Theme 3: Animal Nutrition and Feeding

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

Торіс	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.





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;
 - · Cow observations: BCS, LW, udders, health, behaviour (abnormalities), rumination, manure score
 - Feed & water availability: quantity and quality: colour, smell, feel, moulds, chop length, etc.
 - Environment: barn climate, feeding area, feed storage, cubicles: cleanliness, abnormalities
 - Milking parlour/equipment: cleanliness, hygiene, state of milk units, etc.
 - Scrutinise farm records: milk yield, feeds & fodders, qualities, quantities, DMI, prices, fertility, ...
 - Assess the level of management: owner, manager, other workers (level of knowledge and skills)
 - Rumen8 formulation: focus on early & mid lactation, step by step approach: 1 month-objective
 - Print recommended diet report

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)



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 V Hol	stein ~				
Live weight (kg)	500 🜲	Θ	0	-t	
Live weight change (kg/d)	-0.60 🜻	9	U	-1	
Days in milk	60 🌩	<u> </u>			
Days pregnant	0	99			
Number of animals in herd	1 🜲	99		-t	
Milk yield (I/d)	15.0 🜩	Θ	0	1	
Milk fat (%m/v)	3.60 ≑	Θ	0	-1	
Milk true protein (%m/v)	3.00 ≑	Θ		4	
Fat: Protein ratio	1.20			Energy corr	rected milk
Fat, Protein, F+P (kg/d)	0.54 0	.45 0.99)	14.0	kg/d
DMI estimation method	O Conver	ntional C	NDF intake	9	
Farm terrain		Distance w	alked (km/d)	0.5
Steep				1	

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 -/+0.5km/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)



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.

General Advanced Recommended levels Standard	cows
Milk yield units Litres Kilograms 	Milk component units
Feed concentration units	Feed proportion units Proportion Percentage
Fat to protein ratio	Tool tips detail
Dry matter intake estimate	
Cow Conventional method: kg DM/d NRC eqn. NDF intake: % of liveweight 1.3	Dry Close-up Heifer 11.0 + 10.0 + AFRC eqn. 1.0 + 0.8 + 1.0 +
Currency System Ugandan Shilling Do not display cents	g (Ush) ~ Ush Currency divisor 100 ~
□ Load warning for milk price change ☑ Load warning for intake estimate change	☑ Show Diet tab ☑ Show Split herd tab
Change the Rumen8 home directory after rest	tarting Rumen8 Change home
Restore all the preferences to their default set	ting Restore Defaults
Show Optimiser tab	

Dairy preferences

?

 \times

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).

Dairy	Diet	Diet detail	Price	Feed cost	Compare	Split	herd Not	es (Optimise
	Pric (Ush/	e L)			Equivalent (Ush/kgFP)		Payment	by ents	Meld
() 1.	8.00	00 ≑			121.21	I			
02.	9.00	0 🗘			136.36	6			
○ 3 .	10.00	0 🗘			151.52	2			
◯ 4 .	0.00	0			0.00)			
05.	0.00	0 ≑			0.00)	✓ Sets a	nd lib	rary price files
◯ 6 .	0.00	0 🗘			0.00)			
○7.	0.00	0 🗢			0.00)			
◯ 8 .	0.00	0 🗢			0.00)			
○ 9 .	0.00	0 🗢			0.00)			
◯ 10 .	0.00	0 🗘			0.00)			
O 11.	0.00	0 🗢			0.00)			
O 12.	0.00	0 ≑			0.00)			
									_

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	-	(w)

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.



