

# GUIDELINES FOR RATION CALCULATION FOR VARIOUS BREEDS, HEIFERS, LACTATION STAGE (RUMEN8) – Level 3

Topic	Training & information Content
3.1	Estimating feeding value of fodder & feed on dairy farms
3.2	Sampling feeds & forages/analysis interpretation
3.3	Estimating Dry Matter intake for various breeds/age categories of dairy cattle in the tropics
3.4	Reviewing feed intake, rumen fill, Body Condition Scoring (BCS)
3.5	Life weight estimation of cows
3.6	Rumen fermentation
3.7	Mineral & vitamin requirement, guidelines
3.8	Manure scoring and evaluation
3.9	Guidelines for ration calculations for various breeds, heifers, lactation stage (Rumen8)
3.10	Use of Rumen8 software for ration calculation
3.11	Optimization of ration with Rumen8
3.12	Feeding management guidelines
3.13	Feeding management of dry cows/close up
3.14	Feeding systems
3.15	Metabolic disorders
3.16	Scoring locomotion and hoof condition
3.17	Mycotoxin in dairy cattle nutrition
3.18	Heat stress in dairy cattle nutrition
3.19	Monitoring feeding management, using KPIs (based on Rumen8)



## 1. You will learn about (learning objectives):

- ❑ Introduction to ration formulation using Rumen8 Software
- ❑ How to use Rumen 8 to determine rations of various breeds, heifers, lactation stage considering their body requirements.



*This module has three parts; this is part II – ensure you download Parts I and III to cover to END.*



## 2. Having the SNV Tropical Feed library visible as well as the user feed library (Empty Feed library)

- To open the empty feed library, go to the right hand of the page named Library management.
- On the bottom of the right hand section highlighted in red box as 'User feed library', Click 'Open'.

### Library management

Selected (ticked) diet ingredients (feeds and mixes) are available in the diet ingredient drop down lists

Diet ingredients available 481

Diet ingredients selected 481

Feed libraries in use

Default

Shared

Select

Sort

All

Name

None

Category

Invert

Selection

All feeds

Library

No feeds

All mixes

No mixes

Print

User feed library

Open

Close

New

Shared feed library

Open

Close

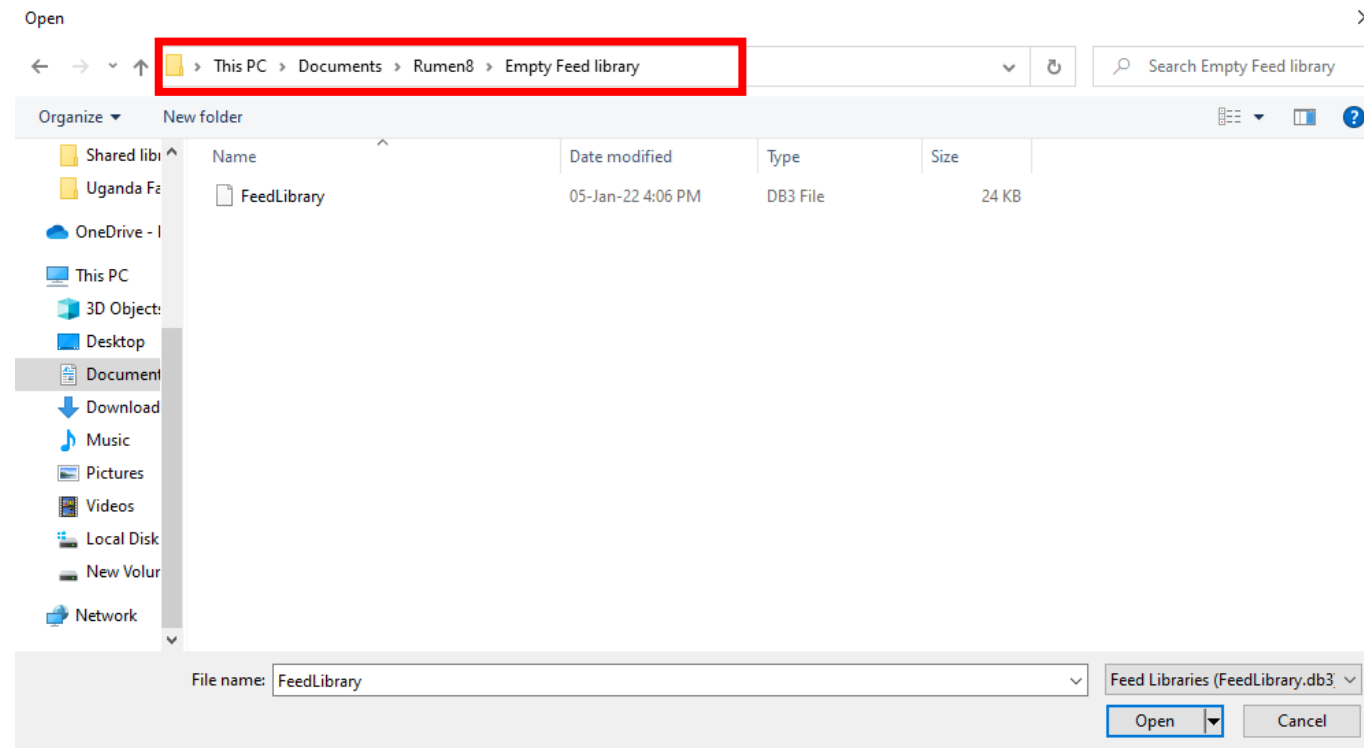
Share

Import

Export

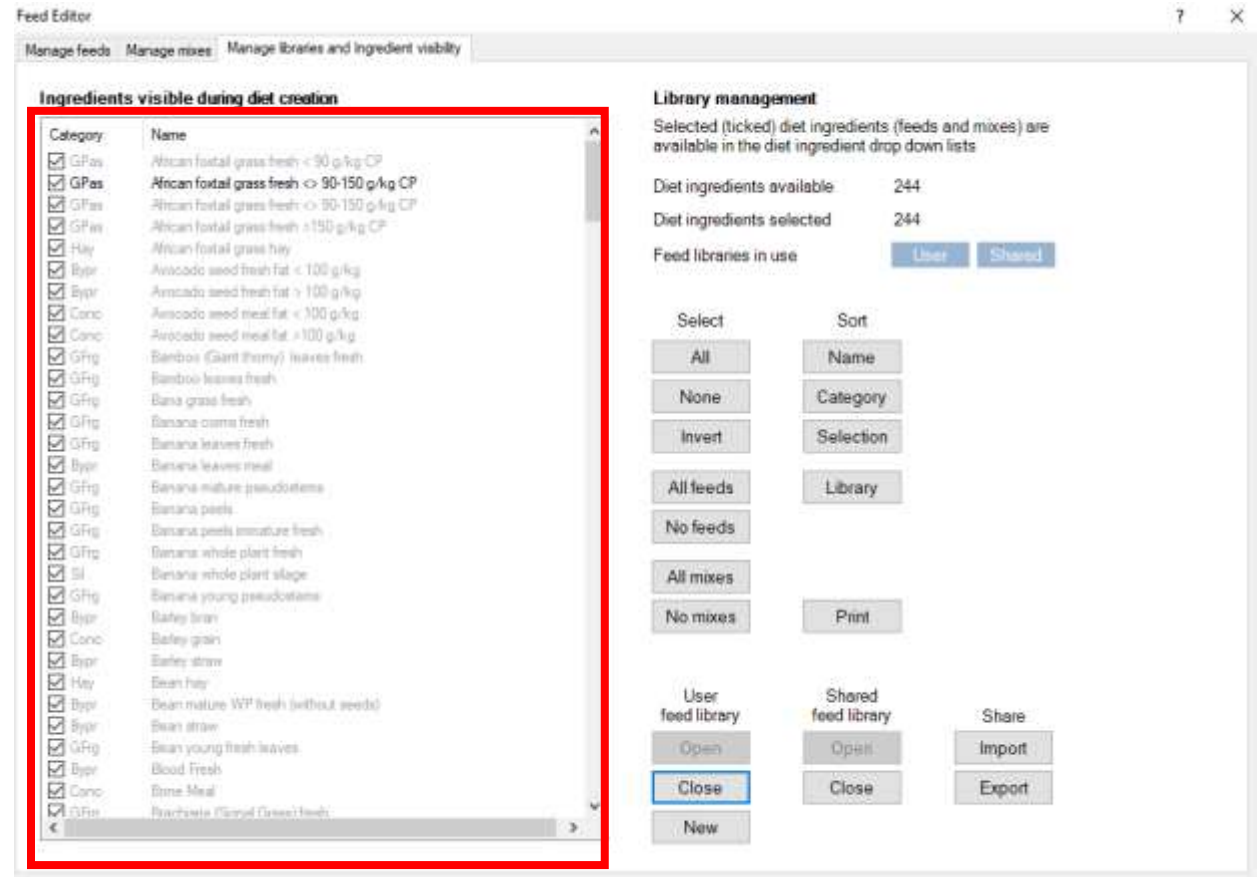
### 3. Open user feed library under the folder the Empty Feed library

- Clicking 'Open' will direct you to your computer's 'Document' folder.
- Select folder 'Rumen8' then 'Empty Feed Library.'
- Then the option '**FeedLibrary**' then click 'open'.



### 3.1 Empty Feed library display

- Notice that most of the feed ingredient from the 'Shared Feed library' are grey/faint in color. Only a few are dark/black in color (Empty feed library).
- The grey colored ingredient list can be used as reference and you can make a copy (Add copy) and after you have copied a number of feeds you save own feed library under your choice of name.
- The next slides will guide you to make your own feed library.



## 4. How to make your own farm-specific Feed library

- Still under the 'Feed Editor' that you have been working on to open the shared library and the user feed library, you now continue under the tab 'Manage feeds' (indicated with the yellow arrow).
- The 'Manage Feeds' displays show the 'Empty feed library' (Displayed in black color and the 'Shared feed library'(displayed in grey color) on the left-hand side (Green box) and the ingredient editor on the right-hand side (Red box).
- Now you can make the ingredient of your choice active and edit the feed parameters.

The screenshot shows the 'Feed Editor' application window. The 'Manage feeds' tab is selected, indicated by a yellow arrow. The interface is divided into two main sections:

- Left Panel (Green Box):** A list of feed ingredients with columns for 'Category' and 'Name'. The list includes items like 'African foxtail grass fresh < 90-150 g/kg CP', 'Avocado seed fresh fat < 100 g/kg', and 'Banana leaves fresh'. The list is currently empty, representing the 'Empty feed library'.
- Right Panel (Red Box):** The 'Edit' form for a selected ingredient, 'African foxtail grass fresh < 90 g/kg CP'. It contains several sections:
  - 1. Feed management category:** Radio buttons for 'Grazed pasture' (selected), 'Grazed other', 'Hay', and 'Silage'. Below are 'Concentrate', 'Additive', and 'Byproduct'.
  - 2. Feed protein type:** Radio buttons for 'Grass silage', 'Other non-forage', 'OtherSilage', 'Other forage' (selected), and 'Distillery byproduct'.
  - 3. Feed particle size classification:** Radio buttons for 'Concentrate', 'Forage' (selected), and 'Other'.
  - Parameter Table:** A grid of input fields for various feed parameters. Bolded parameters (DM, ME, CP, Fat, Ca, P, Mg, K, Na, Cl, S) are required. Other parameters include aN, bN, cN, ADIN, Ca abs, P abs, Mg abs, Max feeding rate, Wet density, NDF, eNDF in NDF, Starch, Sugar, Ash, Cost (Ush/t DM), Cost (Ush/t fed), Losses (%), Cost +loss, and Cost +loss.fr.
  - Source and Comment:** Fields for 'Source' (Kenyan Rumen8 Team) and 'Comment'.
  - Buttons:** 'Edit', 'Add Copy', and 'Delete' buttons are visible between the panels.

## 5. To activate (Black in colour) a feed in the farm-specific library

To activate the ingredients, you need to make a copy of the existing ingredients (grey ones). The following steps will guide you.

- Select an ingredient, in this case, 'African Foxtail grass fresh'.
- Click on 'Add copy' to copy the ingredient.
- Add a copy by clicking 'Okay'. The information of the ingredient will be duplicated one active for use the other (grey one) for reference.

The screenshot shows the 'Feed Editor' application window. On the left, a list of ingredients is displayed with columns for 'Category' and 'Name'. The ingredient 'African foxtail grass fresh > 90-150 g/kg CP' is selected and highlighted in blue. A red box highlights the 'Add Copy' button next to it. A red arrow points from this button to the 'Okay' button in the 'Edit' dialog box on the right. The 'Edit' dialog box shows the name of the selected ingredient and various feed parameters. The 'Okay' button is highlighted in green.

