

USE OF RUMEN8 SOFTWARE FOR RATION CALCULATION (Level 3 – Part I)

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.
- Step by step guide to making a ration for dairy cows.
- Examples of the rations for various categories of cattle.



IMPORTANT

This module has two parts; this is part I – download Part II to continue to END.



Rumen8

2. Background

- Rumen8 is a free software application that allows farmers and consultants to easily manage dairy and beef cattle diets to increase production and reduce costs.
- Rumen8 allows the user to formulate rations from 2 up to 15 feeds or mixes and ensure the dietary needs of animals are met.
- Multiple diets can be stored and compared and the difference between feed price and return from milk and/or meat calculated. Reports can be printed or saved as PDF files.



3. Introduction to Rumen8 Software

- Rumen8 set up, guidelines and introduction was covered under topic: **3.9 - Guidelines for ration calculations for various breeds, heifers, lactation stage (Rumen8).**
- **Topic 3.9** will help you with settings and preferences before you start ration formulation.
- In this topic you will be guided step by step on how to formulate several rations.
- We will guide you through some examples for dairy cows under different conditions and environments.
- Before continuing with this topic we recommend reading through topic 3.9 first.



* Screenshot of the opening page of the rumen8 software.

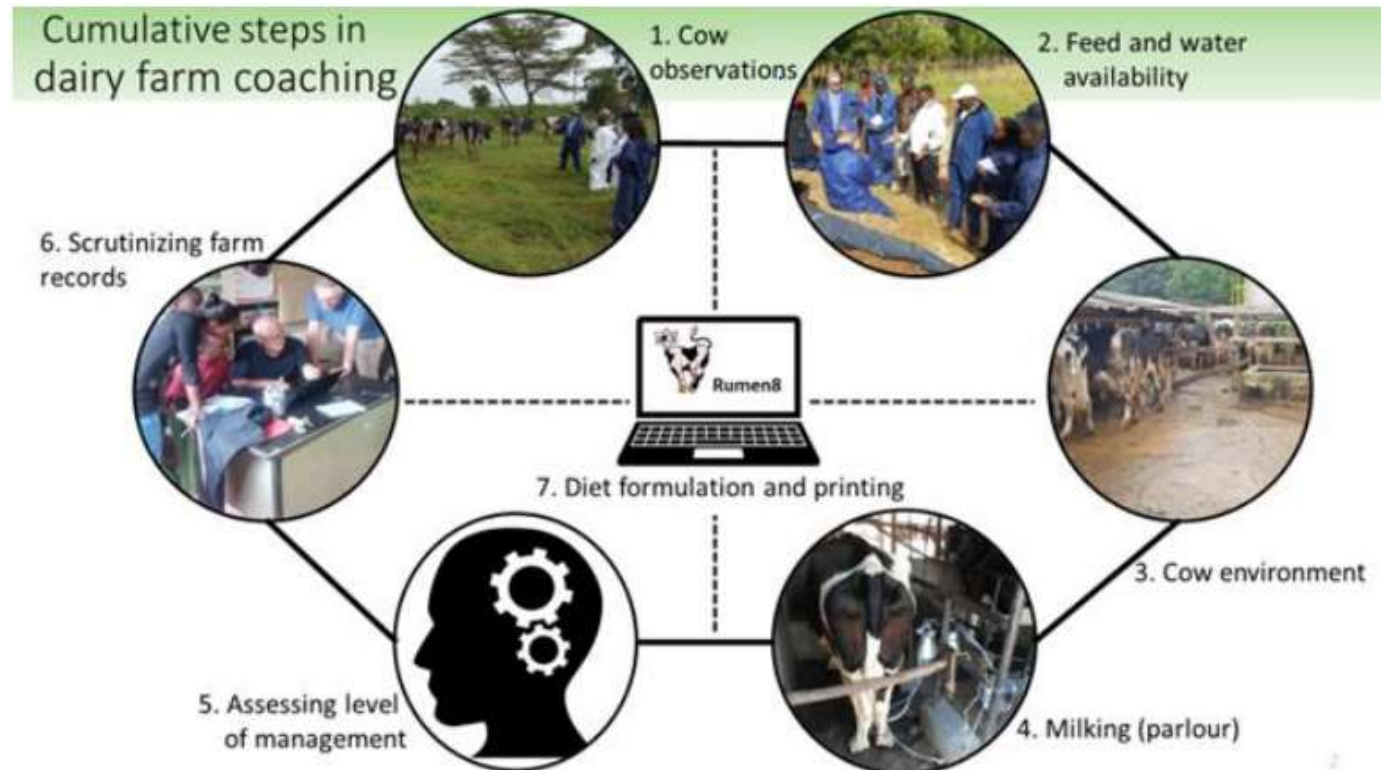
4. Requirements before Ration calculation

- Before any ration calculation is done, the user of this tool should make thorough observations on the dairy farm among other things. Steps to guide you are as follows;