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

Manage feeds Manage mixes Manage libraries and Ingredient visibility

Category	Name
Add	Limestone (CaC03)
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 M	aize bran							
1. Feed ma	anagemer	t category						
O Grazed pa	<u>isture</u> O <u>C</u>	Grazed other	<u>Нау</u>	◯ <u>Silaqe</u>				
O Concentra	<u>ite</u> O <u>/</u>	Additive	ditive Byproduct					
2. Feed pro	otein type							
O <u>Grass sila</u>	<u>ge</u> 💽 🧕	Other non-forage						
OtherSilac		Other forage	O Distillery b	byproduct				
3. Feed pa	rticle size	classificatio	n					
Concentra	<u>ite O F</u>	orage	O <u>Other</u>					
DH (#)			0.00					
DM (g/kg)	887	aN	80.0	NDF (g/kg)	440			
ME (MJ/kg)	11.9	ЬΝ	0.92	eNDF in NDF	339			
CP (g/kg)	100	сN	0.02	Starch (g/kg)	354			
Fat(g/kg)	62	ADIN (g/kg)	1.0	Sugar (g/kg)	22			
Ca (g/kg)	1.9	Ca abs	0.60	Ash (g/kg)	39			
P (g/kg)	3.5	P abs	0.70	Cost (Ush/t DM)	9019			
Mg (g/kg)	2.2	Mg abs	0.16	Cost (Ush/t fed)	8000			
K (g/kg)	7.3	Max feeding rate (a/ka)		Losses (%)	0			
Na (g/kg)	0.8	Wet density		Cost +loss	9019			
CI (g/kg)	0.0	(kg/m3)		Cost +loss. fr	8000			
S (g/kg)	0.0	Source	SNV Team					
DCAD 🖬		Comment ⊕	Ruminal acid	losis risk (risk level dep	ends on ma			
Units are on a D	arameter na)M basis unle	mes are in bold ess shown other	wise	Okay	Cancel			

14. Set the cost of ingredients

- Cost of an ingredient are calculated in two ways;
 - i. Cost of 1 ton of dry matter (e.g. Ush/t DM)
 - ii. 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 Maize b	ran			
1. Feed manag	ement catego	у		
Grazed pasture	Grazed othe	<u>r O Hav</u>	○ <u>Silage</u>	
O Concentrate	O <u>Additive</u>	Byproduct	<u>t</u>	
2. Feed protein	type			
◯ <u>Grass silaqe</u>	Other non-fo	rage		
O <u>OtherSilage</u>	Other forage	<u>Distillery</u>	byproduct	
3. Feed particle	e size classific	ation		
Oncentrate	O Forage	O <u>Other</u>		
DM (g/kg)	887 aN	0.08	NDF (g/kg)	440
ME (MJ/kg)	11.9 bN	0.92	eNDF in NDF	339
CP (g/kg)	100 cN	0.02	Starch (g/kg)	354
Fat(g/kg)	62 ADIN (g	'kg) 1.0	Sugar (g/kg)	22
Ca (g/kg)	1.9 Ca abs	0.60	Ash (g/kg)	39
P (g/kg)	3.5 Pabs	0.70	Cost (Ush/t DM)	9019
Mg (g/kg)	2.2 Mg abs	0.16	Cost (Ush/t fed)	8000
K (g/kg)	7.3 Max fee rate (g/k	ding	Losses (%)	0
Na (g/kg)	0.8 Wetden	sity	Cost +loss	9019
CI (g/kg)	0.0 (kg/m3)		Cost +loss. fr	8000
S (g/kg)	0.0 Source	SNV Team		
DCAD	Comme	nt 🔍 Ruminal acid	losis risk (risk level dep	ends on ma
Required feed parame Units are on a DM bas	eter names are in l sis unless shown (oold 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 a working alongside these modules we can have the same figures.
- The prices provide is 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%)

11.

12. 13.

- Napier grass harvested at 150 meters high (>129cm high)
- Maize bran
- Limestone

