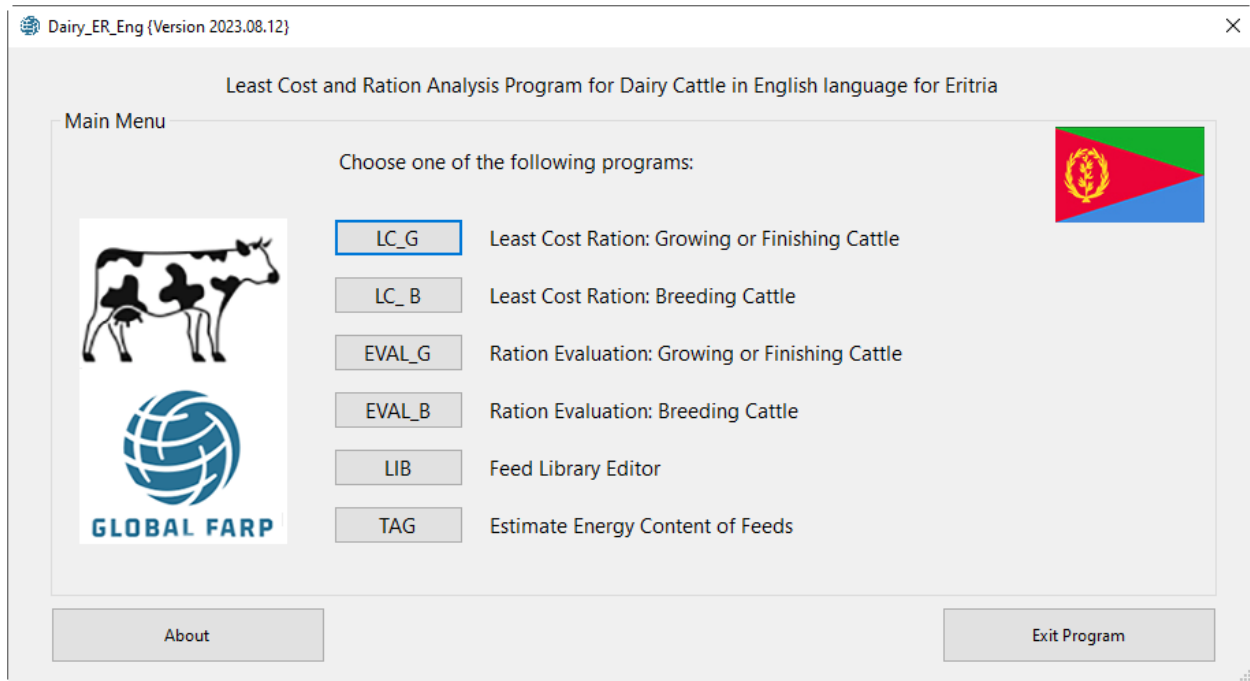


# PcDairy Eritrea Users' Manual



## Ration Evaluation and Formulation Program for Dairy Cattle in Eritrea

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## **Essential Bibliographic Information**

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*Sustainably intensifying smallholder livestock systems to improve human nutrition, health, and incomes*

## **Disclaimer**

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## Opening Menu

Run the GlobalFARP software. The Opening menu appears as shown below:

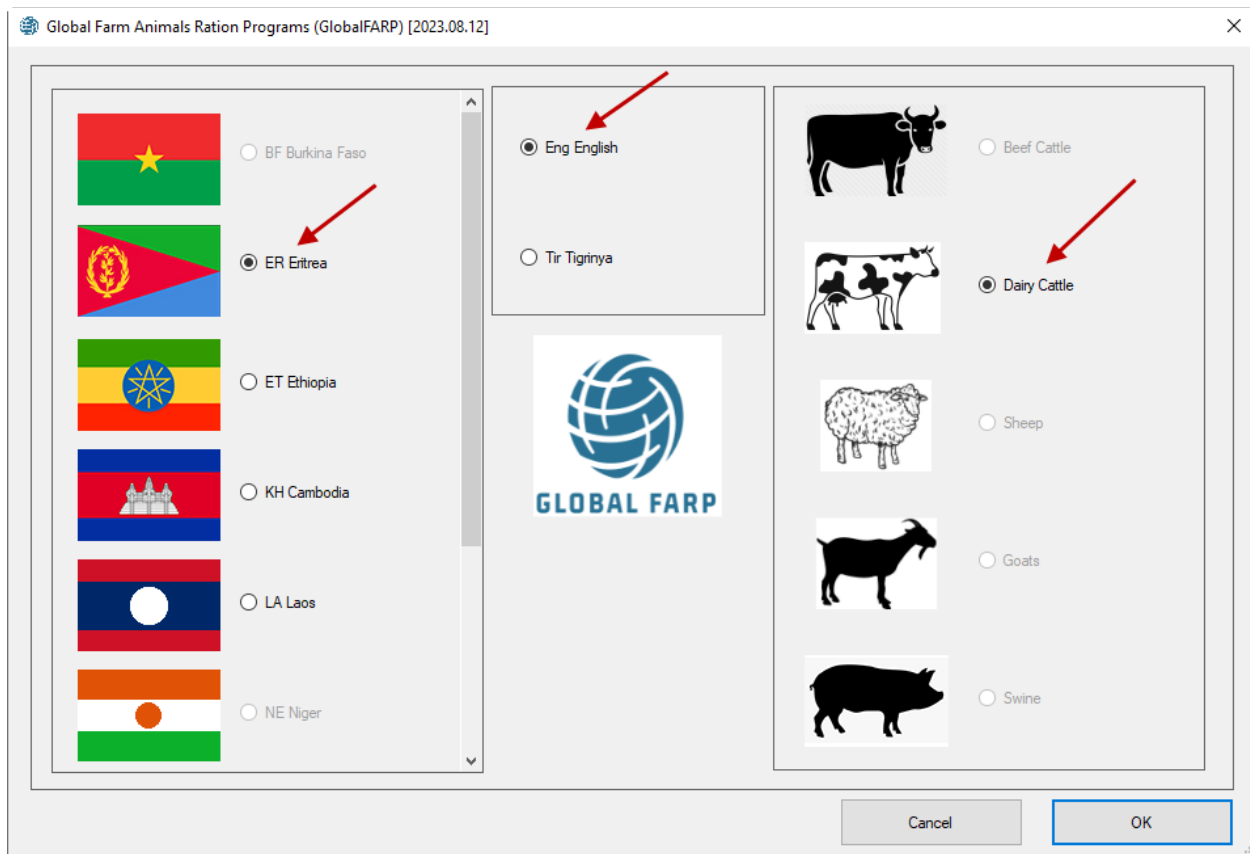
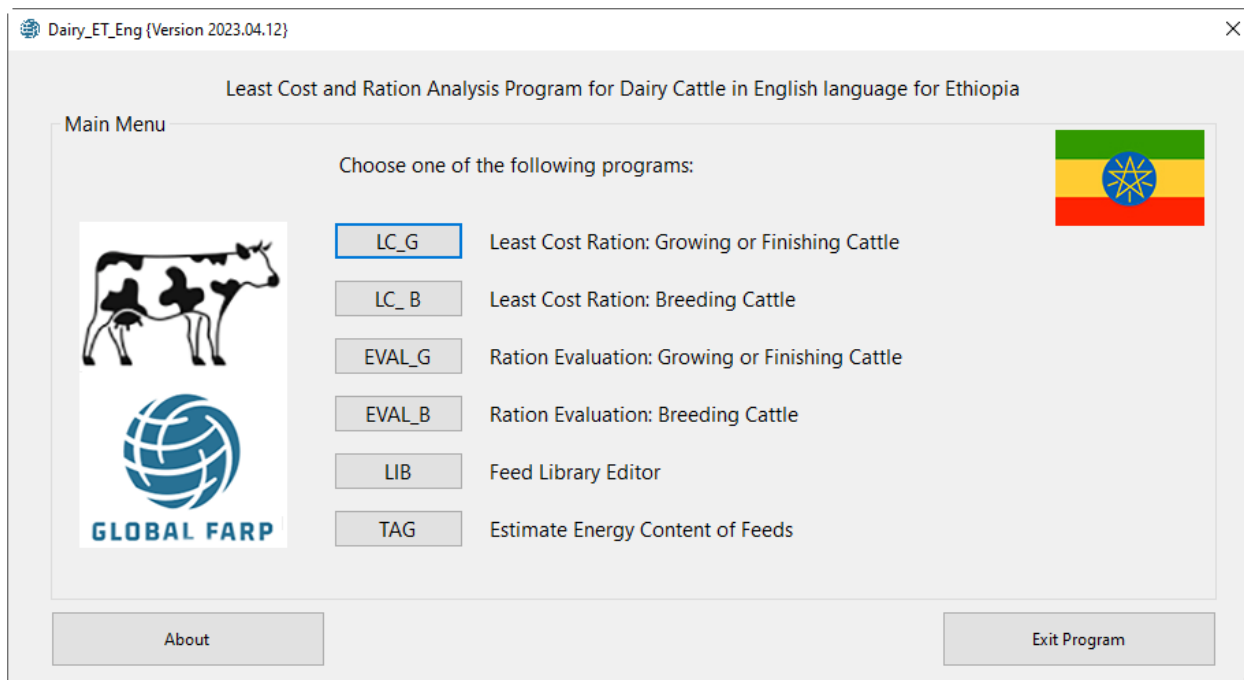