Category	Name
GFas	African foxtail grass fresh < 90 g/kg CP
GFas	African foxtail grass fresh > 90-150 g/kg CP
GFas	African foxtail grass fresh > 150 g/kg CP
Hay	African foxtail grass hay
Bypr	Avocado seed fresh fat < 100 g/kg
Bypr	Avocado seed fresh fat > 100 g/kg
Conc	Avocado seed meal fat < 100 g/kg
Conc	Avocado seed meal fat > 100 g/kg
GFig	Bamboo (Giant thorny) leaves fresh
GFig	Bamboo leaves fresh
GFig	Bana grass fresh
GFig	Banana corms fresh
GFig	Banana leaves fresh
Bypr	Banana leaves meal
GFig	Banana mature pseudostems
GFig	Banana peels
GFig	Banana peels immature fresh
GFig	Banana whole plant fresh
Sl	Banana whole plant silage
GFig	Banana young pseudostems
Bypr	Barley bran
Conc	Barley grain
Bypr	Barley straw
Hay	Bean hay
Bypr	Bean mature WF fresh (without seeds)
Bypr	Bean straw
GFig	Bean young fresh leaves
Bypr	Blood Fresh
Conc	Bone Meal
GFig	Brachiaria (Signal Grass) fresh
Bypr	Brewers grain dry
Bypr	Brewers grain silage
Bypr	Brewers grain wet (Machicha)

**Edit**

Name: African foxtail grass fresh > 90-150 g/kg CP

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 classification  
 Concentrate  Forage  Other

DM (g/kg)	173	aN	0.29	NDF (g/kg)	729
ME (MJ/kg)	9.9	bN	0.63	eNDF in NDF	900
CP (g/kg)	18	cN	0.10	Starch (g/kg)	0
Fat (g/kg)	2	ADIN (g/kg)	1.2	Sugar (g/kg)	0
Ca (g/kg)	2.6	Ca abs	0.30	Ash (g/kg)	103
P (g/kg)	1.7	P abs	0.64	Cost (Ush/t DM)	0
Mg (g/kg)	2.2	Mg abs	0.16	Cost (Ush/t fed)	0
K (g/kg)	19.5	Max feeding rate (g/kg)		Losses (%)	0
Na (g/kg)	0.9	Wet density (kg/m <sup>3</sup> )		Cost + loss	-
Cl (g/kg)	0.0	Source	Kenyan Rumen8 Team	Cost + loss, fr	-
S (g/kg)	0.0	Comment			

DCAD:

Required feed parameter names are in bold  
Units are on a DM basis unless shown otherwise

**Okay** Cancel

## 6. The Copied Feeds

- The copies means all the information are the same/duplicated.
- However, nutritive values and other parameters of a copy can be edited, except the shared feed library that is not editable.
- The correct method is to make a copy of the feed you want to edit and save it under a new name or the same name as in the red box.

Feed Editor

Manage feeds | Manage mixes | Manage libraries and Ingredient visibility

Category	Name
GPas	African foxtail grass fresh < 90 g/kg CP
GPas	African foxtail grass fresh <> 90-150 g/kg CP
GPas	African foxtail grass fresh > 150 g/kg CP
Hay	African foxtail grass hay
Bypr	Avocado seed fresh fat < 100 g/kg
Bypr	Avocado seed fresh fat > 100 g/kg
Conc	Avocado seed meal fat < 100 g/kg
Conc	Avocado seed meal fat >100 g/kg
GFrg	Bamboo (Giant thorny) leaves fresh
GFrg	Bamboo leaves fresh
GFrg	Bana grass fresh
GFrg	Banana coms fresh
GFrg	Banana leaves fresh
Bypr	Banana leaves meal
GFrg	Banana mature pseudostems
GFrg	Banana peels
GFrg	Banana peels immature fresh
GFrg	Banana whole plant fresh
Sil	Banana whole plant silage
GFrg	Banana young pseudostems
Bypr	Barley bran
Conc	Barley grain
Bypr	Barley straw
Hay	Bean hay
Bypr	Bean mature WP fresh (without seeds)
Bypr	Bean straw
GFrg	Bean young fresh leaves
Bypr	Blood Fresh
Conc	Bone Meal
GFrg	Brachiaria (Signal Grass) fresh
Bypr	Brewers grain dry
Bypr	Brewers grain silage

Edit

Add Copy

Delete



## 6.1 Editing the Copied Feeds

- You can edit the parameter of the activated feed. Reasons for changing any of the parameters are a feed analysis or a visual assessment of the quality of the feed on the farm.
- You can also edit the name of the ingredient by adding the date, the name of the farm, or a batch number.
- After activating a feed we do not advise that you change parameters under (red box);
  - i. Feed management categories
  - ii. Feed protein type
  - iii. Feed particle size classification

**Edit**

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

<b>DM (g/kg)</b>	<input type="text" value="887"/>	<b>aN</b>	<input type="text" value="0.08"/>	<b>NDF (g/kg)</b>	<input type="text" value="440"/>
<b>ME (MJ/kg)</b>	<input type="text" value="11.9"/>	<b>bN</b>	<input type="text" value="0.92"/>	<b>eNDF in NDF</b>	<input type="text" value="339"/>
<b>CP (g/kg)</b>	<input type="text" value="100"/>	<b>cN</b>	<input type="text" value="0.02"/>	<b>Starch (g/kg)</b>	<input type="text" value="354"/>
<b>Fat (g/kg)</b>	<input type="text" value="62"/>	<b>ADIN (g/kg)</b>	<input type="text" value="1.0"/>	<b>Sugar (g/kg)</b>	<input type="text" value="22"/>
<b>Ca (g/kg)</b>	<input type="text" value="1.9"/>	<b>Ca abs</b>	<input type="text" value="0.60"/>	<b>Ash (g/kg)</b>	<input type="text" value="39"/>
<b>P (g/kg)</b>	<input type="text" value="3.5"/>	<b>P abs</b>	<input type="text" value="0.70"/>	<b>Cost (Ush/t DM)</b>	<input type="text" value="9019"/>
<b>Mg (g/kg)</b>	<input type="text" value="2.2"/>	<b>Mg abs</b>	<input type="text" value="0.16"/>	<b>Cost (Ush/t fed)</b>	<input type="text" value="8000"/>
<b>K (g/kg)</b>	<input type="text" value="7.3"/>	<b>Max feeding rate (g/kg)</b>	<input type="text"/>	<b>Losses (%)</b>	<input type="text" value="0"/>
<b>Na (g/kg)</b>	<input type="text" value="0.8"/>	<b>Wet density (kg/m3)</b>	<input type="text"/>	<b>Cost +loss</b>	9019
<b>Cl (g/kg)</b>	<input type="text" value="0.0"/>	<b>Source</b>	<input type="text" value="SNV Team"/>	<b>Cost +loss. fr</b>	8000
<b>S (g/kg)</b>	<input type="text" value="0.0"/>	<b>Comment</b>	<input type="text" value="Ruminal acidosis risk (risk level depends on ma"/>		
<b>DCAD</b>	<input type="text"/>				

Required feed parameter names are in bold  
Units are on a DM basis unless shown otherwise

## 6.2 Editing the Copied Feed Ingredients Cont'd...

- Based on your experience and expertise in the field or if the feed analysis has data for DM, ME, CP, NDF, and starch, you may want to change those values in the farm-specific new feed.
- It is recommended to leave all other values as copied from the ingredient in the shared feed library. E.g in our example that includes the list of minerals, fat, aN, bN, cN, ADIN, Ca abs, P abs, Mg abs, eNDF, sugar, and Ash.
- Rumen8 will not run properly if you put a dash or zero (0) in the 'boxes' in case no accurate data are available to replace the data used in the SNV Tropical Feed Library.

**Edit**

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

<b>DM (g/kg)</b>	<input type="text" value="887"/>	<b>aN</b>	<input type="text" value="0.08"/>	<b>NDF (g/kg)</b>	<input type="text" value="440"/>
<b>ME (MJ/kg)</b>	<input type="text" value="11.9"/>	<b>bN</b>	<input type="text" value="0.92"/>	<b>eNDF in NDF</b>	<input type="text" value="339"/>
<b>CP (g/kg)</b>	<input type="text" value="100"/>	<b>cN</b>	<input type="text" value="0.02"/>	<b>Starch (g/kg)</b>	<input type="text" value="354"/>
<b>Fat (g/kg)</b>	<input type="text" value="62"/>	<b>ADIN (g/kg)</b>	<input type="text" value="1.0"/>	<b>Sugar (g/kg)</b>	<input type="text" value="22"/>
<b>Ca (g/kg)</b>	<input type="text" value="1.9"/>	<b>Ca abs</b>	<input type="text" value="0.60"/>	<b>Ash (g/kg)</b>	<input type="text" value="39"/>
<b>P (g/kg)</b>	<input type="text" value="3.5"/>	<b>P abs</b>	<input type="text" value="0.70"/>	<b>Cost (Ush/t DM)</b>	<input type="text" value="9019"/>
<b>Mg (g/kg)</b>	<input type="text" value="2.2"/>	<b>Mg abs</b>	<input type="text" value="0.16"/>	<b>Cost (Ush/t fed)</b>	<input type="text" value="8000"/>
<b>K (g/kg)</b>	<input type="text" value="7.3"/>	<b>Max feeding rate (g/kg)</b>	<input type="text" value=""/>	<b>Losses (%)</b>	<input type="text" value="0"/>
<b>Na (g/kg)</b>	<input type="text" value="0.8"/>	<b>Wet density (kg/m<sup>3</sup>)</b>	<input type="text" value=""/>	<b>Cost +loss</b>	9019
<b>Cl (g/kg)</b>	<input type="text" value="0.0"/>	<b>Source</b>	<input type="text" value="SNV Team"/>	<b>Cost +loss. fr</b>	8000
<b>S (g/kg)</b>	<input type="text" value="0.0"/>	<b>Comment</b>	<input type="text" value="Ruminal acidosis risk (risk level depends on ma"/>		
<b>DCAD</b>	<input type="text" value=""/>				

Required feed parameter names are in bold  
Units are on a DM basis unless shown otherwise

## 7. Cost of ingredients

- The cost of an ingredient are calculated in two ways;
  - Cost of 1 ton of dry matter (e.g. Ush/t DM)
  - Cost of 1 ton as fed (e.g. Ush/t fed)
- The price of a ton of an ingredient can be affected by losses, for example, when feeding the cow, maxing a ration, etc. This can be accounted for by estimating the losses as a percentage (%) per ton of feed.
 

\*Note for all prices in this example **the currency divisor 100 (Cd 100)**.
- The price of Maize bran in this example has been divided by 100. Meaning the correct amount is **Ush 8,000 X 100 = Ush.800,000** per ton of Maize bran.