Edit Animal View Help				Dairy f	Diet Diet de	atail Pric	-	Feed cost	Compare	Solitherd	Notes	
Los realized and		DM	As Fed		Dier Dieron	John P.M.		recutos	Compare	opinitiers	140065	
Maize silage DM < 30%	Ý	0.00	0.00	Dairy o	cow	Ŷ	Hols	tein ~				
Napier fresh mature > 120 cm		0.00 \$	0.00 🛊	Live we	eight (kg)			500 \$	0	0	-	
Maize bran	V	0.00 \$	0.00	Live we	sight change (k	g(d)	屇	-0.60				
Limestone (CaC03)	Ŷ	0.00	0.00(\$)	Days in	nmilk	Contract.		60 \$	0 0		1	- (+)
		0.00.0	0.00 \$	Days p	regnant			0	00-			
	4	0.00 \$	0.00 \$	Numbe	er of animals in	herd	16a)	1.	G0-		4	
	÷	0.00 \$	0.00 \$	Milk vie	eld (I/d)			15.0	9	0		-0
	Ý	0.00 \$	0.00 \$	Milk fat	L (%m/v)			3.60		0	-	-@
		0.00 \$	0.00 0	Milk tru	e protein (%m)	W)		3.00	<u> </u>	0	-	æ
		0.00 \$	0.00 \$	Fat:Pro	otein retio	580		1 20	-			
	~	0.00 1	0.00 \$	Ent Pr	otein E+P (ka)	an l		0.54 0	45 0.99		Energy corrected	milk
	4	0.00 \$	0.00 \$	1.	oreast to st fuge	0)		36363			ten igne	
	~	0.00 \$	0.00 \$	DMI es	timation metho	bd		 Conver 	ntional C	NDF intake	B	
	-	0.00 2	0.00 0	Førm te	errain				Distance w	alked (km/d	0	0.5
	~	0.00 0	0.00 \$	O Flat	O Undulatin	g () St	вер		00			- 🕀
aany miake (kgra)		00	0.0	and a state								
Feed costs		Milk income			Food	officion					Annin	(III)
Ush/t DM -		Ush/L raw milk	E.	0.00	kgEC	M/kg DN			S	ĩ	Jsh/cow/d	
Ush/MJ ME -		Ush/kg ECM		0.00	g.F+F	/kg DM				L	lsh/herd/d	
Ush/kg CP -		Ush/kg F+P		0.00	Ush N	lik/Ush F	eed			F	eed % income	-
Ush/cow/d -		Ush/cow/d		0.00							Milk yield (Ud)	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.

	Ush/kg CP - I	Jsh/kg F+P		0.00	Ush Milk/Ush F	eed		2		Feed % income	
	Ush/MJ ME - 1	Jish/kg ECM		0.00	g F+P/kg DM					Ush/herd/d	
	Ush/t DM -	Ush/L raw mil	k.	0.00	kg ECM/kg DM			S		Ush/cow/d	-
	Feed costs	Milk income			Feed efficienc					Morgin	
Total	dady intake (ka/d)	0.0	0.0							6016173	
15.	~	0.00 \$	0.00 \$	O Flat) Undulating 🔘 Ste	вер		00		1	-
14	2	0 00 0	0.00 \$	Farm terrai	in.			Distanc	e walked (kr	n/d)	0.5
13.	v	0.00 \$	0.00 \$	UNI estime	econ method		Conver	CORA	U NDP IN	260	
12.	~	0.00 \$	0.00 \$	DMI and	the mathed		0.000	tion of	A SIDE IN		
11	· · · · · · · · · · · · · · · · · · ·	0.00 2	0.00 \$	Fat, Protein	n, F+P (kg/d)		0.54 0	45 0	.99	14.0 kg/d	a mule.
10	~	0.00 🔅	0.00 \$	Fat:Protein	1 ratio		1.20			-	
.9.	· · · · · · · · · · · · · · · · · · ·	0.00 \$	0.00.0	Milk true pr	rotein (%m/v)		3.00 😩	0-	Q.	1	
8	v	0.00 \$	0.00 \$	Milk fat (%)	m/v)		3.60 💠		0	-64	- 1
7	×	0.00 \$	0.00 \$	Milk yield ((Ja)		15.0 😂	0	0		-0
6	v	0.00 \$	0.00 ‡	Number of	animals in herd		1 🛊	99-			-
5		0.00.0	0.00 \$	Days pregn	sent		0 💠	00-			
4	Limestone (CaC03)	0.00 \$	0.00(\$	Days in mil	lk		60 🛟	0	Ø	12	- 1
3	Maize bran v	0.00 \$	0.00	Live weight	t change (kg/d)	圜	-0.60				-
2	Napier fresh mature > 120 cm	0.00 \$	0.00 🔃	Live weight	t (kg)		500 ‡	0	0	li	۲
1	Maize silage DM < 30% ~	0.00 🔹	0.00	Dairy cow	*	Holst	tein ~				

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.