Figure 1. Opening menu of Global FARP software.

Figure 1 shows the opening menu of GlobalFARP software. For country select Eritrea, for language select English for farm animal select dairy cattle and click the OK button. The main menu of PcDairy program appears:




**Figure 2. Main menu of PcDairy program**

The main menu offers six choices:


1. LC\_G: Least cost ration formulation for growing dairy cattle
2. LC\_B: Least cost ration formulation for breeding dairy cattle
3. LC\_G: Ration evaluation for growing in dairy cattle
4. LC\_B: Ration evaluation for breeding dairy cattle
5. LIB: Feed library editor
6. TAG: Feed tag program to calculate energy values of feeds

## About


About (Version 2023.08.12) ✕



Ermias Kebreab, PhD



Abbas Ahmadi, PhD



Efreem Areaya Teckle

This program is a least cost and ration analysis program for Dairy cattle in Tigrina language for Eritrea. It is designed and developed by a team of animal science experts, software engineers, and local translators at Global Engagement Office, University of California Davis, USA.

The team members are listed below:

Dr Ermias Kebreab, Associate Dean, College of Agriculture and Environmental Sciences, Director, World Food Center, and Professor and Sesnon Endowed Chair at University of California, Davis, CA USA (ekebreab@ucdavis.edu).

Dr. Abbas Ahmadi, Software Developer, Global Engagement Office, University of California, Davis, CA USA (abahmadi@ucdavis.edu).

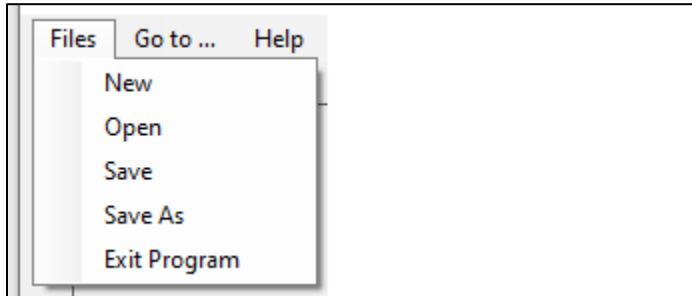
Efreem Areaya Teckle, Head, Rangeland Development Unit, Ministry of Agriculture, State of Eritrea, Asmara. (Efremat@moa.gov.er).

OK

## Navigation Bar

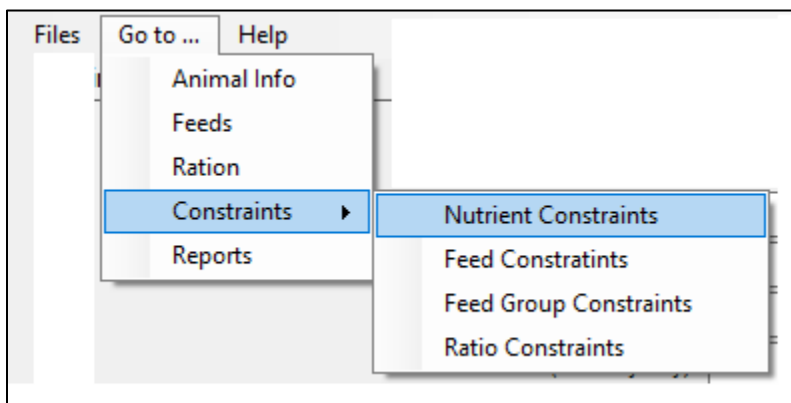
The navigation bar has three main options: Files, Go To, and Help.