**Edit**

**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

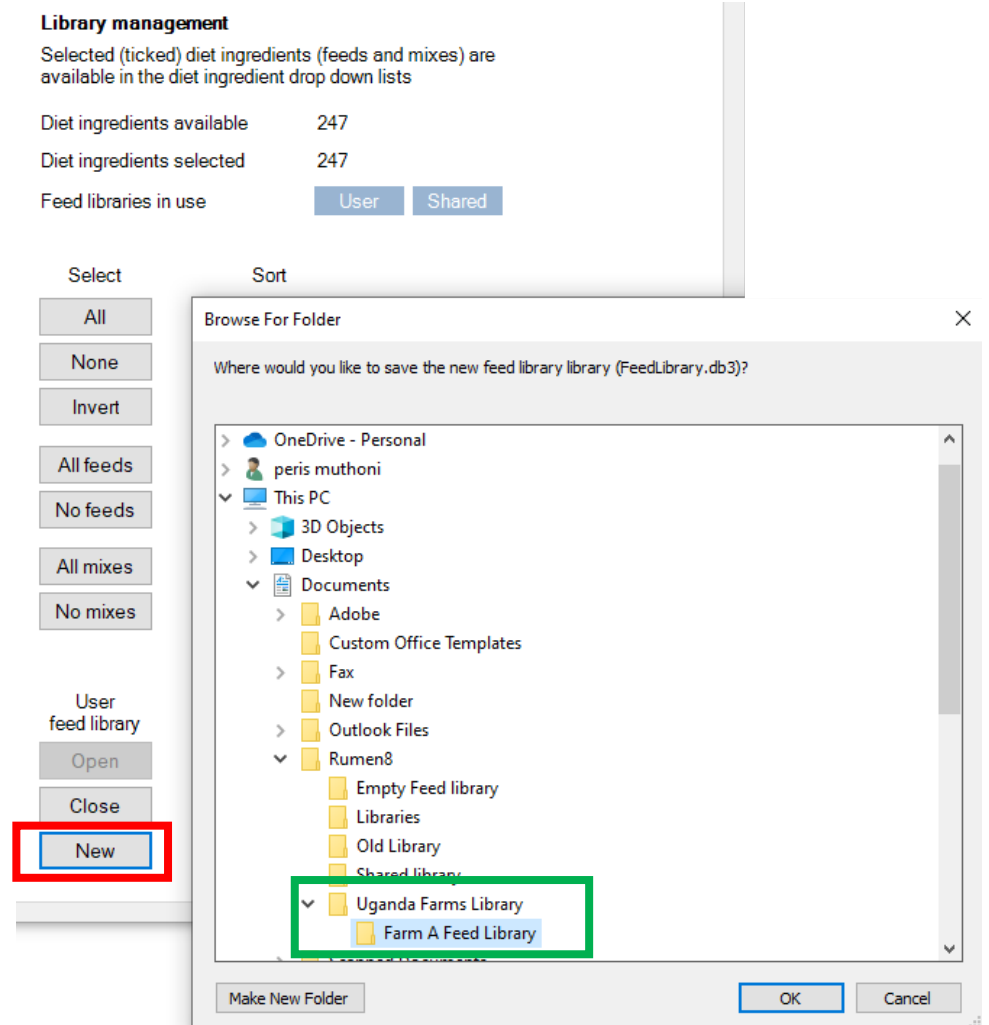
<b>DM (g/kg)</b>	<input type="text" value="887"/>	<b>aN</b>	<input type="text" value="0.08"/>	<b>NDF (g/kg)</b>	<input type="text" value="440"/>
<b>ME (MJ/kg)</b>	<input type="text" value="11.9"/>	<b>bN</b>	<input type="text" value="0.92"/>	<b>eNDF in NDF</b>	<input type="text" value="339"/>
<b>CP (g/kg)</b>	<input type="text" value="100"/>	<b>cN</b>	<input type="text" value="0.02"/>	<b>Starch (g/kg)</b>	<input type="text" value="354"/>
<b>Fat (g/kg)</b>	<input type="text" value="62"/>	<b>ADIN (g/kg)</b>	<input type="text" value="1.0"/>	<b>Sugar (g/kg)</b>	<input type="text" value="22"/>
<b>Ca (g/kg)</b>	<input type="text" value="1.9"/>	<b>Ca abs</b>	<input type="text" value="0.60"/>	<b>Ash (g/kg)</b>	<input type="text" value="39"/>
<b>P (g/kg)</b>	<input type="text" value="3.5"/>	<b>P abs</b>	<input type="text" value="0.70"/>	<b>Cost (Ush/t DM)</b>	<input type="text" value="9019"/>
<b>Mg (g/kg)</b>	<input type="text" value="2.2"/>	<b>Mg abs</b>	<input type="text" value="0.16"/>	<b>Cost (Ush/t fed)</b>	<input type="text" value="8000"/>
<b>K (g/kg)</b>	<input type="text" value="7.3"/>	<b>Max feeding rate (g/kg)</b>	<input type="text" value=""/>	<b>Losses (%)</b>	<input type="text" value="0"/>
<b>Na (g/kg)</b>	<input type="text" value="0.8"/>	<b>Wet density (kg/m3)</b>	<input type="text" value=""/>	<b>Cost +loss</b>	<input type="text" value="9019"/>
<b>Cl (g/kg)</b>	<input type="text" value="0.0"/>	<b>Source</b>	<input type="text" value="SNV Team"/>	<b>Cost +loss. fr</b>	<input type="text" value="8000"/>
<b>S (g/kg)</b>	<input type="text" value="0.0"/>	<b>Comment</b>	<input type="text" value="Ruminal acidosis risk (risk level depends on ma"/>		
<b>DCAD</b>	<input type="text" value=""/>				

Required feed parameter names are in bold  
Units are on a DM basis unless shown otherwise

## 8. Saving your (Farm name) populated feed library

After the several ingredients from the empty feed library, you can save your new feed library. Here are the steps;

- Under the 'Feed editor' select the last tab 'Manage feed and ingredients visibility', on the right-hand side on the section 'Library management. At the bottom indicated 'User feed library, Click on 'New'(Red box).
- Browse for a folder will pop up, select folder Rumens, then select the folder under your Surname or country. In this case, Uganda Farms Library.
- Make a new folder under this and you can name it Farm A Feed Library (green box), finally click 'OK' (blue box).



## 9. Your (Farm name) feed library

- To view all the feeds you copied in your library, under the 'Feed editor' select the tab 'Manage feed and ingredients visibility', on the right-hand side on the section 'Library management'.
- At the bottom indicated 'Shared feed library', Click on 'close' (red box). This will close the 'Shared feed library' in grey color and remain with the black-colored ingredients (green box) you saved library.

The screenshot shows the 'Feed Editor' application window with the 'Manage libraries and ingredient visibility' tab selected. The interface is divided into two main sections: 'Ingredients visible during diet creation' and 'Library management'.

**Ingredients visible during diet creation**

Category	Name
<input checked="" type="checkbox"/> GPae	African foxtail grass fresh > 90-150 g/kg CP
<input checked="" type="checkbox"/> GFrg	Brachiaria (Signal Grass) fresh
<input checked="" type="checkbox"/> Bypr	Brewers grain wet
<input checked="" type="checkbox"/> Mix	Fam A MIX 01/01/22
<input checked="" type="checkbox"/> Add	Limestone (CaCO3)
<input checked="" type="checkbox"/> Bypr	Maize bran
<input checked="" type="checkbox"/> Conc	Maize grain
<input checked="" type="checkbox"/> Sil	Maize silage DM > 30-35%
<input checked="" type="checkbox"/> Add	Minerals Maclick Super
<input checked="" type="checkbox"/> Conc	Molasses (cane)
<input checked="" type="checkbox"/> GFrg	Napier fresh 60 cm
<input checked="" type="checkbox"/> Hay	Rhodes hay High CP (Chloris gayana)
<input checked="" type="checkbox"/> Conc	Sunflower seed meal dehulled CF < 200 g/kg
<input checked="" type="checkbox"/> Bypr	Wheat pollard

**Library management**

Selected (ticked) diet ingredients (feeds and mixes) are available in the diet ingredient drop down lists

Diet ingredients available: 14  
Diet ingredients selected: 14

Feed library in use: [User](#)

Select: All, None, Invert, All feeds, No feeds, All mixes, No mixes

Sort: Name, Category, Selection, Library, Print

User feed library: Open, Close, New

**Shared feed library** (highlighted in red): Open, Close

Share: Import, Export

## 10. Deleting a feed from the farm feed library

If you want to delete or edit an existing feed from your library;

- Click on 'Edit' from the Rumen8 landing page and then click on the 'Edit Feeds' option.
- If your library is still open, click the first tab 'Manage feeds' and select an ingredient in this case then click on 'Delete' (red box). The copy will be deleted.
- To Edit the parameter/value and other parameters click on 'Edit' (green box). The Edit section on the right hand side will be activated for editing.

The screenshot shows the 'Feed Editor' application with three tabs: 'Manage feeds', 'Manage mixes', and 'Manage libraries and Ingredient visibility'. The 'Manage feeds' tab is active, displaying a list of feeds. The feed 'African foxtail grass fresh < 90-150 g/kg CP' is selected and highlighted in blue. To the right of the list are three buttons: 'Edit' (highlighted with a green box), 'Add Copy' (highlighted with a green box), and 'Delete' (highlighted with a red box). The 'Edit' panel on the right is also highlighted with a green box and contains the following information:

**Edit**  
Name: African foxtail grass fresh < 90-150 g/kg CP

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

DM (g/kg)	173	aN	0.29	NDF (g/kg)	729
ME (MJ/kg)	9.9	bN	0.63	eNDF in NDF	900
CP (g/kg)	118	cN	0.10	Starch (g/kg)	0
Fat (g/kg)	21	ADIN (g/kg)	1.2	Sugar (g/kg)	0
Ca (g/kg)	2.6	Ca abs	0.30	Ash (g/kg)	103
P (g/kg)	1.7	P abs	0.64	Cost (Ush/t DM)	57803
Mg (g/kg)	2.2	Mg abs	0.16	Cost (Ush/t fed)	10000
K (g/kg)	19.5	Max feeding rate (g/kg)		Losses (%)	0
Na (g/kg)	0.9	Wet density (kg/m3)		Cost +loss	57803
Cl (g/kg)	0.0	Source	Kenyan Rumen8 Team	Cost +loss. fr	10000
S (g/kg)	0.0	Comment			
DCAD					

Required feed parameter names are in bold  
Units are on a DM basis unless shown otherwise

Okay Cancel

## 11. Manage Mixes

- If you want to make a compounded feed such as dairy meal, or any other mixes this feature will be helpful.
- Feed mixtures can be made under the tab 'Manage Mixes' or created automatically from the current diet.
- To create mixes under the tab 'Manage mixes', in the landing page click <Edit> then <Edit feeds> followed by <Manage mixes> then click <Add New> (red box) for a new mixture.
- Multiple feeds can be added to the mix by selecting the first feed from the list of ingredients (in the green box).

The screenshot shows the 'Feed Editor' application window. The 'Manage mixes' tab is active, and the 'Add New' button is highlighted with a red box. A yellow arrow points to this button. Below the 'Add New' button is a text input field for the mix name. To the right, the 'Edit' panel shows a table for mix percentages and a list of ingredients. The ingredients list is highlighted with a green box, and the first item, 'GPas African foxtail grass fresh <=> 90...', is selected. The 'Edit' panel also includes fields for 'Name', 'Max feeding rate (g/kg)', 'Wet density (kg/m3)', 'Source', and 'Comment', along with 'Mix cost (Ush/t)' and 'Ingredients cost (Ush/t)' fields.

Feed Editor

Manage feeds Manage mixes Manage libraries and Ingredient visibility

Edit Add New Add Copy Delete

Name

Edit

Mix percentages  Dry matter  As fed

Percent	Feed
---------	------

Total: 88% (12%) Mix DM 55.5%

Category	Name
GPas	African foxtail grass fresh <=> 90...
GFrG	Brachiaria (Signal Grass) fresh...
Bypr	Brewers grain wet
Add	Limestone (CaCO3)
Bypr	Maize bran
Add	Minerals Maclick Super
Conc	Molasses (cane)
GFrG	Napier fresh 60 cm
Bypr	Wheat pollard

Okay Cancel

Name

Max feeding rate (g/kg)  Mix cost (Ush/t)  DM  as fed

Wet density (kg/m3)  Ingredients cost (Ush/t) 99999 99999

Losses (%)

Source

Comment

## 11.1 Manage Mixes Cont'd...

- Click on the arrow (<) button to move the selected feeds into the mix. Now enter the percentages of each feed, either on a 'Dry matter' or on an 'As fed' basis.
- The feed percentages must equal 100% before you will be able to exit the mix editor and save the mix with a unique name.
- Identify the mix by saving it with a unique name and date.

visibility

### Edit

Mix percentages  Dry matter  As fed Okay Cancel

Percent	Feed
5	Limestone (CaCO3)
50	Maize bran
5	Minerals Maclick Super
5	Molasses (cane)
35	Sunflower seed meal dehulled C...

**<** **>**


Category	Name
GFrg	Brachiarina (Signal Grass) fresh
Bypr	Brewers grain wet
Conc	Maize grain
Sil	Maize silage DM <> 30-35%
GFrg	Napier fresh 60 cm
Hay	Rhodes hay High CP (Chloris g...
Bypr	Wheat pollard

Total: 100.0 Mix DM 89.3%

**Name** MIX A 10/1/2022

Max feeding rate (g/kg)	<input type="text"/>	Mix cost (Ush/t)	<input type="text" value="100"/>	DM	<input type="text" value="100"/>	as fed	<input type="text" value="89"/>
Wet density (kg/m3)	<input type="text"/>	Ingredients cost (Ush/t)	1615				1442
		Losses (%)	<input type="text" value="1"/>				

Source SNV RUMEN 8 TEAM

Comment 



## 11.2 Manage Mixes Cont'd...

- Before clicking 'Okay' enter a cost of the mix, which usually is the sum of the 'Ingredients cost' plus a fee for mixing and the percentage of losses.

\*The cost of the ingredients will be displayed in your feed library if every ingredient is edited or issued with the cost per ton fed.