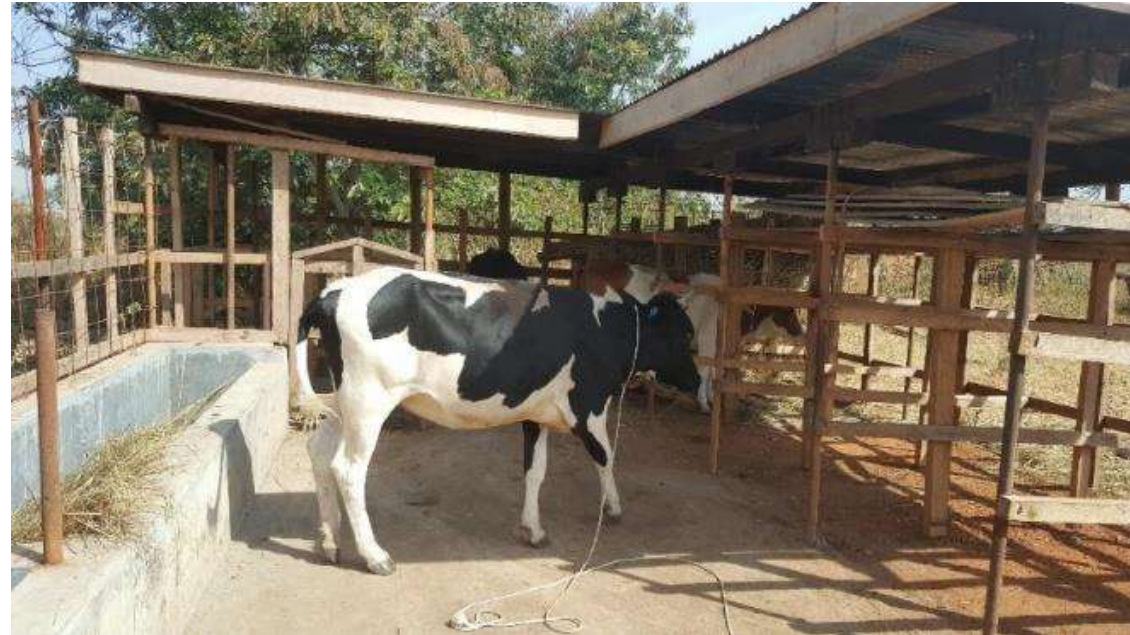
4.1 Requirements before Ration calculation Cont'd...

- This 'farm walk' illustrated below is particularly important to get an accurate idea about the quantities and qualities of feedstuffs given and the milk produced. When farmers do not keep records, obtaining accurate data can be a challenge.
- Rumen8 is to be used in a conducive environment and is only a management or advisory tool when integrated in a broader farm coaching program.
- The following are sample case studies before we start formulating a ration.



5. Case study 1

- A dairy farmer has 3 Holstein Friesian cows under a zero-grazing system with a flat walking area. The 3 cows weighed an average of 500Kgs are 60 days in milk and none of them was in-calf at the moment of the farm visit. The average milk production per day is 15 liters. The farmer was getting a milk price of Ush.800.00 per liter.
- The farmer fed the cows different forages but never weighed them. During the farm walk the farmer together with you, the consultant, weighed the feeds supplied by the farmer per cow.
- You, the consultant weighed all the cows and confirmed the live weight of each to be an average of 500kg.



6. Case study 1 Cont'd: Feed quantities

- After weighing, the farmer and the consultant concluded that the farmer was using the following quantities of each feed listed below;
 - i. 5kg of maize silage 30% Dry Matter at Ush.150.00 per kg,
 - ii. 30kg of Napier grass harvested at 150 meters high at Ush.75.00 per kg,
 - iii. 2kg of maize bran at Ush.800.00 per Kg,
 - iv. 20gms of limestone at Ush.750.00 per Kg.



7. Case study 1 Cont'd: Early lactating Cow, zero grazed

- Set the cow's details from 'case study 1' on the right-hand side of the landing page as follows;
 - Dairy cow
 - Breed; Holstein Friesian
 - Cow's live weight: 500kg
 - Live weight change: -0.6kg/day (live weight loss)
 - Days in milk: 60 days in milk (early lactation stage)
 - Day pregnant: 0 (zero - not pregnant)

Dairy Diet Diet detail Price Feed cost Compare Split herd Notes

Dairy cow Holstein

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 1.20

Fat, Protein, F+P (kg/d) 0.54 0.45 0.99

Energy corrected milk 14.0 kg/d

DMI estimation method Conventional NDF intake

Farm terrain Flat Undulating Steep

Distance walked (km/d) 0.5

7.1 Case study 1: Early lactating cow, zero grazed Cont'd...

- Number of animal(s) in the herd (one cow represents cows in the same production group)
- Average milk yield: 15 liters/day
- Milk fat: 3.6%
- Milk true protein: 3.0%

*Milk fats and milk true protein will be estimated because the farmer had never analyzed his milk. This is the situation in most of the dairy farms in the tropics. This estimate is based on information from livestock organizations, a milk factory, or a breeding society.

Dairy Diet Diet detail Price Feed cost Compare Split herd Notes

Dairy cow Holstein

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 1.20

Fat, Protein, F+P (kg/d) 0.54 0.45 0.99

Energy corrected milk 14.0 kg/d

DMI estimation method Conventional NDF intake

Farm terrain Flat Undulating Steep

Distance walked (km/d)

7.2 Case study 1: Early lactating cow, zero grazed Cont'd...

- There are two ways to estimate DMI; The 'Conventional' method and the 'NDF intake' method. Select 'NDF intake' for tropical regions (East Africa).
- For a cow under zero-grazing system, she can walk a distance of ± 0.5 km/day. Use the slider to get the correct distance covered per day.
- The farm's terrain is flat (Zero grazing barns have flat walking area)

Dairy Diet Diet detail Price Feed cost Compare Split herd Notes

Dairy cow Holstein

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 1.20

Fat, Protein, F+P (kg/d) 0.54 0.45 0.99

Energy corrected milk 14.0 kg/d

DMI estimation method Conventional NDF intake

Farm terrain Flat Undulating Steep

Distance walked (km/d)

8. Set currency and currency divisor

- Under the 'File' tab on the landing page, click 'Preferences' then tab 'General' to set the currency and related settings like in the highlighted region on the red box;
 - Currency option drop-down list to select a favorable currency.
 - Under feed cost prices are expressed per ton of feed. This makes it necessary for some currencies to use a divider. For our examples, to allow more digits of currency to be used we will use the divisor 100. Meaning all displayed currency on the software should be multiplied by 100 to get the accurate figures.
 - 'Currency divisor'- All currency values are assumed to be divided by the selected number/amount.
- The other parameter on the General Dairy preferences should be set as is.

Dairy preferences ? ×

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	Close-up	Heifer
Conventional method: kg DM/d	NRC eqn.	<input type="text" value="11.0"/>	<input type="text" value="10.0"/>	AFRC eqn.
NDF intake: % of liveweight	<input type="text" value="1.3"/>	<input type="text" value="1.0"/>	<input type="text" value="0.8"/>	<input type="text" value="1.0"/>

Currency

System

Do not display cents

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

9. Set the milk price under tab 'Price'

- There are two option payment by 'Components' (quality and quantity of milk e.g butter fats, protein etc.) and by 'Yield' (quantity).
- You can input 12 prices that you can keep on switching depending on the situation at the farm.
- For our first example we will use the price in milk in Uganda as Ush.800.00 per liter of milk.