e Edit Animal Vie	w Нөр		A. Lad	Dairy De	9 Diet detail Price F	eed cost Co	ompare Sp	plitherd Notes	
Maize silage DM < 30)%e	- 0.26	As red	Dry M	atter Intake			2 %	Limit
Napier tresh mature 3	> 120 cm	· 0.00	÷ 0.00 ÷						
Maize bran	11112012011	~ 0.00	• 0.00 •	Metal	oolisable Energy			2 %	Req't
Limestone (CaC03)		~ 0.00	0.00						
		- 0.00	: 0.00 :	Metal	oolisable Protein			1 %	Req't
-		~ 0.00	0.000						
1		~ 0.00	\$ 0.00 \$	Calci	um			1 %	rpef
1		0.00	0.00 0					1	
		~ 0.00	: 0.00 0	Phos	phorus			3 % (leq't
1		~ 0.00	: 0.00 :						
1		- 0.00	0.00 0	Magn	esium			1%	Req1
-		- 0.00	: 0.00 :	_					
		- 0.00	: 0.00 0	NDF	% DM)	49 %	0		
1		~ 000	\$ 0.00 \$	Starc	h (% DM)	19 %			
		000	\$ 0.00 \$	Forag	e:Conc. ratio	100.0	0		2
al daily intake (kg/d)		0.3	1.0	049443				anguation (
Feed costs		Milk inco	me		Feed efficiency			Morgin	
Ush/t DM	11450	Ush/L raw	rmilk	8.00	kg ECM/kg DM	53.9		Ush/cow/d	117.02
Ush/MJ ME	1.157	Ush/kg E(CM	8.56	g F+P/kg DM	3806		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).

File E	dit Animal View	Help		-	Dairy
-			DM	As Fed	
1 8	rachiaria (Signal Grase)	tresh ~	10.28 🗣	40.80 9	Dŋ
2		v	0.00 \$	0.00 \$	
3			0.00 \$	0.00 0	Me
4		4	0.00 ‡	0.00 \$	
5		4	0.00.0	0.00 \$	Me
6		Ý	0.00 ‡	0.00 1	
7		4	0.00 \$	0.00 \$	Ca
8		ų	0.00 \$	0.00 \$	
9		ų.	0.00 \$	0.00 0	Ph
10.		v	0.00 \$	0.00 \$	
11		Ŷ	0.00.0	0.00 \$	Mo
12		4	0.00 0	0.00 \$	
13.		÷	0.00 \$	0.00 \$	ND
14:		4	0.00.0	0.00.2	Sta
15		ų.	0.00 0	0.00 \$	For
Total dai	ly intake (kg/d)		10.3	40.8	
Fe	ed costs		Milk income		
Us	h/t DM	3968	Ush/L raw mi	k	8.00
Us	h/MJ ME	0.436	Ush/kg ECM		8.56
Us	h/kg CP	30.76	Ush/kg F+P		121.21
Lin	(almosula)	48.70	Unblocked		80.00

Dairy	Diart	Diet detail	Price	Feed cost	Company	e Splitherd	Notes		
D	ry Matte	er Intake					100	% Limit	
N	letabolis	sable Energy					93	% Req1	
M	letabolis	sable Protein					133	% Req1	
c	alcium						54	% Req't	
p	hospho	nes					106	% Req'l	
M	lagnesiu	m		_			142	% Req't	
N	IDF (% C)		63 1	. 0				
s	tarch (%	4 DM)		1 9					
F	orage C	onc. ratio		100:0	0				ŧ.
		Feed effici	ency			,	(Cantild) Margin	M 88	UFE
8.00		kg ECM/kg1	M	(19		/sh/cow/d	39	21
21.21		Lish Milc/Lis	h Feed	1.0	61		Feed % income		51 .0
80.00		Serrington	11.946		644		Milk yield ((d) 1	0.0

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.

			DM	As Fed
Brachiaria (Si	gnal Grass) fresh	Y	10.28	40.80
		~	0.00 \$	0.00
		~	0.00 \$	0.00
		4	0.00 ‡	0.00
		4	0.00 \$	0.00
		- 21	0.00 \$	0.00 \$
		4	0.00 0	0.00
		~	0.00 0	0.00
		4	0.00 ‡	0.00
0		÷	0.00 \$	0.00 3
1		- 21	0.00 \$	0.00
		4	0.00 \$	0.00 \$
Ē		4	0.00 \$	0.00
		4	0.00 ‡	0.00
		~	0.00 \$	0.00 \$
tal daily intake (kg	g/d)		10.3	40.8
Feed costs			Milk income	
Ush/t DM	3968		Ush/L raw mil	k
Ush/MJ ME	0.436		Ushikg ECM	
Ush/kg CP	30.76		Ush/kg F+P	
Linklooudd	40.70		liphicow/d	

Diet detail Price Feed cost Compare Split herd Notes Diet 100 % Limit **Dry Matter Intake** Metabolisable Energy 100 % Reg't Metabolisable Protein 142 % Reg't Calcium 58 % Reg t Phosphorus 113 % Reg't Magnesium 152 % Reg't NDF (% DM) 63 % Starch (% DM) 1 % Forage: Conc. ratio 100:0 ESTIDE R M SHI UFL Margin Feed efficiency kg ECM/kg DM 0.8 Ush/cow/d 29.61 00 56 g F+P/kg DM 56 Ush/herd/d 21 Ush Milk/Ush Feed 1.726 40 Milk yield (l/d) 8.8 \$

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%.

