryegrass ann., Lupins grain, and Ryegrass/clover hay. The 'Nutrient values' section shows various parameters like Metabolisable energy, Metabolisable protein, DM intake estimate, and General NRC. A tooltip is displayed over the 'ADF (%DM)' value for Barley grain, stating: 'This value cannot be calculated as this parameter value is missing in at least one of the ingredients. The feed(s) without this parameter value: Barley grain'. The 'Recommended Levels' section at the bottom shows 'Active recommended levels' with radio buttons for One, Two, Three, Four, Five, and Off, where 'Off' is selected.

Recommended levels

The section in the bottom middle of the diet detail tab shows which set of Recommended Levels has been selected, if any, and allows the user to change between sets (4). In the figure at the start of this section set one of the Recommended Levels has been selected and the small traffic light adjacent to NDF (%DM) is linked to this (3). See the Preferences section for how to turn on and off and adjust the Recommended Levels. Rumen8 can also automatically switch between sets of Recommended levels based on the animal's days since calving and days in calf.

PRICE

The price paid per kilogram of live or carcass weight is used to calculate income and margins of income over feed costs. Use the 'Payment by' box to select if you wish to enter your prices by live or carcass weight.

You can enter 5 different sale weights and the related prices and switch between them using the round buttons down the left of the tab. The first option at the top uses the sale weight from the beef animal tab. If payment by carcass weight is selected the total price per head is calculated using the dressing percentage for the animal on the beef animal tab.

The bottom four sale scenarios are numbered 1 to 4 and are linked to the 4 scenarios in the live weight change calculator on the beef animal tab that is used to determine the target live weight change. When using one of these scenarios ensure the current animals LWC still matches the one estimated by the calculator.

The price tab with payment by live weight selected shown within the red rectangle.

The screenshot shows the 'Price' tab in the Rumen8 software. The 'Payment by' section is highlighted with a red rectangle, showing 'Live weight' selected. Below this is a table of sale scenarios:

	Sale Date	Sale live weight (kg)	Price (\$/kg)	Price per head (\$)
<input type="radio"/>		500	3.50	1,750
<i>From the live weight change calculator</i>				
<input checked="" type="radio"/>	1/06/2023	450	3.50	1,575
<input type="radio"/>	15/06/2023	450	3.50	1,575
<input type="radio"/>	1/07/2023	450	3.50	1,575
<input type="radio"/>	15/07/2023	450	3.50	1,575

Below the table are buttons for 'Add Copy', 'Import', 'Rename', 'Export', and 'Delete'. The 'Prices library in use' is set to 'Default'.

The main interface also shows a list of feed items (1-15) with DM and As-fed values, and a summary table at the bottom:

Feed costs		Feed efficiency		Margin	
\$/t DM	235	FCR feed/lw gain (kg)	8.6	\$/head/d	1.48
\$/MJ ME	0.020	Gain:Feed (kg/kg DM)	0.1163	\$/herd/d	-
\$/kg CP	2.07	Feed % income	58	Income (\$/d)	3.50
\$/head/d	2.02	\$ Feed/\$ Gain	0.58	Live weight change (kg/d)	1.00

The price tab with payment by carcase weight selected.

Payment by
 Live weight Carcase weight

Sale Date	Sale live weight (kg)	Price (\$/kg)	Carcase weight (kg)	Price per head (\$)
○	500	7.00	275	1,925
<i>From the live weight change calculator</i>				
1. <input checked="" type="radio"/>	1/06/2023	450	7.00	248 1,733
2. <input type="radio"/>	15/06/2023	450	7.00	248 1,733
3. <input type="radio"/>	1/07/2023	450	7.00	248 1,733
4. <input type="radio"/>	15/07/2023	450	7.00	248 1,733

Prices library in use
 Default
 Add Copy Import
 Rename Export
 Delete

Feed costs		Feed efficiency		Margin	
\$/t DM	235	FCR feed/lw gain (kg)	8.6	\$/head/d	1.83
\$/MJ ME	0.020	Gain:Feed (kg/kg DM)	0.1163	\$/herd/d	-
\$/kg CP	2.07	Feed % income	52	Income (\$/d)	3.85
\$/head/d	2.02	\$ Feed/\$ Gain	0.52	Live weight change (kg/d)	1.00

If the animal is a dual purpose cow you will also be able to enter up to four milk prices at the bottom left of the tab (1). The income from milk sold (2) is added to the income from live weight gain and is used in the margin calculation. If the cow is not to be sold at the end of her lactation set the price per kg of live or carcase weight to \$0 so only the milk income is used.

The price tab for a dual purpose cow also allows entry of milk prices.

Payment by
 Live weight Carcase weight

Sale Date	Sale live weight (kg)	Price (\$/kg)	Carcase weight (kg)	Price per head (\$)
○	500	7.00	275	1,925
<i>From the live weight change calculator</i>				
1. <input checked="" type="radio"/>	1/06/2023	450	7.00	248 1,733
2. <input type="radio"/>	15/06/2023	450	7.00	248 1,733
3. <input type="radio"/>	1/07/2023	450	7.00	248 1,733
4. <input type="radio"/>	15/07/2023	450	7.00	248 1,733

Milk price (\$/l)
 1. 0.310
 2. 0.320
 3. 0.330
 4. 0.340

Prices library in use
 Default
 Add Copy Import
 Rename Export
 Delete

Feed costs		Milk income from 8.1/d		Feed efficiency		Margin	
\$/t DM	235	\$/L raw milk	0.31	FCR feed/lw gain (kg)	-	\$/head/d	0.50
\$/MJ ME	0.020	\$/kg ECM	0.31	Gain:Feed (kg/kg DM)	-	\$/herd/d	-
\$/kg CP	2.07	\$ Feed/\$ Milk	0.80	Feed % income	80	Income (\$/d)	2.52
\$/head/d	2.02	\$/head/d	2.52	\$ Feed/\$ Gain	-	Live weight change (kg/d)	0.00

Prices libraries

Multiple libraries of milk prices can be defined and given a name in Rumen8 using the controls in the bottom-right side the tab. This allows you to maintain a price library for different properties, clients or regions for example. The current price library is named Default in the figure above. Switch between price libraries using the drop-down menu. *Multiple price libraries are only available in Standard mode.*

Add Copy	Create a copy of the current library. You will be prompted for the library name. Names must be unique. <i>This option is not available in Compact mode.</i>
Rename	Rename the current library. Names must be unique. <i>This option is not available in Compact mode.</i>
Delete	Delete the current library. You cannot delete the last library. <i>This option is not available in Compact mode.</i>
Import	Import as a new library from a Prices file that has previously been exported or created by Rumen8 version 3. <i>This option is not available in Compact mode.</i>
Export	Export the current prices as a library file. <i>This option is not available in Compact mode.</i>

COMPARE

The 'Compare' tab allows you to build a diet and then save it for comparison with other diets. Think of it as six slots where you can store a diet while you experiment with other feeds in the main window and then compare them before recalling the best one.

The compare tab shown within the red rectangle.

The screenshot displays the 'New Diet' window in Rumen8. The 'Compare' tab is active, showing a comparison of three diets. The first diet, 'Diet 1', consists of 5.80kg Barley grain and 2.80kg Barley hay. The summary table at the bottom left provides a breakdown of feed costs, milk income, and margin. The comparison window also lists various nutritional parameters for the diet.

Feed costs		Milk income from 8.1l/d		Feed efficiency		Margin	
\$/t DM	235	\$/L raw milk	0.31	FCR feed/lw gain (kg)	-	\$/head/d	0.50
\$/MJ ME	0.020	\$/kg ECM	0.31	Gain:Feed (kg/kg DM)	-	\$/herd/d	-
\$/kg CP	2.07	\$/Feed/\$ Milk	0.80	Feed % income	80	Income (\$/d)	2.52
\$/head/d	2.02	\$/head/d	2.52	\$/Feed/\$ Gain	-	Live weight change (kg/d)	0.00

There is room for six diets numbered 1 to 6 from left to right. To store the current diet, click the 'S' button (store) for one of the diet slots. The 15 ingredients that make up the diet will appear in the slot along with important parameters below. You can make changes to the current diet, store an additional five versions, decide which offers the best solution and then recall that one to the main window by clicking the 'R' button (recall) for that slot. Clicking the 'C' button (clear) will clear the slot.

When a diet is recalled, you have the option to also restore the animal parameters to the values when the diet was stored.

NOTES

The notes tab allows you to write anything about the current diet you may wish to remember when looking at it later. This is often useful if you save diets by date and then refer to them in later years for guidance. The notes can also be used to communicate with your nutritionist if you save the diet file and email it to them for comment or adjustment.

The notes tab shown within the blue rectangle.

The screenshot shows the 'New Diet' window in Rumen8. The interface includes a menu bar (File, Edit, Animal, View, Help) and a list of diet ingredients with their respective DM and As-fed values. A summary table at the bottom provides financial and efficiency metrics. The 'Notes' tab is highlighted with a blue rectangle.

	DM	As-fed
1. Barley grain	5.80	6.61
2. Barley hay	2.80	3.14
3.	0.00	0.00
4.	0.00	0.00
5.	0.00	0.00
6.	0.00	0.00
7.	0.00	0.00
8.	0.00	0.00
9.	0.00	0.00
10.	0.00	0.00
11.	0.00	0.00
12.	0.00	0.00
13.	0.00	0.00
14.	0.00	0.00
15.	0.00	0.00
Totals	882 g DM/kg as-fed	8.6 kg 9.8 kg

Feed costs		Milk income from 8.1/d		Feed efficiency		Margin	
\$/t DM	235	\$/L raw milk	0.31	FCR feed/lw gain (kg)	-	\$/head/d	0.50
\$/MJ ME	0.020	\$/kg ECM	0.31	Gain:Feed (kg/kg DM)	-	\$/herd/d	-
\$/kg CP	2.07	\$/Feed/\$ Milk	0.80	Feed % income	80	Income (\$/d)	2.52
\$/head/d	2.02	\$/head/d	2.52	\$/Feed/\$ Gain	-	Live weight change (kg/d)	0.00

OPTIMISE (ADVANCED)

The Optimise function within Rumen8 is difficult to setup unless you have a good knowledge of Microsoft Windows and Excel. It requires Microsoft Excel and the Solver add-in to be installed (versions 2010, 2013, 2016 or 2019 or Office365) and configured for use with Rumen8. See the Optimiser Installation section for step-by-step instructions. If you use the Optimiser regularly it is recommended to use a later version of Excel as the Solver add-in optimises diets more successfully than earlier versions.

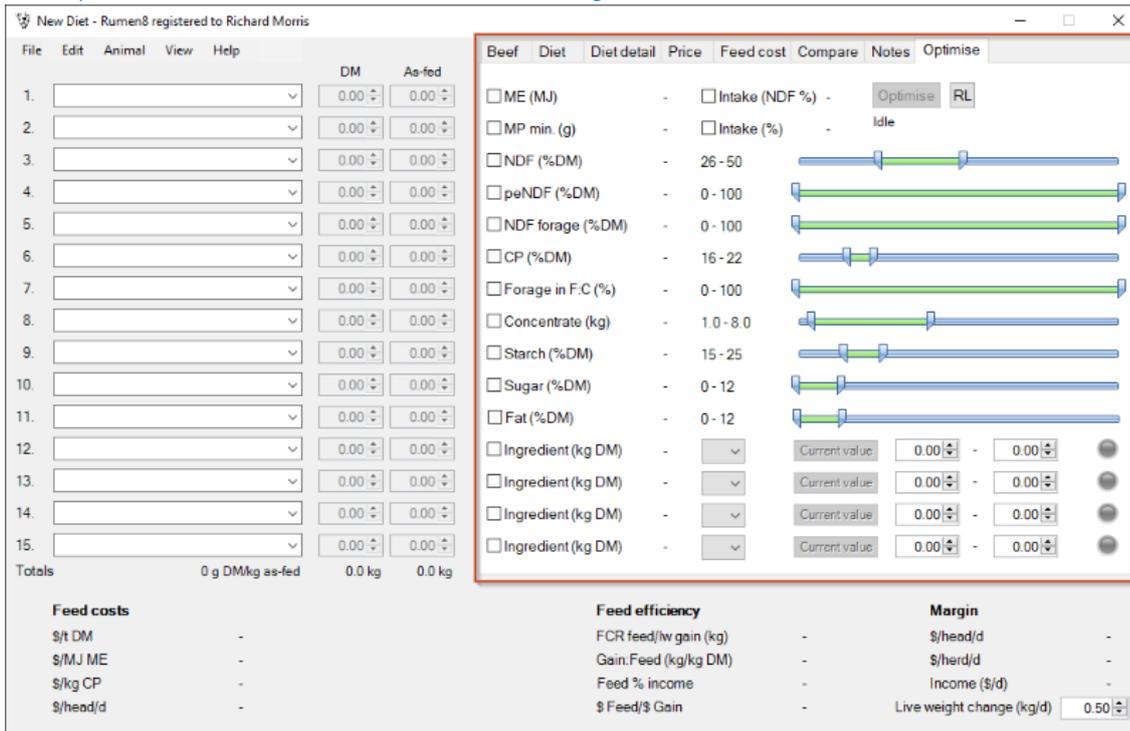
The Optimise tab and button will only be available if it is enabled in the Rumen8 Preferences.

Optimising allows you to fine tune a diet to minimise cost. The Optimiser will vary the amount fed of each ingredient to find the cheapest diet that meets the constraints you have chosen. Using the Optimiser requires all feeds have costs entered in the feed library or the feed costs tab.

You should first add your feeds to the diet in the approximate quantities required. These amounts are used to 'seed' the optimiser and help it find a better diet. For the first run of the Optimiser enable the ME and MP constraints to ensure it is possible to calculate a diet from the feeds selected that meets the animal's requirements. Once a feasible diet has been found progressively add additional constraints in decreasing order of importance starting with your preferred intake estimate until you have a diet that meets your needs, or the Optimiser cannot find a feasible solution. This step-by-step approach is far more likely to result in an optimised diet than simply turning on all the constraints immediately. This is because if a feasible diet cannot be found you know it was the last constraint that is the issue, and you can then either exclude that or relax constraints until a feasible diet can be found. With many ingredients it may take a few minutes for the optimiser to search for a solution. If after 3 minutes no solution has been found Excel will ask you if you wish to continue.

Remember, the Optimiser simply treats the diet as a mathematical problem to solve and has no nutritional awareness. It can find a feasible diet that minimises cost and meets the constraints but that may harm your cows. Evaluate each feasible diet carefully based on your knowledge of the animal and the diet. If in doubt consult with a qualified nutritionist!

The Optimise tab shown within the red rectangle.



You can add constraints to control the diet content of NDF, peNDF, NDF supplied by forage, crude protein, forage concentrate ratio, kilograms of concentrate, starch, sugar and fat. For each of these constraints you must specify the minimum and maximum levels that are acceptable using the left and right sliders. The actual values will be displayed to the left of the slider. The more constraints are activated, the more expensive the diet is likely to become. Also, the narrower the range the less likely it is that a feasible diet can be found. To make the constraint active click the box to the left of the constraint name to put a tick in it.

To the left of the constraint ranges are the current diet value for each parameter. If the constraint is active (ticked) and the diet value is outside the constraint range it will turn red. A parameter such as ME or MP may be close enough to the animal demand to have a green traffic light on the Diet detail tab and still be displayed in red on the Optimiser tab. This is due to a wider margin for the traffic lights (set in the preferences, default is 2%) and rounding differences between Rumen8 and the spreadsheet calculations.

The last four ingredient constraints refer to diet ingredients 1 to 15. Using these you can restrict the amount of each of four feeds in the diet. The drop-down list allows you to select the ingredient you wish to constrain, and the two entry boxes specify the range of kg DM fed that is acceptable. The 'Current value' button lets you to quickly fix an ingredient at the amount currently entered. This is useful when the amount of pasture available has been previously determined and needs to be fixed at a certain level. Then the remainder of the diet ingredients will be changed to optimise the diet.

The light on the right of each of the ingredient constraint will turn green when that constraint is active. To be active it must be ticked, specify an ingredient number that has a feed or mix and have a valid range of DM fed.

The Optimiser has been unable to find a feasible diet.

The screenshot shows the Rumen8 software interface with the following data:

Ingredient	DM	As-fed
1. Barley grain	3.54	4.03
2. Lupins grain	3.40	3.79
3. Ryegrass ann. - Dry - Aut - Low quality	8.84	13.14
4.	0.00	0.00
5.	0.00	0.00
6.	0.00	0.00
7.	0.00	0.00
8.	0.00	0.00
9.	0.00	0.00
10.	0.00	0.00
11.	0.00	0.00
12.	0.00	0.00
13.	0.00	0.00
14.	0.00	0.00
15.	0.00	0.00
Totals	419 g DM/kg as-fed	8.8 kg 21.0 kg

Constraint	Value	Target Range
ME (MJ)	0.8	0.8
MP min. (g)	271	271
NDF (%DM)	31.8	28 - 41
peNDF (%DM)	18.2	0 - 100
NDF forage (%DM)	43.1	0 - 100
CP (%DM)	21.7	16 - 22
Forage in F.C (%)	21.0	20 - 60
Concentrate (kg)	6.9	1.0 - 8.0
Starch (%DM)	24.8	15 - 25
Sugar (%DM)	6.1	0 - 6
Fat (%DM)	4.2	0 - 12
Ingredient (kg DM)	-	0.00 - 0.00
Ingredient (kg DM)	-	0.00 - 0.00
Ingredient (kg DM)	-	0.00 - 0.00
Ingredient (kg DM)	-	0.00 - 0.00

Feed costs	Feed efficiency	Margin
\$/t DM	FCR feed/lw gain (kg)	\$/head/d
0.025	17.6	-0.74
\$/kg CP	Gain:Feed (kg/kg DM)	\$/herd/d
1.40	0.0569	-
\$/head/d	Feed % income	Income (\$/d)
2.67	139	1.93
	\$ Feed/\$ Gain	Live weight change (kg/d)
	1.39	0.50

When a feasible diet cannot be found check the diet values to see how close the Optimiser was to the specified level. You can see in the figure above the sugar constraint is highlighted red and is outside the desired range, preventing the optimiser finding a diet that meets all constraints. Try relaxing the constraint until a feasible diet can be found or add additional feeds. In this example by allowing a greater sugar content in the diet resulted in a feasible diet as shown in the figure below.

The number shown in brackets at the end of the message from the Optimiser (under the 'Optimise' button in the figure above) is the return code from the Solver add-in in Excel. You can find more information about these return codes in the Solver documentation provided with Excel.

Successful optimisation after relaxing the sugar constraint.

The screenshot shows the Rumen8 software interface with the 'Optimise' tab selected. The main window displays a list of ingredients (1-15) with their DM and As-fed values. To the right, various constraints are listed with checkboxes and sliders, such as ME (MJ), MP min. (g), NDF (%DM), peNDF (%DM), NDF forage (%DM), CP (%DM), Forage in F:C (%), Concentrate (kg), Starch (%DM), Sugar (%DM), and Fat (%DM). A message indicates 'Feasible diet found (all constraints satisfied)'. At the bottom, summary statistics are provided:

Feed costs		Feed efficiency		Margin	
\$/t DM	210	FCR feed/lw gain (kg)	22.0	\$/head/d	-0.39
\$/MJ ME	0.021	Gain.Feed (kg/kg DM)	0.0455	\$/herd/d	-
\$/kg CP	1.43	Feed % income	120	Income (\$/d)	1.93
\$/head/d	2.31	\$ Feed/\$ Gain	1.20	Live weight change (kg/d)	0.50

The figure above shows a successful optimisation with a feasible diet found.

The constraint ranges on the Optimiser tab can be quickly set to the recommended levels (set in preferences) by clicking on the 'RL' button which opens the 'Apply recommended levels to the optimiser' window. Up to 5 sets of recommended levels for a range of diet parameters can be set in the preferences providing quick feedback on the suitability of a diet on the Diet tabs.

Apply previously set recommended levels to the optimiser.

The dialog box 'Apply recommended levels to the optimiser' is shown. It features a 'Recommended levels set' dropdown menu with options 'One', 'Two', 'Three', 'Four', and 'Five'. Below this is a table comparing recommended levels with current optimiser values:

Set description	Recommended level	Current Optimiser
NDF (%DM)	28 to 30	28 to 40
peNDF (%DM)		0 to 100
NDF forage (%DM)		0 to 100
Forage in F:C (%)		0 to 60
Starch (%)	20 to 25	15 to 25
Sugar (%)	0 to 6	0 to 12
Fat (%)		0 to 12

At the bottom, a message reads: 'The current range is bold, click on the other range to change to it. Click the heading to change all.' There are 'Okay' and 'Cancel' buttons.

To set the optimiser constraint range to the same as the recommended range first select which set to use at the top of the window. In the figure above set one has values for early lactation cows

and three of the parameters are active and available to be used in the optimiser. Initially all the ranges are from the Optimiser tab so all the ranges under the 'Current Optimiser' column are in bold. To change ranges simply click on them. For example, to use the NDF% range from the recommended levels set one click on the '28 to 30' text and it will turn bold signifying it is now active.

Diet parameter ranges from recommended level set one have been selected for NDF and sugar.

Apply recommended levels to the optimiser ? X

Recommended levels set

One
 Two
 Three
 Four
 Five

Set description	Early lactation	
	Recommended level	Current Optimiser
NDF (%DM)	28 to 30	28 to 40
peNDF (%DM)		0 to 100
NDF forage (%DM)		0 to 100
Forage in F:C (%)		0 to 60
Starch (%)	20 to 25	15 to 25
Sugar (%)	0 to 6	0 to 12
Fat (%)		0 to 12

The current range is bold, click on the other range to change to it. Click the heading to change all.

Click 'Okay' to return to the Optimiser tab and the constraint ranges for NDF and sugar will be updated.

COSTS, INCOME, EFFICIENCIES, AND MARGINS

The bottom of the Rumen8 window displays a range of parameters that allow you to evaluate the financial performance of the current diet. All feeds in the diet must have a feed cost entered and income from sale or milk.

The costs, income, efficiency and margin measures shown within the red rectangle.

The screenshot shows the Rumen8 software interface with a 'New Diet' window. The window is divided into several sections: a feed list on the left, animal parameters on the right, and a summary table at the bottom. The summary table is highlighted with a red rectangle.

Feed costs		Milk income from 9.4/d		Feed efficiency		Margin	
\$/t DM	210	\$/L raw milk	0.31	FCR feed/lw gain (kg)	55.0	\$/head/d	1.38
\$/MJ ME	0.021	\$/kg ECM	0.31	Gain:Feed (kg/kg DM)	0.0182	\$/herd/d	138
\$/kg CP	1.43	\$ Feed/\$ Milk	0.79	Feed % income	63	Income (\$/d)	3.69
\$/head/d	2.31	\$/head/d	3.69	\$ Feed/\$ Gain	3.00	Live weight change (kg/d)	0.20

These parameters are divided into four groups. From left to right they are feed costs, milk income (only for dual purpose cows), feed efficiencies and margins. The first feed efficiency measure and the feed as a percent of income measure may also have a recommended level set in Preferences to quickly show if they are within the recommended range via a small traffic light.

The current live weight change can also be adjusted in the bottom right of the window allowing the animal performance to be fine-tuned while the animal tab is not visible.

PREFERENCES FOR BEEF

The preferences allow you to change some Rumen8 settings to suit your business and location. Access to the Preferences window is via the Preferences option in the File menu of the main Rumen8 window. The settings you can adjust in Rumen8 are divided into General and Advanced. Additionally, you can adjust Recommended levels on the rightmost tab.

GENERAL PREFERENCES

The general preferences tab contains setting most users will want to adjust. The settings shown in bold such as 'Milk yield units' and 'Currency' are common with the dairy mode. This means changing the value while in beef mode as shown in the figure below also changes it when creating a diet for a dairy animal. Settings that do not have their title in bold are specific to beef.

The General preferences tab.

The screenshot shows the 'Beef preferences' dialog box with the 'General' tab selected. The dialog has three sub-tabs: 'General', 'Advanced', and 'Recommended levels'. The 'General' sub-tab contains the following settings:

- Milk yield units:** Radio buttons for 'Litres' (selected) and 'Kilograms'.
- Milk component units:** Radio buttons for 'Mass/mass' and 'Mass/volume' (selected).
- Feed concentration units:** Radio buttons for 'g/kg' (selected) and 'Percentage'.
- Feed proportion units:** Radio buttons for 'Proportion' (selected) and 'Percentage'.
- Tool tips detail:** Radio buttons for 'Standard' and 'Extended' (selected).
- NDF dry matter intake estimate:** Two spinners. 'Cow intake: % of live weight' is set to 1.1. 'Young stock, bull intake: % of live weight' is set to 1.0.
- Currency:** A checked checkbox for 'System', a dropdown menu showing 'Australian Dollar (\$)', and a '\$' symbol. A checked checkbox for 'Do not display cents' and a 'Currency divisor' dropdown set to '1'.
- Two checked checkboxes: 'Load warning for intake estimate change' and 'Show Diet tab'.
- Buttons for 'Change the Rumen8 home directory after restarting Rumen8' (labeled 'Change home') and 'Restore all the preferences to their default setting' (labeled 'Restore Defaults').
- A checked checkbox for 'Show Optimiser tab' with a descriptive paragraph: 'The optimiser requires the Microsoft Excel spreadsheet (Optimiser4.xlsm) in the Rumen8 libraries folder to grant access to the Rumen8 application. See the User Guide for step by step set up instructions before attempting to optimise a diet for the first time.' Below this are two unchecked checkboxes: 'Excel visible during optimisation (faster if off)' and 'Excel saves diet after optimisation (faster if off)'.

A 'Close' button is located at the bottom right of the dialog box.

Milk yield units	Milk yield can be entered and reported in litres or kilograms.
Milk component units	The fat, protein and lactose percentage of milk can be entered and reported in mass/volume (i.e., per litre) or mass/mass (i.e., per kg) units (mm% or mv%).
Feed concentration units	The units for concentration in feeds used by Rumen8 can be set to g/kg or percentage.
Feed proportion units	The units for parameters such as aN, bN or cN can entered and displayed as a proportion (0 to 1) or a percentage.
Tool tips detail	This allows you to set the level of information provided by the tool tips. Standard displays a one-line explanation and Extended provides more detailed explanations with diagrams.
Dry matter intake estimate	The animal's feed intake potential can be estimated using the 'NDF as a percentage of live weight' method and is selected on the animal tab. If the NDF DMI method is selected for an animal, for each of the cow classes above, a predicted NDF intake amount as a percentage of live weight can be specified by the user.
Currency – System	Check to use the currency symbol set in Windows on your computer. Uncheck to manually set the currency symbol from the drop-down list. Choose 'Custom' at the end of the drop-down list to enter you own currency symbol.
Currency – Do not display cents	When checked all prices and costs will not show cents.
Currency – Divisor	For currencies with very large values select a divisor from the drop-down list. For example, If the currency divisor is set to 1000 all feed costs and milk prices should be entered into Rumen8 already divided by 1000. For example, 100,000 Rp/t would be entered as 100 Rp. The currency divisor will be displayed on reports if it is greater than 1 and a flag appears on the main Rumen8 window below the tabbed section.
Show the Diet tab	The Diet tab can be turned off by un-ticking this box. Useful if you only use the Diet detail tab.
Load warning for intake estimate change	When checked a warning will be given if a file is opened with a different intake estimation method to the current. See below for more details.
Change Rumen8 home directory after restart	If you want to change where Rumen8 stores its files (usually ~\Documents\Rumen8) then clicking the 'Change home' button will cause Rumen8 to ask you where to place the Rumen8 directory next time it is started. If this is a new directory the default feed library and Preferences files will be copied across. If you wish to retain your existing library files you should copy them into the new location using Windows Explorer.

Restore all the Preferences to their defaults	This will set all the preference settings back to their default values.
Show Optimiser tab	The Optimiser tab will be available in the main window if this box is ticked. This also makes available the Optimiser Preferences below it. See the Optimiser section of this document for more information on using the Optimiser as it requires Microsoft Excel and the Solver add-in along with careful setup. It will not work if you just enable it here!
Excel visible during optimisation	Tick this to see Excel load and optimise the diet. Usually left unticked.
Excel saves diet after optimisation	Tick this to make Excel save the Optimiser spreadsheet after optimising the diet. This is useful for debugging and is usually left un-ticked.

Dry matter intake estimate changes result in a warning

The method and parameters to estimate the animal's dry matter intake are saved with the current diet in the save file (.rm8) and if they have changed when the file is reopened the user will be warned and given the option to revert to the value when the diet was saved.

For example, a lactating cow has the DMI estimation method set to NDF on the animal tab and in Preferences this is 1.2% of live weight. A diet is created, saved and the user moves on to other scenarios, during which the cow value for NDF is changed to 1.3% of live weight in Preferences after talking to a colleague. A few months later when opening the save file it reloads the cow parameters, setting DMI method to NDF, and then prompts the user that the Preferences value for cows NDF intake has changed from 1.2% when saved to the current 1.3% of live weight. The user can ignore this and continue with the 1.3% value or choose to set it back to 1.2%. **If the Preferences are set back to 1.2% this will apply to all cows with DMI set to NDF method.**

Whether Rumen8 warns the user about changes to DMI parameters in the Preferences can be turned off in the General Preferences.

ADVANCED PREFERENCES

The advanced section of the Preferences contains those settings that are unlikely to need adjustment and may have a significant impact on the animal nutrition model if they are changed. Please change them only in consultation with an experienced nutritionist.

The Advanced preferences tab.