***Note:** For all prices in this example, the currency divisor 100 (green box is active) – For example price '1' a liter of milk is Ush.800.00 but entered as Ush.8.00.
- The best option is to use 'Payment by, Yield' if you are not paid by quality of milk (red box).

	Price (Ush/L)	Equivalent (Ush/kgFP)	Payment by
<input checked="" type="radio"/> 1.	8.000	121.21	<input type="radio"/> Components <input checked="" type="radio"/> Yield
<input type="radio"/> 2.	9.000	136.36	
<input type="radio"/> 3.	10.000	151.52	
<input type="radio"/> 4.	0.000	0.00	
<input type="radio"/> 5.	0.000	0.00	
<input type="radio"/> 6.	0.000	0.00	
<input type="radio"/> 7.	0.000	0.00	
<input type="radio"/> 8.	0.000	0.00	
<input type="radio"/> 9.	0.000	0.00	
<input type="radio"/> 10.	0.000	0.00	
<input type="radio"/> 11.	0.000	0.00	
<input type="radio"/> 12.	0.000	0.00	

▼ Sets and library price files

Cd 100 P M UFL

10. Set recommended levels of all lactation stages

- It is advisable to use the recommended five physiological sets and settings as shown in the table below. However, for experienced persons these parameters can be adjusted.
- For our first example (case 1), we will use the 'Early Lactation' parameters.
- For ration formulation of cows' other lactation stages, you can also set their parameters using this table.
- Early lactation recommended level setting example is in the next slide.

Variable	Early lactation	Mid lactation	Late lactation	Dry	Transition
Levels set	No 1	No 2	No 3	No 4	No 5
Days in milk	1-100	101-200	201-end lact.	dry	>257 d.i.c.
NDF % in DM	35-45	40-50	45-55	50-60	45-55
eNDF % of NDF	60-75	65-80	70-80	70-80	70-80
Sugar % in DM	3-8	2-8	2-6	2-4	2-5
Starch % in DM	10-24	10-22	5-20	0-15	10-20
Fat % in DM	2-5	2-5	1-5	1-5	2-5
RDP %	65-70	68-72	70-74	75-80	75-80
UDP %	30-35	28-32	26-30	20-25	20-25
Forage % in F:C	40-70	45-70	50-80	80-100	75-85
Feed % income	40-60	50-60	50-60	-	-
ME per kg DM	10-12	10-11	10-11	9-10	10-11
CP % (as proxy for MP)	15-19	14-17	12-15	≈ 12	≈ 14
Body wt change, kg/d	- 0.6	0.0	+ 0.6	-	-

11. Set recommended levels for early lactation cow

- To set the recommended levels follow these steps. For example; on the landing page select tab 'File' then click on option 'Preferences' and finally select tab 'Recommended level'.
- Tick the box in front of the parameters as shown before changing the ranges (green bar, with sliders) from the default settings.
- The final display will appear as shown, click option 'Close' to save.

The screenshot shows the 'Dairy preferences' window with the 'Recommended levels' tab selected. The 'Recommended levels set' is 'One'. The 'Description' is 'Early Lactation 60 days (Typical MY 18-22)'. The 'Auto' checkbox is unchecked. The 'Day of lactation' is set to 0 - 500. The 'Days pregnant' is set to 0 - 300. The following table shows the recommended levels for various parameters, with the green bar and sliders indicating the current settings:

Parameter	Default Range	Current Range
<input checked="" type="checkbox"/> NDF (%DM)	35 - 45	35 - 45
<input checked="" type="checkbox"/> eNDF (%NDF)	60 - 75	60 - 75
<input type="checkbox"/> NDF forage (%DM)	60 - 80	60 - 80
<input type="checkbox"/> NDF forage (%LW)	0.6 - 0.9	0.6 - 0.9
<input checked="" type="checkbox"/> Sugar (%DM)	3 - 8	3 - 8
<input checked="" type="checkbox"/> Starch (%DM)	10 - 24	10 - 24
<input checked="" type="checkbox"/> Fat (%DM)	2 - 5	2 - 5
<input type="checkbox"/> NFC (%DM)	25 - 37	25 - 37
<input checked="" type="checkbox"/> RDP (%CP)	65 - 70	65 - 70
<input checked="" type="checkbox"/> UDP (%CP)	30 - 35	30 - 35
<input checked="" type="checkbox"/> Forage % in F:C	40 - 70	40 - 70
<input type="checkbox"/> FE kg ECM/ kg DMI	1.2 - 1.3	1.2 - 1.3
<input type="checkbox"/> FE g FP/ kg DMI	80 - 90	80 - 90
<input checked="" type="checkbox"/> Feed % income	40 - 60	40 - 60

The 'Close' button is located at the bottom right of the window.

12. Case study 1: Feed library

- As a consultant you should make a feed library and name it, e.g. the farm's name and date, etc.
- Making a feed library was illustrated in module **3.9 - Guidelines for ration calculations for various breeds, heifers, lactation stage (Rumen8)**.
- You can make a User feed library with the variety of feeds ingredient you found on the farm and the ones that can be bought locally.
- One type of feed ingredient can have several nutritional values. You can add all categories of the feed ingredient to demonstrate further to your farmer/client.
- See example of Napier grass categories harvest in different height and nutritional levels (red box).

Feed Editor

Category	Name
Add	Limestone (CaCO ₃)
Bypr	Maize bran
Sil	Maize silage DM < 30%
Sil	Maize silage DM ∞ 30-35%
Sil	Maize silage DM > 35%
Conc	Molasses (cane)
GFrg	Napier fresh 120 cm
GFrg	Napier fresh 60 cm
GFrg	Napier fresh mature > 120 cm
Conc	Sunflower seed meal dehulled CF < 200 g/kg
Conc	Sunflower seed meal non dehulled CF > 240 g/kg
Conc	Sunflower seed meal partly dehulled CF < 200-240 g...