			DM	As Fed
1.	Brachiaria (Signal Grass) f	íresh ~	9.30 🗘	36.90
2	Maize bran	Ŷ	1.33 🗘	1.50
3		Ű	0.00 \$	0.00 \$
4.		~	0.00 \$	0.00 \$
5.		9	0.00 \$	0.00 0
6.		0	0.00 \$	0.00 \$
7. [~	0.00 \$	0.00 0
8		9	0.00 \$	0.00 :
9		Y	0.00 \$	0.00 \$
10		0	0.00 \$	0.00 0
1. [2	0.00 ‡	0.00 \$
12		Ű	0.00 ‡	0.00 \$
13.		~	0.00 🗘	0.00 \$
14.		~	0.00 \$	0.00 0
15.		Ŷ	0.00-0	0.00 0
Total d	aily intake (kg/d)		10.6	38.4
F	eed costs		Milk income	
U	/sh/t DM	4600	Ush/L raw mil	k
U	ish/MJ ME	0,487	Ushikg ECM	
U	Jsh/kg CP	36.69	Ush/ikg F+P	
1	ish/cow/d	48.90	Ushicowid	

Dairy I	Diet Diet detail	Price Feed cost	Compare	Splitherd	Notes	
Dry	Matter Intake				100	% Limit
Me	abolisable Energy				100	% Req't
Mel	tabolisable Protein				130	% Req't
Cal	cium				58	% Req't
Pho	osphorus				111	% Req't
Mag	gnesium				144	% Req't
ND	F (% DM)	61	% 📀			
Sta	rch (% DM)	6	% 👄			
For	age:Conc. ratio	87:13	0			1
0.00	Feed effici	ency		Ľ	COLOR E Nargin	M CON UEL
8.56	a F+P/ka Di	VI.	63	1	lsh/herd/d	32.70
21.21	Ush Milk/Us	h Feed 1.	669	E	eed % income	60
81.60					Milk yield	(/d) 10.2 ♥

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'.

can runna	new rich		DM	As Fed
Brachiaria (Signal	Grass) fresh	÷.	9.30 😫	36.90 😫
Maize bran		×	1.33 🗘	1.50 🗘
		÷	0.00 ‡	0.00 \$
		×	0.00 ‡	0.00 \$
-		Ŷ	0.00 \$	0.00 \$
-		Ŷ	0.00 \$	0.00 \$
[×	0.00 \$	0.00 0
[Ŷ	0.00 \$	0.00 1
[×	0.00 ‡	0.00 \$
		ų,	0.00 \$	0.00 \$
[2	0.00 \$	0.00 ‡
-		Ŷ	0.00 ‡	0.00 \$
		Ŷ	0.00 ‡	0.00 \$
		×	0.00 \$	0.00 0
		Ŷ	0.00.0	0.00 0
I daily intake (kg/d)			10.6	38.4
Feed costs			Milk income	
Ush/t DM	4600		Ush/L raw mil	k
Ush/MJ ME	0.487		Ushikg ECM	
Ush/kg CP	36.69		Ush/kg F+P	
Ush/cow/d	48.90		Ush/cow/d	

Diet detail Price Feed cost Compare Split herd Notes **Dry Matter Intake** 100 % Limit Metabolisable Energy 100 % Reg't Metabolisable Protein 130 % Reg't Colcium 58 % Reg't 111 % Reg't Phosphorus Magnesium 144 % Reg't 61 % NDF (% DM) Starch (% DM) 6 % Forage:Conc. ratio 87:13 M REAL REAL Feed efficiency Margin 8.00 kg ECM/kg DM 0.9 Ush/cow/d 32.70 8.56 g F+P/kg DM 63 Ush/herd/d Ush Milk/Ush Feed 1.21 1.669 Food % income 60 1.60 Milk yield (I/d) 10.2 \$

21. Case study 1: Original feed ration

- For case study 1, a cow in a zerograzing 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.