- Now the mix can be used when formulating a cow ration.
- When using the mix to formulate a ration you can scroll/hover over it by putting the cursor on the name of the mix and all parameters will be shown in a pop-up.

**Edit**

Mix percentages     Dry matter     As fed    Okay Cancel

Percent	Feed
5	Limestone (CaCO <sub>3</sub> )
50	Maize bran
5	Minerals Maclick Super
5	Molasses (cane)
35	Sunflower seed meal dehulled C...

Total: 100.0                      Mix DM 89.3%

**Name**

	DM	as fed
Mix cost (Ush/t)	<input type="text" value="100"/>	<input type="text" value="89"/>
Ingredients cost (Ush/t)	1615	1442
Losses (%)	<input type="text" value="1"/>	

Max feeding rate (g/kg)

Wet density (kg/m<sup>3</sup>)

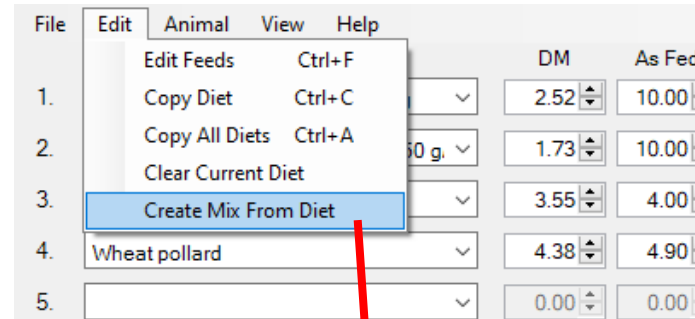
Source

Comment

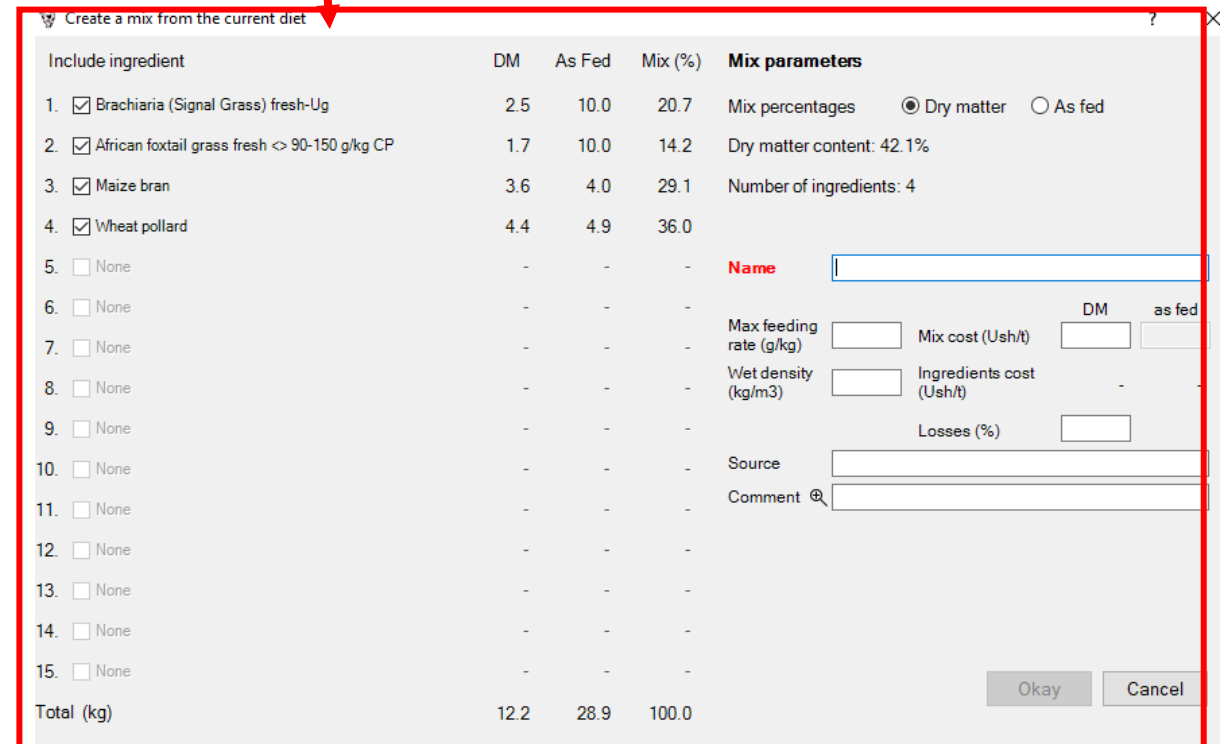
Category	Name
GFrg	Brachiaria (Signal Grass) fresh
Bypr	Brewers grain wet
Conc	Maize grain
Sil	Maize silage DM <> 30-35%
GFrg	Napier fresh 60 cm
Hay	Rhodes hay High CP (Chloris g...
Bypr	Wheat pollard

## 12. 'Create Mix from Diet (ration)'

- Mixtures can also be created automatically from the current diet being formulated by selecting the <Edit> tab from the landing page and then the <Create Mix From Diet>.
- Then unselect feeds that you don't want to include in the (compound) feed mix and then give the mix a name (highlighted in red box).
- Mix percentages can be shown on an 'as-is' or on a dry matter basis.



		DM	As Fed
1.		2.52	10.00
2.		1.73	10.00
3.		3.55	4.00
4.	Wheat pollard	4.38	4.90
5.		0.00	0.00



Include ingredient	DM	As Fed	Mix (%)	Mix parameters
1. <input checked="" type="checkbox"/> Brachiaria (Signal Grass) fresh-Ug	2.5	10.0	20.7	Mix percentages <input checked="" type="radio"/> Dry matter <input type="radio"/> As fed Dry matter content: 42.1% Number of ingredients: 4
2. <input checked="" type="checkbox"/> African foxtail grass fresh < 90-150 g/kg CP	1.7	10.0	14.2	
3. <input checked="" type="checkbox"/> Maize bran	3.6	4.0	29.1	
4. <input checked="" type="checkbox"/> Wheat pollard	4.4	4.9	36.0	
5. <input type="checkbox"/> None	-	-	-	Name <input type="text"/> Max feeding rate (g/kg) <input type="text"/> Mix cost (Ush/t) <input type="text"/> <input type="text"/> <input type="text"/> Wet density (kg/m3) <input type="text"/> Ingredients cost (Ush/t) <input type="text"/> Losses (%) <input type="text"/> Source <input type="text"/> Comment <input type="text"/> Okay Cancel
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)	12.2	28.9	100.0	

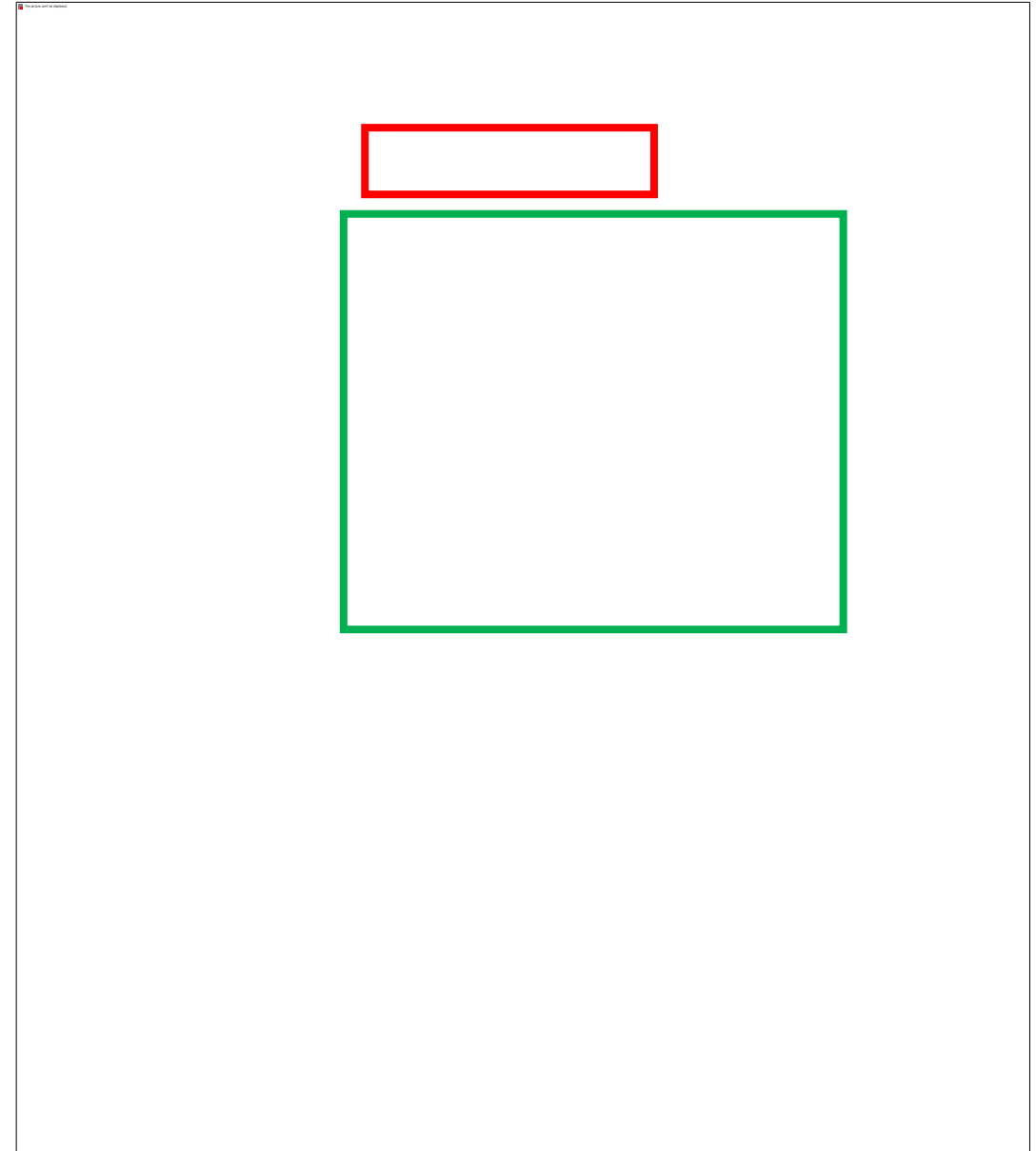
## 13. Dairy animal parameter set-up

- On the landing page click the tab 'Animal' and select the 'Use standard Animal' (red boxes).
- The software will show the default settings for the standard cow at different production levels and lactation stages for all the parameters under the tab 'Dairy' animal on the right-hand side of the landing page.
- For example as highlighted, we can select a cow producing 5,000 liters (in most cases in the tropics/East Africa a cow producing this amount is a high producer) in lactation and click on the early lactation stage.

The screenshot shows a software interface with a menu bar (File, Edit, Animal, View, Help) and a 'Dairy' tab. The 'Animal' menu is open, showing options: 'Save Current Animal as Default', 'Reload Default Animal', 'Use Standard Animal' (highlighted), 'Dry Off Current Animal' (Ctrl+D), and 'Move Cow into the Transition Herd' (Ctrl+Shift+D). The 'Dairy' panel shows a dropdown menu for 'Dairy cow' (set to 'Dairy cow') and 'Holstein'. Below this, there are several lactation stage options: 'Lactation 10000 litres', 'Lactation 9000 litres', 'Lactation 8000 litres', 'Lactation 7000 litres', 'Lactation 6000 litres', 'Lactation 5000 litres' (highlighted), 'Lactation 4000 litres', 'Lactation 3000 litres', and 'Lactation 2000 litres'. To the right of these options are input fields for values like 500, -0.60, 60, 4.00, and 3.10. The 'Early Lactation' option is also highlighted in a sub-menu.