13. Editing the copied feed ingredients

- You can edit the copied feed ingredient from the Feed editor - 'Manage feeds'. Select a feed ingredient then click 'Edit'. The figure on the right-hand side will be active for editing.
- 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 feed.
- It's recommended to leave all other values as copied from the ingredient in the shared feed library.

*For purposes of this exercise, you are advised not to change the feed parameters so you can have the same results as the examples.

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

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

Required feed parameter names are in bold

Units are on a DM basis unless shown otherwise

14. Set the cost of ingredients

- 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 ingredient can be affected by losses for example, when feeding the cow, mixing 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 **8000 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

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

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

Okay Cancel

15. Set all the feed costs

- Follow the steps from the last slides, and enter examples of most of the feed ingredients we will use for this module.
- Enter the exact figure (table on the right) so when you are working alongside these modules we can have the same figures.
- The prices provided are not necessarily the same as in farms or region.

***Cd 100** - View slide 12 about currency settings. The attached prices have been divided by 100.

Feed ingredients	Ush/ton *(Cd 100; divided by 100)
Bracharia grass (grazing)	1000.00
Bracharia grass. Cut and carry	1500.00
Napier grass	750.00
Maize silage	3500.00
Maize bran	8,000.00
Maize grain	13,000.00
Wet brewers spent grain	1200.00
Sunflower seed cake	20,000.00
Cottonseed cake	20,000.00
Rhodes grass hay	10,000.00
Molasses	20,000.00
Maclick super	50,000.00
Limestone	5,000.00
Urea	

16. Case study 1: Current feeding

- Select the feed ingredients from your feed library created for this farm (red box). The feed ingredients currently fed on case study 1 and the quality of forage were concluded as follows after the farm walk;
 - Maize silage Dry matter below 30% (<30%)
 - Napier grass harvested at 150 meters high (>129cm high)
 - Maize bran
 - Limestone

The screenshot shows a software interface for feed management. The top menu includes File, Edit, Animal, View, Help, Dairy, Diet, Diet detail, Price, Feed cost, Compare, Split herd, and Notes. The main area is divided into several sections:

- Feed Ingredients (Red Box):** A list of 15 ingredients with columns for 'DM' and 'As Fed'. The first four are highlighted in a red box:

	DM	As Fed
1. Maize silage DM < 30%	0.00	0.00
2. Napier fresh mature > 120 cm	0.00	0.00
3. Maize bran	0.00	0.00
4. Limestone (CaCO3)	0.00	0.00
- Animal Parameters:** Includes sliders and input fields for 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 (Conventional or NDF intake), and Form terrain (Flat, Undulating, or Steep).
- Summary Table (Green Box):** A table with four columns: Feed costs, Milk income, Feed efficiency, and Margin.

Feed costs	Milk income	Feed efficiency	Margin
Ush/t DM	Ush/L raw milk	kg ECM/kg DM	Ush/cow/d
Ush/MJ ME	Ush/kg ECM	g F+P/kg DM	Ush/herd/d
Ush/kg CP	Ush/kg F+P	Ush Milk/Ush Feed	Feed % income
Ush/cow/d	Ush/cow/d		Milk yield (l/d) 15.0

16.1 Case study 1: Current feeding Cont'd...

- To learn how to judge the quality of forage visit modules;
 - 3.1 Sampling feeds & forages/analysis interpretation.**
 - 1.4 Growing maize/sorghum for fodder.**
 - 1.5 Brachiaria, panicum & Napier grass management.**
- When the feeds are still at zero (0) the values of the region marked green remain zero (0) except the milk yield expected per day at the bottom right corner.

The screenshot shows a software interface for simulating a dairy farm. On the left, there is a list of 15 feed items with dropdown menus and input fields for 'DM' and 'As Fed' values, all currently set to 0.00. On the right, there are sliders and input fields for various animal parameters: Live weight (500 kg), Live weight change (-0.60 kg/d), Days in milk (60), Days pregnant (0), Number of animals in herd (1), Milk yield (15.0 l/d), Milk fat (3.60 %m/v), Milk true protein (3.00 %m/v), Fat:Protein ratio (1.20), and Energy corrected milk (14.0 kg/d). There are also options for 'Dairy cow' and 'Holstein' breed, and 'Form terrain' (Flat, Undulating, Steep) with a 'Distance walked (km/d)' of 0.5.

At the bottom, a table summarizes key metrics:

Feed costs	Milk income	Feed efficiency	Margin
Ush/t DM	Ush/L raw milk	kg ECM/kg DM	Ush/cow/d
Ush/MJ ME	Ush/kg ECM	g F+P/kg DM	Ush/herd/d
Ush/kg CP	Ush/kg F+P	Ush Milk/Ush Feed	Feed % income
Ush/cow/d	Ush/cow/d		Milk yield (l/d) 15.0

17. Populating feed quantities

- On the arrows pointed up and down for each feed ingredient, click the arrow facing upwards to add feeds quantities to a make a ration/diet (red box).
- Note that the bars on the right-hand side of the landing page turn red (green box) immediately you increase the amount under 'As fed'.
- The percentage of dry matter intake and other nutritional values of the feed are displayed on the right (green box).
- At the bottom of the landing page (blue box), the figures have also changed from the default zero-cost/prices.

The screenshot shows a software interface for managing feed rations. It features a list of feed ingredients on the left, a summary of nutritional values on the right, and a summary of costs and income at the bottom.