File	Edit Animal View Help		DM	As Fed	Dairy Die	t Diet detail Price	Feed
\mathbf{T}_{i}	Maize silage DM < 30%	v.	1.31 0	5.00 \$	Dry M	atter Intake	
2.	Napier tresh mature > 120 cm	÷	6.99 🕄	3 .00 .		-	
3	Maize bran	~	1,77 🕏	00	Metab	oolisable Energy	
4	Limestone (CaC03)	<i></i>	0.02 🗣	02 💠			
5		~	0.00 0	00 \$	Metab	olisable Protein	
6		0	0.00 0	00.0			
7		~	0.00 \$	0.00 \$	Calciu	Im	_
8	1	~	0.00 0	0.00.0			
9.	1	4	0.00 \$	0.00 ‡	Phose	ohorus	
10.		~	0.00 \$	0.00 ‡	-		
11		5	0.00 0	0.00 \$	Mogne	esium	
12		~	0.00 \$	0.00 ‡			
13.			0.00 0	0.00 \$	NDF (% DM)	
14.		~	0.00 0	0.00 \$	Starc	h (% DM)	
15.		~	0.00 0	0.00 0	Forag	e:Conc. ratio	8
Total	l daily intake (kg/d)		10.1	37.0			
	Feed costs Ush/t DM 6057 Ush/MJ ME 0.713		Ailk income Jsh/L raw mi Jsh/kg ECM	ĸ	8.00 8.56	Feed efficiency kg ECM/kg DM g F+P/kg DM	
	Ush/kg CP 109.97	L	lsh/kg F+IP		121.21	Ush Milk/Ush Fe	ed
	Lish/cow/d 61.11	1	lshionw/d		120.00		

Metabolisable Energy 66 % F Metabolisable Protein 35 % F Calcium 44 % Re Phosphorus 88 % Re Magnesium 120 % Re NDF (% DM) 61 % Starch (% DM) 10 % Forage: Conc. ratio 82.18 Margin	
Metabolisable Protein 35 % F Calcium 44 % Re Phosphorus 88 % Re Magnesium 120 % Re NDF (% DM) 61 % Starch (% DM) 10 % Forage: Conc. ratio 82.18	leq't
Colcium 44 % Re Phosphones 88 % Re Magnesium 120 % Re NDF (% DM) 61 % Starch (% DM) 10 % Forage: Conc. ratio 82.18 Feed efficiency Margin	Req't
Phosphones 88 % Par Magnesium 120 % Re NDF (% DM) 61 % Starch (% DM) 10 % Forage: Conc. ratio 82.18 Feed efficiency Margin	əq't
Magnesium 120 % Re NDF (% DM) 61 % Starch (% DM) 10 % Forage: Conc. ratio 82.18 Feed efficiency Margin	t'pe
NDF (% DM) 61 % Starch (% DM) 10 % Forage:Conc. ratio 82.18 Feed efficiency Margin	eq't
Starch (% DM) 10 % 😁 Forage: Conc. ratio 82:18 🔿	_
Forage:Conc. ratio 82.18	
Feed efficiency Margin	1
0 kg ECM/kg DM 1.4 Ush/cow/d	58.89
6 g F+P/kg DM 98 Ush/herd/d	
1 Ush Milk/Ush Feed 1.964 Feed % income	51

cost Compare Solithard Notes

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;
 - <mark>Red</mark> 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).

con Aners	a view rielp		DM	As Fed
Maize silage I	DM < 30%	w.	1.31 0	5.00 0
Napier tresh r	nature > 120 cm	÷	6.99 🕏	30.00
Maize bran		~	1,77 🕏	2.00
Limestone (C	aC03)	4	0.02 🕏	0.02
		×	0.00 0	0.00 ‡
		ų,	0.00 0	0.00 \$
		×	0.00 \$	0.00 \$
		~	0.00 0	0.00 \$
		4	0.00 \$	0.00 ‡
		~	0.00 \$	0.00 2
		0	0.00 0	0.00 \$
		×	0.00 \$	0.00 ‡
		4	0.00 0	0.00 \$
		~	0.00 \$	0.00.\$
		×	0.00 \$	0.00/\$
aily intake (k	3/d)		10.1	37.0
Feed costs			Milk income	
Jsh/t DM	6057		Ush/L raw mil	k :
Ush/MJ ME	0.713		Ush/kg ECM	
Jsh/kg CP	109.97		Ush/kg F+P	
Ush/cow/d	61.11		Ush/cow/d	