⚙️ Beef preferences
? ×

General

Advanced

Recommended levels

Preferences library in use

Default ▼

Add Copy

Delete

Rename

Import

Export

	Subclinical pH	Acute pH
<input type="checkbox"/> Acidosis (low rumen pH) warning - experimental	6.0	5.7
Metabolisable protein demand correction factor	1.00	
Animal time standing (hrs/d)	14	
Animal position changes/day	10	
Gross energy in 1 kg of dry matter (MJ)	18.8	
Fixed addition to ME demand (MJ)	0	
Milk true protein content (of CP)	0.94	
Milk lactose (m/v)	5.0	
Weight of a litre of milk (kg)	1.030	

Standard reference weights

	Birth	Female	Steer	Bull
Angus ▼	31	550	660	770

Reset

Traffic light and progress bar accuracy

The percentage above or below the cow demand or requirement the traffic light is green. Below will show red and above yellow.

	ME	MP	DMI	Minerals
	2	2	2	2

Close

Preferences library in use	Select the Preferences library you would like to use from the drop-down menu. A preferences library contains the settings for both beef and dairy modes. <i>This option is not available in Compact mode.</i>
Add Copy	Create a copy of the current library. You will be prompted for the library name. Names must be unique. <i>This option is not available in Compact mode.</i>
Rename	Rename the current library. Names must be unique. <i>This option is not available in Compact mode.</i>
Delete	Delete the current library. You cannot delete the last library. <i>This option is not available in Compact mode.</i>
Import	Import as a new library from a Preferences file that has previously been exported or created by Rumen8 version 3. <i>This option is not available in Compact mode.</i>
Export	Export the current preferences as a library file. <i>This option is not available in Compact mode.</i>
Acidosis (low rumen pH) warning	Turning this on displays an estimate of rumen8 pH on the Diet Detail tab. The two pH levels control when warnings will appear for sub-clinical and acute acidosis. The rumen pH value is the daily average and assumes TMR feeding of grain so many other factors may result in actual rumen8 pH being lower than the prediction. See the tool tip on the Diet Detail tab for further information. This calculation is experimental so use it with caution.
MP demand correction factor	The animal's total protein requirement will be multiplied by this value.
Cow time standing	The number of hours per day the animal is standing. Leave at 14 hours unless you have access to a better estimate.
Cow position changes	The number of times an animal gets up or down during the day. Leave at 10 unless you have access to a better estimate.
Gross energy in 1 kg of dry matter	Enter the gross energy contained in 1 kilogram of dry matter in mega joules. Used as part of the animal energy requirement calculation. Set by default to 18.8 for a diet containing significant quantities of silage. May be set to 18.5 for diets not containing silage.
Fixed addition to ME requirement	Rumen8 will add this value to the animal's energy requirement.
Milk true protein content	The percentage of crude protein in milk that is true protein.
Milk lactose	The lactose content (%) of the milk for your cows.
Weight of a litre of milk	The weight of one litre of milk in kilograms.

<p>Standard reference weights</p>	<p>This section allows the user to change the standard reference weights for each breed of beef animal. There is a standard weight at birth, and then mature weight for females, steers and bulls. These weights are used to calculate the energy and protein demand for the animal. To return the weights to their defaults click on the Reset button below the breed drop down menu. Note, the reset button will only change the weights for the current breed back to the default values. The default values for each breed are shown below.</p>
<p>Traffic light and progress bar accuracy</p>	<p>These parameters set the sensitivity of the 'traffic lights' for the cow's energy, protein, intake and minerals on the Diet detail tab and the progress bars in the Diet tab. The lights will show green if the diet provides an amount of energy, protein, dry matter intake or mineral that is within this percentage of the cow demand. The exception is the DMI acceptable range, which is asymmetric, with the 'green' values below the maximum intake x10 the value entered. For the default 2% this gives a 'green' range of 80-102%.</p>

Standard reference and birth weights

<i>Breed</i>	<i>Species</i>	<i>Type</i>	<i>Birth weight (kg)</i>	<i>Female reference weight (kg)</i>	<i>Male reference weight (kg)</i>
Angus	Bos taurus	A	31	550	660
Ankole	Bos indicus	A	22	450	540
Arsi	Bos indicus	A	20	225	270
Australian Milking Zebu	Hybrid	A	33	450	540
Ayrshire	Bos taurus	A	33	450	540
Beef Shorthorn	Bos taurus	A	33	550	660
Begait	Bos indicus	A	22	250	300
Belgium Blue	Bos taurus	B	50	850	1000
Blonde d Aquitaine	Bos taurus	B	35	550	660
Boran	Bos indicus	A	27	400	550
Braford	Hybrid	A	36	550	660
Brahman	Bos indicus	A	35	550	660
Brangus	Hybrid	A	33	550	660
Braunvieh	Bos taurus	B	39	650	780
Brown Swiss	Bos taurus	A	39	600	720
Charolais	Bos taurus	B	41	650	780
Chianina	Bos taurus	B	41	700	840
Criollo	Bos taurus	A	33	500	600
Dairy Shorthorn	Bos taurus	A	35	550	660
Devon	Bos taurus	A	33	500	650
East African Zebu	Bos indicus	A	25	350	450
Fleckvieh	Bos taurus	B	41	650	780
Fogera	Bos indicus	A	22	250	300
Friesian	Bos taurus	A	38	550	660
Galloway	Bos taurus	A	36	550	660
Gelbvieh	Bos taurus	B	38	700	840
Generic B.indicus	Bos indicus	A	26	425	520

<i>Breed</i>	<i>Species</i>	<i>Type</i>	<i>Birth weight (kg)</i>	<i>Female reference weight (kg)</i>	<i>Male reference weight (kg)</i>
Generic B.taurus British	Bos taurus	A	34	530	630
Generic B.taurus European	Bos taurus	B	40	640	760
Gir	Bos indicus	A	22	400	470
Girolando	Hybrid	A	32	500	600
Guernsey	Bos taurus	A	33	450	540
Hereford	Bos taurus	A	36	550	700
Holstein	Bos taurus	AB	41	650	750
Horro	Bos indicus	A	20	250	300
Jersey	Bos taurus	A	28	400	480
Limousin	Bos taurus	B	38	550	660
Lincoln Red	Bos taurus	A	36	550	660
MaineAnjou	Bos taurus	B	41	650	780
Montbeliarde	Bos taurus	B	38	700	840
Murray Grey	Bos taurus	A	31	550	660
Nelore	Bos indicus	A	32	450	540
Nguni	Bos indicus	A	23	350	450
Piedmontese	Bos taurus	B	40	600	720
Pinzgauer	Bos taurus	B	37	650	780
Polled Hereford	Bos taurus	A	36	550	660
Red Poll	Bos taurus	A	36	500	600
Sahiwal	Bos indicus	A	38	450	540
Salers	Bos taurus	B	38	700	840
Santa Gertrudis	Hybrid	A	33	650	780
Shorthorn	Bos taurus	A	36	550	660
Simmental	Bos taurus	B	41	650	780
South Devon	Bos taurus	A	38	550	660
Tarentaise	Bos taurus	A	36	500	600
Texas Longhorn	Bos taurus	A	30	550	660

RECOMMENDED LEVELS

Rumen8 allows the user to set a recommended level range for several important diet parameters. These provide quick feedback on the suitability of the current level of a diet measure on the Diet and Diet detail tabs with a traffic light. Five sets of Recommended Levels can be defined and quickly switched between on the Diet detail tab. These could be used for early, mid, late lactation cows or finishing steer diets for example.

The Recommended levels tab in Preferences showing example ranges for early lactation cow.

Beef preferences [?] [X]

General | **Advanced** | Recommended levels

Recommended levels set [?]
 One Two Three Four Five

Description:

Auto Days since calving: - Days in calf: -

<input checked="" type="checkbox"/> NDF (%DM)	28 - 50	<input type="range" value="28 50"/>
<input type="checkbox"/> peNDF (%DM)	0 - 100	<input type="range" value="0 100"/>
<input type="checkbox"/> NDF forage (%DM)	50 - 100	<input type="range" value="50 100"/>
<input type="checkbox"/> NDF forage (%LW)	0.0 - 3.0	<input type="range" value="0.0 3.0"/>
<input type="checkbox"/> Sugar (%DM)	0 - 30	<input type="range" value="0 30"/>
<input checked="" type="checkbox"/> Starch (%DM)	15 - 30	<input type="range" value="15 30"/>
<input type="checkbox"/> Fat (%DM)	0 - 20	<input type="range" value="0 20"/>
<input type="checkbox"/> NFC (%DM)	20 - 60	<input type="range" value="20 60"/>
<input type="checkbox"/> RDP (%CP)	0 - 100	<input type="range" value="0 100"/>
<input type="checkbox"/> UDP (%CP)	0 - 100	<input type="range" value="0 100"/>
<input checked="" type="checkbox"/> Forage % in F:C	30 - 60	<input type="range" value="30 60"/>
<input type="checkbox"/> FCR live weight	0 - 40	<input type="range" value="0 40"/>
<input checked="" type="checkbox"/> Feed % income	0 - 60	<input type="range" value="0 60"/>

[Close]

Select the current Recommended Levels set by clicking on one of the buttons across the top of the tab. Describe the use of the set with a short description below.

For each of the 13 diet measures you can set an acceptable range by moving the minimum and maximum sliders left or right. The actual values are displayed to the left of the slider. So, if you wish to target NDF levels of 28-50% in early lactation activate the NDF recommended level by clicking on the checkbox to the left and then move the sliders until that range is displayed. Now a traffic light will appear on the Diet and Diet detail tabs that will show you if the diet NDF level is below (red), within (green) or above (yellow) your recommended NDF level. Repeat this process for each of the diet measures for you wish to display a Recommended Level traffic light.

Linking Recommended Levels sets to cow day of lactation

Each recommended level set has an additional two auto parameters called 'Days since calving' and 'Days in calf'. These can be set to a range of days and turned on or off. For example, the early lactation set might have the days since calving parameter set to days 1 to 60 as shown in the figure above.

If the 'Days since calving' parameter is checked and 'Recommended Levels set switching' is set to automatic, when the current cow is between 1 to 60 days in milk, the first set of Recommended Levels will be activated. When the cow is outside the range 1 to 60 days the Recommended Levels will be turned off.

The Diet Detail tab with the Recommended Levels selection control highlighted in blue.

The screenshot shows the 'Diet detail' tab in Rumen8. On the left, there are 15 diet ingredients with sliders for DM and As-fed values. The central table lists various nutritional metrics with their current values and recommended levels indicated by traffic lights. A red box highlights the 'Active recommended levels' control, which is currently set to 'One' and 'Early lactation cow'. The bottom section displays feed costs, milk income, feed efficiency, and margin data.

Ingredient	DM	As-fed	Metric	Value	Recommended Level
1. Barley grain	4.40	5.01	Metabolisable energy	47.2	Green
2. Lupins grain	0.00	0.00	Supply (MJ)	112	
3. Ryegrass ann. - Dry - Aut - Low quality	6.60	47.14	Demand (MJ)	122	
4.	0.00	0.00	Balance (MJ)	-11	
5.	0.00	0.00	Density (MJ/kg DM)	10.2	
6.	0.00	0.00	Metabolisable protein	75.8	Yellow
7.	0.00	0.00	Supply (g)	912	
8.	0.00	0.00	Demand (g)	764	
9.	0.00	0.00	Balance (g)	148	
10.	0.00	0.00	CP (%DM)	14.7	
11.	0.00	0.00	DM intake estimate	290	Green
12.	0.00	0.00	NDF intake (%)	81	
13.	0.00	0.00	Young stock (%)	-	
14.	0.00	0.00	General NRC (%)	94	
15.	0.00	0.00	Cow (%)	87	
Totals	211 g DM/kg as-fed	11.0 kg	52.2 kg		

In the figure above the Active recommended level is set to set one and Rumen8 will switch between sets automatically as the button in the bottom right corner is displaying an 'A' for automatic. The mode can be toggled between automatic and manual by clicking on the button. It will display a 'M' when in manual mode. The user can also switch to manual mode by simply selecting one of the Recommended Levels sets directly by clicking on its round button. If no 'Recommended Levels sets' in the Preferences have the days since calving or days in calf parameter turned on (checked) then the button will not appear in the active Recommended Levels section of the animal tab as automatic mode is not available.

An example of automatic switching between Recommended Levels sets:

1. Define recommended sets for early, mid and late lactation cows as well as dry and transition/close-up cows in Preferences.
2. Set the days since calving range when each of the sets should be active and ensure each is turned on. You might choose early 1-60, mid 61-150, late 151-500 and 0 days since calving for dry and transition/close-up cows. To match the 0 days of lactation condition the milk yield must also be 0 as the cow must be dry.
3. Set the days in calf range off for sets one to three (early, mid and late lactation) and on for dry and transition/close-up sets. You might choose days 222- 256 for the dry cows and transition cows 257-285 days.
4. Close the Preferences and return to the Diet Detail tab. Click on the button in the bottom right of the Active Recommended Levels section until it shows (A)utomatic mode.
5. Now as the Animal days since calving and days in calf parameters are changed the relevant recommended levels will automatically become active through the cow's lactation and dry period.

Note, if none of the sets cover a particular day of lactation then the Recommended Levels set will be turned off.

Recommended level sets can have overlapping day of lactation ranges. In this instance Rumen8 switches to the set with the lowest number. For example, if set 2 is day of lactation 80 - 120 and set 3 is days 100 – 180, for an animal that is at day 110 of lactation set 2 will be selected.

If both day or lactation and days pregnant ranges are active for a set, the current animal must match **both** to automatically switch the set.

THE REPORT DESIGNER

The report designer can be accessed via the File menu. In it you can create several reports based on the current diet and customised for your business.

Note that reports require additional software to be installed. See the Getting Started section of the User Guide for details.

When the report designer window first opens it will have no entries for the farm name, diet name and who prepared the diet. This information will be printed at the top of the report, so it is useful to include it for your business. It only needs to be entered once and Rumen8 will remember it for future reports.

The report type is selected in the top drop-down menu.

THE DIET REPORT

The diet report presents all the information about a completed diet including the animal details, ingredients list, animal performance, diet performance, efficiencies and margins.

The Report Designer window highlighting the ingredients list (1) and the mixes list (2).

The screenshot shows the 'Report Designer' window with the following elements:

- Report type:** Diet Report (dropdown)
- Farm name:** Yelverton Dairy Fam
- Diet name:** Early calver diet Nov 2022
- Prepared by:** John Smith
- Contact details:** johm@smith.com.au 0428 216 324
- Logo:** A cow illustration with 'None' and 'Select' buttons.
- Notes:** Barley sourced from new supplier, slightly higher protein
- Ingredients listed in order (1):** A list with items: 1 Barley grain, 2 Lupins grain, 3 Ryegrass ann. - D..., 4 Mix Demo. A red circle with '1' is at the bottom.
- Mixes to list as their ingredients (2):** A checkbox for 'Mix Demo' (checked), a red circle with '2' below it, and radio buttons for 'Keep separate' and 'Combine' (selected).
- Disclaimer:** While all reasonable efforts have been taken to ensure the accuracy of the advice provided, use of the information is at one's own risk. To the fullest extent permitted by Australian law, the advisor disclaims all liability for any losses, costs, damages and the like sustained or incurred as a result of the use of or reliance upon the information provided, including liability stemming from reliance upon any part which may contain
- Buttons:** 'Create' and 'Cancel' at the bottom right.

Once the farm name, diet name, prepared by, contact details, notes and disclaimer have been completed you may also include a business logo on the top right of the report. Click on the 'Select' button in the Logo section of the Report Designer (top right) and choose an image file. The image file can be either jpeg, tiff, png or bmp format and will look best if it is between 600 x 300 and 300 x 300 pixels in size (W x H). If the logo is very wide (aspect ratio > 2) it may cover some of the farm detail text.

The order the ingredients are listed on the report is determined in the 'Ingredients listed in order' box. It is labelled with a 1 in the figure above. The numbers alongside each ingredient are their ingredient number in the main Rumen8 window so will not change as you change the list order with the arrow buttons alongside them or by dragging and dropping with the mouse.

You can also control if mixes are listed as a single ingredient (their mix name) or broken down to their constituent ingredients. Mixes checked in the 'Mixes to list as their ingredients' box labelled 2 in the figure above will be shown as their ingredients. The figure below shows the report created with mixes listed by name, not ingredients.

Below the mixes ingredients box you can choose if common ingredients from mixes that are being

listed as their ingredients should be combined with the same ingredient already in the diet. For example, Mix Demo above contains barley grain, lupins grain and wheat grain. If it was checked in box 2 to list as it's ingredients and common ingredients 'Keep separate' was selected the final report would list barley and lupins grain twice, once as an ingredient added by the user and once as part of the Mix Demo ingredient. the figure below shows the report created with these settings. If Common ingredients 'Combine' was selected only a single entry for barley and lupins grain would be included on the report and they would be the combined amount from the user added ingredients and the barley and lupins in the mix. See the figure below to see the report created with mix ingredients combined.

The Report Preview window showing a diet report with the Mix Demo ingredient listed as a mix.

Report Preview
- □ ×

Save report as PDF

Main Report

DIET REPORT

Yelverton Dairy Farm
Early calver diet Nov 2022

Diet created by John Smith
johm@smith.com.au 0428 216 324



Animal					
Liveweight (kg)	600	Milk yield (l)	25.0	Fat (kg)	1.00
LW change (kg/d)	0.0	Milk fat (%)	4.0	Protein (kg)	0.75
Days pregnant	70	Milk protein (%)	3.0	Fat + Protein (kg)	1.75
Days in milk	150	Fat:Protein ratio	1.33	Energy corrected milk (kg)	24.6

Diet/cow/day							
# Ingredient	kg DM	kg As Fed	ME (MJ)	CP (g)	Ca (g)	P (g)	Mg (g)
1 Barley grain	4.45	5.07	57.0	543	3.1	16.9	6.2
2 Lupins grain	2.58	2.88	35.6	890	6.7	9.3	5.9
3 Ryegrass ann. - Dry - Spr - Low quali	9.02	50.11	84.8	1,245	64.0	41.5	19.8
4 Mix Demo	3.00	3.37	40.6	741	5.1	11.1	5.6

Total/cow/day							
	kg DM	kg As Fed	ME (MJ)	MP (g)	Ca (g)	P (g)	Mg (g)
Supply	19.1	61.4	218	1,987	79.0	78.8	37.6
Demand			215	1,672	109.2	64.7	35.4
Balance			3	315	-30.2	14.1	2.2
% Requirement			101.3	118.8	72.3	121.8	106.2

Total Diet		Feed Efficiency		Margin		(\$/cow/d)	
Diet DM (%)	31.0	ME density (MJ/kg DM)	11.4	kg ECM/kg DM	1.3	Milk income	9.90
% of DMI limit	91	CP (%DM)	17.9	g MS/kg DM	92	Feed cost	3.80
NDF (%DM)	37.9	RDP (%CP)	74.5	\$ Milk/\$ Feed	2.60	MOFC	6.10
Starch (%DM)	20.9	UDP (%CP)	25.5				
Forage:Conc ratio	47.53	DCAD (mEq/kg)	100				

Notes Rumen8 diet summary report printed 6/09/2023 10:30AM

Barley sourced from new supplier, slightly higher protein

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Page 1 of 1

Current Page No.: 1
Total Page No.: 1
Zoom Factor: 100%

The Report Preview window showing a diet report with the Mix Demo ingredient listed as its ingredients and common ingredients kept separate.

Report Preview
- □ ×

Save report as PDF

Main Report

DIET REPORT

Yelverton Dairy Farm
Early calver diet Nov 2022

Diet created by John Smith
johm@smith.com.au 0428 216 324

Animal					
Liveweight (kg)	600	Milk yield (l)	25.0	Fat (kg)	1.00
LW change (kg/d)	0.0	Milk fat (%)	4.0	Protein (kg)	0.75
Days pregnant	70	Milk protein (%)	3.0	Fat + Protein (kg)	1.75
Days in milk	150	Fat:Protein ratio	1.33	Energy corrected milk (kg)	24.6

Diet/cow/day								
# Ingredient	kg DM	kg As Fed	ME (MJ)	CP (g)	Ca (g)	P (g)	Mg (g)	
1 Barley grain	4.45	5.07	57.0	543	3.1	16.9	6.2	
2 Lupins grain	2.58	2.88	35.6	890	6.7	9.3	5.9	
3 Ryegrass ann. - Dry - Spr - Low quali	9.02	50.11	84.8	1,245	64.0	41.5	19.8	
4 Mix Demo: Barley grain	0.30	0.34	3.8	37	0.2	1.1	0.4	
4 Mix Demo: Wheat grain	1.05	1.18	14.0	135	0.6	4.0	1.4	
4 Mix Demo: Lupins grain	1.65	1.85	22.8	569	4.3	5.9	3.8	

Total/cow/day		kg DM	kg As Fed	ME (MJ)	MP (g)	Ca (g)	P (g)	Mg (g)
Supply		19.1	61.4	218	1,987	79.0	78.8	37.6
Demand				215	1,672	109.2	64.7	35.4
Balance				3	315	-30.2	14.1	2.2
% Requirement				101.3	118.8	72.3	121.8	106.2

Total Diet		ME density (MJ/kg DM)		Feed Efficiency		Margin (\$/cow/d)	
Diet DM (%)	31.0	11.4	11.4	kg ECM/kg DM	1.3	Milk income	9.90
% of DMI limit	91	17.9	17.9	g MS/kg DM	92	Feed cost	3.80
NDF (%DM)	37.9	74.5	74.5	\$ Milk/\$ Feed	2.60	MOFC	6.10
Starch (%DM)	20.9	25.5	25.5				
Forage:Conc ratio	47:53	DCAD (mEq/kg)	100				

Notes Rumen8 diet summary report printed 6/09/2023 10:32AM

Barley sourced from new supplier, slightly higher protein

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Total Page No.: 1
Zoom Factor: 100%

The Report Preview window showing a diet report with the Mix Demo ingredient listed as it's ingredients and common ingredients combined.

Report Preview
- □ ×

Save report as PDF

Main Report

DIET REPORT

Yelverton Dairy Farm
Early calver diet Nov 2022

Diet created by John Smith
johm@smith.com.au 0428 216 324

Animal					
Liveweight (kg)	600	Milk yield (l)	25.0	Fat (kg)	1.00
LW change (kg/d)	0.0	Milk fat (%)	4.0	Protein (kg)	0.75
Days pregnant	70	Milk protein (%)	3.0	Fat + Protein (kg)	1.75
Days in milk	150	Fat:Protein ratio	1.33	Energy corrected milk (kg)	24.6

Diet/cow/day							
# Ingredient	kg DM	kg As Fed	ME (MJ)	CP (g)	Ca (g)	P (g)	Mg (g)
1 Barley grain	4.75	5.41	60.8	580	3.3	18.1	6.7
2 Lupins grain	4.23	4.73	58.4	1,459	11.0	15.2	9.7
3 Ryegrass ann. - Dry - Spr - Low quali	9.02	50.11	84.8	1,245	64.0	41.5	19.8
4 Mix Demo: Wheat grain	1.05	1.18	14.0	135	0.6	4.0	1.4

Total/cow/day	kg DM	kg As Fed	ME (MJ)	MP (g)	Ca (g)	P (g)	Mg (g)
Supply	19.1	61.4	218	1,987	79.0	78.8	37.6
Demand			215	1,672	109.2	64.7	35.4
Balance			3	315	-30.2	14.1	2.2
% Requirement			101.3	118.8	72.3	121.8	106.2

Total Diet				Feed Efficiency		Margin (\$/cow/d)	
Diet DM (%)	31.0	ME density (MJ/kg DM)	11.4	kg ECM/kg DM	1.3	Milk income	9.90
% of DMI limit	91	CP (%DM)	17.9	g MS/kg DM	92	Feed cost	3.80
NDF (%DM)	37.9	RDP (%CP)	74.5	\$ Milk/\$ Feed	2.60	MOFC	6.10
Starch (%DM)	20.9	UDP (%CP)	25.5				
Forage:Conc ratio	47:53	DCAD (mEq/kg)	100				

Notes Rumen8 diet summary report printed 6/09/2023 10:33AM

Barley sourced from new supplier, slightly higher protein

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THE DAILY FEEDING SHEET REPORT

This report allows you to create a PMR/TMR sheet from the current diet for the number of cows to be fed. For this report you must provide additional information beyond that for the Diet Summary report. In the figure below you can see there are 150 cows to be fed (1) and the target dry matter content of the PMR/TMR mix is 52% (2). You must also specify where the ingredients will be fed. When the Report Designer opens all the feeds are listed in the left most TMR/PMR box. You should drag and drop (or use the arrow buttons) the ingredients to be fed in the dairy (3) and elsewhere (4). This is usually the paddock and includes grazed forages. The 'Mixes to list as their ingredients' works in the same manner as in the Diet report described in the section above. You can see in the figure below the Mix Demo ingredient is being fed in the dairy (3) and the Ryegrass is listed as fed elsewhere (4) as it is grazed in the paddock. If the dry matter content of the TMR/PMR is higher than the target (2) then the report will show the quantity of water to add to the TMR/PMR to reduce it. If the dry matter content is already below the target water will not be added.

The Report Designer window showing a Daily Feed Sheet. In this report you must specify the number of cows (1), the target dry matter for the TMR/PMR mix (2) and ingredients fed in the dairy (3) and elsewhere (4).

Report Designer [?] [X]

Report type:

Farm name:

Diet name:

Prepared by:

Contact details:

Logo: 

Notes:

Number cows: **1** Target DM (%): **2**

Ingredients in order in the TMR/PMR	Ingredients in order to be fed in the dairy	Ingredients in order to be fed elsewhere	Mixes to list as their ingredients
<input type="button" value="↑"/> 1 Barley grain <input type="button" value="↓"/> 2 Lupins grain <input type="button" value="↕"/> <input type="button" value="→"/> <input type="button" value="⇌"/>	<input type="button" value="↑"/> 4 Mix Demo <input type="button" value="↓"/> <input type="button" value="↕"/> <input type="button" value="←"/> 3 <input type="button" value="→"/>	<input type="button" value="↑"/> 3 Ryegrass ann. - D... <input type="button" value="↓"/> <input type="button" value="↕"/> <input type="button" value="←"/> 4 <input type="button" value="→"/>	<input type="checkbox"/> Mix Demo Common ingredients <input type="radio"/> Keep separate <input checked="" type="radio"/> Combine

Disclaimer:

The Report Preview window showing a Daily Feeding Sheet report with diet ingredients listed fed in a TMR/PMR, in the dairy and fed elsewhere (grazed in the paddock in this case).

Report Preview
- □ ×

Save report as PDF

Main Report

Daily Feeding Sheet

Yelverton Dairy Farm
Early calver diet Nov 2022

Diet created by John Smith
johm@smith.com.au 0428 216 324

Number of animals to be fed: 150
PMR/TMR dry matter content: 52% (Target DM: 52%)

Diet

# Ingredient	kg DM		kg as Fed	
	/cow/day	Total/day	/cow/day	Total/day
Fed in TMR/PMR:				
1 Barley grain	4.45	668	5.07	761
2 Lupins grain	2.58	387	2.88	432
Water added			5.57	835
Sub-Total	7.03	1,055	13.52	2,028
Fed in the dairy:				
4 Mix Demo	3.00	450	3.37	506
Sub-Total	3.00	450	3.37	506
Fed by other means:				
3 Ryegrass ann. - Dry - Spr - Low quality (Aust)	9.02	1,353	50.11	7,517
Sub-Total	9.02	1,353	50.11	7,517
Total	19.05	2,858	67.00	10,050



Notes Rumen8 daily feeding sheet printed 6/09/2023 10:37AM

Barley sourced from new supplier, slightly higher protein

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THE BATCHING SHEET REPORT

This report allows you to create a batching sheet from the current diet for a batch size in tonnes (fresh weight). In this report you can add a mix name below the contact details of the person who prepared the diet.

For this report you must provide additional information beyond that for the Diet Summary report. In the figure below can see the batch size will be 2.5 tonnes fresh weight (2) and the target dry matter content of the PMR/TMR mix is 52% (1). You must also specify which ingredients will be fed in the batch and elsewhere. When the Report Designer opens, all the feeds are listed in the left most batch box (3). You should drag and drop (or use the arrow buttons) the ingredients to be fed elsewhere (4). This is usually the dairy and paddock and includes grazed forages. The 'Mixes to list as their ingredients' works in the same manner as in the Diet report described in the section above.

You can see in the figure below the Mix Demo and Ryegrass ingredients are being fed outside of the batch (4) and the barley grain, lupins grain and barley hay make up the batch (3).

As for the Daily Feed Sheet report, if the dry matter content of the batch is higher than the target (1) then the report will show the quantity of water to add to reduce it. If the dry matter content is already below the target water will not be added.

The Report Designer window showing a Batching Sheet report design. In this report you must specify the target dry matter for the TMR/PMR mix (1), the weight of the final batch (2) and ingredients fed in the batch (3) and elsewhere (4).

Report Designer
? X

Report type: Batching Sheet

Farm name: Yelverton Dairy Farm

Diet name: Early calver diet Nov 2022

Prepared by: John Smith

Contact details: john@smith.com.au 0428 216 324

Mix name:

Notes: Barley sourced from new supplier, slightly higher protein

Target DM (%)

52

Batch size (t fresh)

2.500

Ingredients in order included in batch

1 Barley grain

2 Lupins grain

5 Barley hay

Ingredients not in the batch

3 Ryegrass ann. - D...

4 Mix Demo

Mixes to list as their ingredients

Mix Demo

Common ingredients

Keep separate

Combine

Disclaimer

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Create
Cancel

The Report Preview window showing a Batching Sheet report with diet ingredients listed fed in the batch and elsewhere. Water has been added to reduce the target dry matter of the batch down to 52% while keeping the batch weight within the specified 2.5 tonnes of ingredients.