Feed Ingredients List:

	DM	As Fed
1. Maize silage DM < 30%	0.26	1.00
2. Napier fresh mature > 120 cm	0.00	0.00
3. Maize bran	0.00	0.00
4. Limestone (CaCO3)	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

Total daily intake (kg/d): 0.3 (DM), 1.0 (As Fed)

Nutritional Summary:

- Dry Matter Intake: 2 % Limit
- Metabolisable Energy: 2 % Req't
- Metabolisable Protein: 1 % Req't
- Calcium: 1 % Req't
- Phosphorus: 3 % Req't
- Magnesium: 1 % Req't

Other Nutritional Values:

- NDF (% DM): 49 %
- Starch (% DM): 19 %
- Forage: Conc. ratio: 100.0

Summary Table:

Feed costs		Milk income		Feed efficiency		Margin	
Ush/t DM	11450	Ush/L raw milk	8.00	kg ECM/kg DM	53.9	Ush/cow/d	117.02
Ush/MJ ME	1.157	Ush/kg ECM	8.56	g F+P/kg DM	3808	Ush/herd/d	-
Ush/kg CP	176.16	Ush/kg F+P	121.21	Ush Milk/Ush Feed	40.308	Feed % income	2
Ush/cow/d	2.98	Ush/cow/d	120.00			Milk yield (l/d)	15.0

18. Example of grazing pastures, with one feed ingredient

- In case study 1 for cows are under a zero-grazing system, we can first practice using Rumen8 with a simple ration on grazed pasture.
- For this example the farmer has a cow with the same parameter settings as used in case study 1 (slide no. 10 & 11). The target production is 10L/d.
- Assuming that the cow grazes on Brachiaria grass and eats to her capacity, the dry matter intake bar turns green. The situation is as shown in the attached screenshot.
- If the cow is grazing only on Brachiaria grass, she will not be able to produce the targeted 10L/d because the metabolizable energy requirement has not been met (93% requirement bar is still red).



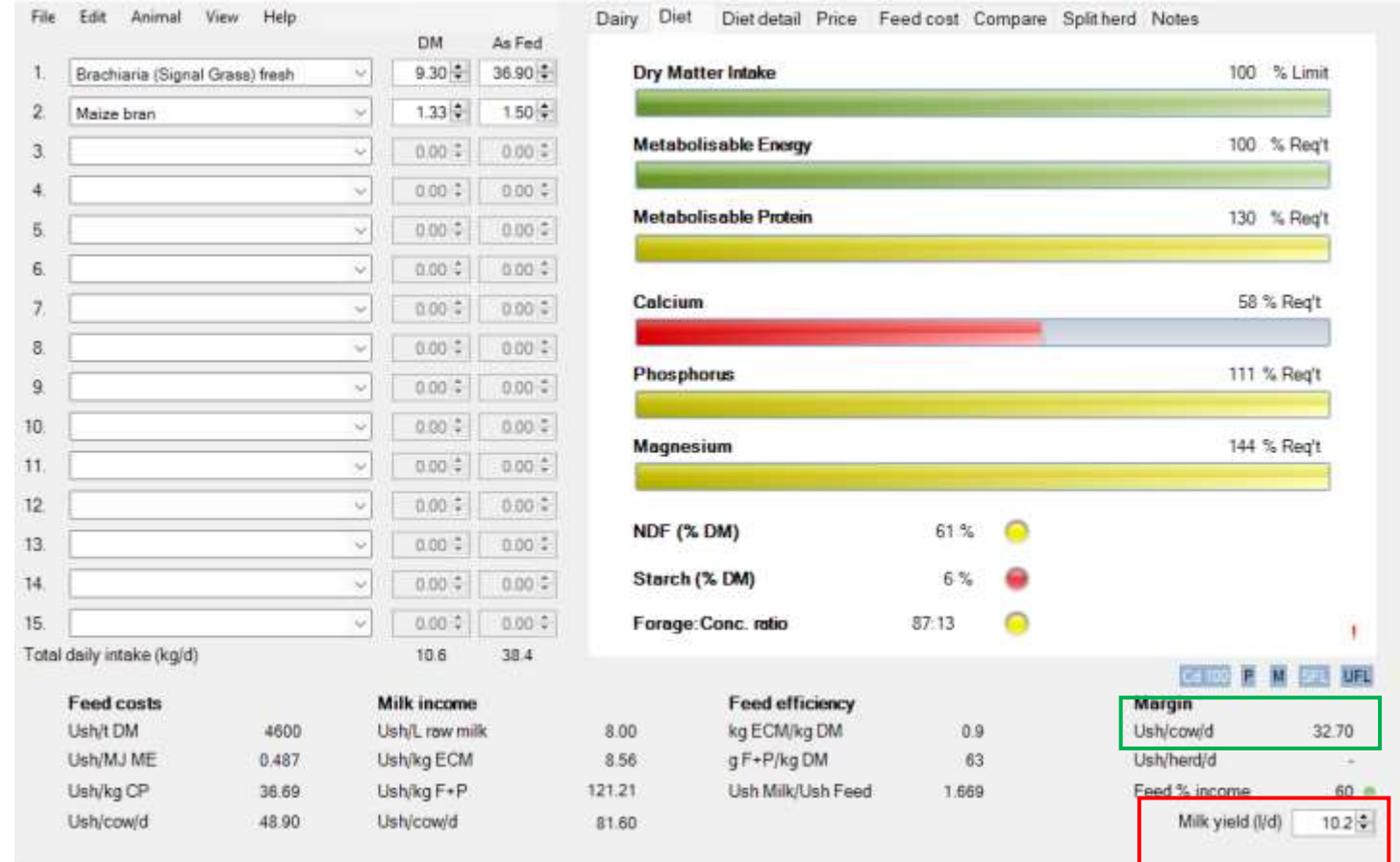
19. Realistic milk production for the cow grazing on Brachiaria grass pasture

- With the same amount of pasture as fed and dry matter intake capacity achieved, we need to reduce the milk yield (bottom red box) to the level where the metabolizable energy meets 100%.
- The attached screenshot shows the amount of milk yield that in reality will be produced on such a ration (red box, 8.8L/d).
- With this reduction in milk yield, the margin, in reality, will be Ush.29.69 (green box).
- Take note that this diet has excess protein and in the next step, we try to utilize some of this protein.



20. Improving the (grazing) ration

- To utilize the excess protein we need to bring in a feed ingredient with a high energy density.
- For example, adding maize bran can improve the ration and reduce excess metabolizable protein by 12% (from 142% to 130%).
- As you change the feed ingredients, adjust the milk yield from the red box to the amount that the metabolizable energy and dry matter intake bars turn green up to 100%.