Dairy Diet Diet detail Price Feed cost Compare Splitherd Notes

Dry Ma	atter Intake			95 %	Limit
Metab	olisable Energy			66 %	Req't
Metab	olisable Protein			35 %	Req't
Calciu	m			44 % F	leq't
Phosp	horus			88 % F	Req't
Mogne	esium			120 % F	leq't
NDF (% DM)	61 %	•		
Starch	a (% DM)	10 %			
Forage	e:Conc. ratio	82.18	0		
	Feed efficiency			Margin	50
00	kg ECM/kg DM	1.4		Ush/cow/d	58
56	g F+P/kg DM	.98		Ush/herd/d	
21	Ush Milk/Ush Feed	1.964		Feed % income	
.00				Milk yield (l(d)	1

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.

		DM	As Fed	_
Maize silage DM < 30%	×.	1.31 0	5.00 \$	
Napier tresh mature > 120 cm	÷	6.99 🔹	30.00 ‡	
Maize bran	Ŷ	1,77 🗘	2.00 🗘	
Limestone (CaC03)	÷	0.02 🕏	0.02 🗘	
	~	0.00 0	0.00 ‡	
	÷	0.00 0	0.00 2	
	×	0.00 \$	0.00 0	
	×.	0.00 0	0.00 0	
	6	0.00 \$	0.00 \$	
	~	0.00 \$	0.00 \$	
	5	0.00 0	0.00 \$	
	×	0.00 \$	0.00 ‡	
	Ý	0.00 0	0.00 0	
	~	0.00 0	0.00 \$	
	~	0.00 0	8.00.0	
laily intake (kg/d)		10.1	37.0	
Feed costs	4	Milk income	i.	
Jsh/t DM 6057	, 1	Ush/L raw mi	k	8.0
Jsh/MJ ME 0.713	1	Ush/kg ECM		8.5
Jsh/kg CP 109.97	f i	Ush/kg F+P		121.2
ishicowid 61.11	ě N	Ishionwid		120.0



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.

	File	Edit Animal View Help	DM	As Fed	Dairy Die	t Diet detail Price F	Feed cost (Compare	Splithere
	з.	Maize silage DM < 30%	1.31 0	5.00 0	Dry Ma	atter Intake			
	2	Napier tresh mature > 120 cm ~	6.99 🗘	30.00 ‡	-				
	3	Maize bran 🗸	1.77 🗘	2.00	Metab	olisable Energy			
	4	Limestorie (CaC03)	0.02 🕏	0.02 💠					
	5		0.00 0	0.00 \$	Metab	olisable Protein			
	6	<u></u>	0.00 0	0.00 \$	_				
	7	v)	0.00 \$	0.00 \$	Calciu	im			
	8	Vi	0.00 0	0.00 \$					
er	9.	U	0.00 ‡	0.00 \$	Phosp	horus			
	10.		0.00 ‡	0.00					
	11	U	0.00 \$	0.00 \$	Mogne	esium			
	12	v	0.00 \$	0.00 ‡					
	13.		0.00 0	0.00 0	NDF (% DM)	61 %	0	
	14.		0.00 \$	0.00.0	Starch	a (% DM)	10 %		
	15.	v	0.00 \$	0.00 0	Forage	e:Conc. ratio	82.18	0	
е	Total	daily intake (kg/d)	10.1	37.0		2			
		Feed costs N Ush/t DM 6057 U	lilk income sh/L raw mi	k	8.00	Feed efficiency kg ECM/kg DM	1.	4	
		Ush/MJ ME 0.713 U	sh/kg ECM		8.56	g F+P/kg DM	9	8	
		Ush/kg CP 109.97 U	sh/kgF+P		121.21	Ush Milk/Ush Feed	1.964	4	

Notes

95 % Limit

66 % Reg

35 % Reg't

44 % Reg't

88 % Reg't

120 % Reg't

MALL PM

Milk vield (I/d)

58.89

51

15.0 \$

lsh/cow/d

lsh/herd/d eed % income

24. Important note: Download Part II



This module continues in Part II...

- PROCEED TO PART II -