Report Preview
- □ ×

Save report as PDF

1 / 1

Main Report

Batching Sheet

Yelverton Dairy Farm
 Early calver diet Nov 2022
 Diet created by John Smith
 johm@smith.com.au 0428 216 324



Mix
 Name
 Batch size 2.5 tonnes as-fed (1,301 tonnes DM)
 Batch dry matter content 52% (Target DM: 52%)

Ingredients

Name	Mixing Order	kg As fed	Cumulative	% As Fed	kg DM
Barley grain	1	852.7	853	34.1	748.6
Lupins grain	2	240.5	1,093	9.6	215.5
Barley hay	3	376.7	1,470	15.1	336.4
Water added to achieve target DM%	4	1,030.1	2,500	41.2	
Total		2,500.0	2,500	100.0	1,300.5

Notes Rumen8 batching sheet printed 6/09/2023 10:45AM

Barley sourced from new supplier, slightly higher protein

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Page 1 of 1

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THE DIET COMPARISON REPORTS

This report allows you to print a comparison between three diets that have been stored in the Compare tab in slots 1, 2 and 3. Typical use might be an existing diet and then two alternatives with improving margins.

The Compare tab showing three stored diets. Diet 1 is the existing diet, diet 2 uses the same ingredients but better matches the cow's requirements and improves the margin. Diet 3 substitutes the barley grain with a smaller quantity of slightly more expensive wheat grain to further increase the diet margin.

Report Designer
? X

Report type: Diet Comparison Report (DM) v

Farm name: Yelverton Dairy Farm

Diet name: Early calver diet Nov 2022

Prepared by: John Smith

Contact details: johm@smith.com.au 0428 216 324

Notes: Alternative diets provided after farm visit 12/11/2022

Logo



None Select

Store 1 diet
Current diet

- 1 Barley grain
- 2 Lupins grain
- 3 Ryegrass ann. - D...
- 4 Mix Demo
- 5 Barley hay

Store 2 diet
Improved diet

- 1 Barley grain
- 3 Ryegrass ann. - D...
- 4 Mix Demo

Store 3 diet
Wheat, not barley

- 3 Ryegrass ann. - D...
- 4 Mix Demo
- 5 Wheat grain

Mixes to list as their ingredients

Mix Demo

Disclaimer

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Create Cancel

Once multiple diets have been stored in the Compare tab the Diet Comparison report shows the ingredients in each. Ingredient order can be adjusted using the buttons to the left of the lists or they can be dragged and dropped with the mouse.

The report designer displaying the three stored diets from the Compare tab when creating a Diet Comparison report.

Report Designer
? X

Report type: Diet Comparison Report (DM)

Farm name:

Diet name:

Prepared by:

Contact details:

Notes:

Store 1 diet
Current diet

1 Barley grain

2 Lupins grain

3 Ryegrass ann. - D...

4 Mix Demo

5 Barley hay

Store 2 diet
Improved diet

1 Barley grain

3 Ryegrass ann. - D...

4 Mix Demo

Store 3 diet
Wheat, not barley

3 Ryegrass ann. - D...

4 Mix Demo

5 Wheat grain

Mixes to list as
their ingredients

Mix Demo

Disclaimer:

Create
Cancel

The Report Preview window showing a Diet Comparison report with three diets, the current diet, an improved version of the current diet with a better margin and an alternative with barley grain replaced with wheat grain that improves the margin further.

Report Preview - □ ×

Save report as PDF

Main Report

Diet Comparison Report

Yelverton Dairy Farm
Early calver diet Nov 2022

Diet created by John Smith
johm@smith.com.au 0428 216 324



	Current diet	Improved diet	Wheat, not barley
Cow details			
Cow liveweight (kg)	600	600	600
Cow liveweight change (kg/d)	0.00	0.00	0.00
Days in milk	150	150	150
Days pregnant	70	70	70
Milk production			
Milk yield(l/d)	25.0	25.0	25.0
Milk fat (%m/v)	4.00	4.00	4.00
Milk protein (%m/v)	3.00	3.00	3.00
Diet ingredients (kg DM)			
Barley grain	4.5	4.5	0.0
Lupins grain	1.3	0.0	0.0
Ryegrass ann. - Dry - Spr - Low quality (Aust)	9.0	12.8	12.8
Mix Demo	3.0	3.0	3.0
Barley hay	2.0	0.0	0.0
Wheat grain	0.0	0.0	4.3
Feed intake			
Dry matter intake (kg)	19.8	20.3	20.1
Dry matter intake (kg as-fed)	62.2	79.6	79.3
Dry matter intake (%max. NDF)*	112	121	116
Dry matter intake (%max. NRC)	94	97	96
Feed efficiency (kg ECM/kg DM)	1.2	1.2	1.2
Feed efficiency (g MS/kg DM)	89	86	87
Energy			
ME supply (MJ)	218	218	218
ME required (MJ)	218	219	219
ME density (MJ/kg DM)	11.0	10.8	10.9
Protein			
MP supply (g)	1,963	1,932	1,943
MP required (g)	1,693	1,717	1,711
CP supply (%)	16.0	15.1	15.2
CP supply (g)	3,161	3,057	3,062
RDP CP (%)	73.6	71.9	71.6
UDP CP (%)	26.4	28.1	28.4
Fibre			

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Page 1 of 2

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Zoom Factor: 100%

The Diet Comparison report can also be printed with ingredient quantities show on an as fed basis if this is more suitable for the recipient.

PRINTING REPORTS

The Report Preview window has a tool bar across the top of the window with icons for

1. exporting the report in PDF, CSV, Word, Excel, RTF or XML formats,
2. printing the report,
3. refresh the report,
4. copying text from the report for pasting into other documents,
5. changing to another report page number for multi-page reports,
6. finding text within the report,
7. and changing the zoom level of the report preview.

The print report button opens a standard Windows print dialog box where you can specify the printer, page size and layout.

To save the report and as a PDF document click on the 'Save report as PDF' button at the top of the Report Preview window. You will be asked for a name for the PDF file and where you would like to save it.

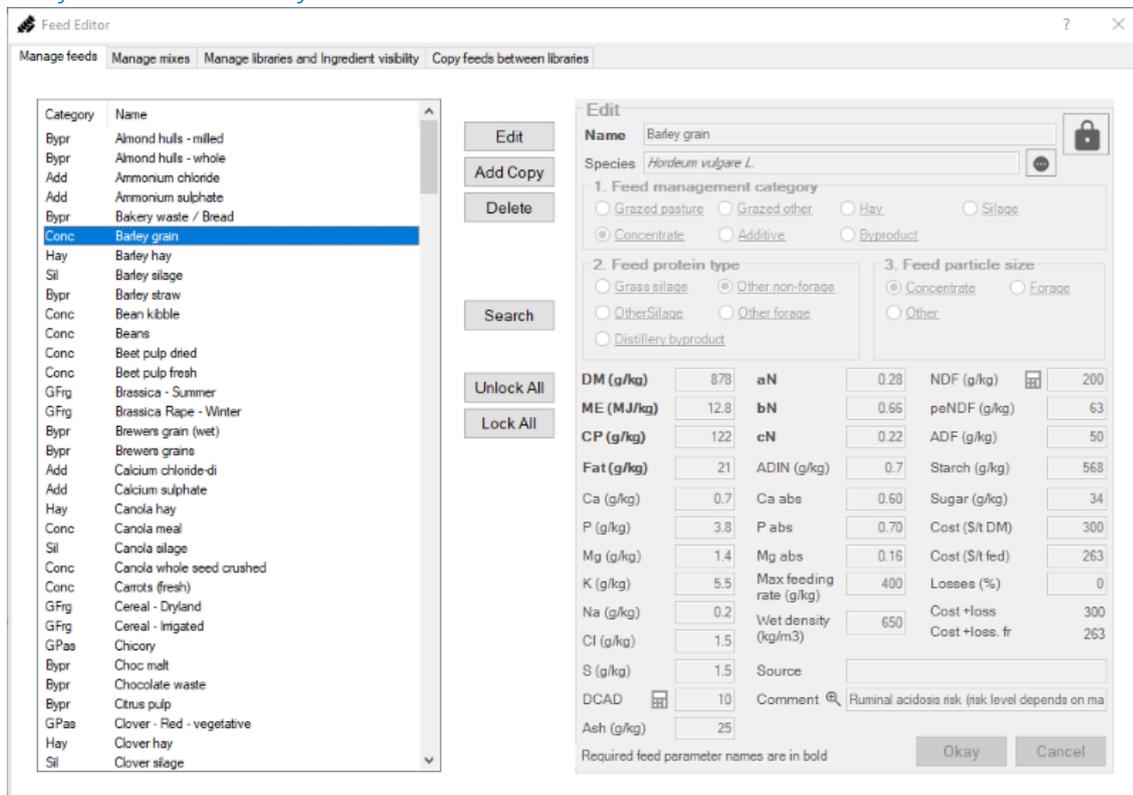
THE FEED LIBRARY EDITOR

The feed library is accessible from the edit menu of the main Rumen8 window. It allows you to edit all the parameters for each feed and define commonly used mixes made up of feeds. The feed library window is divided into three tabbed sections. The first allows you to manage individual feeds, the second manage mixes and the third tab provides control of the feed library and which ingredients are visible in the main Rumen8 window.

MANAGE FEEDS

The 'Manage feeds' tab lets you edit all the parameters for each of the feeds in the current library. The currently highlighted feed has its parameters displayed in edit section of the window.

The feeds editor in the feed editor.



<i>Edit</i>	Edit the parameters of the currently selected feed.
<i>Add Copy</i>	Add a new feed to the library that is a copy of the currently selected feed.
<i>Delete</i>	You can add a blank new feed by holding down the Shift key and the 'Add Copy' button will change to 'Add New'. Adding a feed this way is not recommended, always add a copy of the closest related feed and modify the parameters with the new values. Remove the currently selected feed from the library.
<i>Search</i>	Opens the search window allowing all feed libraries to be searched for a name or partial name. See below for more details.
<i>Unlock All</i>	Unlocks all the feeds in the current library.
<i>Lock All</i>	Locks all the feeds in the current library.

To edit an individual feed highlight it in the feed list and click the 'Edit' button or double click on it. The entry boxes in the Edit section of the window will become active and allow you to change any of the feed parameters.

As a minimum, eleven parameters are required for a feed to be accepted as valid and their names are in bold in the edit section. These are a unique name, management category, protein type, particle size classification, ME, CP, DM, Fat, aN, bN and cN. Until valid values for these parameters are entered you will be unable to save the feed.

If you are unsure what the parameters refer to, hover your mouse over the name and a tool tip will appear with the full name and an explanation. Abbreviations are also listed at the end of this document.

If you enter an invalid value into the entry box for any of the parameters, the parameter name will turn red. Once you have entered all the feed parameters you have, or have edited an existing feed, click on the 'Okay' button to save your changes and return to feed selection.

Entering parameters for an individual feed.

Feed Editor

Manage feeds | Manage mixes | Manage libraries and Ingredient visibility | Copy feeds between libraries

Category	Name
Bypr	Almond hulls - milled
Bypr	Almond hulls - whole
Add	Ammonium chloride
Add	Ammonium sulphate
Bypr	Bakery waste / Bread
Conc	Barley grain
Hay	Barley hay
Sil	Barley silage
Bypr	Barley straw
Conc	Bean kibbles
Conc	Beans
Conc	Beet pulp dried
Conc	Beet pulp fresh
GFrq	Brassica - Summer
GFrq	Brassica Rape - Winter
Bypr	Brewers grain (wet)
Bypr	Brewers grains
Add	Calcium chloride-di
Add	Calcium sulphate
Hay	Canola hay
Conc	Canola meal
Sil	Canola silage
Conc	Canola whole seed crushed
Conc	Carrots (fresh)
GFrq	Cereal - Dryland
GFrq	Cereal - Irrigated
GPas	Chicory
Bypr	Choc malt
Bypr	Chocolate waste
Bypr	Citrus pulp
GPas	Clover - Red - vegetative
Hay	Clover hay
Sil	Clover silage

Edit

Add Copy

Delete

Search

Unlock All

Lock All

Edit

Name: Barley grain

Species: *Hordeum vulgare L.*

1. Feed management category

Grazed pasture Grazed other Hay Silage

Concentrate Additive Byproduct

2. Feed protein type

Grass silage Other non-forage

Other Silage Other forage

Distillery byproduct

3. Feed particle size

Concentrate Forage

Other

DM (g/kg)	878	aN	0.28	NDF (g/kg)	200
ME (MJ/kg)	12.8	bN	0.66	peNDF (g/kg)	63
CP (g/kg)	122	cN	0.22	ADF (g/kg)	50
Fat (g/kg)	21	ADIN (g/kg)	0.7	Starch (g/kg)	568
Ca (g/kg)	0.7	Ca abs	0.60	Sugar (g/kg)	34
P (g/kg)	3.8	P abs	0.70	Cost (\$/t DM)	300
Mg (g/kg)	1.4	Mg abs	0.16	Cost (\$/t fed)	263
K (g/kg)	5.5	Max feeding rate (g/kg)	400	Losses (%)	0
Na (g/kg)	0.2	Wet density (kg/m³)	650	Cost + loss	300
Cl (g/kg)	1.5	Source		Cost + loss, fr	263
S (g/kg)	1.5	Comment	Ruminal acidosis risk (risk level depends on ma)		
DCAD	10				
Ash (g/kg)	25				

Required feed parameter names are in bold

Okay Cancel

Given the importance of the correct management category, protein type and particle size classification of a feed, and the difficulty in obtaining aN, bN and cN values for feeds, we strongly suggest you ALWAYS create a new feed in your feed library by adding a copy of a closely matching existing feed from the original Rumen8 feed library, which can then be modified for DM, ME, CP, fat and other feed values. For this reason, we also suggest you never edit feeds in the original Rumen8 feed library, but add copies of these feeds instead which can then be modified to reflect your feeds.

Although Rumen8 can function with just these eleven required parameters, to make full use of the features of the program, all feed values should be entered if possible. Entering feed costs and keeping these up to date is also important if you wish to compare diets to determine the lowest cost option.

As the aN, bN, cN and ADIN values are not easily obtained, a generic list is provided here that indicates typical values for different feed classes (AFRC 1993).

Typical protein degradability (aN, bN and cN) and ADIN (g/kg DM) values for different feed classes

Feed class	aN	bN	cN	ADIN
Fresh forages	0.24	0.67	0.12	1.2
Roots	0.25	0.65	0.41	1.2
Grass and legume silages	0.59	0.31	0.13	1.2
Cereal silage ind maize	0.69	0.20	0.10	2.2
Grass hays	0.22	0.60	0.08	1.2
Legume hays	0.20	0.65	0.29	2.0
Cereal straws	0.30	0.50	0.12	1.0
Cereals	0.47	0.48	0.27	0.4
Legume seeds	0.41	0.57	0.16	0.5
Cereal byproducts	0.36	0.55	0.09	1.0
Beet and citrus pulps	0.39	0.57	0.05	1.2
Oils meals, high fibre	0.24	0.69	0.11	3.3
Oil meals, low fibre	0.14	0.79	0.09	2.1

Feed Locking

To reduce accidental changes to feed parameters, they can be locked preventing change of all the parameters except cost and losses. When the feed is locked the padlock in the top right of the Edit section will be closed. To unlock the feed click on the padlock and it will open. It is recommended all feeds are locked when not being edited.

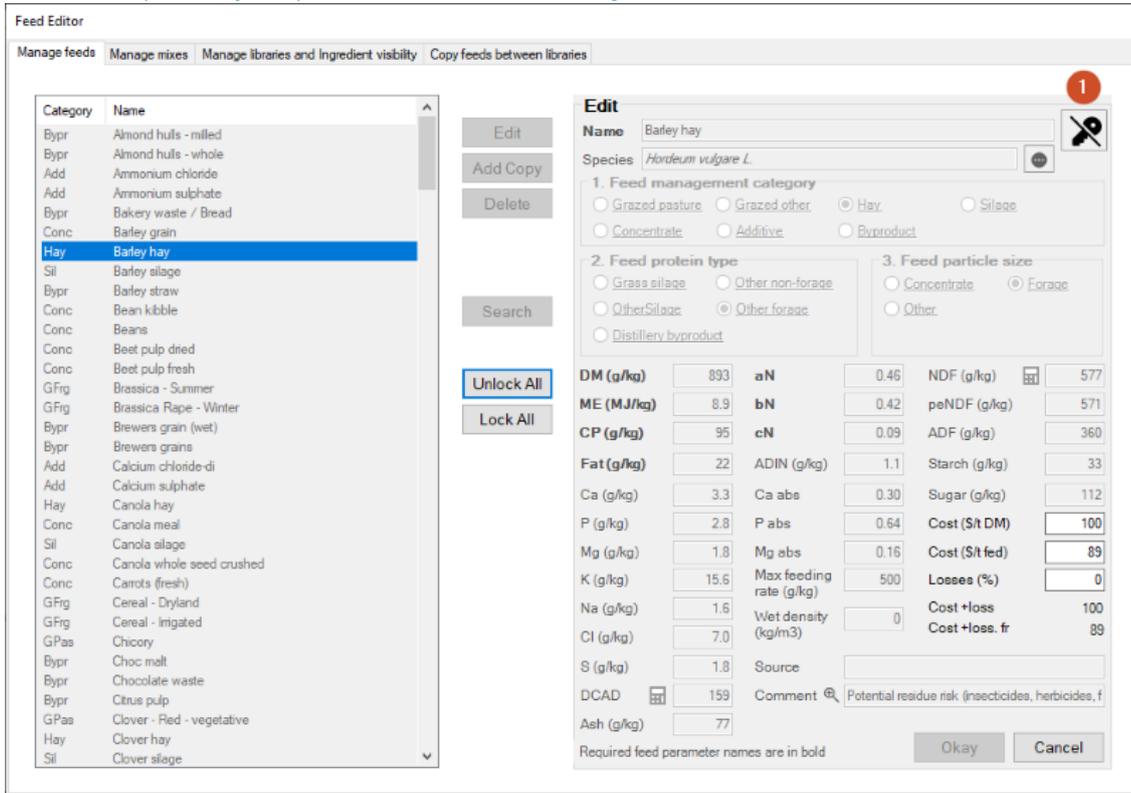
The feed editor showing a locked feed where only the cost and losses can be edited (1). Click on the padlock to unlock the feed.

The screenshot shows the 'Feed Editor' interface. On the left is a list of feed categories and names, with 'Barley grain' selected. The main area is the 'Edit' form for 'Barley grain'. The 'Species' is 'Hordeum vulgare L.'. There are three sections for feed management: 1. Feed management category (Grazed pasture, Grazed other, Hay, Silage), 2. Feed protein type (Grass silage, Other non-forage, Other Silage, Other forage, Distillery byproduct), and 3. Feed particle size (Concentrate, Forage, Other). Below these are various nutrient and cost parameters in a grid. A red circle '1' highlights the 'Cost (\$/t DM)' field, which is the only one that is not greyed out. Another red circle '2' highlights a closed padlock icon in the top right corner of the edit form. Buttons for 'Edit', 'Add Copy', 'Delete', 'Search', 'Unlock All', and 'Lock All' are visible. At the bottom, there are 'Okay' and 'Cancel' buttons.

Feeds can be permanently locked by the library creator. In this case the symbol will be a key with a diagonal line through it instead of an open or closed padlock. Permanently locked feeds cannot be unlocked by the user so if a feed parameter needs to be changed a copy of the feed should be

made first. It is recommended the feeds supplied with Rumen8 are locked and only copies are altered.

The feed editor showing a permanently locked feed signified by the no-key symbol (1). These feeds must be copied before parameters can be changed.



Searching for a feed by name

Open the Feed Search window by clicking on the Search button. At the top left you can enter all or part of a feed's name (1). Click the Search button (2) to search through the current feed library for feeds that contain the entered text in their name, species name or other names. The number of feeds found is displayed at the top right of the window (3) and the feeds below in the main part of the search window (4).

By default only the selected feeds in the current feed library are displayed. To widen the search you can also include unselected feeds (5) and other feed libraries (6).

The feed search window available from the Edit menu.

Q Feed Search X

Barley Unselected All libraries Feeds found: 5

Selected	Name	Species	Other names	Library
<input checked="" type="checkbox"/>	Barley grain	Hordeum vulgare L.	Barley [English]; orge, escourgeon [French]; cebada [Spanish]; cevada [Portuguese]; Amindelig Byg [Danish]; Gerst [Dutch]; Ó [Haitian Creole]; jela [Indonesian]; orzo [Italian]; shayri [Swahili]; sebada [Tagalog]; arpa [Turkish]; Đai mach [Vietnamese]; 7-rih [Arabic]; شعيير [Arabic]; বর [Bengali]; မုဆိပ် [Burmese]; 大麦 [Chinese]; Κοιθόρι [Greek]; שעורה תרבותית [Hebrew]; च [Hindi]; 才ムギ [Japanese]; ಪಾಳೆ [Kannada]; 보리 [Korean]; മറുഗോ [Malayalam]; جو [Persian]; ਜ [Punjabi]; Ячмень [Russian]; ఎంధ్రపెరిగిపిడి [Tamil]; బియ్యం [Telugu]; បរិសាប [Thai]	Default
<input checked="" type="checkbox"/>	Barley hay	Hordeum vulgare L.	Barley [English]; orge, escourgeon [French]; cebada [Spanish]; cevada [Portuguese]; Amindelig Byg [Danish]; Gerst [Dutch]; Ó [Haitian Creole]; jela [Indonesian]; orzo [Italian]; shayri [Swahili]; sebada [Tagalog]; arpa [Turkish]; Đai mach [Vietnamese]; 7-rih [Arabic]; شعيير [Arabic]; বর [Bengali]; မုဆိပ် [Burmese]; 大麦 [Chinese]; Κοιθόρι [Greek]; שעורה תרבותית [Hebrew]; च [Hindi]; 才ムギ [Japanese]; ಪಾಳೆ [Kannada]; 보리 [Korean]; മറുഗോ [Malayalam]; جو [Persian]; ਜ [Punjabi]; Ячмень [Russian]; ఎంధ్రపెరిగిపిడి [Tamil]; బియ్యం [Telugu]; បរិសាប [Thai]	Default
<input checked="" type="checkbox"/>	Barley silage	Hordeum vulgare L.	Barley [English]; orge, escourgeon [French]; cebada [Spanish]; cevada [Portuguese]; Amindelig Byg [Danish]; Gerst [Dutch]; Ó [Haitian Creole]; jela [Indonesian]; orzo [Italian]; shayri [Swahili]; sebada [Tagalog]; arpa [Turkish]; Đai mach [Vietnamese]; 7-rih [Arabic]; شعيير [Arabic]; বর [Bengali]; မုဆိပ် [Burmese]; 大麦 [Chinese]; Κοιθόρι [Greek]; שעורה תרבותית [Hebrew]; च [Hindi]; 才ムギ [Japanese]; ಪಾಳೆ [Kannada]; 보리 [Korean]; മറുഗോ [Malayalam]; جو [Persian]; ਜ [Punjabi]; Ячмень [Russian]; ఎంధ్రపెరిగిపిడి [Tamil]; బియ్యం [Telugu]; បរិសាប [Thai]	Default
<input checked="" type="checkbox"/>	Barley straw	Hordeum vulgare L.	Barley [English]; orge, escourgeon [French]; cebada [Spanish]; cevada [Portuguese]; Amindelig Byg [Danish]; Gerst [Dutch]; Ó [Haitian Creole]; jela [Indonesian]; orzo [Italian]; shayri [Swahili]; sebada [Tagalog]; arpa [Turkish]; Đai mach [Vietnamese]; 7-rih [Arabic]; شعيير [Arabic]; বর [Bengali]; မုဆိပ် [Burmese]; 大麦 [Chinese]; Κοιθόρι [Greek]; שעורה תרבותית [Hebrew]; च [Hindi]; 才ムギ [Japanese]; ಪಾಳೆ [Kannada]; 보리 [Korean]; മറുഗോ [Malayalam]; جو [Persian]; ਜ [Punjabi]; Ячмень [Russian]; ఎంధ్రపెరిగిపిడి [Tamil]; బియ్యం [Telugu]; បរិសាប [Thai]	Default
<input checked="" type="checkbox"/>	Malted barley screenings	Hordeum vulgare L.	Malt distillers grain, malt distillers grains, malt distiller's grain, draft Barley dark grains, malt distillers dark grains, barley distillers dark grains, dried dark grains Barley distillers grain, barley distillers grains	Default

The feed parameters used in the Feed Editor

Name	The feed name. This must be unique in the feed library (feeds and mixes). This can be search for in the Search window.
Species	The species name of the plant. This can be search for in the Search window.
Other name	Any alternative names for the feed. An editing window will open when the button is clicked allowing entry of other names for the feed. These can be search for in the Search window.
Padlock	Allows the feed to be edited when unlocked (open padlock symbol), only cost and losses changed when locked (locked padlock symbol). If the symbol is a key with a diagonal line through it the feed cannot be unlocked and must be copied to change parameters.
Feed management category	This is used to sort feeds into similar groups for easier access. It is not used by the nutrition model to determine nutrient supply (grazed pasture, grazed other, hay, silage, concentrate, additive, by-product).
Feed protein type	This is used by the AFRC nutrition model to calculate the diet's fermentable energy content and hence influences the metabolisable protein supply (grass silage, other silage, other non-forage, other forage, distillery by-product).
Feed particle size classification	This is used to classify feeds as forage or concentrate 'like' in terms of behaviour in the rumen. This is expressed as the 'forage concentrate ratio' and 'NDF from forage' measures on the diet detail tab. It is also used to determine the absorption coefficient for calcium, phosphorus and magnesium (concentrate, forage, other).
DM	Dry matter content of feed in g/kg or % (depending on your choice in Preferences).
ME	Metabolisable energy content of feed in MJ/kg DM.
CP	Crude protein content of feed in g/kg DM or % in DM.
Fat	Fat content of feed in g/kg DM or % in DM.
Ca	Calcium content of feed in g/kg DM or % in DM.
P	Phosphorus content of feed in g/kg DM or % in DM.
Mg	Magnesium content of feed in g/kg DM or % in DM.
K	Potassium content of feed in g/kg DM or % in DM.
Na	Sodium content of feed in g/kg DM or % in DM.
Cl	Chlorine content of feed in g/kg DM or % in DM.
S	Sulphur content of feed in g/kg DM or % in DM.
DCAD	Dietary cation anion difference of feed in milli-equivalents per kg DM. Can only be calculated by clicking on the calculator button if the K, N, Cl and S content of the feed are provided.

<i>aN</i>	Proportion of water-soluble nitrogen (N) in the total N of the feed.
<i>bN</i>	Proportion of potentially degradable N, other than water soluble N, in the total N of a feed.
<i>cN</i>	Fractional rumen degradation rate per hour of the b fraction of feed N.
<i>ADIN</i>	Acid detergent insoluble nitrogen content of feed in g/kg DM or % in DM.
<i>Ca abs</i>	Calcium absorption coefficient for feed (% of total calcium content). Rumen8 adopts the NRC 2001 approach with constant coefficients of 60% and 30% for concentrates and forages respectively.
<i>P abs</i>	Phosphorus absorption coefficient for feed (% of total phosphorus content). Rumen8 adopts the NRC 2001 approach with constant coefficients of 70% and 64% for concentrates and forages respectively.
<i>Mg abs</i>	Magnesium absorption coefficient for feed (% of total magnesium content). Rumen8 adopts the NRC 2001 approach with constant coefficients of 16% for both concentrates and forages.
<i>Max feeding rate</i>	Maximum feeding rate of a feed as a proportion of the total dry matter intake. This is optional and needs to be set by the user.
<i>Wet density</i>	The wet density of a feed as fed. This is not used by Rumen8 but by associated programs.
<i>NDF</i>	Neutral detergent fibre content of feed in g/kg DM or % in DM.
<i>peNDF</i>	The physically effective NDF in the total feed dry matter.
<i>ADF</i>	Acid detergent fibre content of feed in g/kg DM or % in DM.
<i>Starch</i>	Starch content of feed in g/kg DM or % in DM.
<i>Sugar</i>	Sugar content of feed in g/kg DM or % in DM.
<i>Ash</i>	Ash (inorganic matter) content of feed in g/kg DM or % in DM.
<i>Cost \$/t DM</i>	The cost of the feed expressed in \$/t dry matter.
<i>Cost \$/t fed</i>	The cost of the feed expressed in \$/t as fed.
<i>Losses</i>	The proportion of dry matter lost from a feed after purchase. This in effect increases the cost of feed consumed by the animal.
<i>Source</i>	A place for the user to record the source of information for a feed.
<i>Comment</i>	A place for the recording of any other useful information for a feed. Click on the magnifying glass to the left of the comment box to open a larger editing window for more detailed comments.

DCAD calculator

If the feed being edited has values for the minerals potassium (K), sodium (Na), chloride (Cl) and sulphur (S) the DCAD value can be calculated by clicking on the calculator button to the left of the DCAD value box. If a different value than the one calculated is already entered for DCAD, you will be prompted to confirm you wish to overwrite it.

peNDF calculator

When changing a feed's NDF content, you can elect to adjust the feed peNDF content by a similar amount at the same time. To do this click on the calculator button next to the NDF entry box. The peNDF calculator will open and you can enter the new value for the feed NDF. Below that the new value for peNDF will be displayed. If you wish to accept the changes click on the Okay button and the NDF and peNDF values for the feed will be updated. Cancel to exit the calculator without any changes.