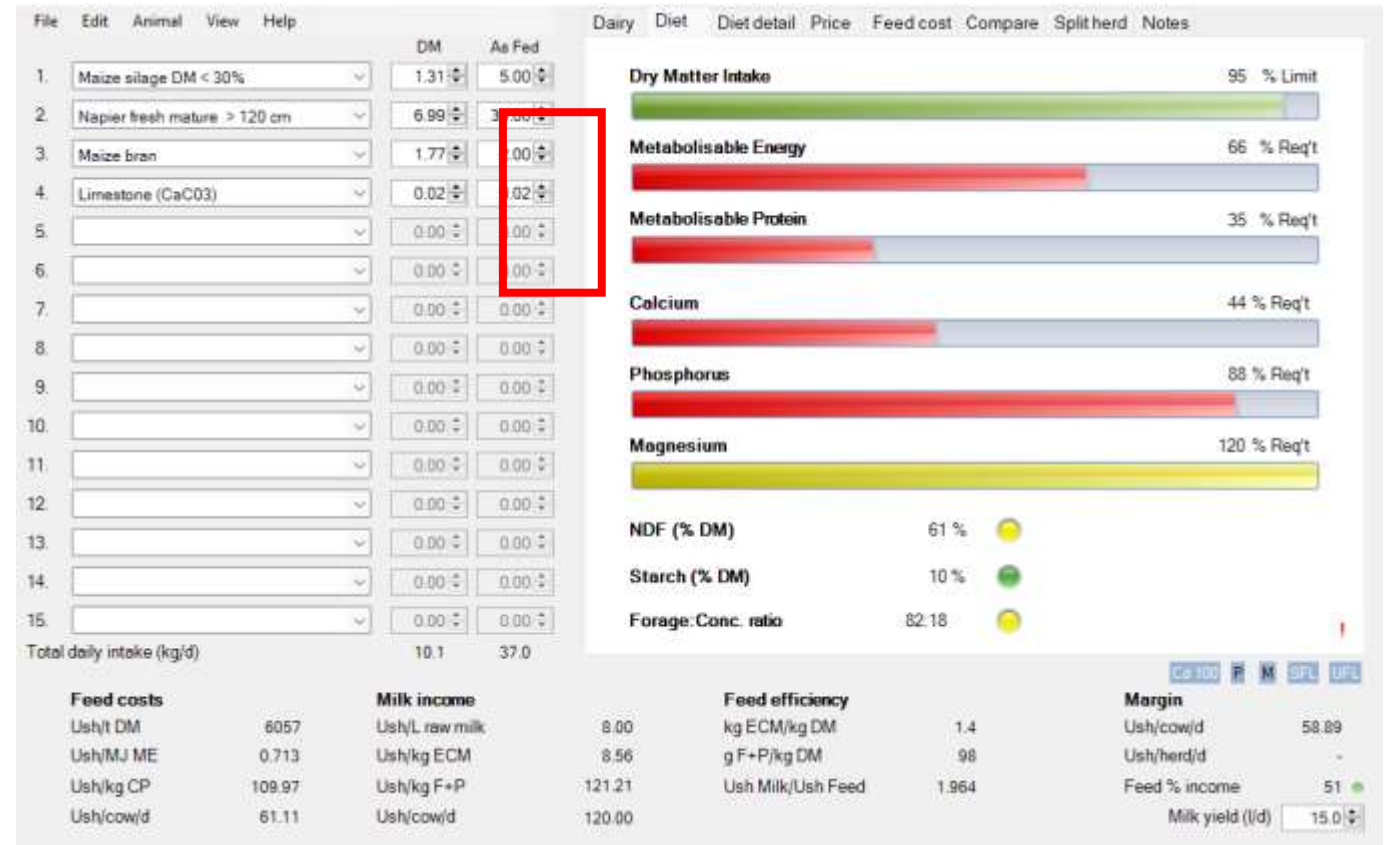
20.1 Improving the (grazing) ration Cont'd...

- With the increase in milk yield from 8.8L/d to 10.2L/d, we have now achieved the targeted milk production and despite the additional feed ingredient and the subsequent increase of feed cost, the margin has increased from Ush.29.61 to Ush.32.70 (green box).
- In reality, this is an increase in margin from Ush.2,961 to Ush.3,270 which means an extra income of Ush.309 per cow per day.
- For the next slides, we will formulate rations using more than two feed ingredients to achieve a healthy balance ration for 'Case study 1'.