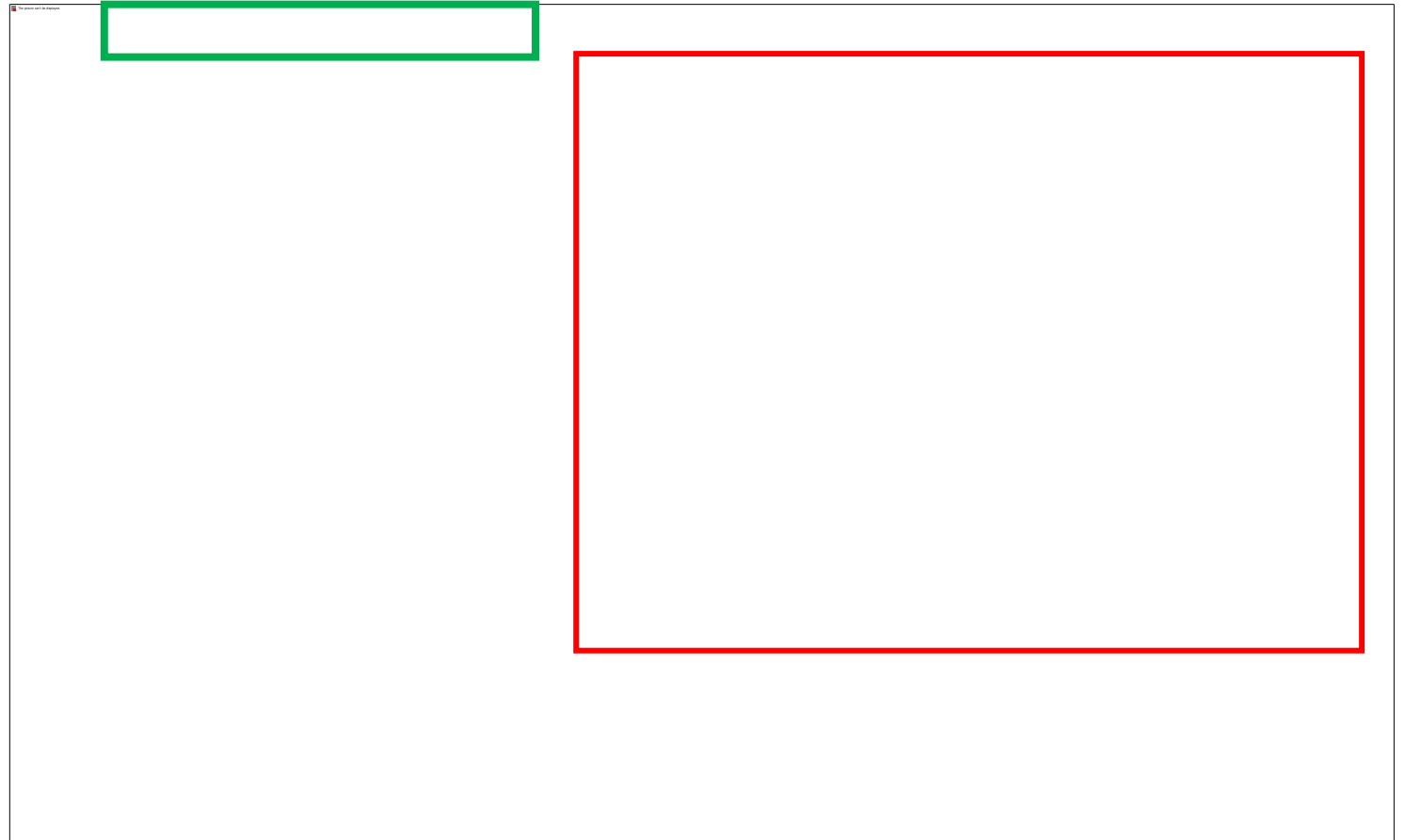
## 13.1 Animal (Dairy) Preference settings

- After selecting the standard cow of your choice, go to the tab 'File' on the Rumen8 landing page; click on 'Preferences' and then the tab 'Standard cows' to edit standard cows settings.
- The figure shows the display where settings can be changed for a standard cow of your choice in different lactation productions levels (red box) and lactation stages (green box).
- 'Close' to save the edited information.



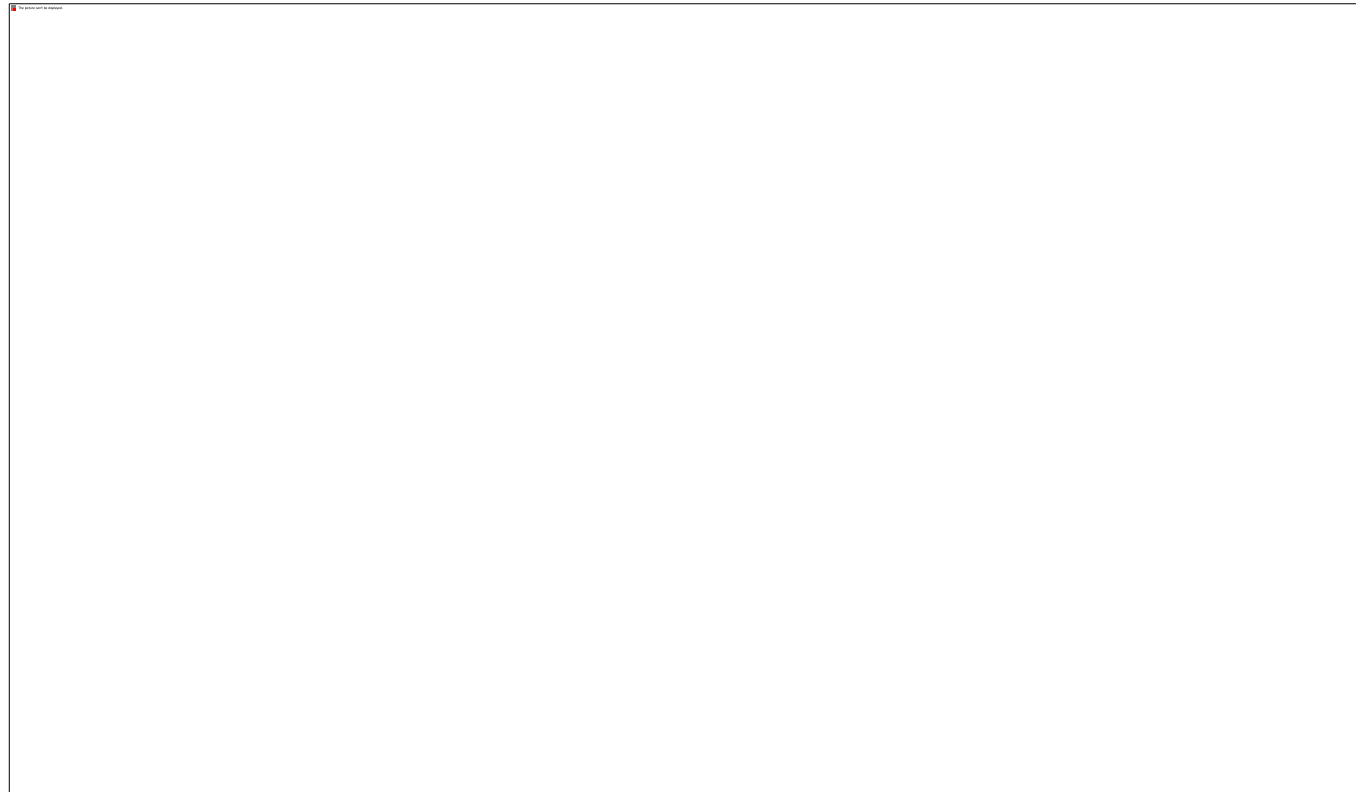
## 13.2 Tab 'Dairy' Parameters

- After selecting and setting your standard cow, the cow information appears on the Rumen8 landing page as shown in the red box.
- The dairy tab further gives you room to edit the information/parameters already displayed.
- These parameters are used to calculate nutrient demand and should be adjusted to match the average of the animal in the herd you are feeding.
- For future use you can 'Save current animal as default' cow after editing her details further on the green box.



## 14. Farm information - Farm tour

- The information required to fill in the page under the 'Dairy' tab should be made available by the farmer from his accurate farm record.
- If accurate farm records in regard to the animal parameters are not available, these figures can only be gotten during a farm walk and measuring the figures required.



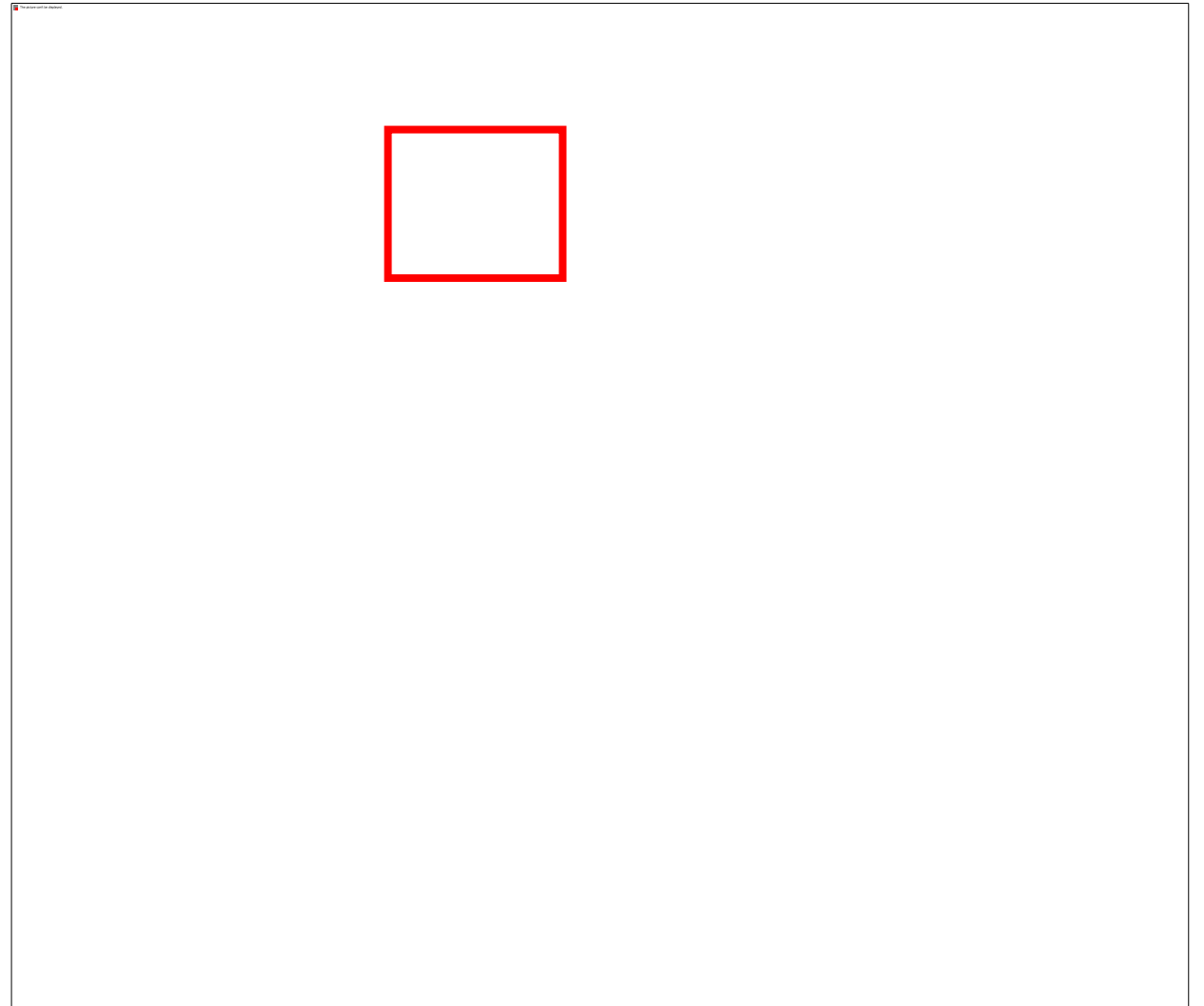
## 15. Cow selection Options

- Click clicking on the 'Diary' (pointed with the yellow arrow) to define the cow to be fed.
- Click the default choice 'Dairy cow' for more options to select the stage of the cow in the (red box);
  - i. Dairy cow - For cows that have calved before.
  - ii. Dairy heifer mated - for inseminated/served heifers.
  - iii. Dairy heifer unmated - for heifers not inseminated yet.



## 16. Breed selection Options

- To select the type of breed, click the section with the red box.
- Cow breed options that are available at the moment are as follows;
  - Holstein breed
  - Jersey breed
  - Other breeds e.g. Ayrshires, crossbreeds.