Water as an ingredient

Water is listed as a feed and can be added to diets like any other ingredient. However, it is handled by Rumen8 as a special case in that

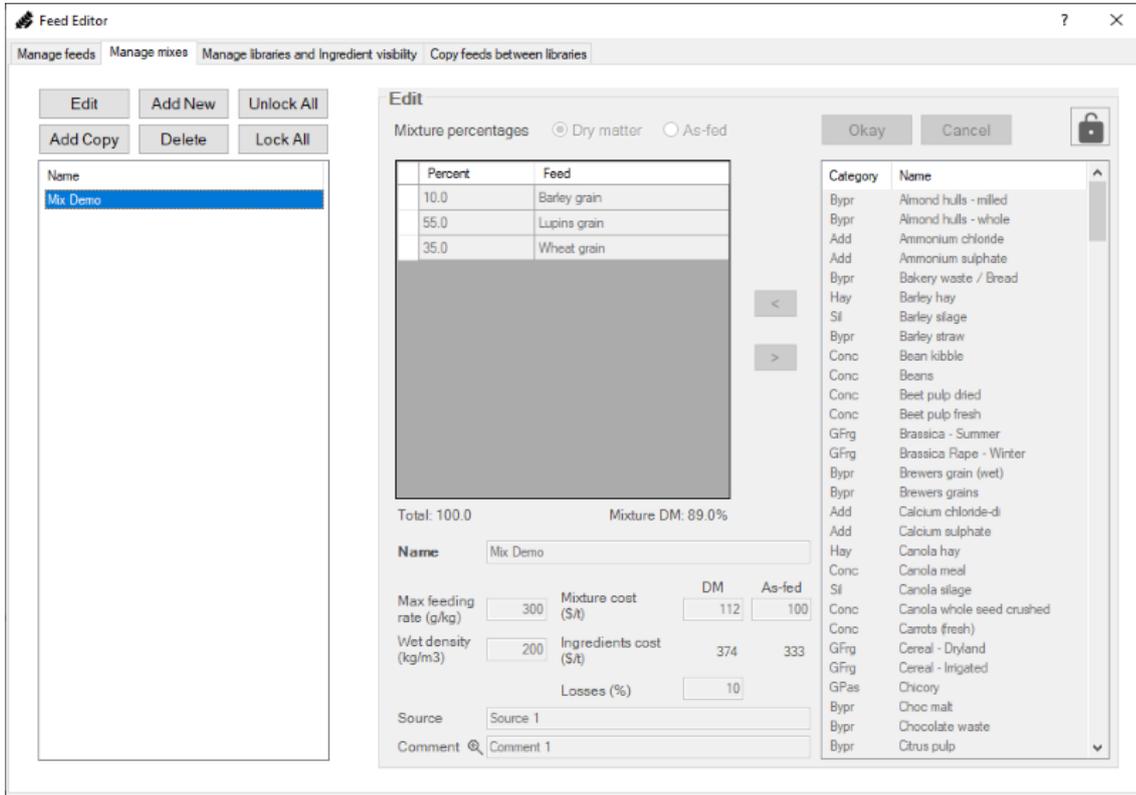
- the quantity must be entered on an as-fed basis,
- it is the only ingredient that can have a no cost and not prevent the diet's cost from being calculated,
- it cannot be added to a mix,
- in the feed editor it has all parameters set to 0.

Water can also be added to a diet in the Batch report when adding it is required to meet a dry matter content target for the mix.

MANAGE MIXES

The 'Mange mixes' tab lets you define commonly used mixes of feeds that can be selected as a single ingredient in a diet.

The mixes editor in the feed editor.



The left part of the window shows all the mixes in the feed library and the Edit section shows the details of the currently selected mix. You can use the buttons above the mix list to create, change, and delete mixes or double click on a mix to edit it.

Edit	Edit the parameters of the currently selected mix.
Add Copy	Add a new mix to the library that is a copy of the currently selected mix.
Add New	Add a new blank mix to the library.
Delete	Remove the currently selected mix from the library.
Unlock All	Unlocks all the mixes in the current library.
Lock All	Locks all the mixes in the current library.

The Edit section becomes active when a mix is being created or changed. The feed list on the right shows all the feeds in the current feed library that are not in the mix. They can be added to the

mix table singly or in groups by selecting them and clicking on the add (<) button. Multiple feeds can be selected by choosing the first one and then holding down the control key while clicking on subsequent ones. Groups of feeds can be moved into the mix by selecting the first feed and then holding down the shift key when selecting the last one. Alternatively, you can double click on a single feed to move it straight into the mix.

To remove a feed from the mix, click on the row header in the mix table to highlight the row and press the remove (>) button.

Once all the feeds have been moved into the mix table you then enter the percentage for each one by clicking in the cell under the 'Percent' column. Feed percentages can be entered on a dry weight or as fed (wet weight) basis. Ensure the 'Mix percentage by' setting above the feed table is set correctly for your feed percentages.

You cannot save the mix unless all the feed percentages add up to 100. The total at the bottom of the mix table shows the current percentage and will be red if it isn't 100%. If the percentage is under or over 100 the difference is shown in brackets. Change each feed percent by double clicking on the value in the table.

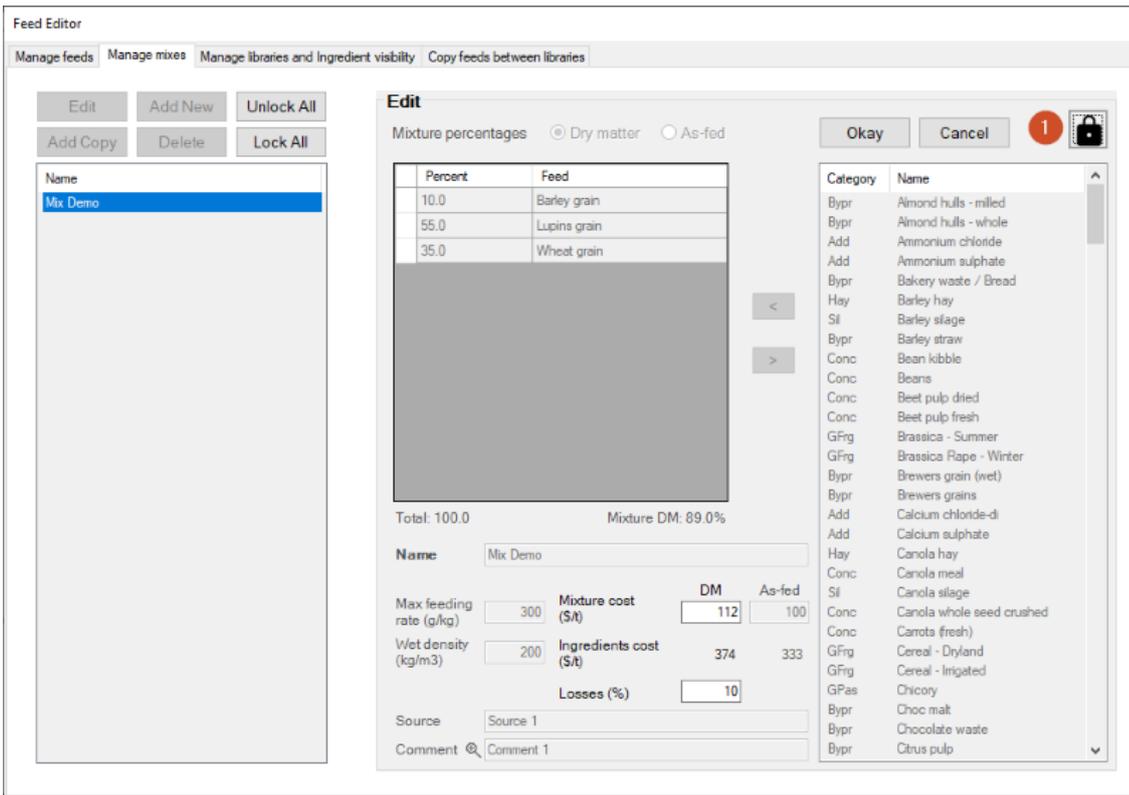
Below the mix table are the remaining parameters needed to define a mix. The mix name must be unique among both feeds and mixes and will turn red if this is not the case. You will be unable to save the mix until it has a unique name. If you are unsure what the parameters are, hover your mouse over the name and a tool tip will appear with the full name. Abbreviations are also listed at the end of this document.

If you enter an invalid value into the entry box for any of the parameters, the parameter name will turn red.

Mix Locking

To reduce accidental changes to mix parameters, they can be locked preventing change of all the parameters except cost and losses. When the mix is locked the padlock in the top right of the Edit section will be closed. To unlock the feed click on the padlock and it will open. It is recommended all feeds are locked when not being edited. If the padlock symbol is a key with a diagonal line through it the mix has been permanently locked by the library creator and cannot be unlocked by the user. In this case you must make a copy of the mix to alter it's parameters.

The feed editor showing a locked mix where only the cost and losses can be edited. Click on the padlock to unlock the feed (1).

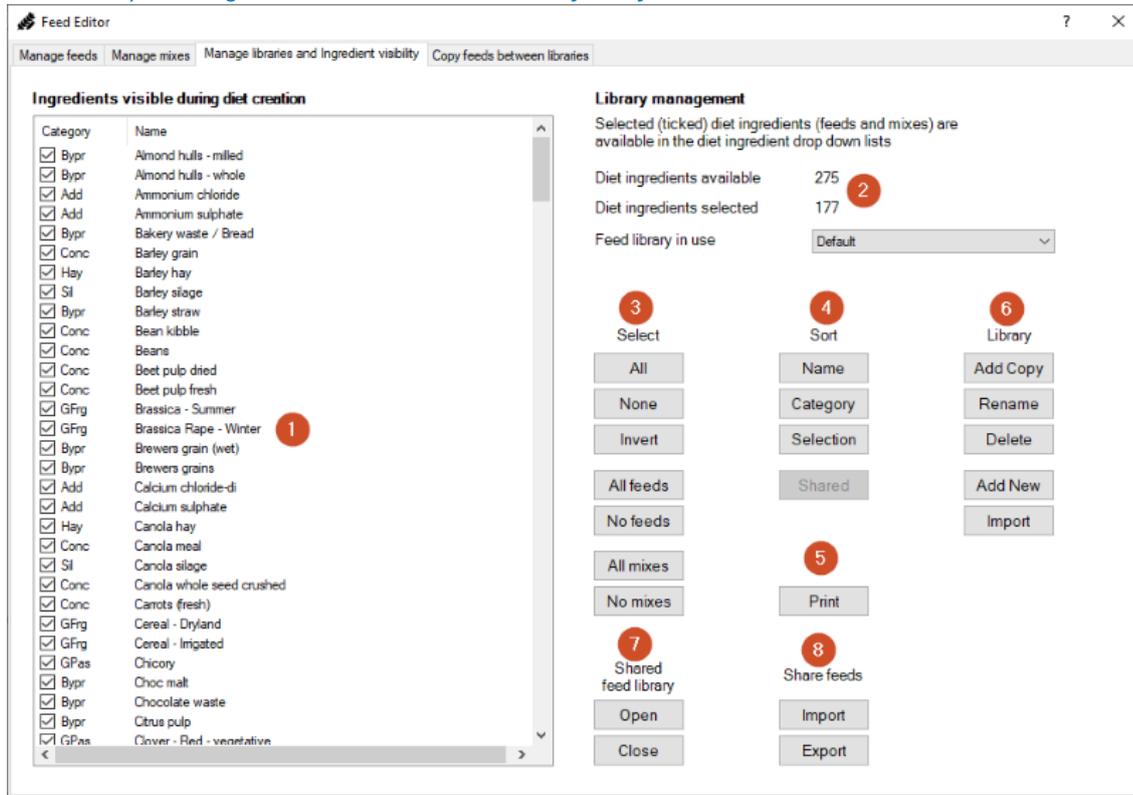


The feed parameters used in the Feed Editor

Name	The mix name must be unique in the feed library (feeds and mixes).
Padlock	Allows the mix to be edited when unlocked (open padlock symbol), only cost and losses changed when locked (locked padlock symbol). If the symbol is a key with a diagonal line through it the mix cannot be unlocked and must be copied to change parameters.
Max feeding rate	The maximum feeding rate of the mix as a proportion of the total dry matter intake. If this rate is exceeded a warning (!) will appear to the right of the ingredient name on the main Rumen8 window. Expressed as g/kg or %.
Wet density	The mass of the mix as fed including liquids (kg/m ³).
Mix cost	The cost of the mix entered per tonne dry matter or as fed. This should be the cost of the ingredient feeds and additional costs incurred such as milling or mixing.
Losses	The proportion of dry matter lost from a feed after purchase. This in effect increases the cost of feed consumed by the animal.
Source	A space for the user to record the source of information for a feed.
Comment	A space for the recording of any other useful information for a feed. Click on the magnifying glass to the left of the comment box to open a larger editing window for more detailed comments.
Ingredient's cost	This shows the value per tonne of the mix ingredients on a dry matter and as fed basis. If any of the ingredient feed costs are missing the value will not be calculated. The tool tip for the value shows the individual feed costs.

MANAGE LIBRARIES AND INGREDIENT VISIBILITY

The library management and selection tab of the feed editor.



The list of feeds in the left of the feed library window shows all the feeds and mixes available in the current library (1). Feeds with a tick in the box to the left of their name will be visible in the diet ingredient drop-down lists of the main Rumen8 window. This allows you to have a large feed library but only make a smaller more manageable number of feeds and mixes visible when creating diets.

To the right of the feed list the total number of feeds and the number currently visible (selected) in the diet ingredient drop-down lists are displayed (2). Below that the current feed library is shown.

Select feeds (3)

The Select buttons allow you to select all, none, or invert the current selection of the feeds and mixes with a single click. Beneath those you can select all or none of just the feeds, or just the mixes.

Sort feeds (4)

The sort buttons allow you to change the order of the feeds and mixes, so they are listed in ascending or descending (reverse) order by name, category, selection (ticked) or by library if a shared library is in use. Sorting can also be changed by clicking on the column heading row in the feed list.

Print report (5)

Generate a report that includes all or a subset of the feeds and mixes in the library and then print or save it to a file.

Click on the 'Print' button and a window will appear that allows you to select all the feeds and mixes you wish to add to the report. Individual feeds can be selected by clicking on the first one and then holding down the Control key when clicking on subsequent feeds. A block of feeds can be selected by clicking on the first one, holding down the Shift key and clicking on the last feed of the group.

To include all the feeds in selected mixes, click on the 'Mix feeds' button. When all the feeds and mixes you wish to add to the report have been selected, click the 'Create' button. A report preview will appear and from here you can export to a variety of formats or print it.

Library (6)

You may have multiple feed libraries and switch between them using the drop-down list 'Feed library in use'. Rumen8 comes with a single default feed library, but you can add additional libraries. These are often useful for different farms or countries.

You manage multiple feed libraries with the library buttons.

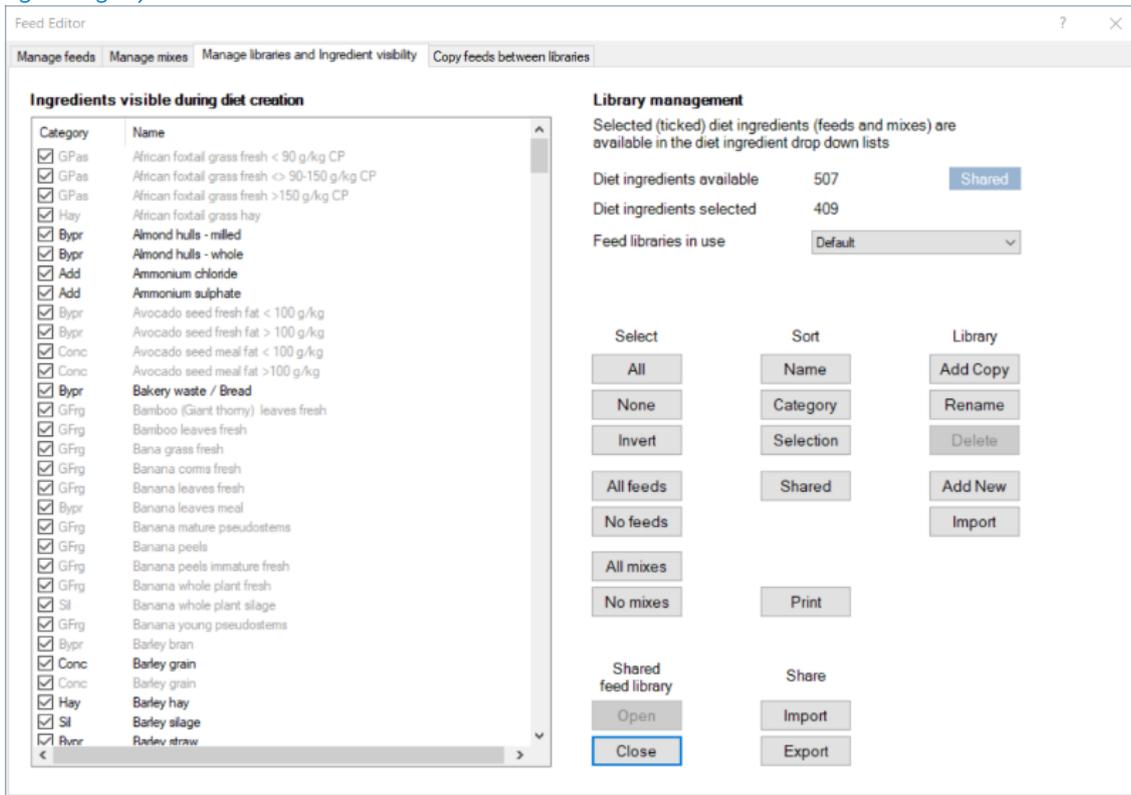
<i>Add Copy</i>	Create a copy of the current library. You will be prompted for the library name. Names must be unique.
<i>Rename</i>	Rename the current library. Names must be unique.
<i>Delete</i>	Delete the current library. You cannot delete the last library.
<i>Import</i>	Import as a new library from a feed library file that has previously been exported or created by Rumen8 version 3.
<i>Export</i>	Export the current feed library as a library file.

Shared feed libraries (7)

A shared feed library can be opened in addition to the current feed library. Shared feed libraries are intended to be used by consultancy teams or several managers on a multiple farm business where it is useful to have access to common feeds and mixes. A shared feed library cannot be edited by users and is maintained by a central manager.

A shared feed library can be opened and closed from the Select tab of the feed editor using the 'Open' and 'Close' buttons at the bottom of the window under the 'Shared feed library' heading. Feeds and mixes from the shared library are shown throughout Rumen8 in a lighter grey colour. The feeds and mixes from the usual libraries that can be edited are shown in the normal black text by default.

A shared feed library is in use as shown by the 'Shared' flag displayed under the number of feeds and mixes. The feeds and mixes from the shared library are visible in the feed list to the left in a lighter grey colour.



If you mouse over the 'Shared' flag to the right of 'Diet ingredients available' number details of the library can be seen in the tool tip. Back in the main Rumen8 window an 'SFL' flag will appear below the tab section of the window to remind you a shared library is open.

On the 'Manage libraries and Ingredient visibility' tab, the visibility of shared feeds and mixes cannot be changed as this has been set by the library manager.

Shared mixes cannot be edited or deleted on the 'Manage mixes' tab of the feed editor. When a shared mix is selected in the mix list the 'Edit' and 'Delete' buttons are not enabled. Shared mixes can be copied into the default/user library using the 'Add Copy' button and then the copy altered. When a mix is copied all the constituent feeds are copied with it unless they are already in the default/user library. If a feed of the same name with different parameters is already present, the shared feed will have the mix name appended to it.

In the same manner, shared feeds cannot be deleted from or edited in the shared library, so those buttons are not enabled when one of the light grey feeds are selected in the feed list. They can be copied into the default/user library using the 'Add Copy' button and then edited.

A shared feed library is in use as shown by the 'SFL' flag displayed under the tab section of the main window. The feeds and mixes from the shared library are visible in the ingredient list in a lighter grey colour. Feed and mixes in the default library are shown in the normal black text colour.

The screenshot shows the Rumen8 software interface. On the left, there is a list of ingredients with columns for 'DM' and 'As Fed'. The ingredients are color-coded: those from the shared library are in a lighter grey font, and those from the default library are in black. A 'Total' row is at the bottom of the list. On the right, there are several control panels for feed parameters, including 'Live weight (kg)', 'Live weight change (kg/d)', 'Days in milk', 'Days pregnant', 'Number of cows in herd', 'Milk yield (l/d)', 'Milk fat (%m/v)', 'Milk true protein (%m/v)', 'Fat:Protein ratio', 'Fat, Protein, F+P (kg/d)', 'DMI estimation method', 'Farm terrain', and 'Distance walked (km/d)'. At the bottom right, there is a summary table with columns for 'Milk income', 'Feed efficiency', and 'Margin'. A small 'SFL' flag is visible in the bottom right corner of the interface.

Ingredient	DM	As Fed
1. Barley grain	0.00	0.00
2. Wheat grain	4.00	4.52
3. Ryegrass per. - Irr - Sum Med. quality	13.10	65.50
4. African foxtail grass fresh < 90 g/kg CF	0.00	0.00
5. African foxtail grass fresh > 90-150 g/kg CF	0.00	0.00
6. African foxtail grass fresh >150 g/kg CF	0.00	0.00
7. Almond hulls - milled	0.00	0.00
8. Almond hulls - whole	0.00	0.00
9. Ammonium chloride	0.00	0.00
10. Ammonium sulphate	0.00	0.00
11. Avocado seed fresh fat < 100 g/kg	0.00	0.00
12. Avocado seed fresh fat > 100 g/kg	0.00	0.00
13. Avocado seed meal fat < 100 g/kg	0.00	0.00
14. Avocado seed meal fat >100 g/kg	0.00	0.00
15. Bakery waste / Bread	0.00	0.00
16. Bamboo (Giant thorny) leaves fresh	0.00	0.00
17. Bamboo leaves fresh	0.00	0.00
18. Banana grass fresh	0.00	0.00
19. Banana corne fresh	0.00	0.00
20. Banana leaves fresh	0.00	0.00
21. Banana leaves meal	0.00	0.00
22. Banana mature pseudostems	0.00	0.00
23. Banana peels immature fresh	0.00	0.00
24. Banana peels	0.00	0.00
25. Banana whole plant fresh	17.1	70.0
26. Banana whole plant silage		
27. Banana young pseudostems		
28. Barley bran		
29. Barley grain		
30. Barley grain		
31. Barley hay		
Total	17.1	70.0

Managing a shared feed library

Shared feed libraries are managed by a single user and distributed to the other users in the group. This can be done via email if the group is small and changes are infrequent. For larger groups it may be better to use a cloud drive service with sharing capability, such as Dropbox, OneDrive or Google Drive.

Using Dropbox as an example, the manager can create a new folder in their Dropbox folder and share it so other Dropbox users can access it. When setting up the shared folder, access can be set to 'Can view' to prevent editing by the users. Sharing also allows you to list the emails of group members you wish to use the shared library and modify them in the future by adding and removing members. Users must have Dropbox installed on their computer but there is a free tier that is suitable.

The manager should keep the master shared feed library in a folder other than the shared Dropbox folder. It can then be opened as a user library to prepare it or make changes. Once it is ready for distribution close the user library and the feed library can be copied, and renamed if needed, to the shared Dropbox folder using Windows File Explorer.

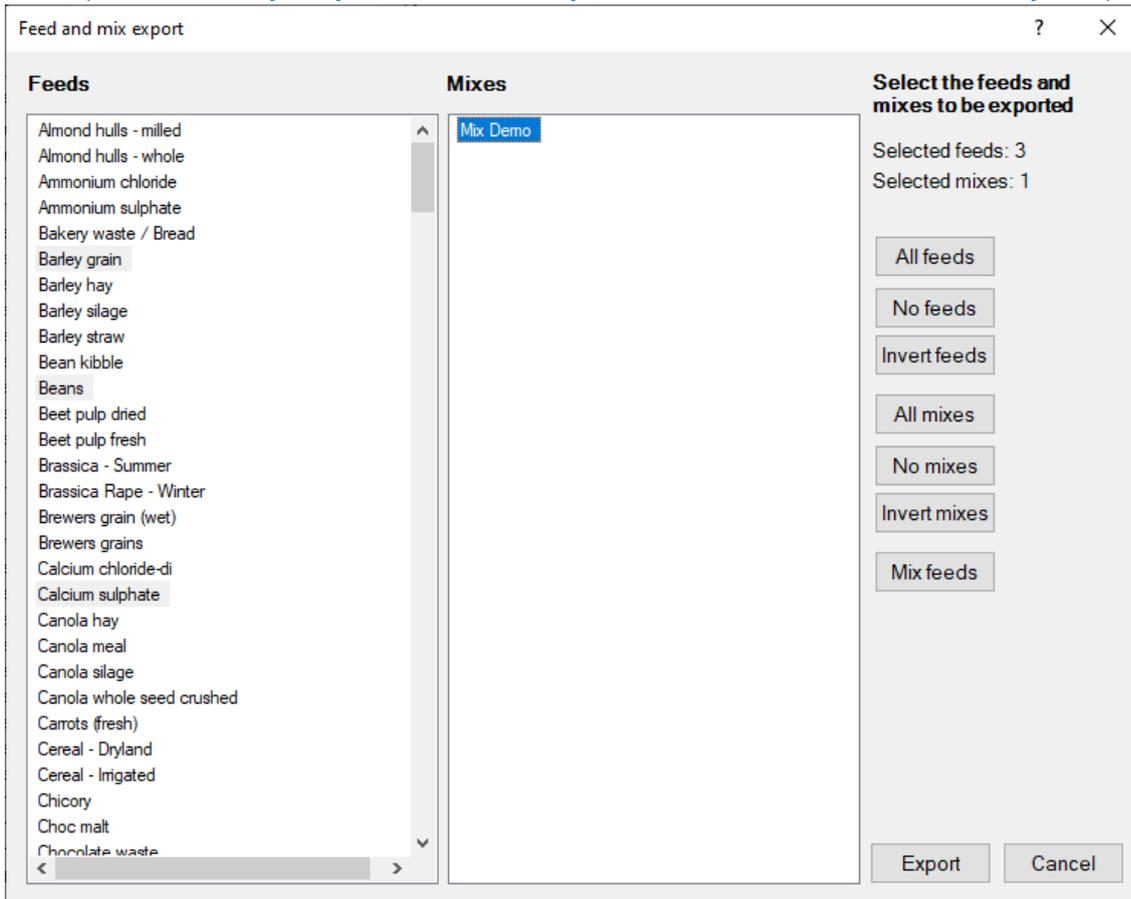
The shared library should not be directly edited in the Dropbox folder as partial changes may be distributed to users while the library is being modified.

Sharing feeds and mixes (8)

At the bottom of the tab the import and export buttons allow you to share feeds with other Rumen8 users.

The 'Export' button allows you to copy selected feeds and mixes from the current library to a small feed library file to transfer them between computers running Rumen8.

The export window of the feed editor. Three feeds and a mix have been selected for export.



Click on the export button and the window shown in the figure above will appear. Select all the feeds and mixes you wish to copy into an export feed library. Individual feeds can be selected by clicking on the first one and then holding down the Control key when clicking on subsequent feeds. A block of feeds can be selected by clicking on the first one, holding down the Shift key and clicking on the last feed of the group.

All the feeds in selected mixes will be exported automatically when you click on the 'Export' button. If you wish to see which feeds make up the selected mixes click on the 'Mix feeds' button and they will be selected in the Feeds list.

When you have selected all the feeds and mixes you wish to copy click on the export button, select the location and file name and click on the 'Save' button. It is recommended exported feed libraries always have the .db3 file name extension but you can change the rest of the file name to whatever you prefer.

Importing feeds and mixes

The 'Import' button allows you to bring into the current feed library

- an older Rumen8 feed library held in a feed.csv file
- a group of feeds previously exported from Rumen8
- import complete data for feeds from a comma delimited .csv text file.

To import an older feed library click on the 'Import' button and select the feed.csv file to import and then the window shown in the figure below will appear.

The import window of the feed editor. Barley grain is already present in the feed library.

Import feed 1 of 4

Name

1. Feed management category

Grazed pasture Grazed other Hay Silage

Concentrate Additive Byproduct

2. Feed protein type

Grass silage Other non-forage

OtherSilage Other forage Distillery byproduct

3. Feed particle size classification

Concentrate Forage Other

Rumen8 version 3 and 4 require two additional categories for each feed, management category and particle size classification. You can step through each feed to be imported and provide these. If they can be determined from other feed information the importer will select them for you. Each feed must have a unique name so if the import feed name already exists the Name label will turn red and you must provide an alternative.

Once the import feed has a unique name and all three categories the 'Add' button will become active so you can add it to the feed library. At any stage, you can click on the Skip button to ignore the current import feed and move to the next. Pressing 'Cancel' will finish the feed importing. Feeds already added will remain in the feed library.

To import a previously exported group of feeds and mixes click on the 'Import' button and select an export feed library file with a .db3 extension. A window like the one shown in the figure below will appear listing all the feeds and mixes available in the file. In Rumen8 all feeds and mixes must have a unique name and you can see in the figure below Wheat grain is highlighted red. This means a feed already exists in the current feed library with that name.

You select the feeds to import in the same manner as you selected feeds to export in the section above. If you select a feed or mix that has the same name as an existing feed by default it will be renamed with (imported) appended to the name. In this case 'Wheat grain' will be renamed 'Wheat grain (imported)' when copied into the current feed library.

You can change the text appended to feeds that already exist in the bottom right of the window in the 'Name suffix' section. You can also choose to append text to all the feeds being imported by selecting the 'All imported feeds/mixes' option. This might be useful if you want to keep track of feed information from a colleague or your nutritionist for example.