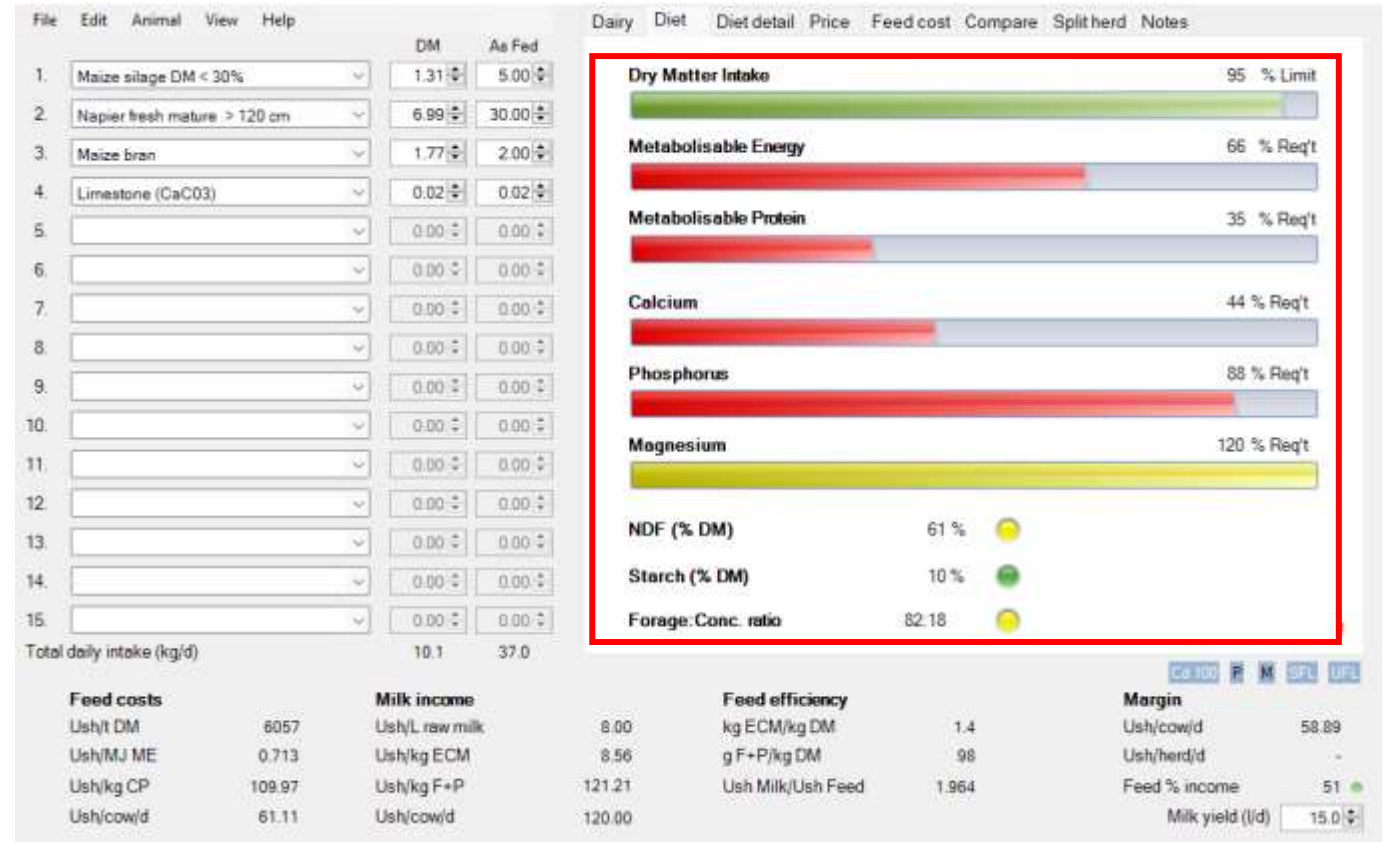
21. Case study 1: Original feed ration

- For case study 1, a cow in a zero-grazing system, enter (red box) the amount of the original feed ingredient ration fed to cows producing an average of 15L/d.
 - 5kg of maize silage 30% Dry Matter,
 - 30kg of Napier grass harvested at 150 meters high,
 - 2kg of maize bran,
 - 20gms (0.02kg) of limestone.
- Notice the change in the rumen 8 landing page on the right-hand side. The bars reflect the current situation.



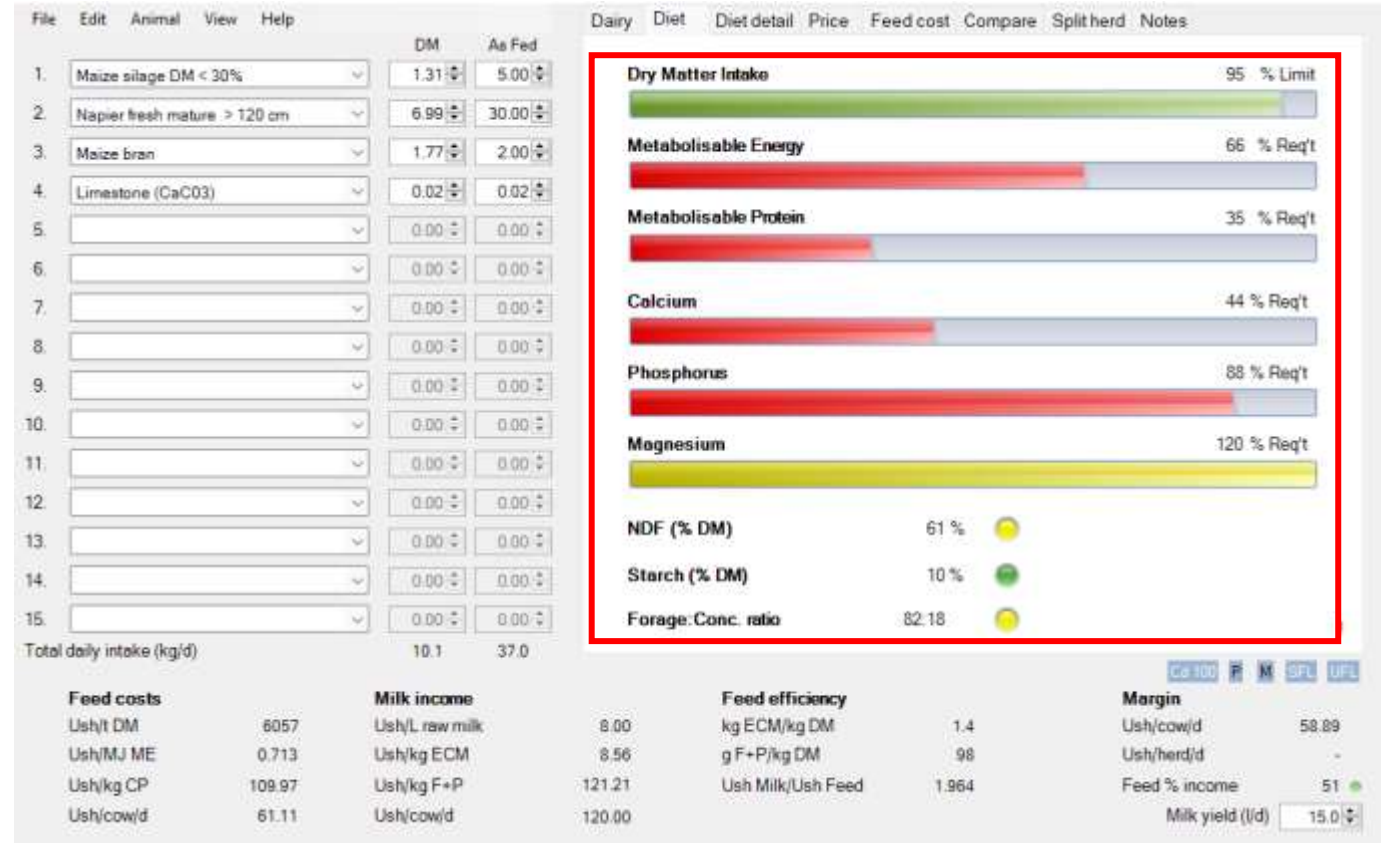
22. Case study 1: Balanced ration indicator