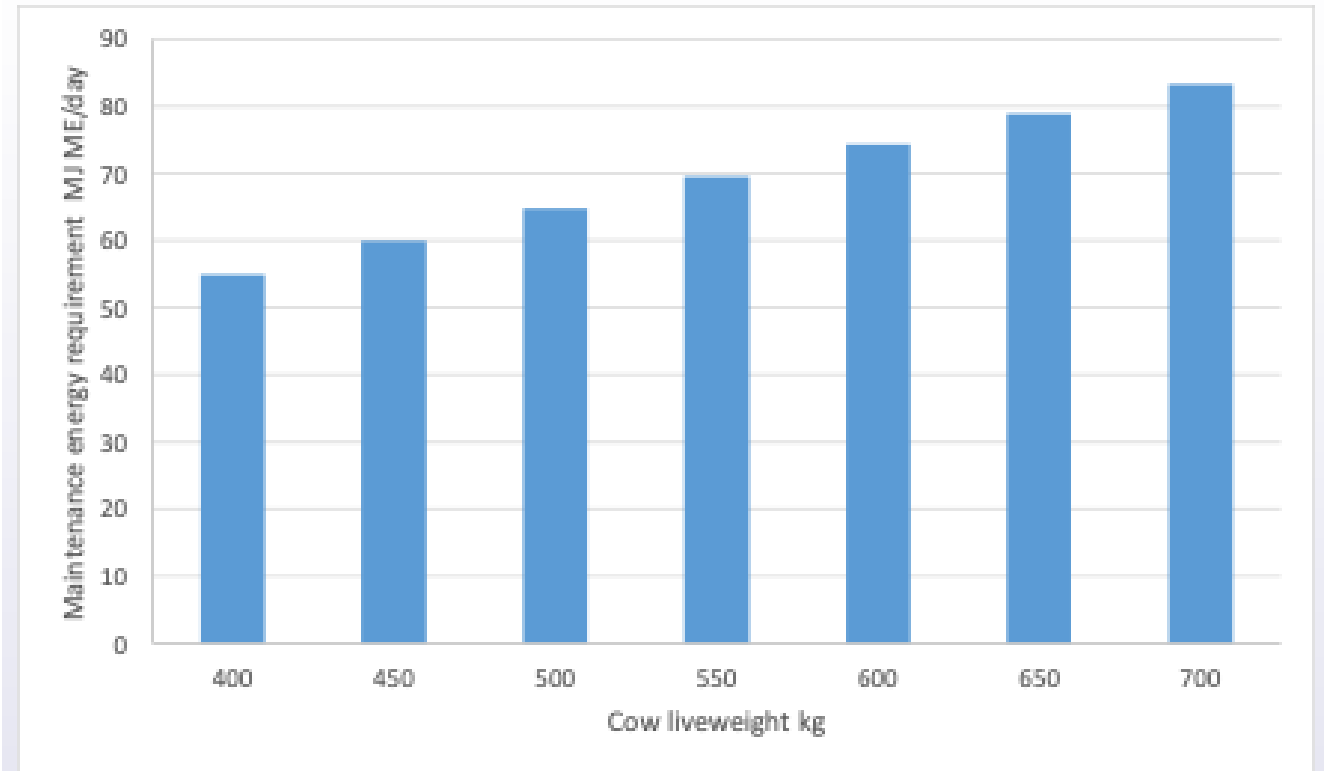




## 17. Animal weight (Kg)

- By placing your cursor on the live weight in kilograms (Kg), a pop-up guides or explains why weight is required.
- Accurate average cow live weight measurement or estimate is important because it affects cows' daily energy requirement.
- Use kill sheets if you don't have weighing scales.
- The figure shows maintenance energy requirement versus live weight.

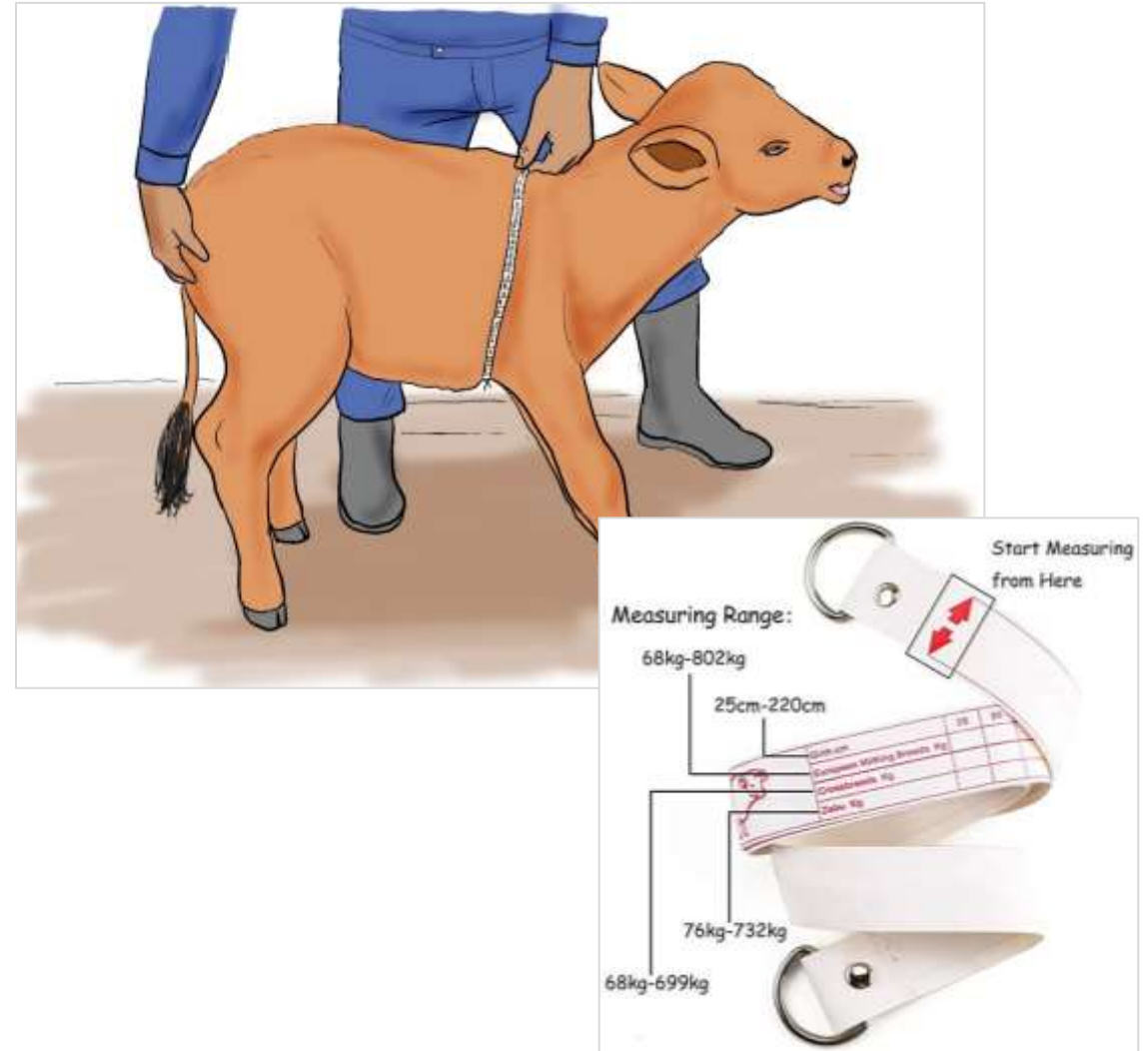
Average cow live weight



Source: Rumen8 version 3.5

## 18. How to weigh your cow

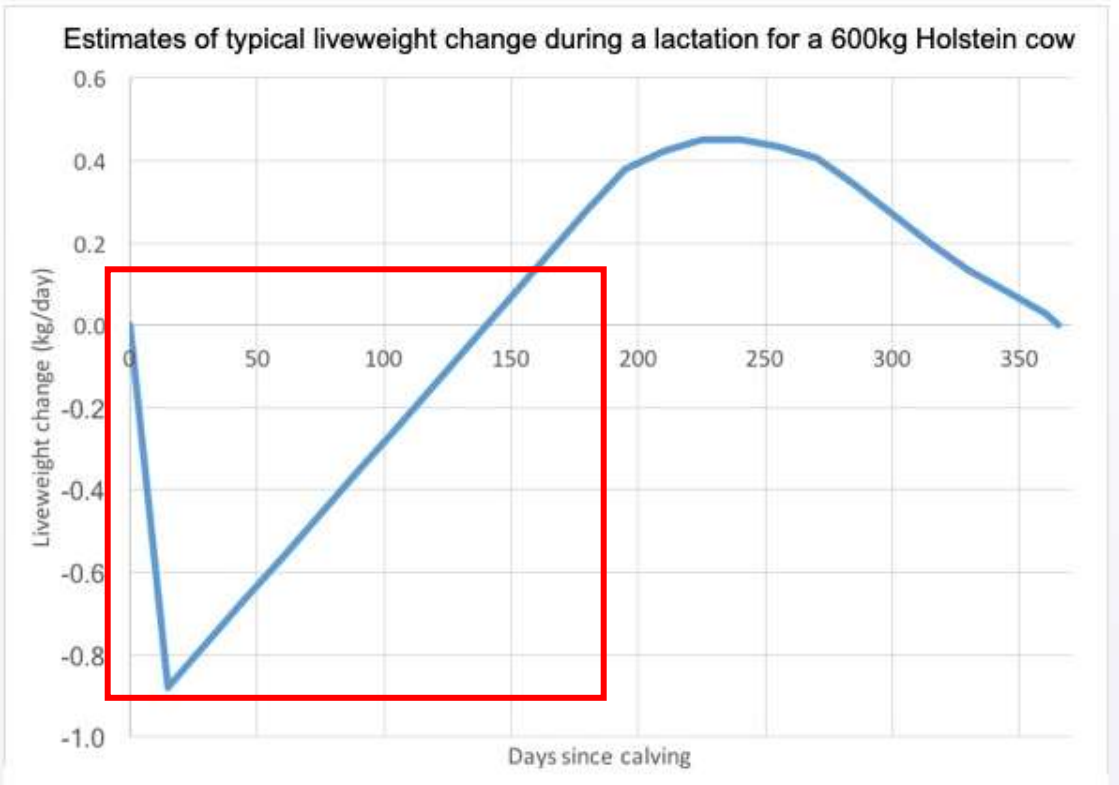
- One of the ways of weighing a cow is by using a weighing band.
- The weighing band method is as shown on the diagram.
  - Put the weigh band for cattle around the girth as close to the forelegs as possible and pull tight, and then check the weight in the tape.
- For getting more accurate results, please take several measurements and average the results.



## 19. Animal weight change (Kg/d)

- Placing your cursor on the Live weight change in Kilograms per day (Kg/d), a pop-up guides or explains why weight is required.
- This is estimated of a typical live weight change per day during a lactation period of different breeds as shown in the graph.
- During early lactation the live weight may drop, and the measure can be indicted while making a ration.

Average cow live weight change



## 19.1 Animal weight change (Kg/d) Cont'd...

- In the table alongside, comparison of lactation stage and body condition score (BCS) is shown as recommended.
- Australian BCS ranges from 1-8 where 1 is under-conditioned and 8 over-conditioned.
- The Penn State BCS ranges from 1-5 where 1 is under-conditioned and 5 are over-conditioned.