If 'Use existing feeds' is ticked Rumen8 will check each feed to be imported to see if it is identical to any existing feed in the library (other than the name). If an identical feed is found that will be used instead of importing the feed. If 'Use existing feeds' is unticked all feeds selected will be imported regardless, and potentially renamed as described above.

Once you have selected the feeds and mixes to import, click on the 'Import' button and they are copied into the current feed library.

The import window of the feed editor. Three feeds are available to import but Wheat grain already exists in the current feed library.

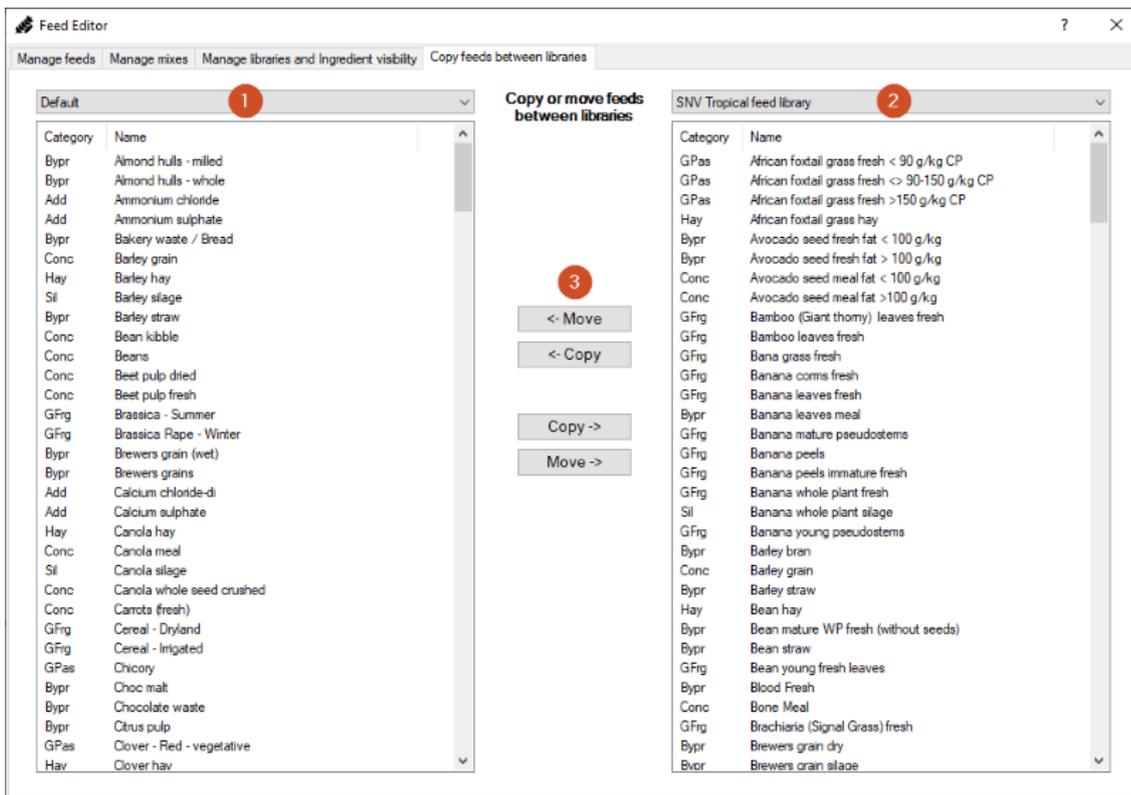
To add feeds to the Rumen8 feed library from a comma separated text file an import file must be created in the correct format. The first line is a header and can be used for comments as it will be ignored. Subsequent lines must consist of 42 values separated by commas in the order specified. The text fields do not require quotes and cannot contain a comma. An example is shown in the Appendix along with the definitions of the values required for the category fields such as management category, protein type and forage or concentrate.

When the csv file is selected Rumen8 will attempt to import the feeds into the current library. A report will be displayed showing the number of feeds successfully imported and a list of any errors. These can include missing values, invalid values or insufficient data for each feed.

COPY FEEDS BETWEEN LIBRARIES

If you have multiple feed libraries you can quickly copy feeds between libraries on this tab.

The feed copy tab allows you to easily move feeds between a source library (1) to a target library (2) using the move and copy buttons (3) or simply dragging and dropping feeds.



To copy a feed or feeds between libraries first select the source library in one of the drop down menus at the top of the window (1 or 2). In the other drop down menu select the target library. You should now see all the feeds for each library in the list below the library names. You can either move or copy feeds in either direction by using the buttons between the libraries (3). Multiple feeds can be moved at once by selecting them with the mouse with the Shift or Control keys on the keyboard held down. You may also just drag and drop feeds between the libraries.

USING THIRD PARTY FEED LIBRARIES

Organisations can build customised feed libraries for their staff, or in the case of industry development agencies, for general industry use. An example is a [SNV Kenya](https://cowsoko.com/rumen8) project which put together a feed library for East African users of Rumen8 that is useful in many other regions (<https://cowsoko.com/rumen8>). Third party feed libraries can be used in two different ways.

Imported as an additional feed library

After downloading the feed library file to your Downloads folder, start Rumen8 and open the Feed Editor from the Edit menu. Click on the 'Manage libraries and Ingredient visibility' tab and then click on the 'Import' button within the library group. In the window that opens navigate to the Downloads folder and select the feed library file you previously downloaded. If the creator of the library has allowed importing the library it will be added to your list of libraries in the 'Feed library in use' drop down list. If the library was created in an older version of Rumen8 it will prompt you to give it a name before importing. If the creator does not allow importing you will get a message telling you this, so it can only be opened as a read-only shared feed library (see below).

Import selected feeds into the current library

If you only wish to import selected feeds and mixes from the downloaded library, click on the

'Import' button in the Share group on the 'Manage libraries and Ingredient visibility' tab within the Feed Editor. This will open a file selection window where you can navigate to the Downloads folder and select the feed library you just downloaded. If the creator of the library has allowed importing feeds and mixes from the library, you will be presented with a list of all the feeds and mixes in the library and you can select the ones you wish to copy into your current library. See the ['Importing feeds and mixes'](#) section in the previous topic for more details. If the creator does not allow importing from the library you will get a message telling you this, so it can only be opened as a read-only shared feed library (see below).

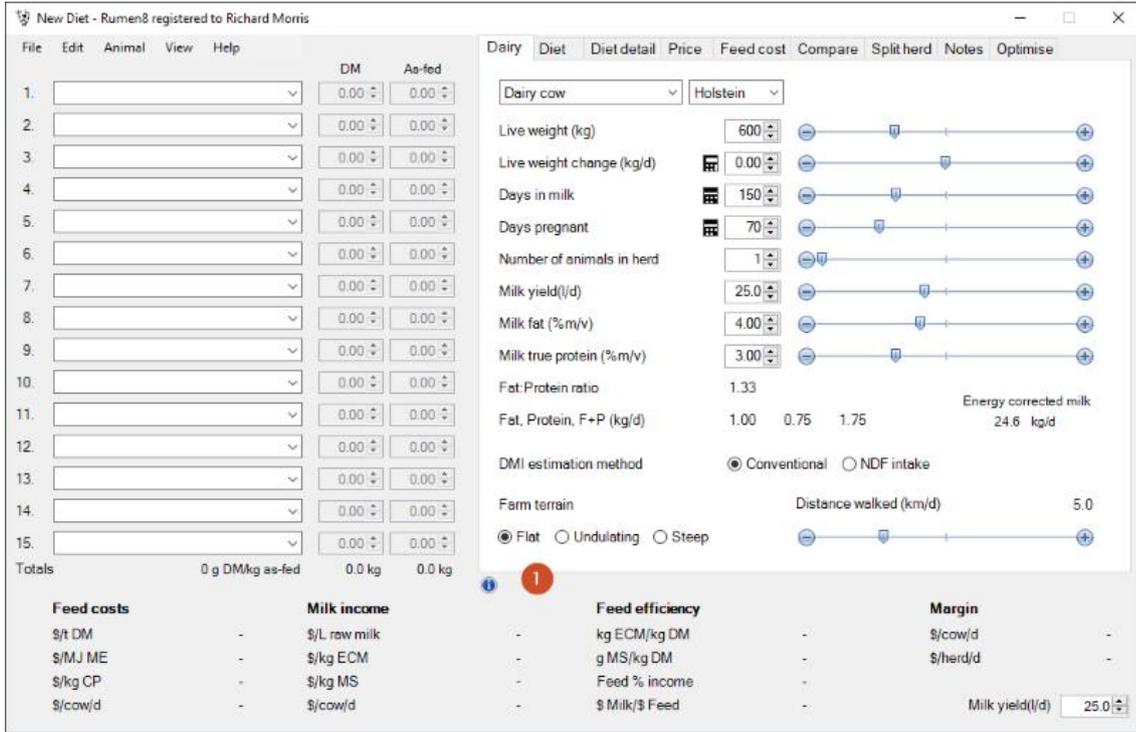
Opened as a shared feed library

If the library is a shared feed library, it cannot be edited and is usually distributed via a cloud-based drive service such as OneDrive or Dropbox for a business team. To use and manage a shared feed library see the ['Shared feed libraries'](#) section in the previous topic.

KEEPING RUMEN8 UPDATED

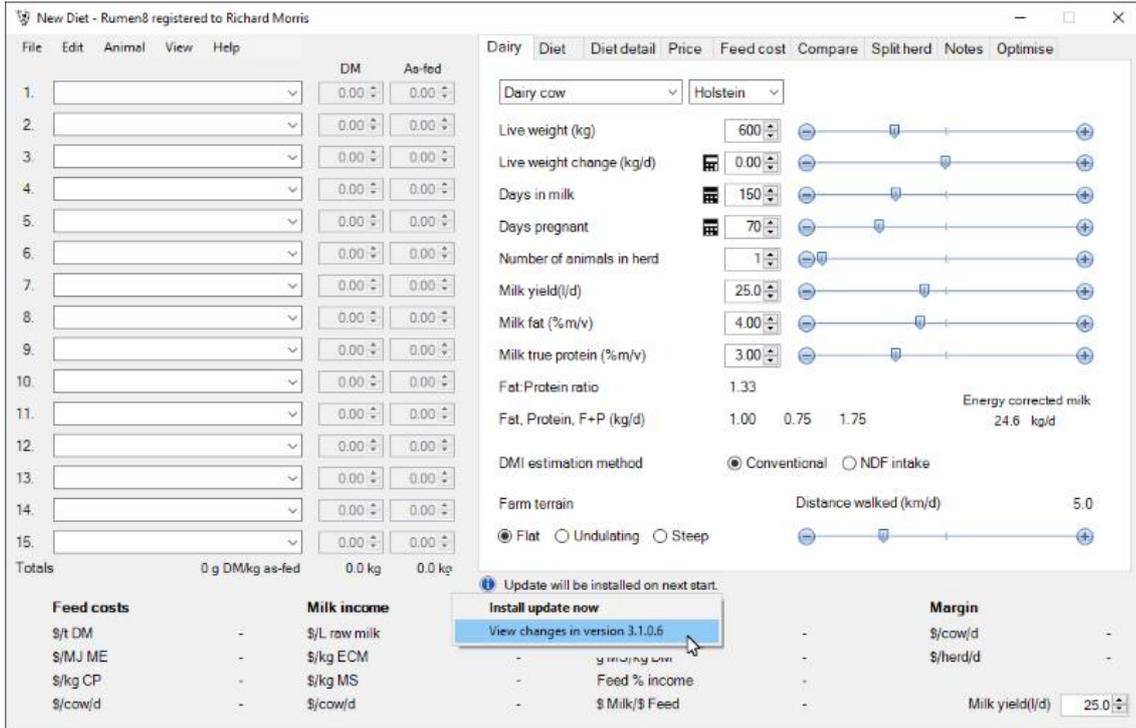
Rumen8 can check for updates if your computer is connected to the Internet. Select 'Check for updates' under the Help menu and if an update is available a small blue information icon will appear above the Margin section of the main window.

The information icon that means an update is available (1).



Clicking on the blue information icon will roll out a menu telling you the update will be installed the next time Rumen8 starts. If you click on this text a drop-down menu gives you the choice to install the update now or view the changes in the new version.

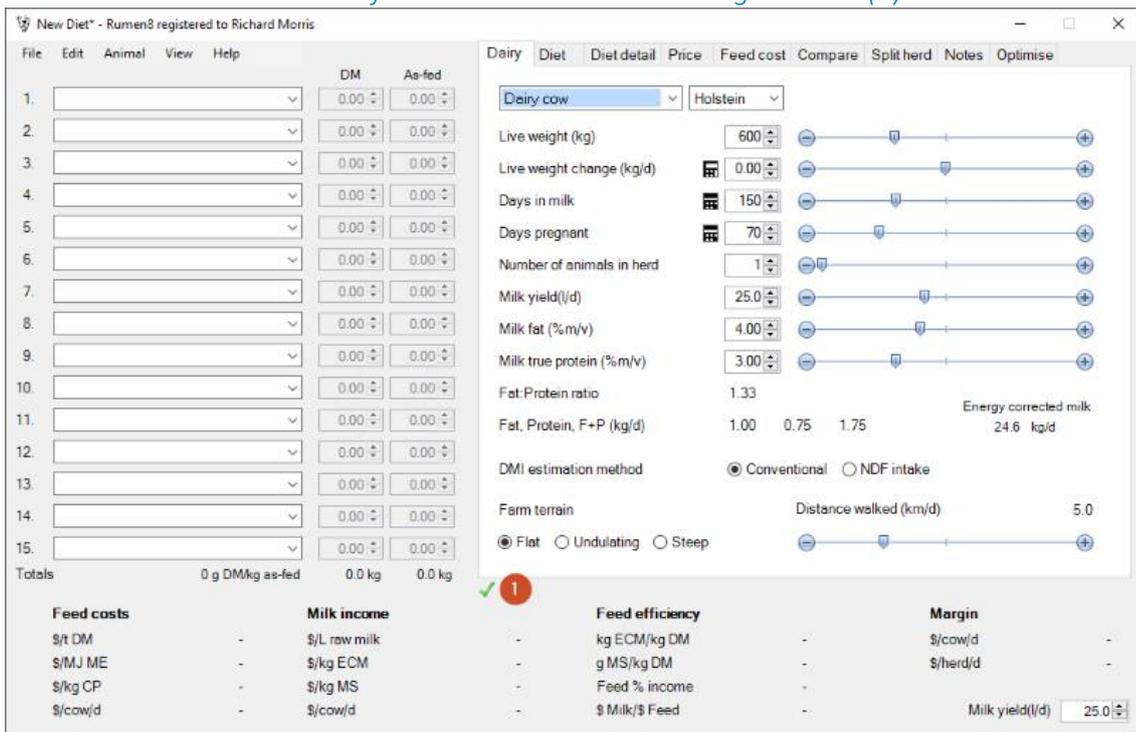
Installing an update or viewing changes.



When Rumen8 is restarted, it will download the files required, update your installation of Rumen8 and then start the new version. The blue information icon will be replaced by a green tick which when clicked will confirm you have updated to the latest version.

If you check for updates and there is not one available a green tick will appear above the Margin section of the main window and if you click on it, it will confirm you already have the latest version of Rumen8.

You have the latest version of Rumen8 is shown with the green tick (1).



Rumen8 will check for updates once a day automatically if your computer has a connection to the Internet. The update system has been optimised for slow connections so it only downloads the file changes that are necessary, not the entire Rumen8 installation each time.

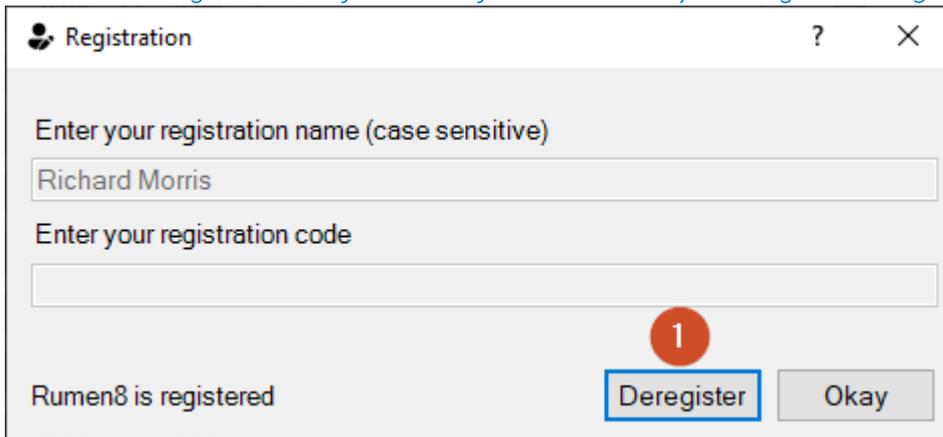
If your computer is offline, you can download the latest version of Rumen8 from the website and then install the new version manually. Your library and diet files will not be changed when you do this.

UNINSTALLING RUMEN8

Completely removing Rumen8 from your computer will take three steps.

1. Remove your registration information from the computer.
Go to the Registration option under the Help menu and click the 'Deregister' button. Your details will be removed from the computer and Rumen8 will revert to trial mode.

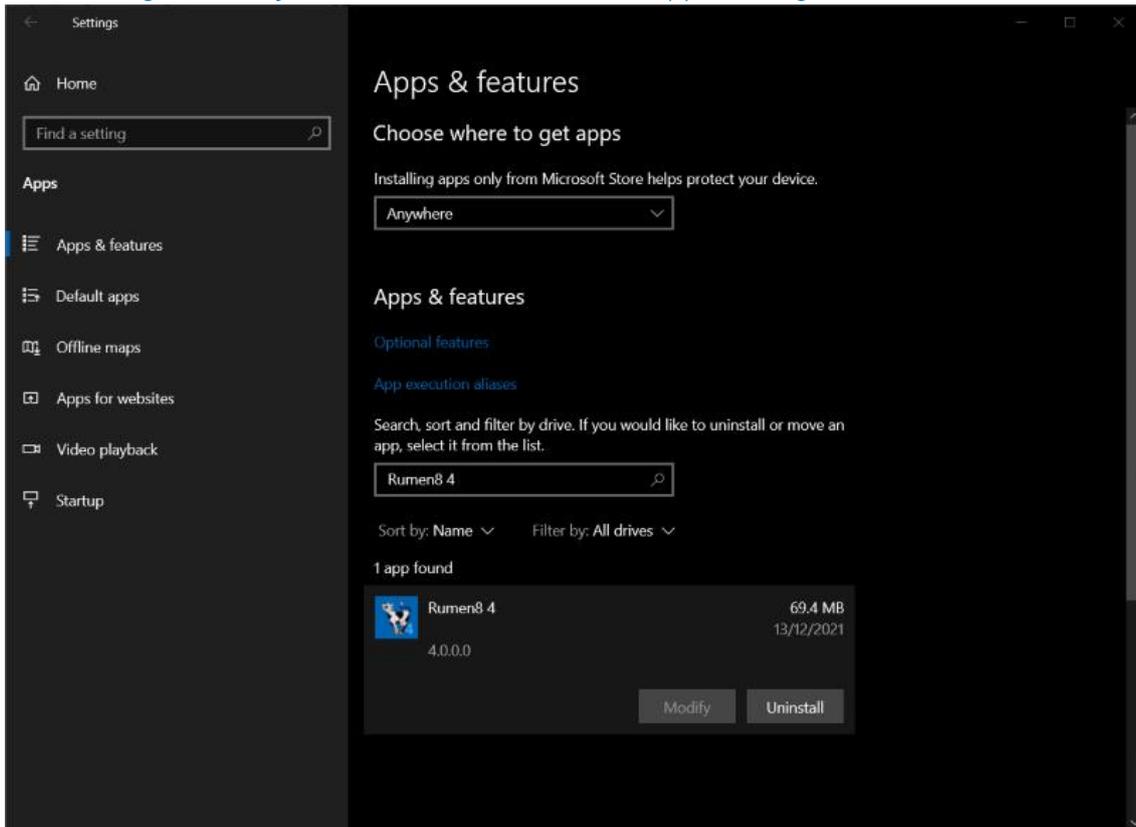
Remove the registration information from Rumen8 by clicking the Deregister button (1).



2. Uninstall the Rumen8 software.

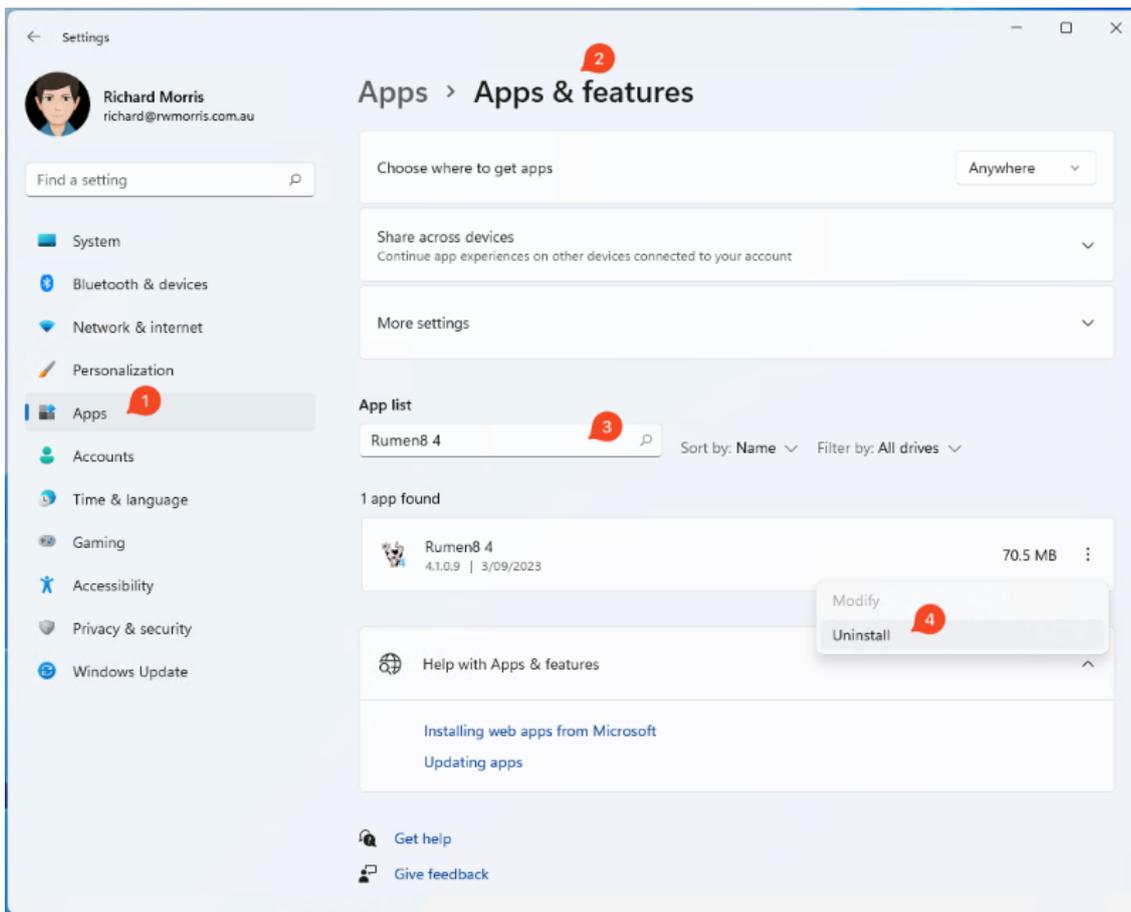
In Windows 10 go to the Windows Setup by clicking on the Start button in the bottom left of the Desktop and then click on the cog icon above it. In the 'Windows Settings' window that appears click on 'Apps'. Scroll down the list of apps installed on the computer until you find Rumen8 or type 'Rumen8 4' in the Search box as shown in the figure below. Select the Rumen8 4 app found and click the 'Uninstall' button below it. Follow the prompts and Rumen8 will be removed from your computer.

Uninstalling Rumen8 from within the Windows 10 Apps Settings.



To uninstall Rumen8 from a Windows 11 computer go to the Settings, Apps (1), Apps & features (2) and entering 'Rumen8 4' in the App list box (3). To remove Rumen8 click on the 3 vertical dots to the right and select Uninstall from the menu that drops down (4).

Uninstalling Rumen8 from a Windows 11 computer.



3. Delete the Rumen8 folder from your Documents folder.
If you do this you will lose your feed library, preference settings, prices and any saved diet files.
4. (Optional) Delete the 'Rumen8_Nutrition_Pty_Ltd' folder containing the settings files from the AppData\Local folder from within your user folder. This folder is normally hidden so this step is for advanced users only. These files only take up a tiny amount of disk space so this isn't important.

OPTIMISER INSTALLATION (ADVANCED)

The Optimiser function in Rumen8 requires using advanced features of Microsoft Excel. Specifically, the Optimiser requires communication with specific versions of Excel and configuration can be cumbersome. However, if you have a good knowledge of Excel and Windows and would like to try, the steps for Excel 2016 are listed below. The process is very similar for Excel 2010, 2013, 2016 and 2019.

Rumen8 only supports Microsoft Excel 2010, (version 14), 2013 (version 15), 2016/2019 (version 16) and Office365 and it needs the free and included Solver add-in to be installed. At the time of writing this guide, Excel version 16 was part of the Office365 subscription from Microsoft. The animal model used by Rumen8 requires non-linear optimisation to estimate the lowest cost diet from the chosen ingredients and Solver provides this for no additional cost if you already own Excel.

Rumen8 copies the current diet into the industry specific Optimiser4.xlsm spreadsheet, configures Solver with the required constraints, runs it and then copies the results back into Rumen8. To allow this you must make three setting changes in Excel and one in the Optimiser4Dairy.xlsm and Optimiser4Beef spreadsheets located in the Rumen8 libraries folder. The steps below show you how to do each of these.

1. Change the Excel security settings allowing Rumen8 to run the macros in the spreadsheet.

Once this setting is changed the Optimiser spreadsheets should be able to complete steps 2 and 3 automatically.

Note, this setting allows programmatic access to Visual Basic for Applications from a macro script. Rumen8 uses this to install the Solver add-on and make changes to allow Rumen8 to optimise diets. However, this may also allow malicious code to run on your computer from other spreadsheets. If you prefer to leave this setting on to maintain the security level, you will have to manually complete the optimiser set up process as described in steps 2 and 3 below.

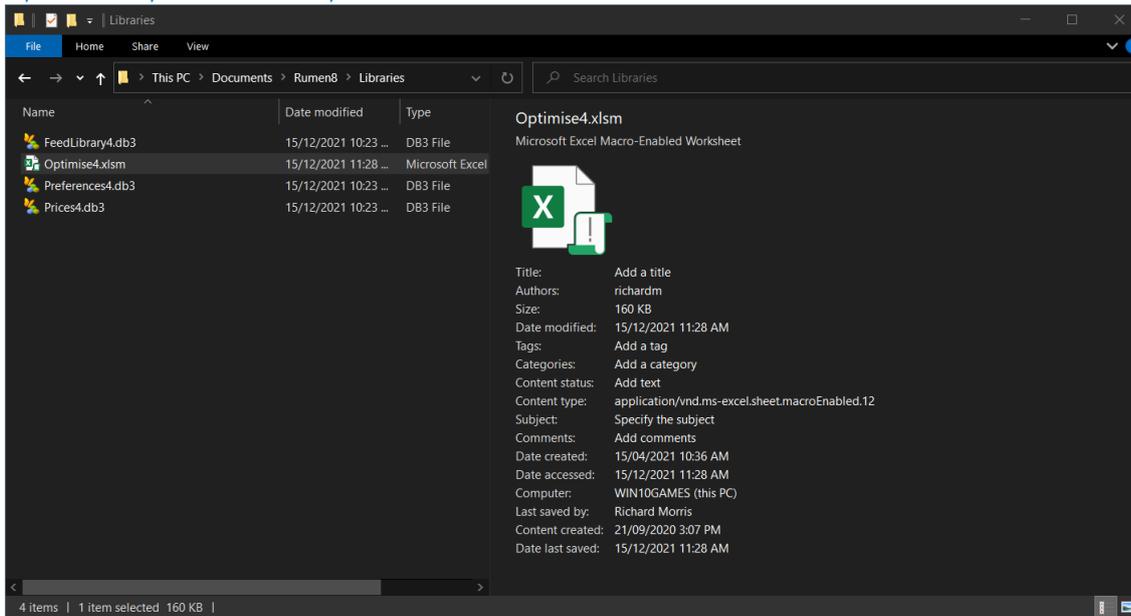
If the optimiser spreadsheet is unable to automatically finish the set up process, you will need to complete steps 2 and 3 below manually for each of the two optimiser spreadsheets.

2. Install the Solver add-in in Excel. This is the optimiser used by Rumen8 and it is run by a macro in the Optimiser4Dairy and Optimiser4Beef.xlsm spreadsheets.
3. In the Visual Basic for Applications (VBA) editor allow the macro access to the Solver add-in.