- When a ration is balanced, in all the bars the colour green needs to be visible in the movable section of the bars. The meaning of the colour code is as follows;
 - Red** - Under supply,
 - Green** - Meets the requirement/demand,
 - Yellow** - Oversupply/exceeds the animal requirements.
- The dry matter intake is at 95% and the other nutritional requirements have red-colored bars (red bars).



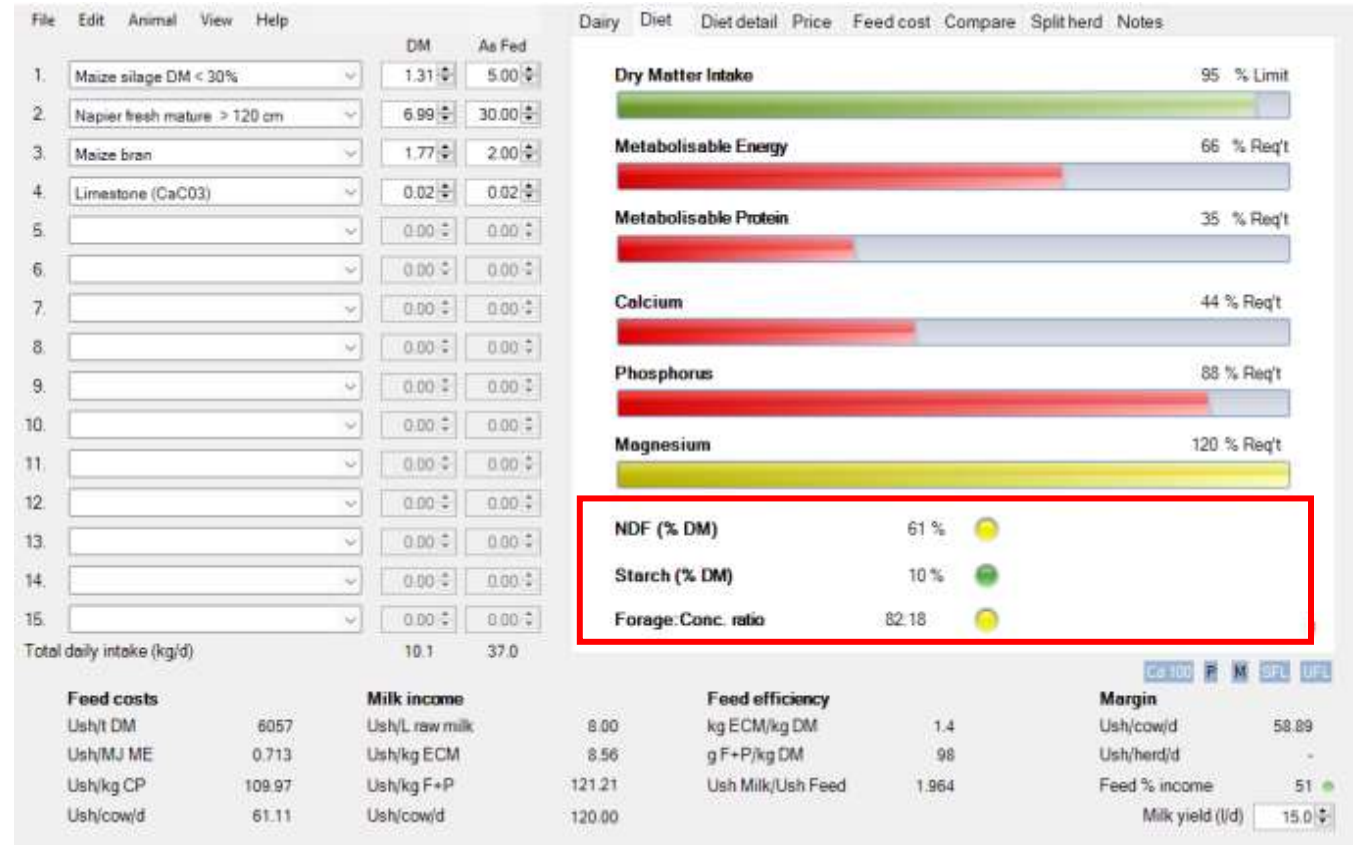
23. Case study 1: Original feed ration status

- The bars on the right have to be green in color and at 100% to meet the requirement of this cow. The overview shows more red bars which means there is a deficiency in the ration.
- Dry matter intake; 95%. This means the cow is not eating enough.
- Metabolizable energy; 66%. This means the ration does not meet the cow's energy requirement.
- Metabolizable protein; 35%. This means the ration does not meet the cow's protein requirement.
- Calcium; 44% and Phosphorus; 88%- This means that the ration does not meet the cow's mineral requirement.



23.1 Case study 1: Original feed ration status Cont'd...

- The percentage in Nutrient Detergent Fibre (NDF) of the Dry matter of the ration is 61%. This exceeds the recommended levels of the range 35-45%.
*To reduce the NDF% in the ration you can advise the farmer to harvest the forage at an earlier vegetative stage.
- The percentage of starch in the dry matter of the original ration is at 10% and within the recommended range (10-24%).
- The ratio of the forage to concentrate is within safe limits.
*There is room to add more concentrate in the ration.



24. Important note: Download Part II



*This module continues in
Part II...*

- PROCEED TO PART II -