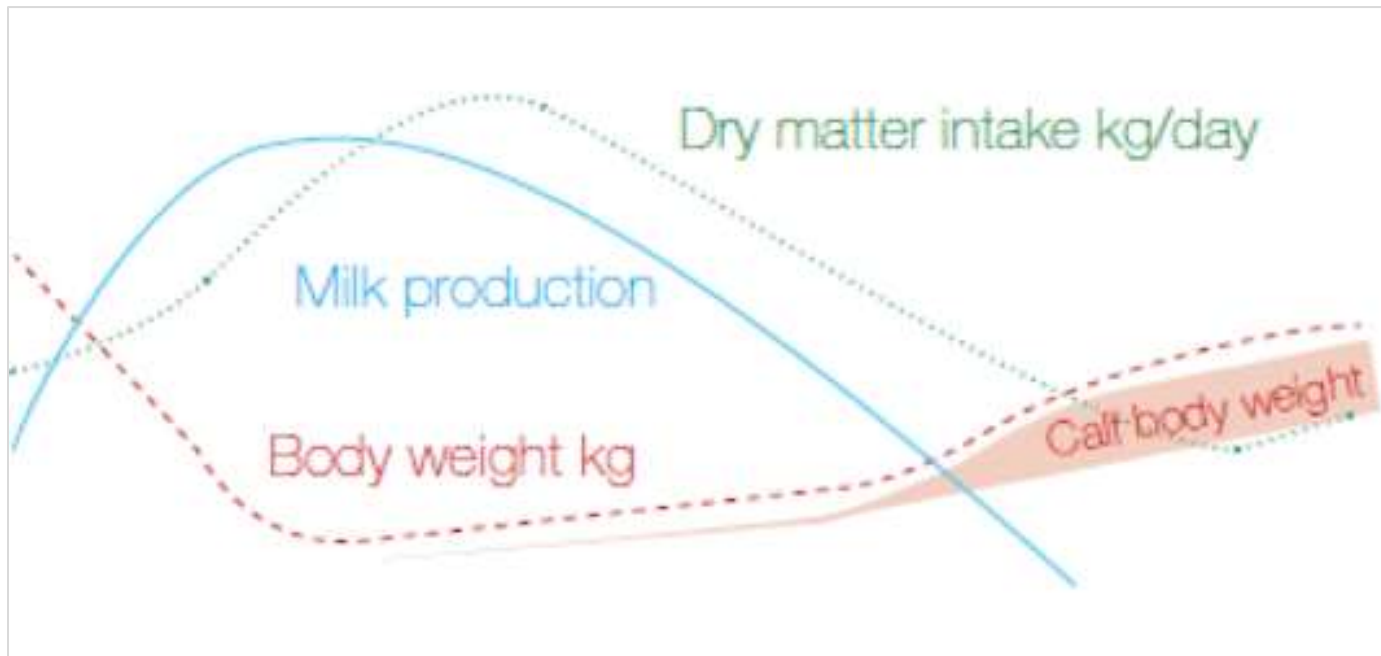
A comparison of body condition score targets at different stages of lactation between the Australian (1-8) and Penn State (1-5) systems

Stage of lactation	Days in milk	Mean Australian BCS goal	Mean Penn State BCS goal
Calving	0	5.0	3.5
Early lactation	1 to 30	4.5	3.0
Peak milk & mating	31 to 100	4.3	2.75
Mid lactation	101 to 200	4.5	3.0
Late lactation	201 to 300	4.75	3.3
Dry off	> 300	5.0	3.5
Dry off	-60 to -1	5.0	3.5

Source: Dr Martin Staines (pers. comm. 2018)

## 20. Days in Milk

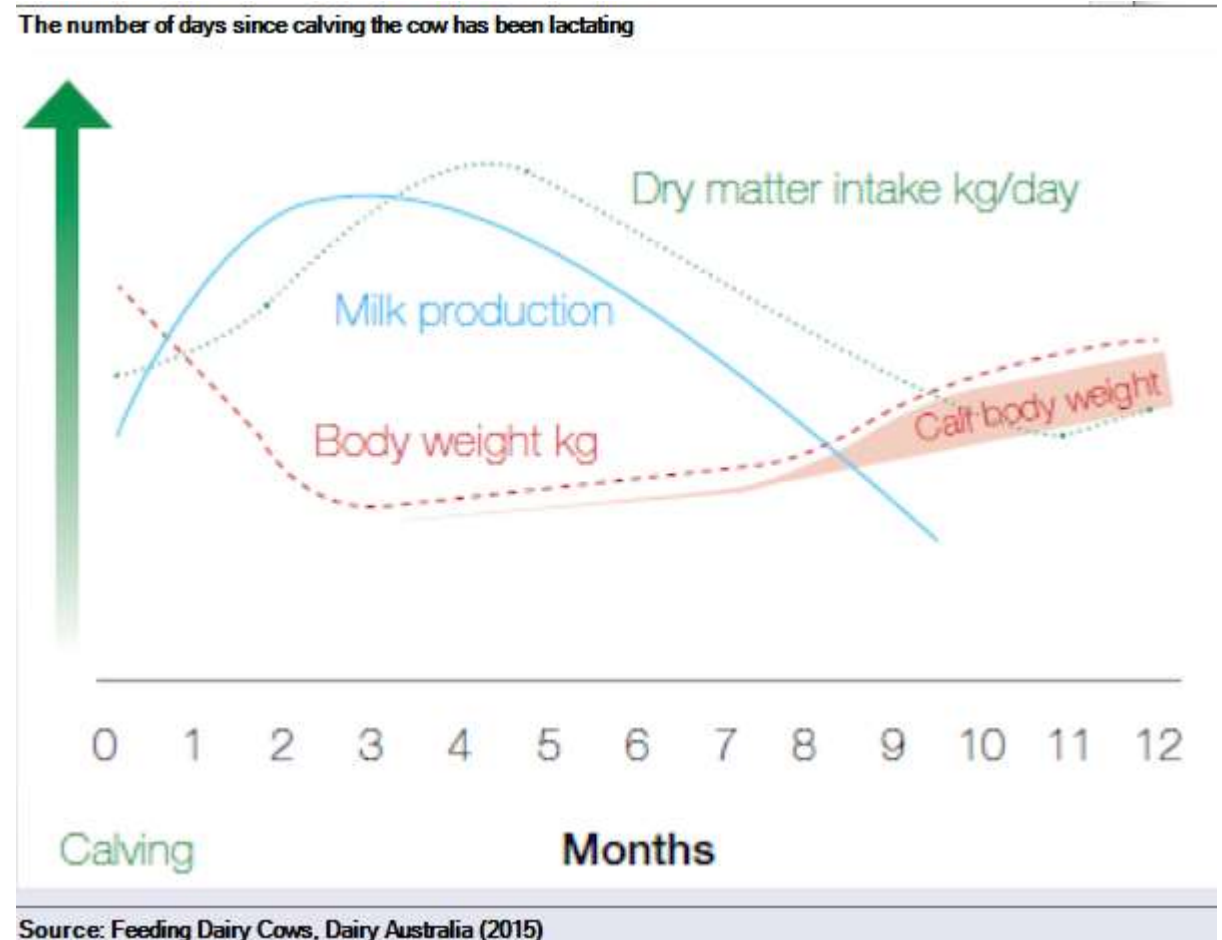
- The accurate Days in Milk (DIM) is important to estimate feed intake potential, as the stage of lactation influences the amount of feed a cow can consume.
- Days in milk is calculated from the date of the last calving to the current you are making ration for.
- Feed intake (KgDM/cow/day) is estimated using either the NRC (National Research Council, 2001) equation or the NDF intake as a percentage of cow live weight.



## 20.1 Days in Milk Cont'd...

- Peak dry matter intake (DMI) generally occurs at 80-100 days post-calving. It may occur at 60-80 days if cows have been well managed through the transition period.

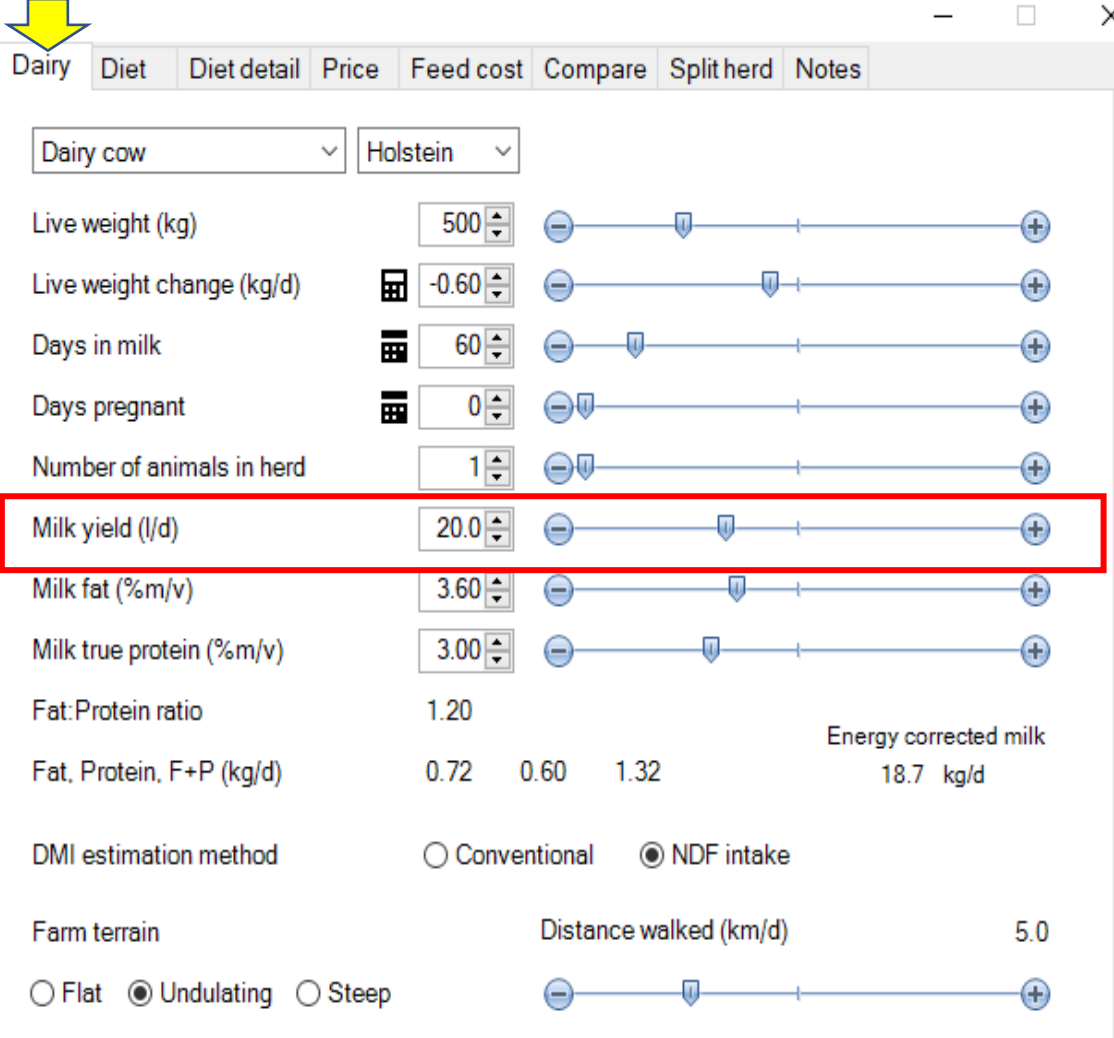
**Note:** Go to Preferences to select what Rumen8 should use.



**Figure:** Milk production and feed intake during the lactation cycle

## 21. Dairy Milk Yield

- Ensure you set the correct unit in the 'Preference' (liter or Kilogram/cow/day).
- If milking numbers are stable this should be the last 5-10 days on average.
- Yield should include all milk, including that being fed to calves and another milk bit suitable for human consumption i.e. total milk from the cow per day.



The screenshot shows a software interface for dairy cow management. A yellow arrow points to the 'Dairy' tab. The 'Milk yield (l/d)' field is highlighted with a red box. The interface includes various input fields and sliders for parameters like live weight, days in milk, and milk yield.

Parameter	Value	Unit
Live weight (kg)	500	kg
Live weight change (kg/d)	-0.60	kg/d
Days in milk	60	days
Days pregnant	0	days
Number of animals in herd	1	animals
Milk yield (l/d)	20.0	l/d
Milk fat (%m/v)	3.60	%m/v
Milk true protein (%m/v)	3.00	%m/v
Fat:Protein ratio	1.20	ratio
Fat, Protein, F+P (kg/d)	0.72	kg/d
Energy corrected milk	18.7	kg/d
Distance walked (km/d)	5.0	km/d

## 22. Milk Fat

- The accurate milk fat and protein concentration are important because they affect the cow's daily energy requirement.
- The concentration of fat and protein and the volume of milk produced vary depending on the breed of cow, stage of lactation and, ration.
- In most cases farmers will not know or have the accurate Milk fat measurement, so it is advisable to estimate e.g. 3.6g/kg of milk.

The concentration of fat in the milk

Fat (%)	Protein (%)									
	2.6	2.8	3.0	3.2	3.4	3.6	3.8	4.0	4.2	4.4
	MJ/kg of milk									
3.0	4.2	4.3	4.3	4.4	4.5	4.6	4.6	4.7	4.8	4.9
3.2	4.3	4.4	4.5	4.5	4.6	4.7	4.8	4.9	4.9	5.0
3.4	4.4	4.5	4.6	4.7	4.7	4.8	4.9	5.0	5.1	5.1
3.6	4.5	4.6	4.7	4.8	4.9	4.9	5.0	5.1	5.2	5.3
3.8	4.7	4.7	4.8	4.9	5.0	5.1	5.1	5.2	5.3	5.4
4.0	4.8	4.9	4.9	5.0	5.1	5.2	5.3	5.3	5.4	5.5
4.2	4.9	5.0	5.1	5.1	5.2	5.3	5.4	5.5	5.5	5.6
4.4	5.0	5.1	5.2	5.3	5.4	5.4	5.5	5.6	5.7	5.7
4.6	5.2	5.2	5.3	5.4	5.5	5.6	5.6	5.7	5.8	5.9
4.8	5.3	5.4	5.4	5.5	5.6	5.7	5.8	5.8	5.9	6.0
5.0	5.4	5.5	5.6	5.6	5.7	5.8	5.9	6.0	6.0	6.1
5.2	5.5	5.6	5.7	5.8	5.8	5.9	6.0	6.1	6.2	6.2
5.4	5.6	5.7	5.8	5.9	6.0	6.0	6.1	6.2	6.3	6.4
5.6	5.8	5.9	5.9	6.0	6.1	6.2	6.2	6.3	6.4	6.5
5.8	5.9	6.0	6.1	6.1	6.2	6.3	6.4	6.4	6.5	6.6
6.0	6.0	6.1	6.2	6.3	6.3	6.4	6.5	6.6	6.7	6.7

**Table:** Mega joules of metabolizable energy per kg of milk at a different fat/protein concentrate.

Source: Feeding Dairy Cows, Dairy Australia (2015)



## 23. Milk true protein

- The accurate milk protein concentration is important because it affects the cow's daily metabolizable protein requirement.
- The concentration of fat and protein and the volume of milk produced vary depending on the breed of cow, stage of lactation and, ration.
- In most cases farmers will not know or have the accurate Milk true protein measurement, so it is advisable to estimate e.g. 3.0g/kg of milk.