### **Files Menu**



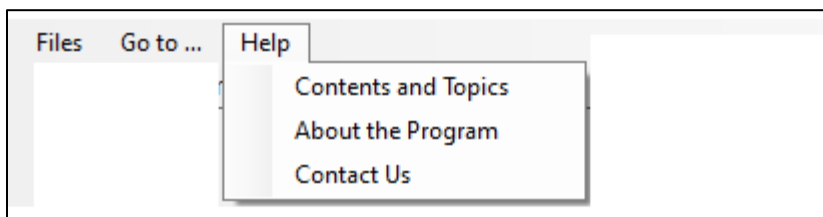
The files menu has five submenus for creating new simulation file, opening an existing simulation file, saving a simulation file, saving a simulation file with different name, and exiting the program.

### **Go To Menu**



The Go To menu has five submenus for going to Animal Info, Feeds, Ration, Constraints, and Reports, The Constraints submenu, in turn, has four more submenu to go to Nutrient Constraints, Feed Constraints, Feed Group Constraints, and Ration Constraints. Note that the Constraints submenu is only available in the formulation module. The evaluation module does not have any constraints submenus.

### **Help Menu**



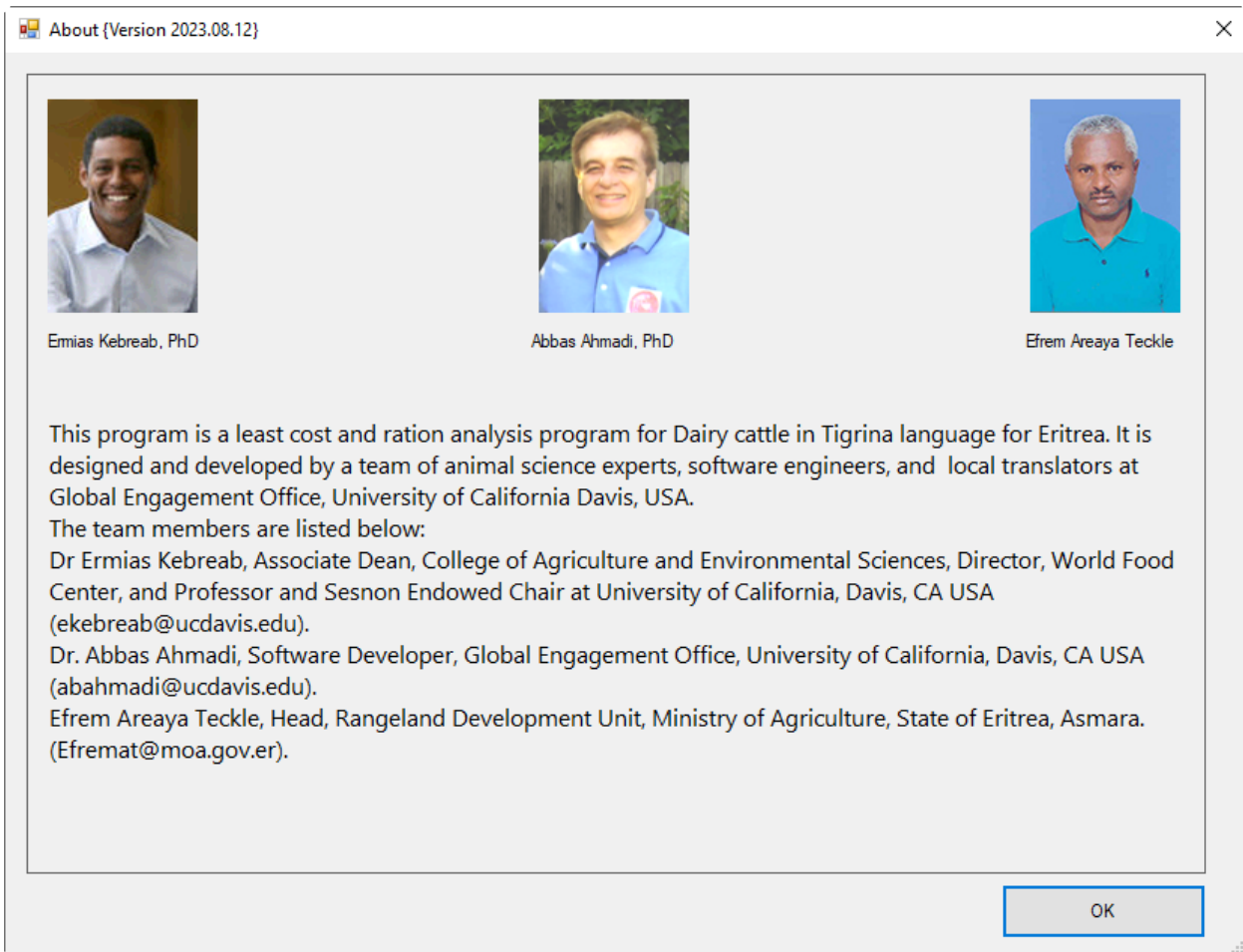
The Help menu has three submenus as listed below:

## Contents and Topics



Currently this local web site is empty, but will be populated at the end, after the software is fully developed.

## About the Program



This submenu shows the same information as provided by the About button in the Main menu.

## ANIMAL INFORMATION

Title	Example
Formulation is based upon fiber	1) ECF
and mineral	1) CA and P only
and protein	1) CP
Cow Weight (kg) (kg)	635
Milk Production (kg) (kg)	36
Milk fat (%) (%)	3.5
Daily body weight change (kg) (kg)	0
NEL added for activity (%) (%)	10
First lactation cows (%) (%)	30
Second lactation cows (%) (%)	20
Average Days In Milk for group	21+

Main Menu

Figure 3. Animal Information Screen for Least cost ration formulation for breeding dairy cattle

Most of the following fields are common to all four modules, but some of the fields may be present in one module but not in others.

### Title

Enter a name and/or address or other identification for your ration on these two lines.

### Fiber formulation basis

A minimum amount of fiber is required in each ration. You may select which type of fiber is to be used as a minimum constraint when the ration is formulated:



1. Effective Crude Fiber (ECF) OR
2. Acid Detergent Fiber (ADF) OR
3. Neutral Detergent Fiber (NDF) OR
4. combinations of these

#### *Mineral formulation basis*

You may select the number of minerals to be used as minimum constraints when a ration is formulated.

Minimum amounts of calcium (CA) and phosphorus (P), based on National Research Council standards, are required in each ration. You may limit the requirements to include only CA and P or you may specify chlorine (CL), potassium (K), magnesium (MG), sodium (NA), and sulfur (S) to be used as additional mineral constraints.

No default requirements are included for the minor elements CO, CU, FE, I, MN, SE, and ZN.

Requirements for these minor minerals may be added by the user on the Nutrient Constraints page of the input screens. However, inclusion of requirements for CO, CU, FE, I, MN, SE, or ZN may result in the inclusion of "MINOR MINERALS" from the "Infeasible Feeds List" to be included in the ration if the minor minerals in the available feeds are inadequate to fulfill specified requirements.

#### *Protein formulation basis*

A minimum amount of protein is required in each ration based on National Research Council standards.

You may select the type(s) of protein to be used as a minimum constraint(s) when the ration is formulated:

1. Crude Protein (CP) OR
2. Undegradable and Degradable Intake Protein (UIP and DIP) OR
3. All three (CP, UIP, DIP)

CAUTION: Reliable data on the UIP and DIP content of many feeds are meager or lacking entirely. If you choose to use the UIP and DIP requirements, you must provide the missing UIP and DIP content of feeds in your feed list. Otherwise, "UIP-DIP Power" from the "Infeasible Feeds List" may be included in the ration indicating that UIP and DIP requirements cannot be fulfilled by feeds in your feed list.