INSTALLATION INSTRUCTIONS FOR EXCEL 2016

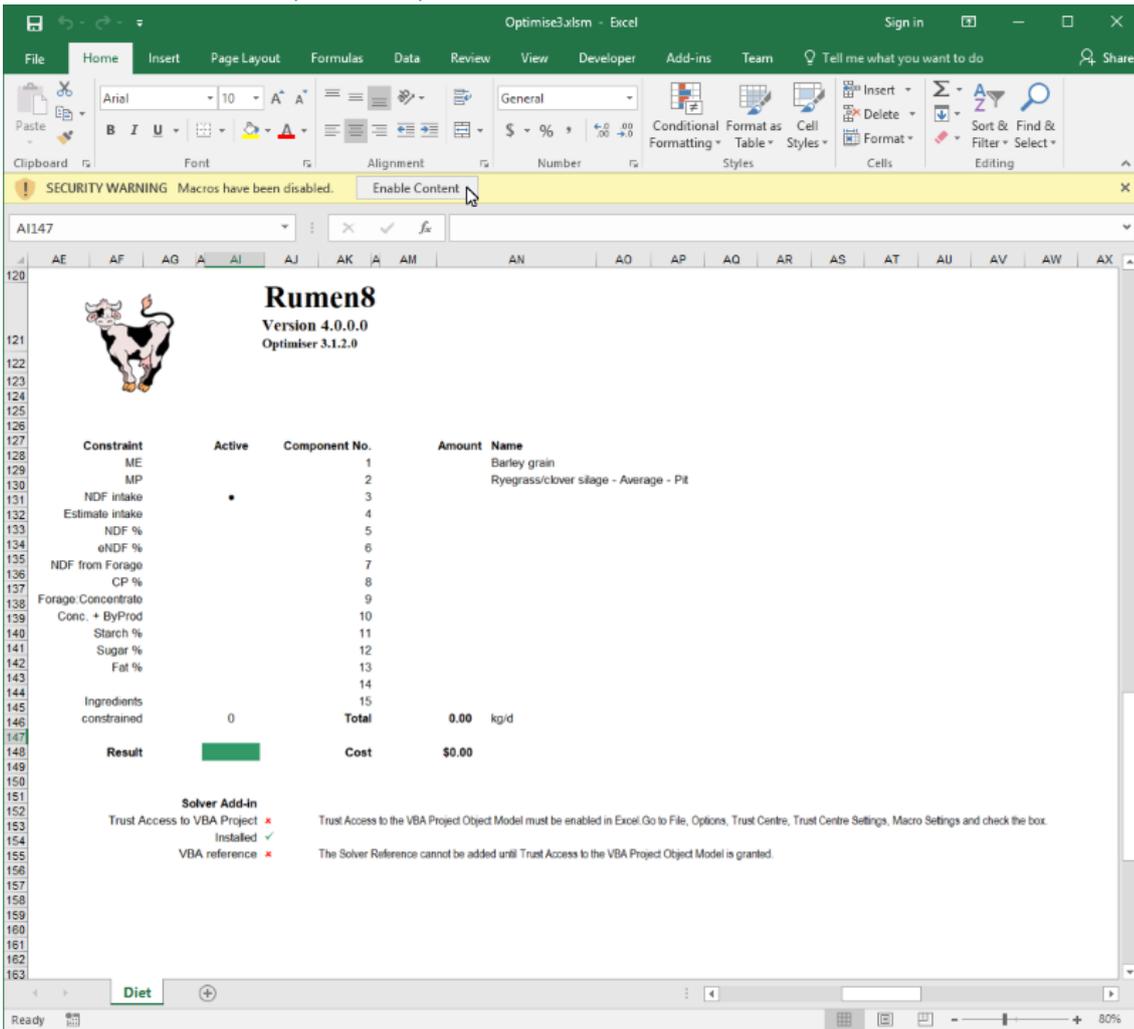
1. Open either the Optimise4Dairy.xlsm or Optimiser4Beef.xlsm spreadsheet in the ~\Documents\Rumen8\libraries folder in Excel. If you have installed Rumen8 to the default location the Rumen8 folder will be in your Windows Documents folder and the complete path for the spreadsheet will be
2. C:\Users\<<logon name>\Documents\Rumen8\Libraries\Optimise4Dairy.xlsm for example. After completing the setup for the Optimise4Dairy.xlsm spreadsheet you then must repeat the process for the Optimise4Beef.xlsm spreadsheet.

Open the Optimise.xlsm spreadsheet.



3. If the security level is still set to the default you will be prompted under the ribbon menu with a Security warning that macros have been disabled. Click on 'Enable content' in the message that appears. If the security level is set too high, it will automatically and silently disable macros which will prevent Rumen8 from optimising diets.

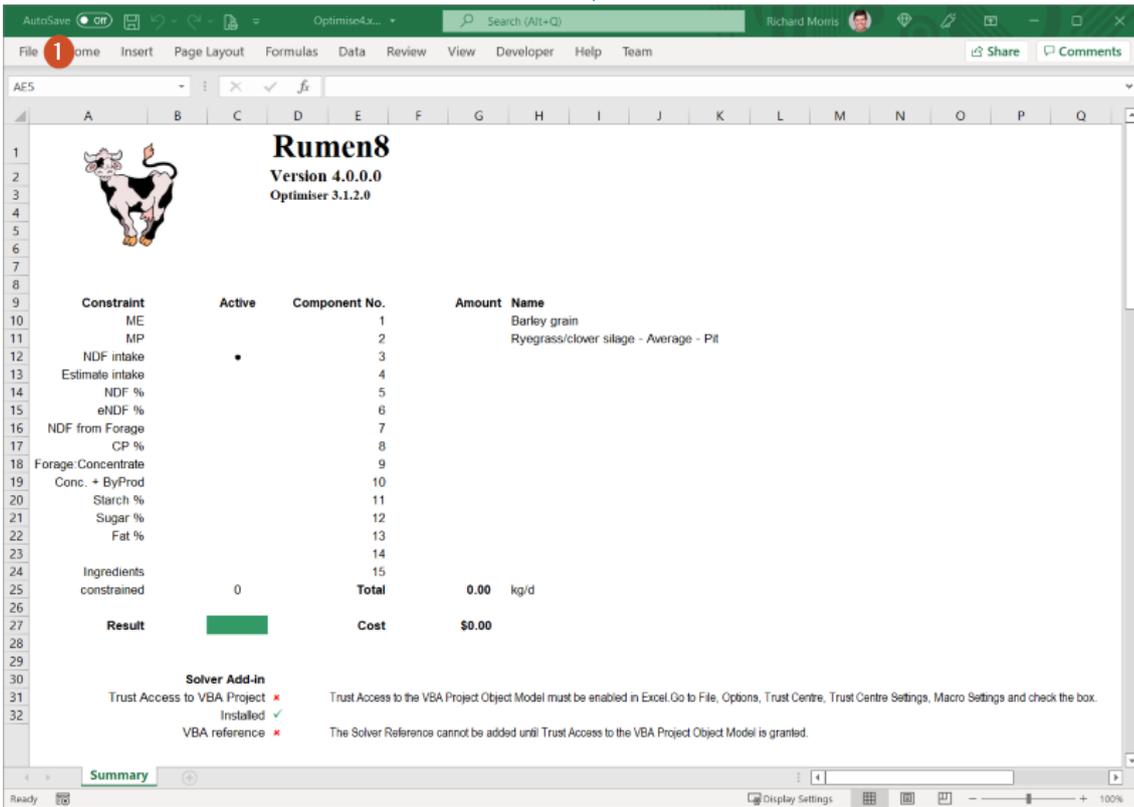
Enable macros in the optimiser spreadsheet.



Set Excel security levels

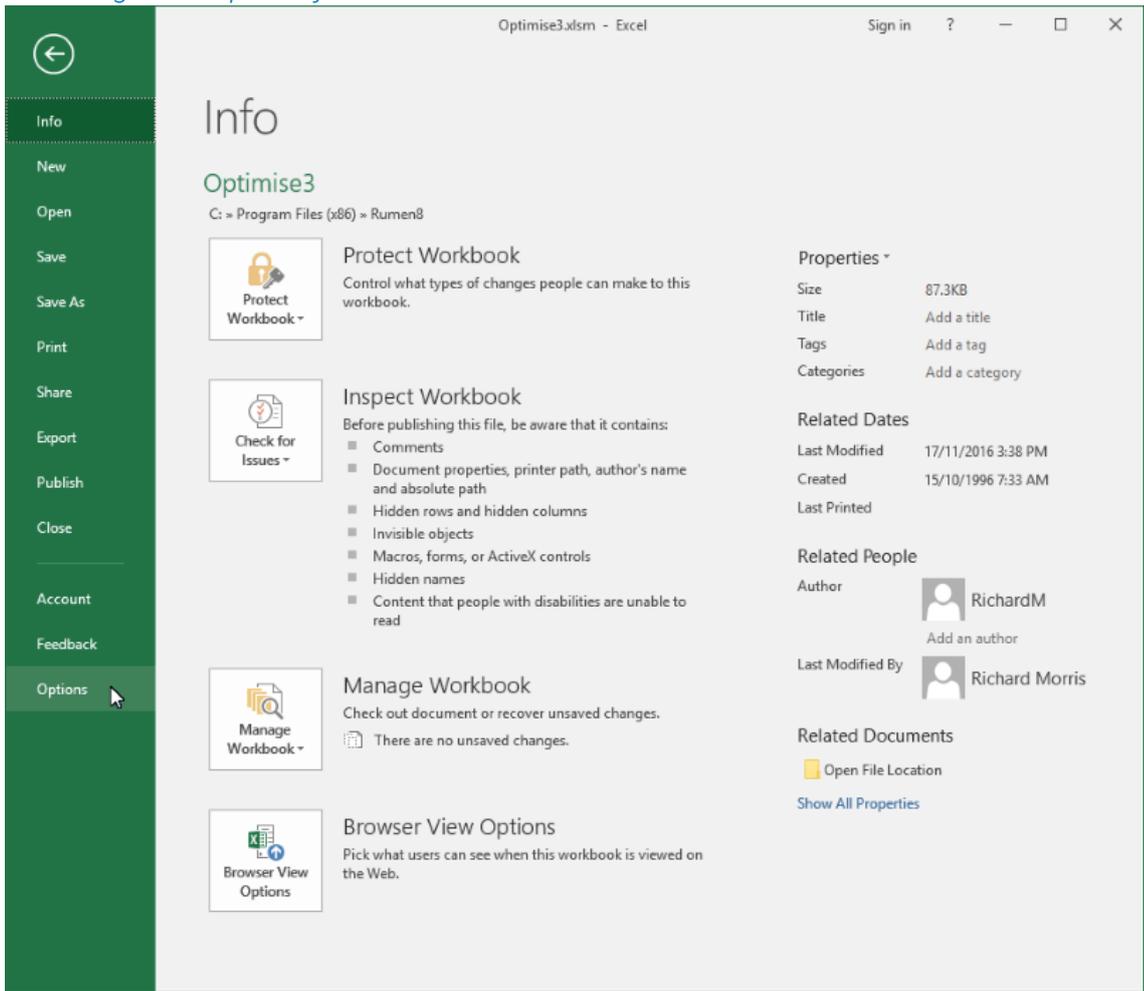
4. To ensure the macros settings are correct we must go into the File menu. It is the left most menu on the ribbon (1).

Click on the File ribbon menu to access Excel options.

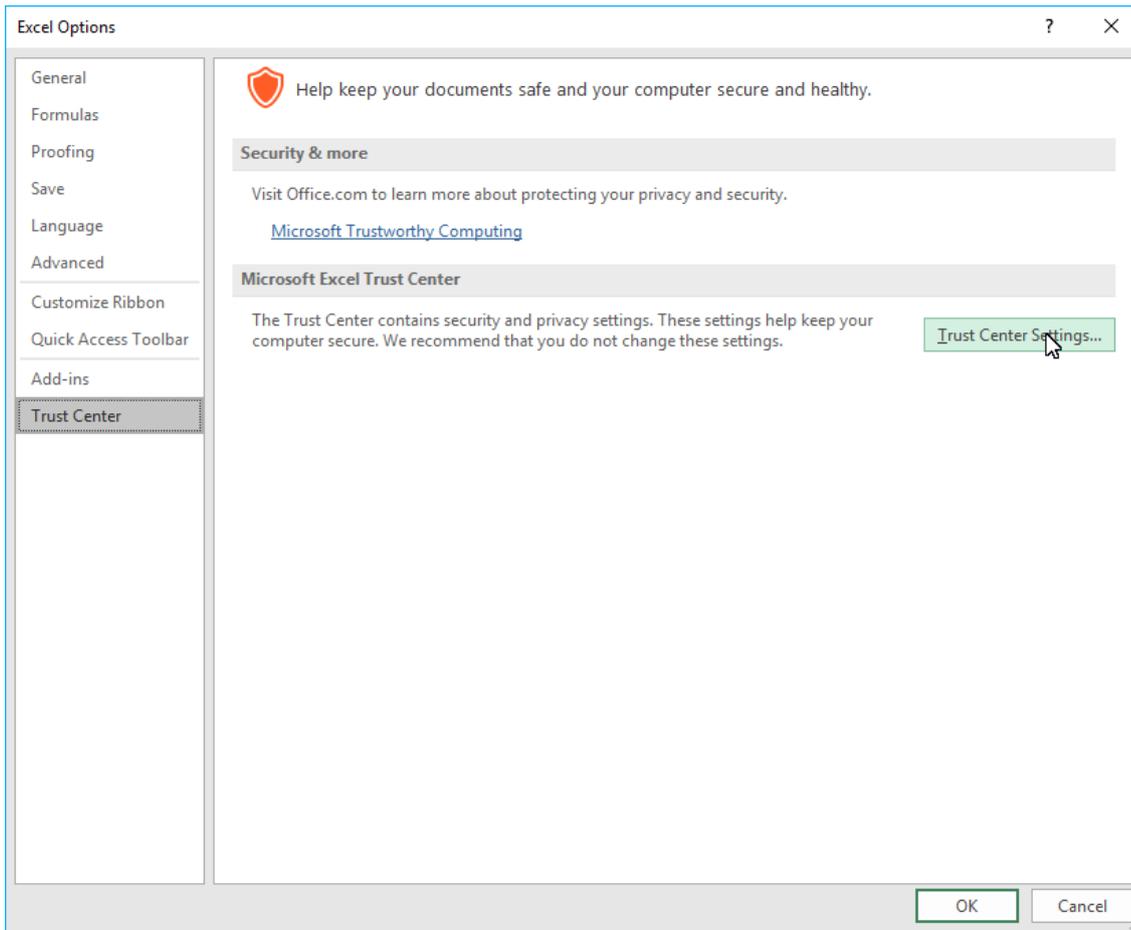


5. Click on the 'Options' button at the bottom of the menu.

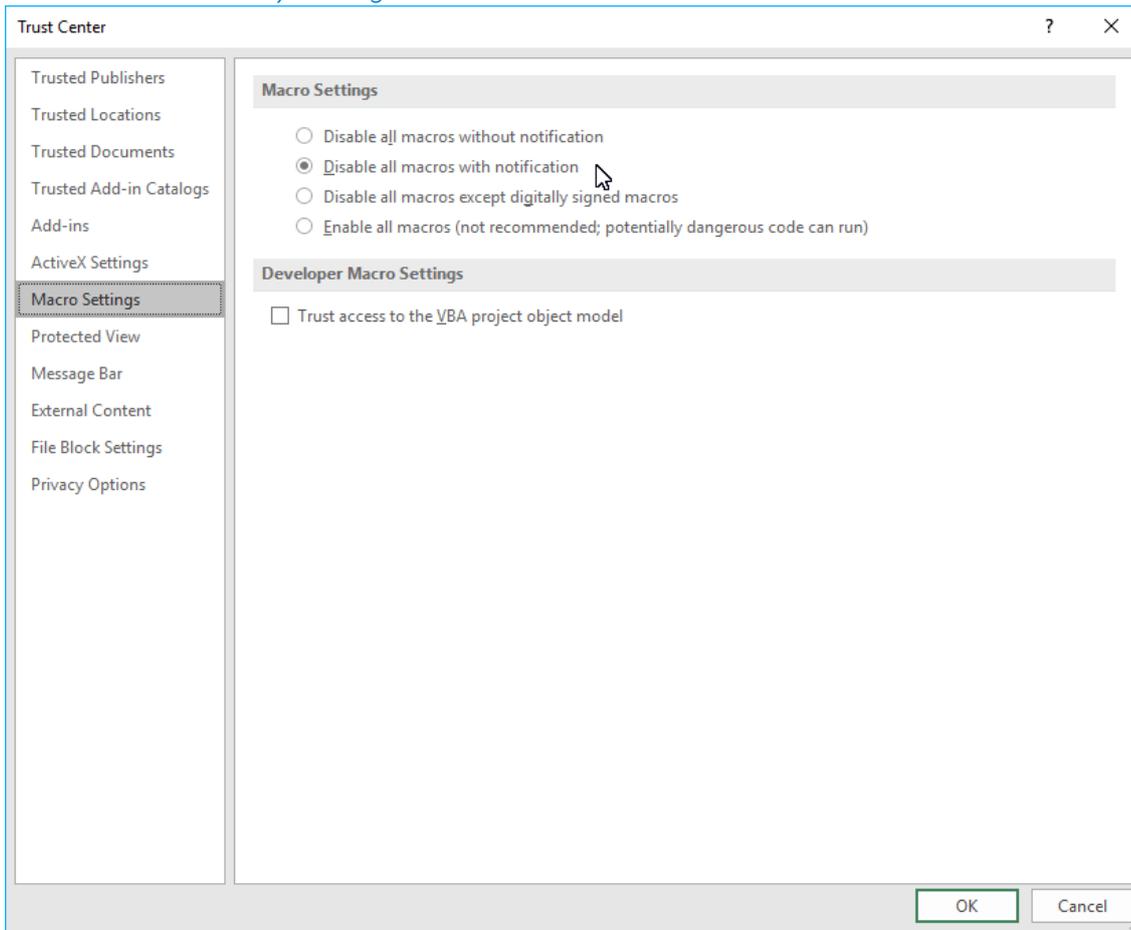
Accessing Excel Options from the menu.



6. On the left side of the window click on the 'Trust Center' and then the 'Trust Center Settings' button to enter the Trust Center.

Enter the Trust Centre in Excel.

7. Select 'Macro Settings' on the left side of the window and then check that Macro Settings are set to 'Disable all macros with notification'. If the macro security level is set higher than this Rumen8 will not be able to run the Optimiser.
Also ensure there is a tick in the box alongside the setting 'Trust access to the VBA project model'.
Click on 'Okay' to exit the Trust Centre once you have finished.

Set the macro security settings in Excel.

If the previous setting was 'Disable all macros without notification', changing it will result in Excel prompting you when it opens any spreadsheet containing macros instead of simply blocking them silently in the background. Macros can be used load malware under some circumstances so only allow spreadsheets access to them when you are sure they are from a reputable source. In this case, the Rumen8 application copies the cow and diet information into the Optimiser spreadsheet and then uses a macro to run Solver to calculate the lowest cost diet. If access to macros is blocked the optimiser function of Rumen8 cannot be used.

Excel setup for use with Rumen8 optimisation is now complete so exit from Excel saving changes if you are prompted to do so.

Rumen8 defaults to not allow access to the optimiser so the final step is to tell it you have configured Excel correctly. In the Rumen8 Preferences General tab enable the Optimiser tab by clicking on the down arrow to the left of 'Optimiser disabled' at the bottom of the window. The Optimiser settings box will open and the title will change to 'Optimiser enabled'. Both settings in the box should be left off for normal use.

Setup the Rumen8 preferences to use the optimiser.

Dairy preferences ? X

General **Advanced** Recommended levels Standard cows

Milk yield units
 Litres Kilograms

Milk component units
 Mass/mass Mass/volume

Feed concentration units
 g/kg Percentage

Feed proportion units
 Proportion Percentage

Fat to protein ratio
 Fat:Protein Protein:Fat

Tool tips detail
 Standard Extended

Dry matter intake estimate

	Cow	Dry	Transition	Heifer
Conventional method: kg DM/d	NRC eqn.	11.0	10.0	AFRC eqn.
NDF intake: % of liveweight	1.2	1.0	0.8	1.0

Currency
 System Australian Dollar (\$) \$
 Do not display cents Currency divisor 1

Load warning for milk price change Show Diet tab
 Load warning for intake estimate change Show Split herd tab

Change the Rumen8 home directory after restarting Rumen8

Restore all the preferences to their default setting

Show Optimiser tab
 The optimiser requires the Microsoft Excel spreadsheet (Optimiser3.xlsm) in the Rumen8 libraries folder to have the Solver Add-on installed and a reference to it added in the Visual Basic editor. See the User Guide for step by step set up instructions before attempting to optimise a diet for the first time.

Excel visible during optimisation (faster if off) Excel saves diet after optimisation (faster if off)

Now when you return to the main Rumen8 window a new tab called 'Optimiser' will be available.

There are two additional Excel setting changes needed to set up the optimiser, but Rumen8 should be able to do them automatically when the optimiser is run for the first time. If you get an error this means it was unable to complete the setup itself and you will have to do it manually. Instructions to do so are below.

MANUAL INSTALLATION INSTRUCTIONS FOR EXCEL 2016

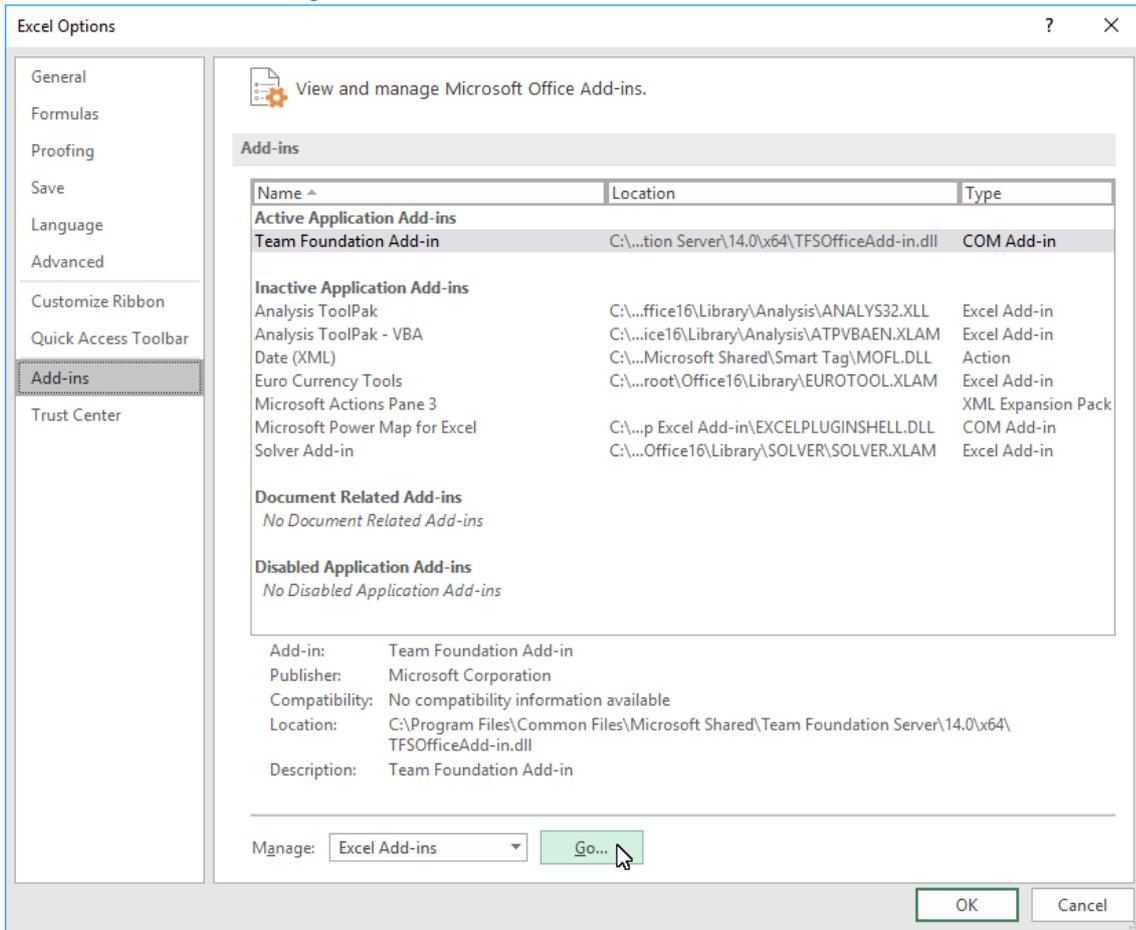
If the automatic optimiser setup has failed, you must complete the last two steps yourself. These are

1. Install the Solver add-in in Excel. This is the optimiser used by Rumen8 and it is run by a macro in the Optimiser4.xlsm spreadsheet.
2. In the Visual Basic for Applications (VBA) editor allow the macro access to the Solver add-in.

Install the Solver add-in

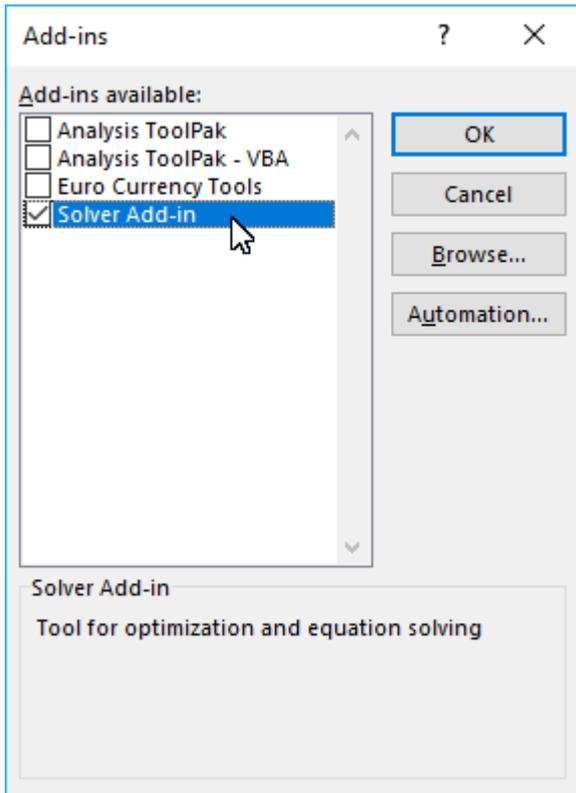
8. While remaining in the Trust Centre, click on the 'Add-Ins' option on the left of the window and then set the Manage drop-down list at the bottom of the window to 'Excel Add-Ins' and click the 'Go' button.

Enter the Add-ins manager.



9. A list of possible Add-Ins appears in the new window. Click on the checkbox alongside 'Solver Add-In' to install it if it is not already selected. Click 'Okay' to install Solver and exit Options back to the spreadsheet.
If it is not available or doesn't install correctly you may need to uninstall and re-install your copy of Excel or Office to remedy this.

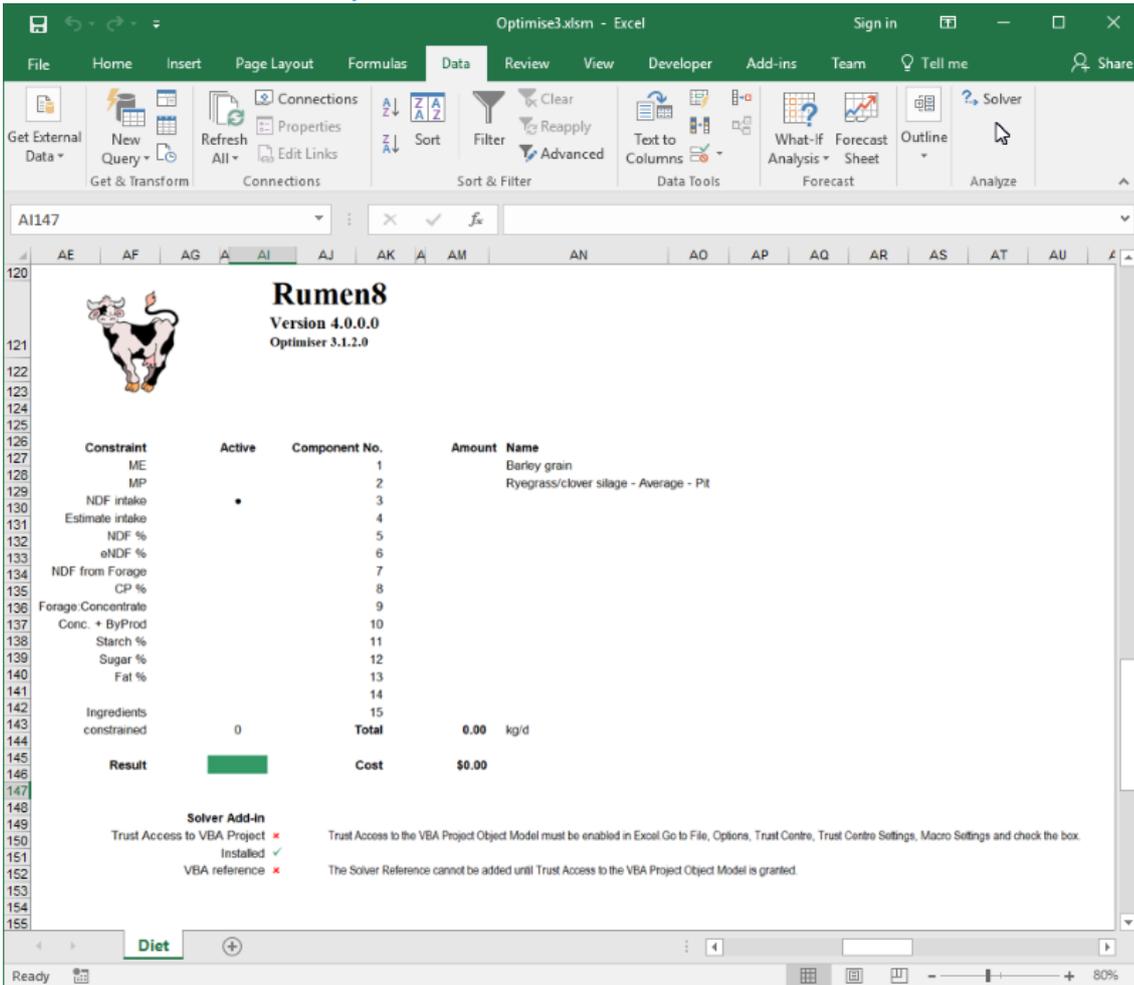
Install the Solver Add-In.