**Table:** Grams of metabolizable protein per kg of milk at a different fat/protein concentrate.

The concentration of true protein in the milk

Fat (%mv)	True protein (%mv)									
	2.6	2.8	3.0	3.2	3.4	3.6	3.8	4.0	4.2	4.4
3.0	47.8	51.5	55.2	58.9	62.5	66.2	69.9	73.6	77.3	80.9
3.2	47.8	51.5	55.2	58.9	62.5	66.2	69.9	73.6	77.3	80.9
3.4	47.8	51.5	55.2	58.9	62.5	66.2	69.9	73.6	77.3	80.9
3.6	47.8	51.5	55.2	58.9	62.5	66.2	69.9	73.6	77.3	80.9
3.8	47.8	51.5	55.2	58.9	62.5	66.2	69.9	73.6	77.3	80.9
4.0	47.8	51.5	55.2	58.9	62.5	66.2	69.9	73.6	77.3	80.9
4.2	47.8	51.5	55.2	58.9	62.5	66.2	69.9	73.6	77.3	80.9
4.4	47.8	51.5	55.2	58.9	62.5	66.2	69.9	73.6	77.3	80.9
4.6	47.8	51.5	55.2	58.9	62.5	66.2	69.9	73.6	77.3	80.9
4.8	47.8	51.5	55.2	58.9	62.5	66.2	69.9	73.6	77.3	80.9
5.0	47.8	51.5	55.2	58.9	62.5	66.2	69.9	73.6	77.3	80.9
5.2	47.8	51.5	55.2	58.9	62.5	66.2	69.9	73.6	77.3	80.9
5.4	47.8	51.5	55.2	58.9	62.5	66.2	69.9	73.6	77.3	80.9
5.6	47.8	51.5	55.2	58.9	62.5	66.2	69.9	73.6	77.3	80.9
5.8	47.8	51.5	55.2	58.9	62.5	66.2	69.9	73.6	77.3	80.9
6.0	47.8	51.5	55.2	58.9	62.5	66.2	69.9	73.6	77.3	80.9

Source: Rumen8 version 3.2

## 24. DMI estimation method

- There are two ways to estimate DMI; The 'Conventional' method and the 'NDF intake' method.
- The conventional method gives the DMI estimate (Kg DM/d) using the NRC equation and for heifers AFRC (Agricultural and Food Research Council, 1993) equation.

Dairy Diet Diet detail Price Feed cost Compare Split herd Notes Optimise

Dairy cow Holstein

Live weight (kg) 500

Live weight change (kg/d) -0.60

Days in milk 60

Days pregnant 0

Number of animals in herd 1

Milk yield (l/d) 20.0

Milk fat (%m/v) 3.60

Milk true protein (%m/v) 3.00

Fat:Protein ratio 1.20

Fat, Protein, F+P (kg/d) 0.72 0.60 1.32

Energy corrected milk 18.7 kg/d

DMI estimation method  Conventional  NDF intake

Farm terrain Distance walked (km/d) 5.0

Flat  Undulating  Steep

## 24.1 DMI estimation method – NDF Intake

- The NDF intake estimates are based on NDF eaten as a percentage of cow live weight.
- The NDF equation relates potential intake constrain to live weight and NDF of the diet/ration for example;

$$\text{DMI (Kg/d)} = (\text{live weight} \times [130 + \text{NDF\%}]) / 100$$

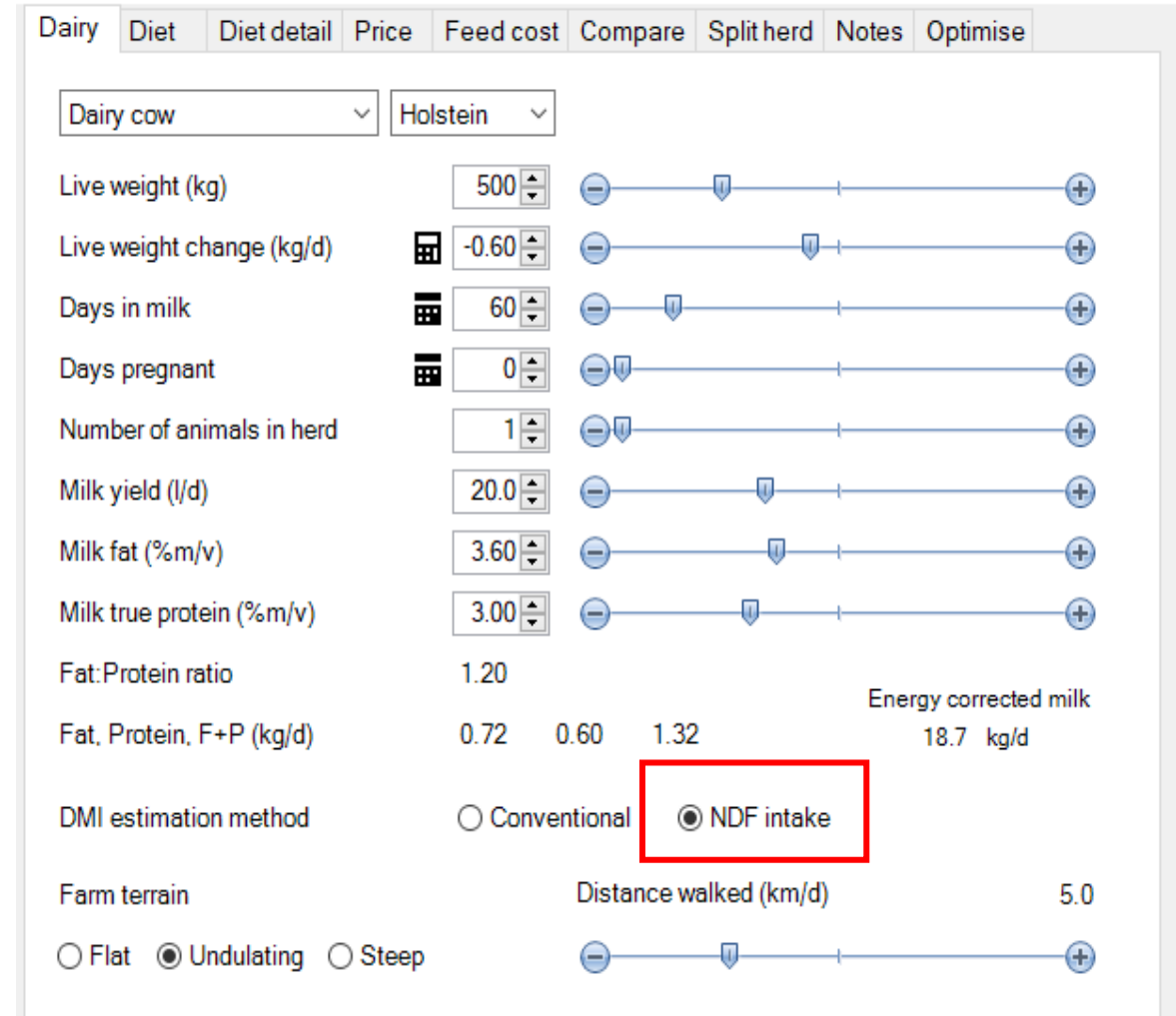
- Empirically, during the Rumen 8 pilot in Kenya we found the factor 130 giving the best match to actual DMI.

The screenshot shows a software interface for dairy cow management. The top navigation bar includes tabs for Dairy, Diet, Diet detail, Price, Feed cost, Compare, Split herd, Notes, and Optimise. Below this, there are dropdown menus for 'Dairy cow' and 'Holstein'. The main area contains several input fields and sliders:

- Live weight (kg): 500
- Live weight change (kg/d): -0.60
- Days in milk: 60
- Days pregnant: 0
- Number of animals in herd: 1
- Milk yield (l/d): 20.0
- Milk fat (%m/v): 3.60
- Milk true protein (%m/v): 3.00
- Fat:Protein ratio: 1.20
- Fat, Protein, F+P (kg/d): 0.72, 0.60, 1.32
- Energy corrected milk: 18.7 kg/d
- DMI estimation method:  Conventional,  NDF intake (highlighted with a red box)
- Farm terrain:  Flat,  Undulating,  Steep
- Distance walked (km/d): 5.0

## 24.2 DMI estimation method – NDF Intake Cont'd...

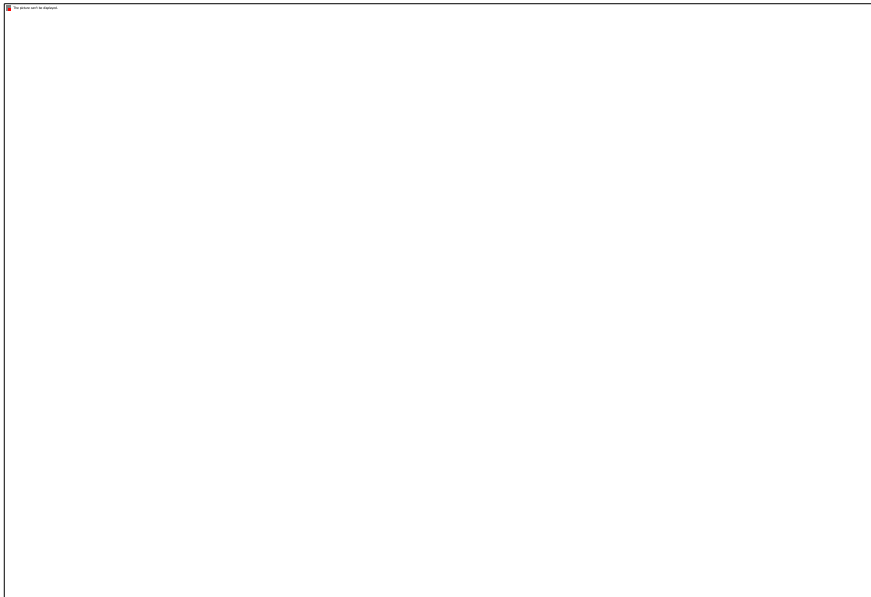
- The factor 130 or expressed as a percentage 130/100 is 1.3%) of live weight used to estimate intake potential of NDF can be adjusted for each class of cow (cow in milk, dry cow, close-up, heifer) in the preferences.
- Click 'File', choose 'Preferences' and click 'Recommended levels'. The class of 'Dairy preferences' will be displayed and ready to be adjusted or used as-is.



The screenshot shows a software interface for dairy cow preferences. The 'Dairy cow' class is selected. The 'DMI estimation method' is set to 'NDF intake', which is highlighted with a red box. Other parameters include live weight (500 kg), milk yield (20.0 l/d), and distance walked (5.0 km/d).

Parameter	Value	Unit
Live weight (kg)	500	kg
Live weight change (kg/d)	-0.60	kg/d
Days in milk	60	days
Days pregnant	0	days
Number of animals in herd	1	animals
Milk yield (l/d)	20.0	l/d
Milk fat (%m/v)	3.60	%m/v
Milk true protein (%m/v)	3.00	%m/v
Fat:Protein ratio	1.20	ratio
Fat, Protein, F+P (kg/d)	0.72	kg/d
Energy corrected milk	18.7	kg/d
DMI estimation method	<input checked="" type="radio"/> NDF intake	method
Farm terrain	<input checked="" type="radio"/> Undulating	terrain
Distance walked (km/d)	5.0	km/d

## 25. Important note: Download Part I and III



*This module continues and ends with Part III, ensure you download Part I...*

**- PROCEED TO PART III -**