10. Confirm Solver is correctly installed by ensuring 'Solver' is visible at the end of the 'Data'

ribbon.

Solver is visible at the end of the Data menu in the Ribbon.

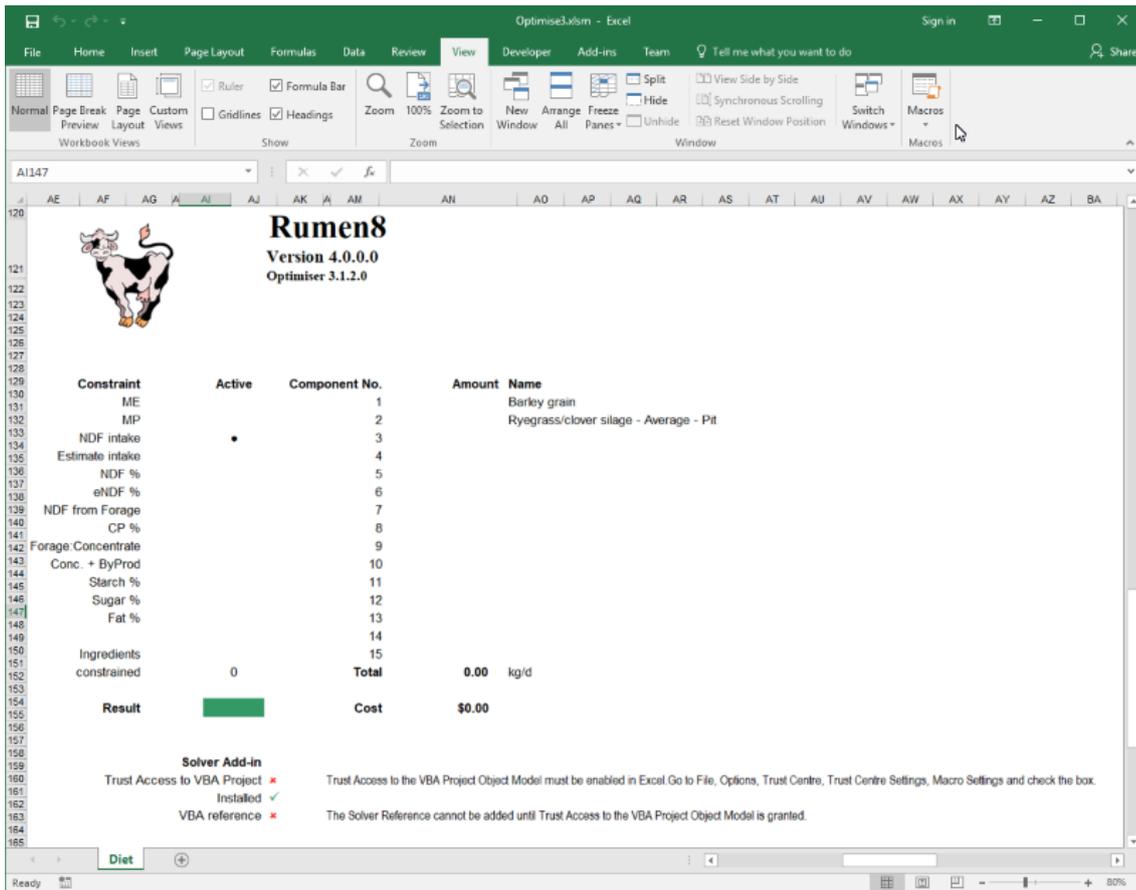


Add the reference to Solver in the Visual Basic for Applications editor

The macros included in the Optimiser spreadsheet also must also be able to access the Solver add-in. To enable this you must go into the macro editor and then tell it where the solver file is located.

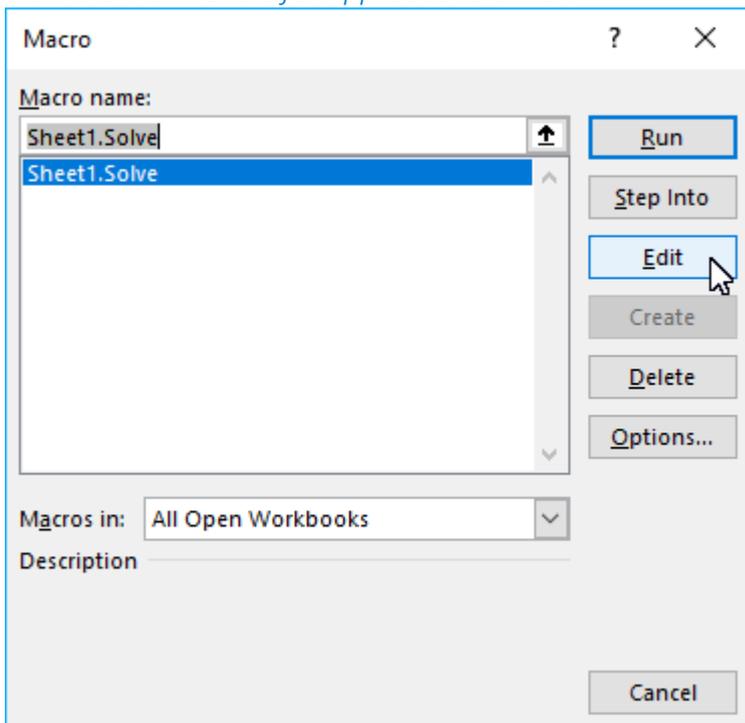
11. Click on the 'View' menu of the ribbon. The last option is called 'Macro', click on the drop-down menu and select 'View macros' from it.

The Macro menu in the View ribbon.



12. In the Macro window that opens select the macro 'Sheet1.Solve' and then click the 'Edit' button.

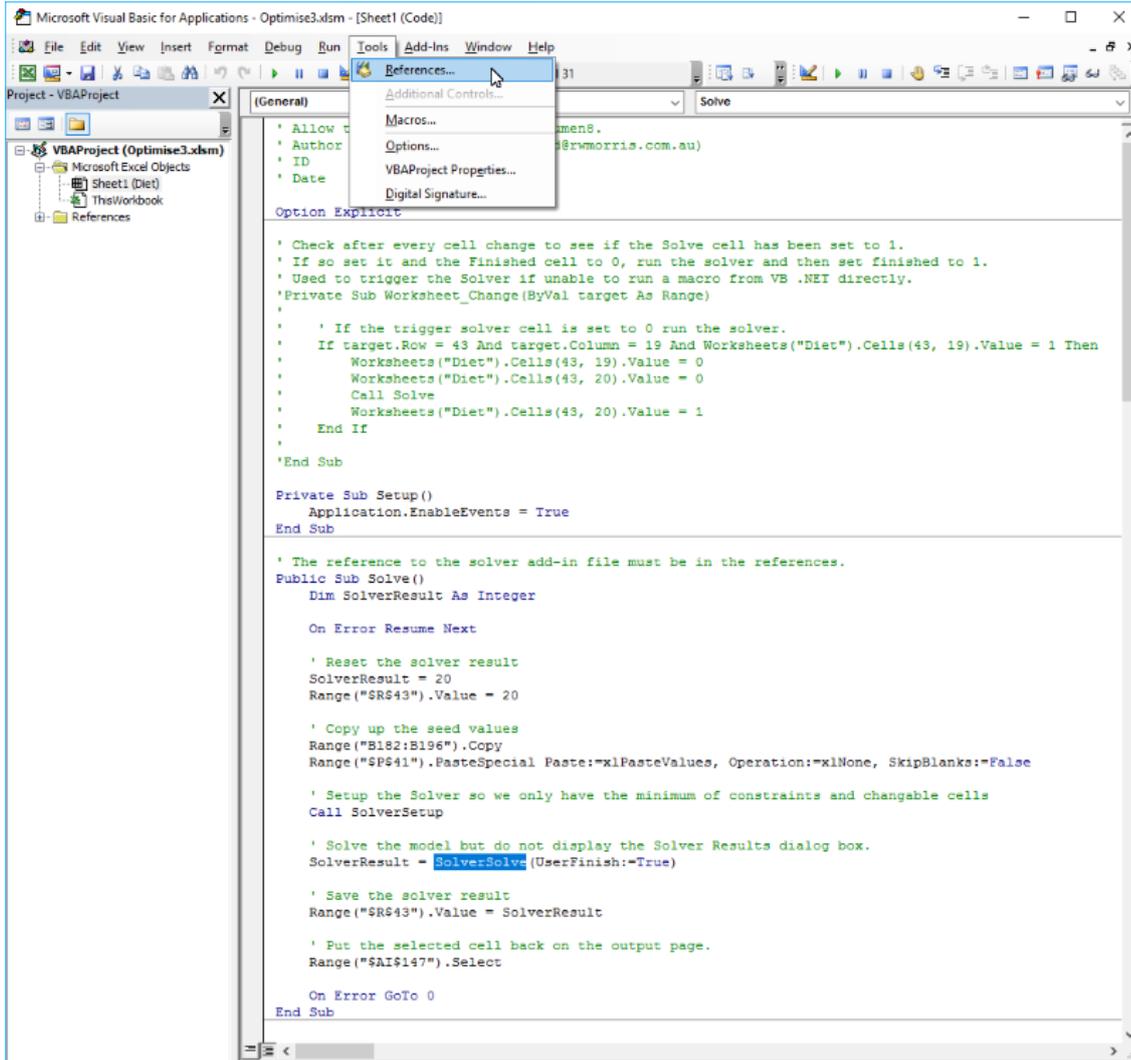
Start the Visual Basic for Applications editor.



A new window will open. This is the Visual Basic for Applications editor which lets you create macros that can be executed as part of a spreadsheet. Rumen8 calls the Solve macro to optimise the diet previously copied into the spreadsheet.

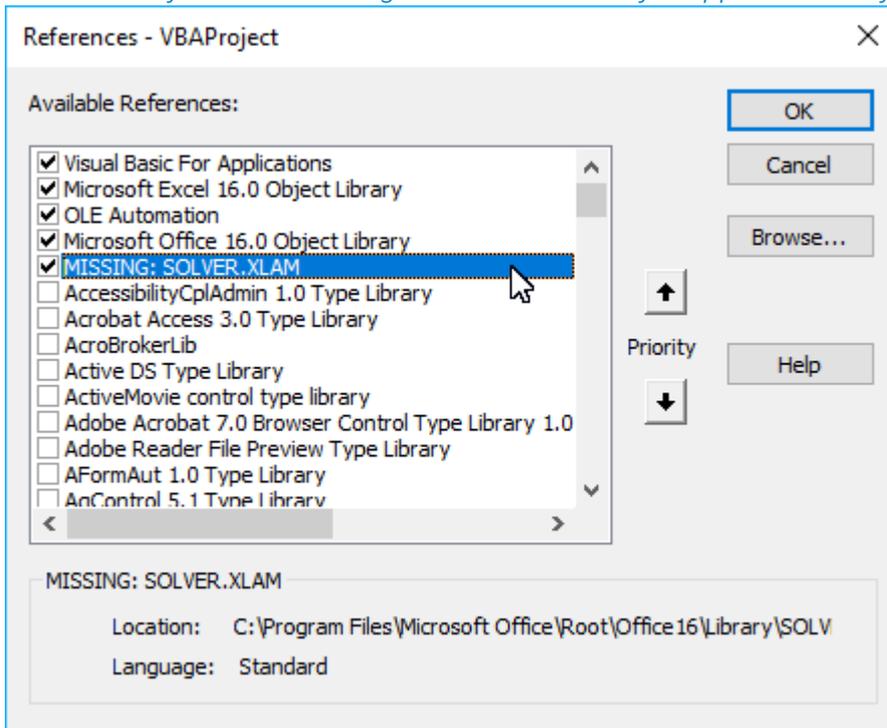
13. In the Visual Basic Editor select 'References' from the 'Tools' menu.

Open the Visual Basic for Applications References editor.



14. Visual Basic for Applications needs to know where to find the Solver add-in. You may need to search down the list to find the Solver entry. When you first open the editor, it may be listed as missing. **Even if it does not say MISSING continue with the steps below.**

The Solver reference is missing in the Visual Basic for Applications References editor.



- Click on the 'MISSING: SOLVER.XLAM' line and then the Browse button. At the bottom of the dialog box change the "Files of type" drop-down to show all files. Now navigate to the directory in which Microsoft Office has installed the solver files.

For the 64-bit version of Office365 Excel 2016 this is usually the folder
 "C:\Program Files\Microsoft Office\Root\Office 16\Library\SOLVER\".

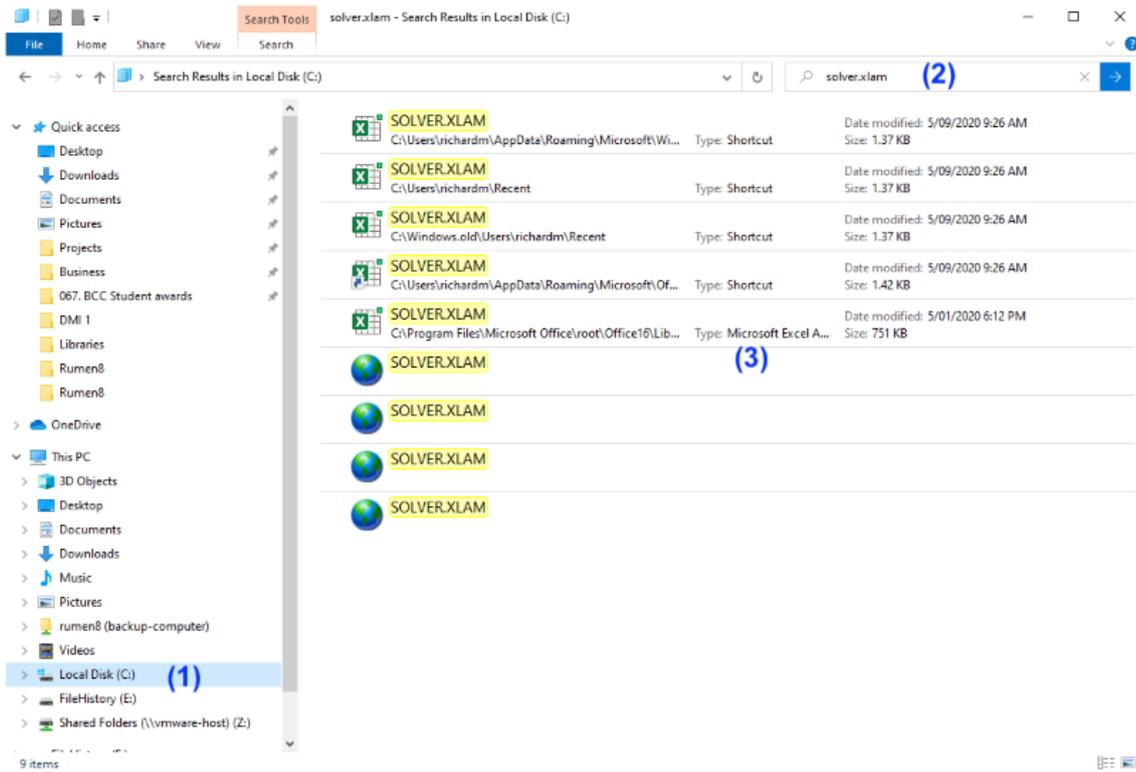
For the 32-bit version of Office365 Excel 2016 this is usually the folder
 "C:\Program Files (x86)\Microsoft Office\Root\Office 16\Library\SOLVER\".

If you are using an earlier version of Office the number 16 in the path will be lower, 15 for Office 2013 for example. Standalone installations may not include the 'Root' folder part of the path. It is important to find the SOLVER.XLAM file used by the default version of Excel on your computer.

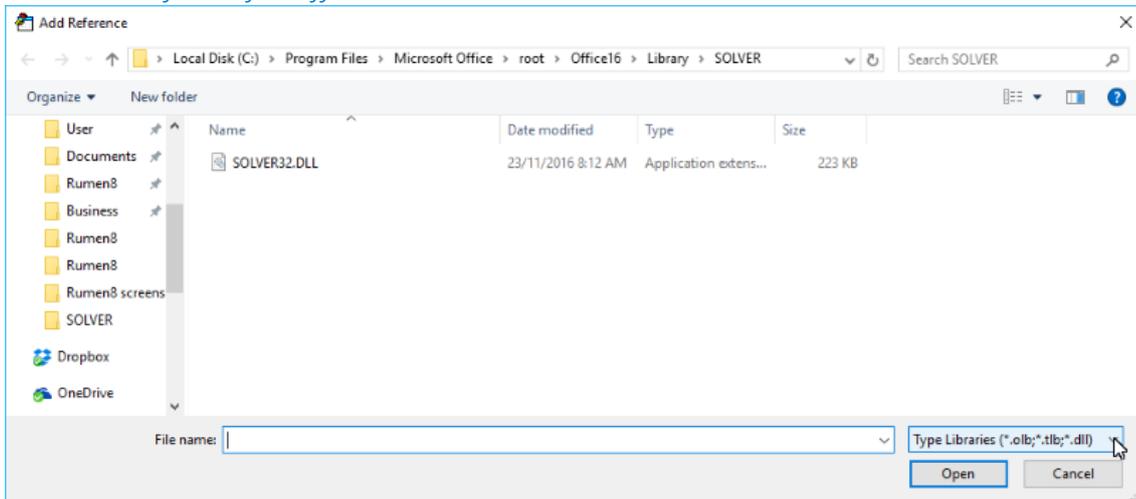
If you cannot find the SOLVER.XLAM file manually an alternative is searching for it using the Windows File Explorer.

Go back to the Windows Desktop and open the File Explorer and select 'Local Disk (C:)' in the folder view on the left (1). In the search box in the top right type in 'solver.xlam' and hit the Enter key (2). The search may take some time, but it will list all files on your C drive called Solver.xlam. When the search has finished, the entry you are looking for has 'Type: Microsoft Excel Application' alongside it. Note down the full location (path) of the file and then return to the VBA References file browser and go to that location.

Using the Windows File Explorer to find the Solver.xlam file.

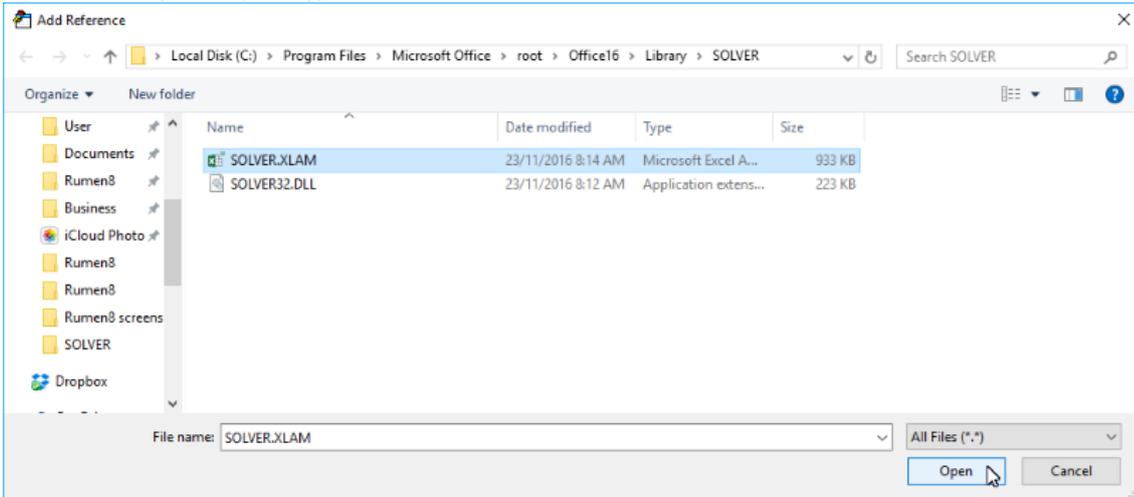


The SOLVER folder for Office 365 Excel 2016.



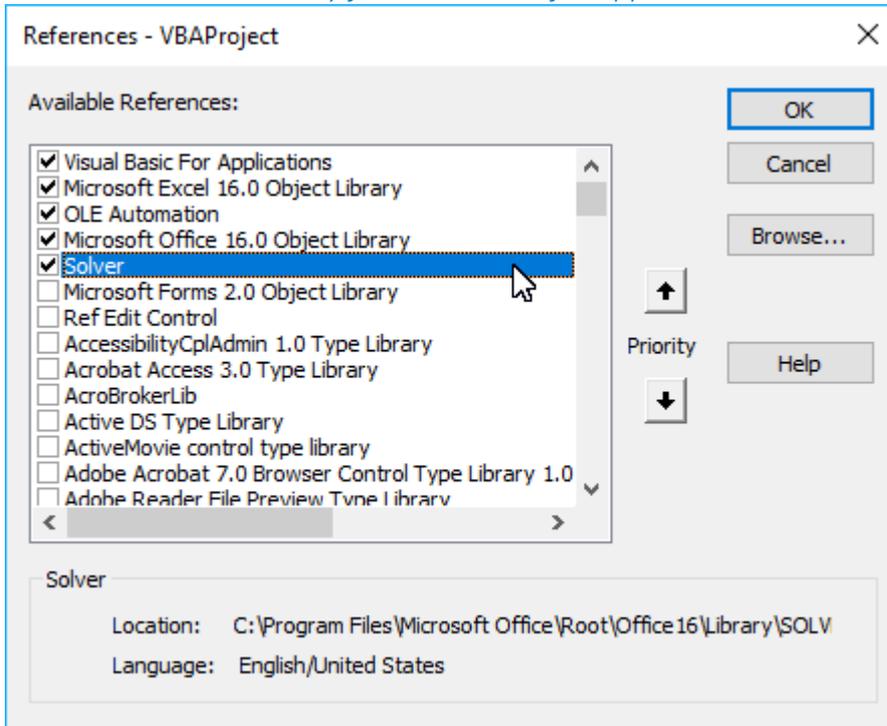
16. With 'All Files' selected SOLVER.XLAM should now be visible. Select it and click on "Open".

The SOLVER folder for Office 365 Excel 2016.



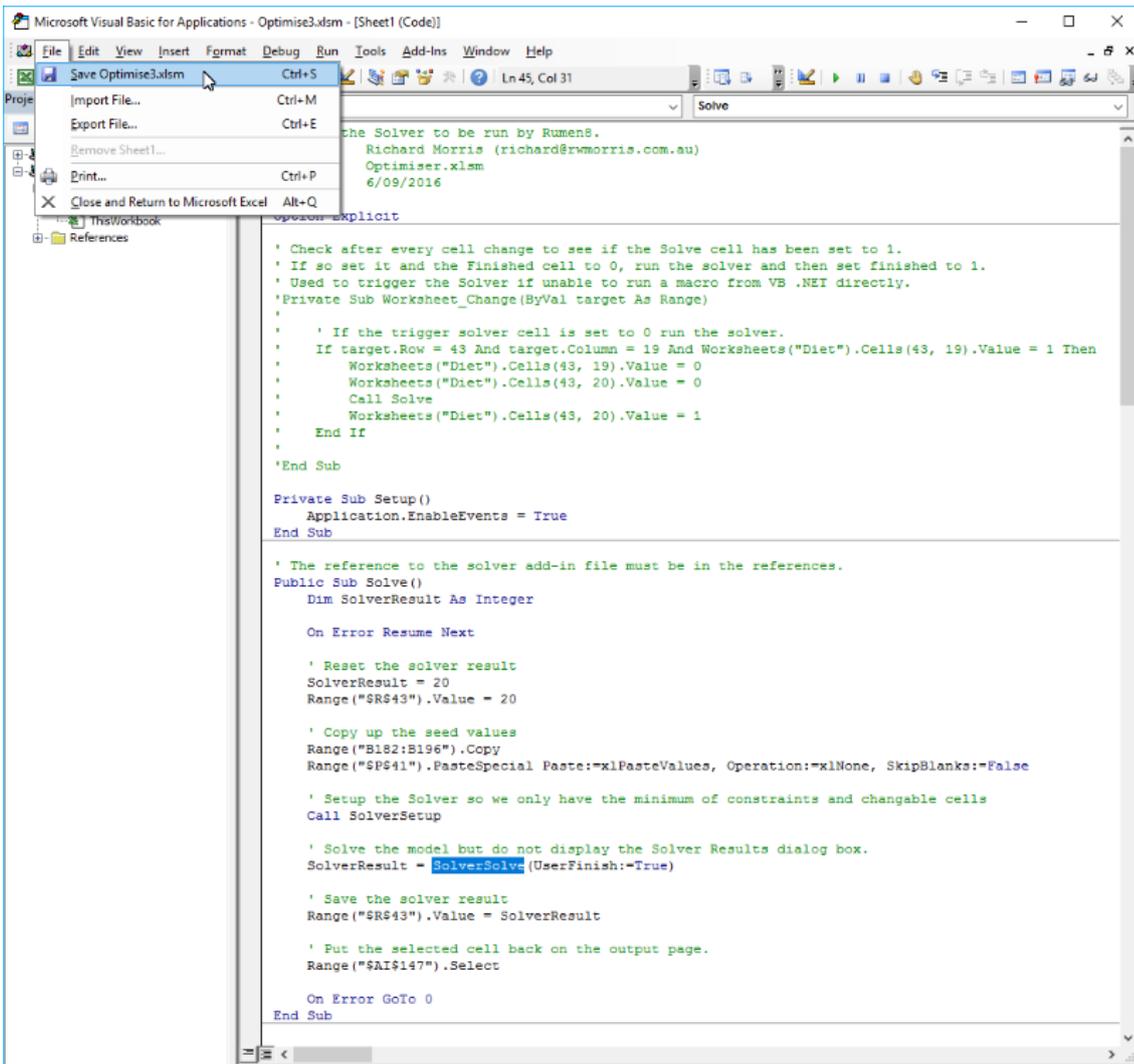
17. The Solver reference should no longer be listed as missing. Ensure it has a tick against it and click the 'Okay' button to exit the window.

Solver is installed correctly for Visual Basic for Applications.



18. Save the Optimiser3.xlsm file by selecting 'Save Optimise3.xlsm' from the File menu.

Save the optimiser spreadsheet.



19. Exit back to the spreadsheet using the 'File' menu and the 'Close and Return to Microsoft Excel' option.
20. Excel setup for use with Rumen8 optimisation is now complete so exit from Excel saving changes if you are prompted to do so.
21. Rumen8 defaults to not allow access to the optimiser so the final step is to tell it you have configured Excel correctly. In the Rumen8 Preferences General tab enable the Optimiser tab by clicking on the down arrow to the left of 'Optimiser disabled' at the bottom of the window. The Optimiser settings box will open and the title will change to 'Optimiser enabled'. Both settings in the box should be left off for normal use.

Setup the Rumen8 preferences to use the optimiser.

Dairy preferences ? X

General **Advanced** Recommended levels Standard cows

Milk yield units
 Litres Kilograms

Milk component units
 Mass/mass Mass/volume

Feed concentration units
 g/kg Percentage

Feed proportion units
 Proportion Percentage

Fat to protein ratio
 Fat:Protein Protein:Fat

Tool tips detail
 Standard Extended

Dry matter intake estimate

	Cow	Dry	Transition	Heifer
Conventional method: kg DM/d	NRC eqn.	11.0	10.0	AFRC eqn.
NDF intake: % of liveweight	1.2	1.0	0.8	1.0

Currency
 System Australian Dollar (\$) \$
 Do not display cents Currency divisor 1

Load warning for milk price change Show Diet tab
 Load warning for intake estimate change Show Split herd tab

Change the Rumen8 home directory after restarting Rumen8

Restore all the preferences to their default setting

Show Optimiser tab
 The optimiser requires the Microsoft Excel spreadsheet (Optimiser3.xlsm) in the Rumen8 libraries folder to have the Solver Add-on installed and a reference to it added in the Visual Basic editor. See the User Guide for step by step set up instructions before attempting to optimise a diet for the first time.

Excel visible during optimisation (faster if off) Excel saves diet after optimisation (faster if off)

Now when you return to the main Rumen8 window a new tab called 'Optimiser' will be available.

AFTER AN OPTIMISER UPDATE

Occasionally updates to Rumen8 require changes to the Optimise4Beef.xlsm and Optimise4Dairy.xlsm spreadsheets in the ~\Documents\Libraries folder. If this occurs and you have the Optimiser turned on in the Preferences, you will be warned when starting the new version of Rumen8 that the Optimiser has also been updated and you may need to repeat part of the Optimiser setup.

Firstly, attempt to optimise a diet and if everything goes well you do not need to do anything. If you get an error message or Excel appears showing the VBA window like the figure in the Optimiser troubleshooting section below you will need to tell Excel where the Solver.xlam file is again.

The first two sections of the optimiser setup in the previous section will not need to be repeated as they are specific to your installation of Excel and have not been changed. These are

- Set Excel security levels,
- Install the Solver add-in.

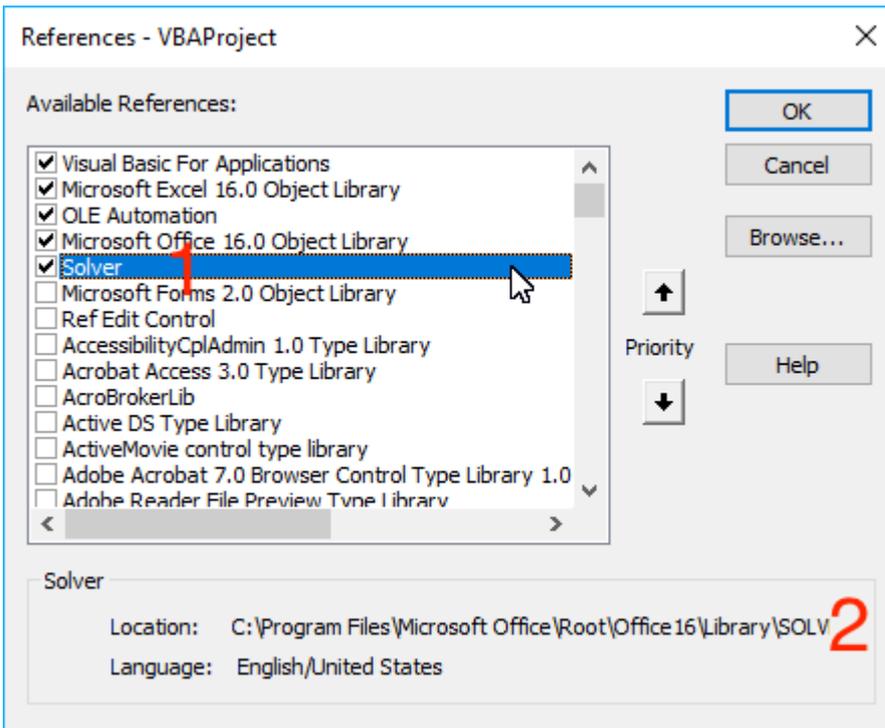
Unfortunately, the last part of the optimiser setup process where you add the reference to Solver in the Visual Basic for Applications editor may need to be repeated. This is because the new Optimiser spreadsheets provided in the update are set up for the most common Excel configuration, a 64bit Office365 subscription with the latest version of Excel. If the location of the Solver.xlam file is different on your computer due to being an earlier version of Excel or different installation process it will need to be located again.

If you are already in the Visual Basic for Applications Editor when the error occurred, you can start at step 12 of the Optimiser setup instructions.

If you got an error message in Rumen8 you will need to open the Optimise4Beef.xlsm or Optimise4Dairy.xlsm spreadsheet in the ~\Documents\Rumen8\libraries folder in Excel. If you have installed Rumen8 to the default location the Rumen8 folder will be in your Windows Documents folder and the complete path for the spreadsheet will be C:\Users\<logon name>\Documents\Rumen8\Libraries\Optimise4Beef.xlsm for example. This is the same as step 1 and 2 of the Optimiser setup instructions. Once there you can skip forward to step 10 to set the location of the Solver.xlam file.

Unfortunately, when setting up the Reference for the Solver.xlam file after an Optimiser update Excel may incorrectly think it knows where the add-in is located and even shows the correct path as shown in the figure below.

The References window incorrectly shows the Solver is correctly setup after a Optimiser spreadsheet update (1). The path to the Solver.xlam file must be selected again using the Browse button on the right of the window. The location shown at 2 will still be the location of the Solver.xlam file.



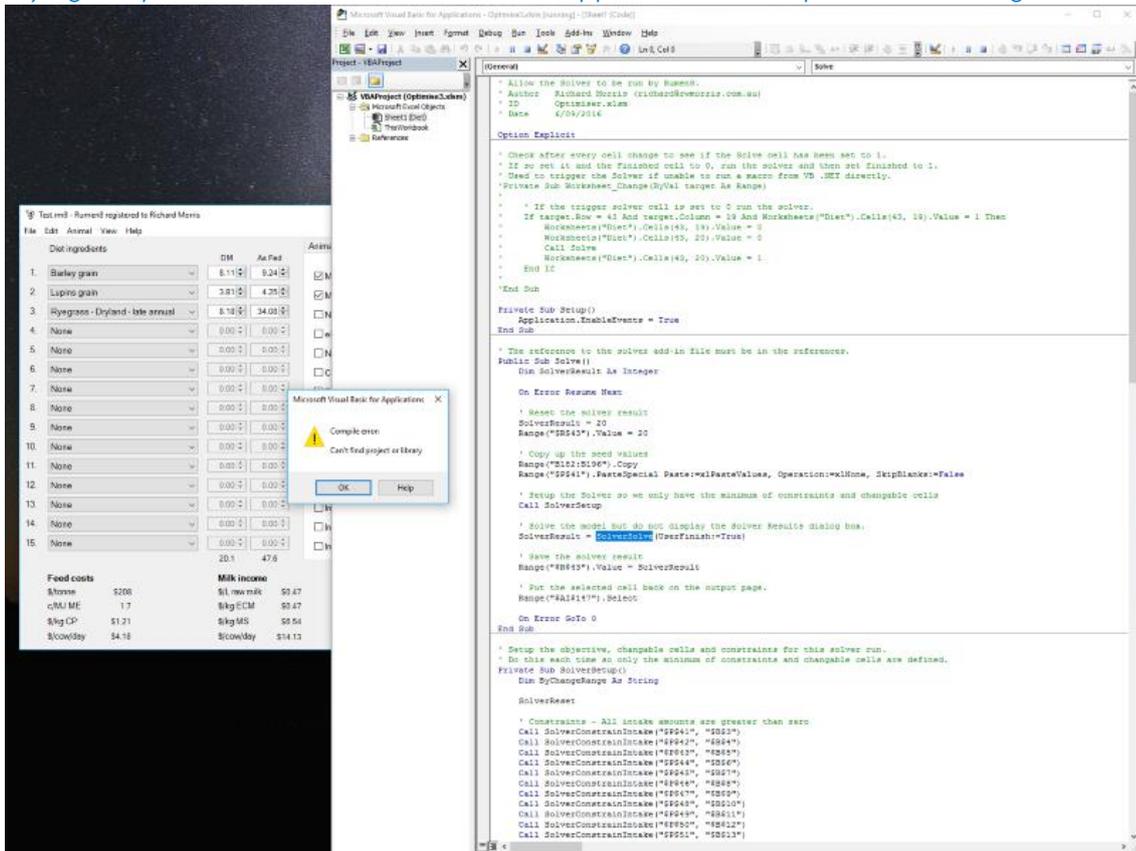
Ignore this and as for the initial setup of the Solver, use the Browse button to specify the location of the Solver.xlam file. It will probably be found at the location at the bottom of the References window - Shown with the number 2 in the figure above.

Once the Reference has been updated you can click the 'Okay' button and then 'Close and Return to Microsoft Excel' via the File menu to get out of the VBA editor window. Then exit Excel saving the Optimiser spreadsheet as you go. The updated Optimiser spreadsheet should now make the Solver available to Rumen8 for optimising.

OPTIMISER TROUBLESHOOTING

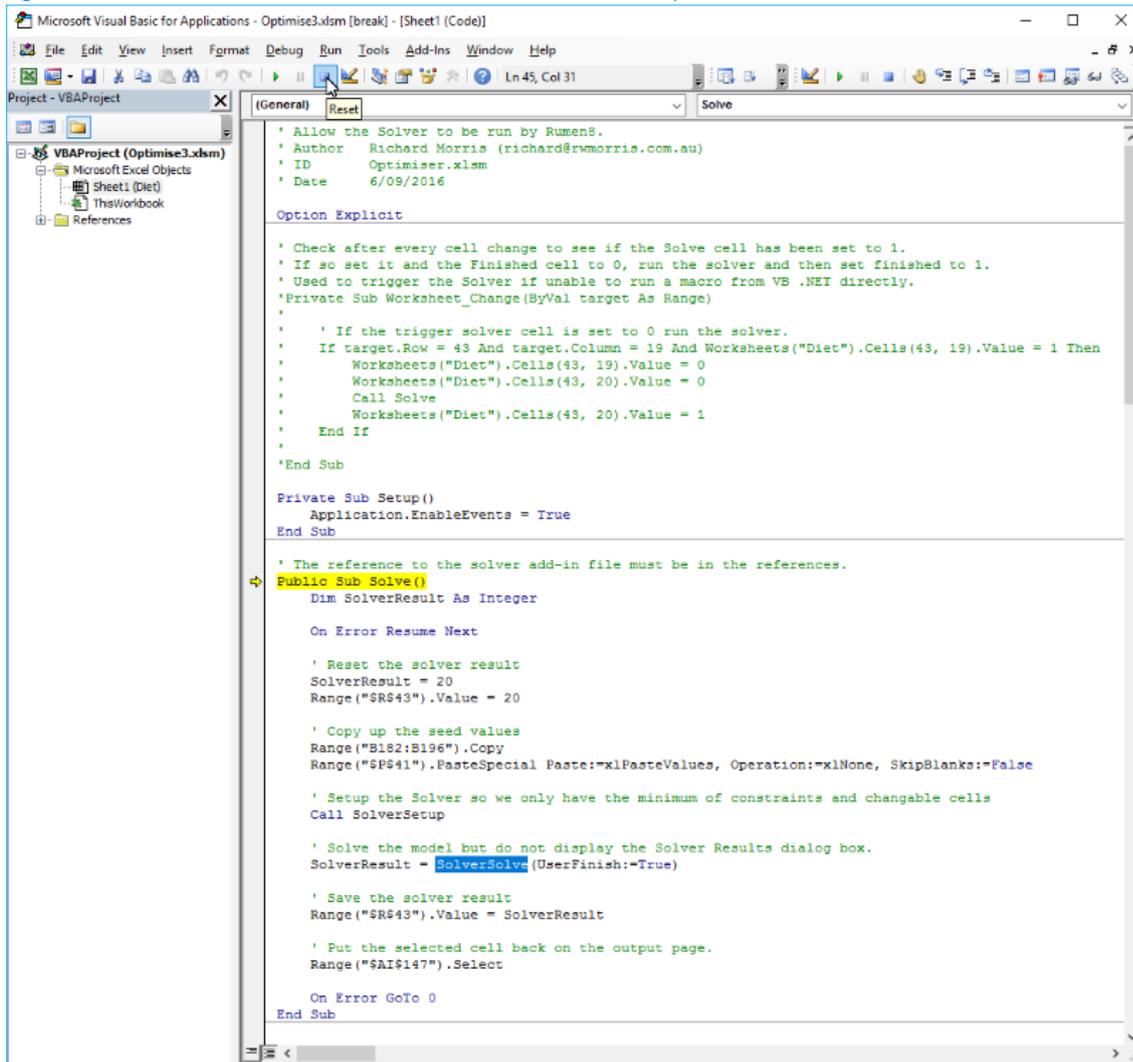
If you have followed the setup instructions for the Optimiser and it fails when you try to optimise, the most likely problem is the Visual Basic for Applications (VBA) reference to the SOLVER.XLAM file. If this happens you will see the VBA editor appear with an error message telling you it cannot compile because it cannot find a project or library (the SOLVER.XLAM file).

Trying to optimise causes the VBA editor to appear with a compile error message.



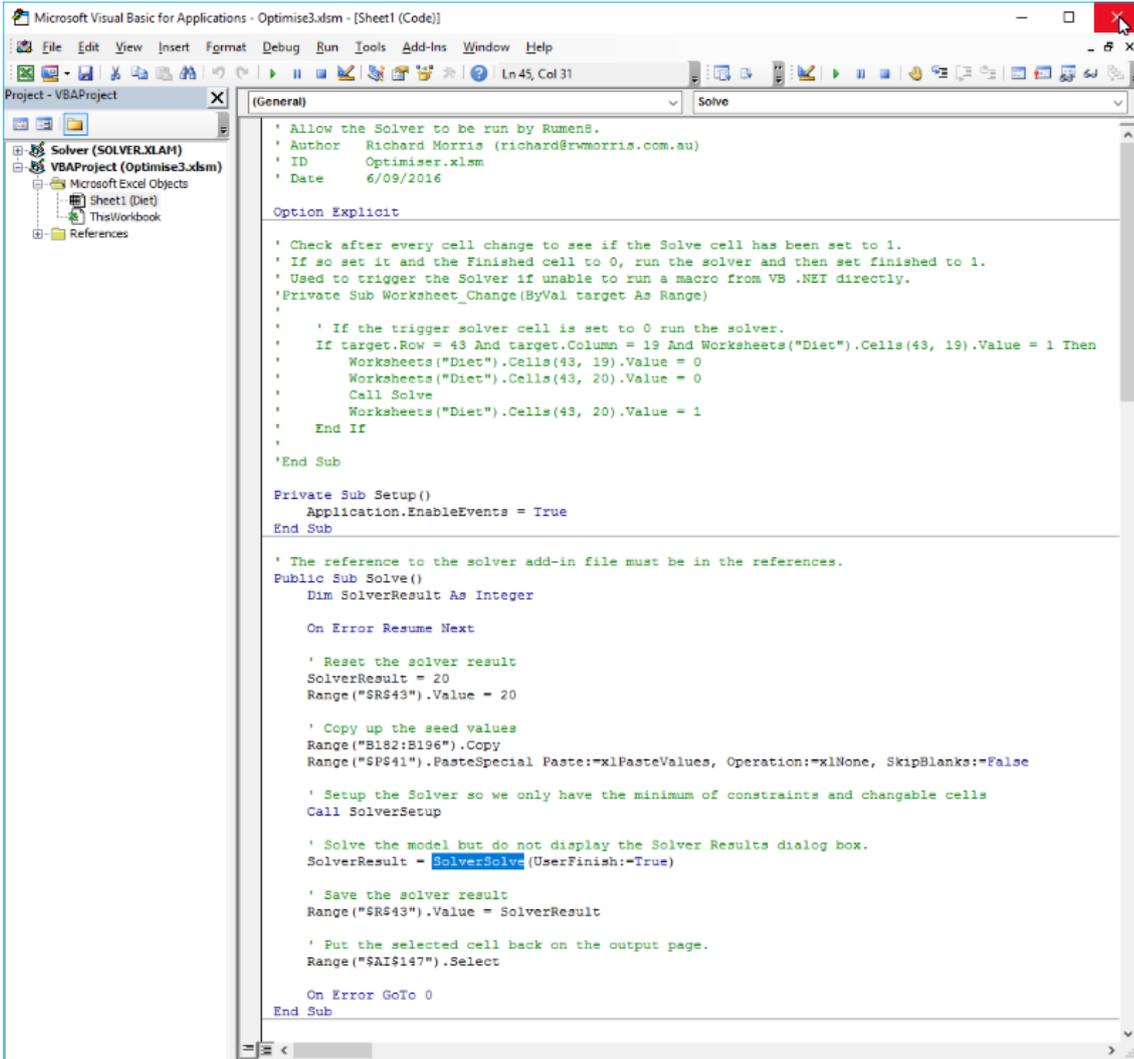
Close the error message by clicking on the 'Okay' button and then reset the macro by clicking on the Reset button in the toolbar. It is a square stop button in the style of VCR play, pause and stop buttons as shown in the figure below.

Figure 11.22. Reset the macro execution with the stop button in the toolbar.



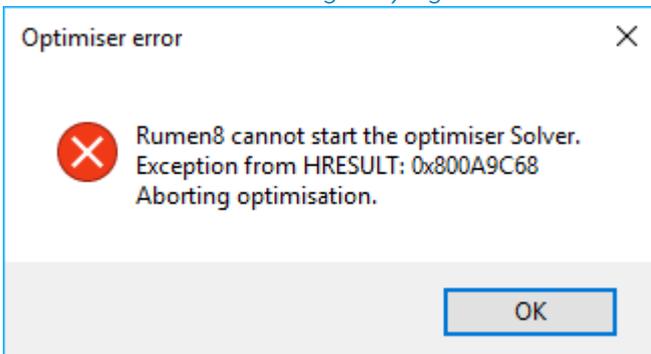
Now you can update the reference to the SOLVER.XLAM file as you did in the third part of the optimiser setup instructions starting with the References editor in the 'Tools' menu.

Accessing the References editor in the VBA editor.



From this point follow the instructions as you did when you originally set up the optimiser from step 12. The only difference is when you return to Rumen8 after saving your changes it will have an error message telling you it couldn't start the Solver. Click 'Okay' and then try optimising again.

The Rumen8 error message saying it could not start the Solver in Excel.



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ABBREVIATIONS

Abbreviation	Units	Description
A	MJ/d	activity allowance
Abs		Absorption
ADIN	g/kg DM	acid detergent insoluble nitrogen
aN		proportion of water-soluble N in the total N of the feed
Ash	g/kg DM	ash content of feed (after heating to 600 C for 10 hours)
Balance (MJ)	MJ	the difference between metabolisable energy requirements and supply
BCS		Body condition score.
bN		proportion of degradable N, other than water soluble N, in the feed
Ca		Calcium
Calcium	g/kg or g/kg DM	concentration of calcium in the diet
CI	MJ/d	plane of nutrition correction factor in calculating ME requirements
cN		fractional rumen degradation rate per hour of the b fraction of the feed N with time
Comp. 1	kg	the amount of component 1 must fall within specified minimum and maximum values
Comp. 2	kg	the amount of component 2 must fall within specified minimum and maximum values
Comp. 3	kg	the amount of component 3 must fall within specified minimum and maximum values
Con+By (kg)	kg	amount of concentrate and by-product in the diet
Conc. + ByPr.	g	the total amount of concentrate + by-product in the diet must fall within specified minimum and maximum values
Conc. + ByPr.	g/kg	the concentration of concentrate + by-product in the diet must fall within specified minimum and maximum values
Cost	\$/cow and c/MJ	diet cost (\$/cow and c/MJ) and margin (\$/cow)
Cost	\$/tonne	cost to produce or buy 1 tonne of feed (nominate if wet or dry)
Cost (\$/t)	\$/tonne	diet cost per tonne
Cost (c/MJ)	c/MJ	diet cost on a metabolisable energy basis
Cost A.L. DM	\$/tonne DM	cost after losses on a dry matter basis
Cost A.L. wet	\$/tonne wet	cost after losses on a wet or fresh basis
CP	g/kg	the concentration of CP in the diet must fall within specified minimum and maximum values
CP	g/kg DM	crude protein ($N * 6.25$)
Days in milk	d	number of days the cow has been lactating
Days pregnant	d	number of days the cow has been pregnant
DCAD		Dairy cation anion exchange
DIM		Days in milk
Distance walked	m/d	distance walked each day by the cow
DM	g/kg	dry matter
DMI	kg and %	dry matter intake (kg) and % of maximum intake (NDF/NRC methods)
DMTP	g	digestible microbial true protein

Abbreviation	Units	Description
DUP	g	digestible undegraded protein
Ec	MJ/d	net energy retained in concept (foetus and placenta etc.)
EI	MJ/d	net energy secreted as milk
Em	MJ/d	net energy for maintenance
peNDF	g/kg or %	the proportion of NDF that is deemed 'physically effective' i.e., that leads to rumination
ERDP	g	effective rumen degradable dietary protein
ERDP CP	%	percentage of the CP that is effective rumen degradable dietary protein
Excess MP	g	MP in excess of requirements which will take ME to remove from the body
Excess MP cost	\$\$?	the metabolic cost to remove excess metabolisable protein expressed as forgone weight change or milk production
F	MJ/d	fasting metabolism
fat	g/kg	the concentration of fat in the diet must fall within specified minimum and maximum values
Fat	g/kg DM	Fat
Feed (\$/cow)	\$/cow/day	feed cost
FME	MJ	fermentable ME of the diet
Height walked	m/d	height change whilst walking each day
Intake (kg)	kg	the maximum DMI cannot exceed 100% as determined by live weight, milk yield and week of lactation
Intake (max. NDF)	g	the maximum DMI cannot exceed 100% as determined by NDF intake and live weight
Kc		efficiency of utilisation of ME for growth of the concepta
Kg		efficiency of utilisation of ME for weight change when lactating
Kl		efficiency of utilisation of ME for lactation
Km		efficiency of utilisation of ME for maintenance
Kt		efficiency of utilisation of mobilised tissue for lactation
L	MJ/d	level of feeding as a multiple of MJ of ME for maintenance
Limited by		factor limiting MP supply
Live weight	kg	the cow's live weight
Live weight change	kg/d	cow's daily live weight change
Losses	%	dry matter loss from feed after costing
Magnesium	g/kg or g/kg DM	concentration of magnesium in the diet
Mg		Magnesium
Margin (\$/cow)	\$/cow/day	margin (milk income - feed costs)
Max DM Intake %	%	percentage of predicted maximum intake currently provided by the diet based on live weight, milk yield and stage of lactation
Max MP cost	MJ	Maximum ME cost to remove excess MP
Max NDF DMI %	%	percentage of predicted maximum intake currently provided by the diet based on NDF intake and live weight
Mc	MJ/d	ME requirement for growth of concepta
MCP	G	microbial crude protein
ME	MJ	metabolisable energy supplied and required
ME	MJ/kg DM	metabolisable energy

Abbreviation	Units	Description
ME requirement	MJ	the diet must provide the ME required for maintenance and production
M _g	MJ/d	ME requirement for live weight change when lactating
Milk (\$/cow)	\$/cow/day	milk income
Milk fat	% m/v	percentage of milk that is fat
Milk lactose	% m/v	percentage of milk that is lactose
Milk protein	% m/v	percentage of milk that is true protein
Milk yield	L	daily milk production
Min MP cost	MJ	Minimum ME cost to remove excess MP
MI	MJ/d	ME requirement for milk production
Mm	MJ/d	ME requirement for maintenance
Mmp	MJ/d	ME requirement for maintenance and production
MP	g	metabolisable protein
MP balance	g	metabolisable protein balance
MP min. requirement	g	the diet must provide an MP supply at least that required for maintenance and production
MP required	g	the amount of metabolisable protein required for the production level
MPb	g/d	basal endogenous nitrogen requirement
MPC	g/d	MP requirement for the growth of the concepta
MPd	g/d	dermal loss as scurf and hair
MPg	g/d	MP requirement for live weight gain when lactating
MPI	g/d	MP requirement for milk production
MPm	g/d	MP requirement for maintenance
MPmp	g/d	MP requirement for maintenance and production
MTP	g	microbial true protein
NDF	g/kg	the concentration of NDF in the diet must fall within specified minimum and maximum values
NDF	g/kg DM	neutral detergent fibre
NDF (%)	%DMI	neutral detergent fibre in the diet
NDF (kg)	kg	total NDF in the diet
NDF forage	g/kg	the concentration of NDF from forage in the diet must fall within specified minimum and maximum values
NDF frg (%)	%DMI	NDF in the diet supplied from forages
NFC (%)	%DMI	non fibrous carbohydrate in the diet
Phosphorus P	g/kg or g/kg DM	concentration of phosphorus in the diet Phosphorus
Position changes	no./d	number of body position changes per day (lying down / standing up)
Protein	g and %	metabolisable protein supplied and required and crude protein %
QDP	g	quickly degradable protein
Qm		metabolisability of GE at maintenance
r(fraction/hr)		rumen digesta fractional outflow rate per hour
RDP	g	rumen degradable protein
Required (MJ)	MJ	metabolisable energy supply required from the diet for specified production
SDP	g	slowly degradable protein
Source	source of information	FIM (feed information manual) / TFD (top fodder data) / VMF (Vasse Milk Farmlets) / MvHS (M Staines data) / Protein Plus project etc.

Abbreviation	Units	Description
starch	g/kg or g/kg DM	the concentration of starch in the diet must fall within specified minimum and maximum values
Starch (%)	%DMI	starch in the diet
sugar	g/kg or g/kg DM	the concentration of sugar in the diet must fall within specified minimum and maximum values
Sugar (%)	%DMI	sugar in the diet
Time standing	hr/d	time cow spends standing each day
Total (kg)	kg	total dry matter in the diet
Total (MJ)	MJ	total metabolisable energy supplied from the diet
Total MP (g)	g	total metabolisable protein in the diet
Type	name	other forage / grass silage / other silage / distillery product / other non-forage
UDP	g	undegradable dietary protein
y	g	potential microbial protein yield in the rumen from FME

FEED IMPORT FORMAT

Feeds can be imported from a text file of comma separated values (csv). These can be exported from a Microsoft Excel spreadsheet, so it is straightforward to change the order and format of feed data from a laboratory analysis.

The first line can be a comment as it will be ignored.

The data lines must have 42 values separated by commas and contain a single feed definition. Text fields do not require quotes and cannot contain a comma.

Field order and format use to import feeds from a csv file into the feed library.

Field Name	Units	Type	Additional Information
Feed name		Text	Must be unique across existing feed and mix names
Category		Integer	0=not used, 1=grazed pasture, 2=grazed forage, 3=conserved as hay, 4=conserved as silage, 5=concentrate/grain, 6=by-product, 7=minerals
Protein type		Integer	0=other forage, 1=grass silage, 2=other silage, 3=distillery by-product, 4=other non-forage
Forage or concentrate		Integer	0=forage, 1=concentrate
Cost	Dollars	Decimal	
Cost DM or as fed		Integer	0=cost entered on DM basis, 1=cost entered on as fed basis
Max feeding rate	g/kg DM	Decimal	
Wet density	kg/tonne	Decimal	
Losses	%	Decimal	
Dry matter	g/kg	Decimal	
Metabolisable energy	MJ/kg DM	Decimal	
Crude protein	g/kg DM	Decimal	
Neutral detergent fibre	g/kg DM	Decimal	
Physically effective neutral detergent fibre	g/kg DM	Decimal	
Starch	g/kg DM	Decimal	
Sugar	g/kg DM	Decimal	
Fat	g/kg DM	Decimal	
Ash	g/kg DM	Decimal	
aN		Decimal	0.00 to 1.00
bN		Decimal	0.00 to 1.00
cN		Decimal	0.00 to 1.00
ADIN	g/kg DM	Decimal	
Lysine	g/kg DM	Decimal	Not used so can be left empty
Threonine	g/kg DM	Decimal	Not used so can be left empty
Methionine	g/kg DM	Decimal	Not used so can be left empty

Cysteine	g/kg DM	Decimal	Not used so can be left empty
Histidine	g/kg DM	Decimal	Not used so can be left empty
Calcium	g/kg DM	Decimal	
Calcium absorption		Decimal	0.0 to 1.0
Phosphorus	g/kg DM	Decimal	
Phosphorus absorption		Decimal	0.0 to 1.0
Magnesium	g/kg DM	Decimal	
Magnesium absorption		Decimal	0.0 to 1.0
Sodium	g/kg DM	Decimal	
Potassium	g/kg DM	Decimal	
Chloride	g/kg DM	Decimal	
Sulphur	g/kg DM	Decimal	
DCAD		Decimal	
DCAD calculated		Integer	
Source		Text	
Comment		Text	
Selected		Integer	0=not visible in ingredient lists, 1=visible in ingredient lists

File example

```
#Name, Category, Type, ForageConcentrate, Cost, CostWet, MaxFeedingRate, WetDensity,
Losses, DM, ME, CP, NDF, peNDF, Starch, Sugar, Fat, Ash, aN, bN, cN, ADIN, LYS, THR,
MET, CYS, HIS, Calcium, CalciumAbsorption, Phosphorus, PhosphorusAbsorption, Magnesium,
MagnesiumAbsorption, Sodium, Potassium, Chloride, Sulphur, DCAD, DCADCalculated,
Source, Comment, Visible
Barley
Grain,5,4,1,185,0,500,100,2,911,12.5,110,166,77,567,35,28,29,0.24,0.71,0.35,0.4,4.02,3.
64,1.8,2.28,2.46,1,0.3,4,0.4,2,0.5,0.5,1.5,2.5,3.5,100,0,Prot+ FIM,,1
Barley Hay -
DemoDairy,5,0,0,150,1,500,200,12,850,9.5,90,600,550,80,150,16,82,0.22,0.6,0.08,1.2,5.5,
5.22,1.52,1.13,2.12,3,0.3,2,0.4,2,0.5,0.5,1.5,2.5,3.5,100,0,FIM VMF,,1
Brewers Grain
(Wet),6,3,1,1450,0,500,300,10,230,11,227,500,250,72,0,70,39,0.32,0.62,0.03,1,3.85,3.8,1
.95,2.05,2.05,2,0.3,6,0.4,2,0.5,0.5,1.5,2.5,3.5,100,0,Prot+ FIM,,1
Broll,5,4,1,180,1,500,400,5,900,11,160,250,75,670,27,19,21,0.35,0.6,0.2,0.5,3.04,3.06,1
.7,2.22,2.52,1,0.3,4,0.4,2,0.5,0.5,1.5,2.5,3.5,100,0,Prot+ FIM,,1
Minerals,7,4,2,7000,1,500,500,2,1000,8,0,0,0,0,0,0,995,0.24,0,0,0.9,0,0,0,0,0,0,46,0.3,0,
0.4,5,0.5,0.5,1.5,2.5,3.5,100,0,FIM,,1
Calf Meal
18%,5,0,1,270,1,500,600,2,881,12.5,203,236,,311,83,68,53,0.19,0.64,0.05,1,,,,,16,0.3,8
,0.4,3,0.5,0.5,1.5,2.5,3.5,100,0,,Based on Meadow 18% Calf Pellets,1
Canola Hay -
DemoDairy,3,0,0,270,1,500,800,10,850,9.5,165,330,300,0,150,16,82,0.22,0.6,0.08,1.2,5.5,
5.22,1.52,1.13,2.12,9,0.3,3,0.4,2,0.5,0.5,1.5,2.5,3.5,100,0,FIM VMF,,1
Canola
Meal,5,4,1,430,0,500,700,2,973,12.1,375,280,125,40,105,130,57,0.22,0.7,0.16,3.6,5.77,4.
8,2.33,2.71,2.86,6,0.3,10,0.4,5,0.5,0.5,1.5,2.5,3.5,100,0,Prot+ FIM,,1
Canola Whole Seed
Crushed,5,4,1,350,0,500,600,2,900,23.1,215,396,198,4,35,485,50,0.25,0.7,0.06,1.5,6.47,4
.63,2.31,2.44,3.07,4,0.3,8,0.4,3,0.5,0.5,1.5,2.5,3.5,100,0,FIM TFD,,1
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