#### *Energy formulation basis*

Each ration requires minimum amounts of energy for maintenance and weight gain based on National Research Council standards. You may choose the type of energy system to be used for formulating the ration:

1. Net Energy for Maintenance and for Gain (NEM and NEG) OR
2. Total Digestible Nutrients (TDN)

### *Cow weight*

Enter the average weight of the group of cows for which this ration is being formulated (range: 700 to 1800 lb or 350 to 800 kg).

### *Milk production*

Enter the amount of milk yield per cow for which you would like to formulate or evaluate the ration (range: 0 to 130 lb/day, or 0 to 59 kg/day).

Enter 0 if you are formulating or evaluating a least cost ration for dry cows. Milk production should be entered as the actual amount (lb or kg) per cow per day, not fat-corrected-milk.

### *Milk fat percentage*

Enter the average milk fat percentage of milk produced by cows in this group (range: 3.0 to 5.5 percent).

### *Daily body weight change*

Enter the desired amount of weight gain (or loss) per cow per day (range: -4.000 to 2.000 lb/day, or -1.814 to 0.907 kg/day). Lactating cows in early-lactation (0 - 60 days postpartum) usually are in negative energy balance and are losing body weight (-1 to -4 lb/day, or -0.45 to -1.80 kg/day). Cows in mid- and late-lactation (more than 100 days postpartum) should be in positive energy balance and should be gaining weight (0.45 to 2.00 lb/day, or 0.2 to 0.9 kg/day).

Dry cow requirements include an allowance for normal weight gain during the dry period. Additional weight gain may be specified for cows that are extremely thin at drying off.

### *NEL added for activity*

Energy required for maintenance of cows depends upon their body weight, activity, and environmental conditions. The percentage that you enter on this line will increase the NRC maintenance requirement of NEL in the ration by the percentage entered.

For cows on pasture, the NEL requirement should be increased by 10 to 20% for extra activity associated with grazing.

For extremely cold and wet conditions when cows are not housed indoors, the maintenance requirement may need to be increased by as much as 50%.

### *First lactation cows*

Enter the percentage of cows in this group that are in their first lactation (range: 0 - 100%). This will automatically add an allowance for growth of first lactation cows.

### *Second lactation cows*

Enter the percentage of cows in this group that are in their second lactation (range: 0 - 100%). This will automatically add an allowance for growth of second lactation cows.

### Days in milk (DIM)

Select an item from a list of available choices.

1. For Dry Cows, DIM = 0.
2. For Lactating Cows If DIM is 1-20, default nutrient constraints for protein, fiber, calcium, and phosphorus concentrations in the dietary dry matter are those specified for the "Early Lactation" diet in Table 6-5 and Appendix Table 5 of NRC "Nutrient Requirements of Dairy Cattle", Sixth Revised Edition, Update 1989. If DIM is 21+, normal NRC requirements are used.

### Sex

The nutrient requirements for growing animals are calculated using many factors, one of which is the sex of the animal. You should formulate or evaluate rations separately for each sex.

### Breed

The nutrient requirements for growing animals are calculated using many factors, one of which is the breed of the animal. This program classifies animals as either large breed or small breed. You should formulate or evaluate rations separately for each type.

### Age in months

The nutrient requirements for growing animals are calculated using many factors, one of which is the age of the animal. This program classifies growing animals into three age groups: 3 to 6 months, 7 to 12 months, or greater than 12 months.

### Body weight

Enter the average weight of the animals for which this ration is being formulated or evaluated.

1. Large breed females (range: 200 to 1300 lb, or 100 to 600 kg)
2. Small breed females (range: 200 to 1000 lb, or 100 to 450 kg)
3. Large breed males (range: 200 to 1800 lb, or 100 to 800 kg)
4. Small breed males (range: 200 to 1300 lb, or 100 to 600 kg)

### Daily gain

Enter the desired average gain per animal per day.

1. Large breed females (range: 1.3 to 1.7 lb/day, or 0.6 to 0.8 kg/day)
2. Small breed females (range: 0.9 to 1.3 lb/day, or 0.4 to 0.6 kg/day)
3. Large breed males (range: 1.8 to 2.2 lb/day, or 0.8 to 1.0 kg/day)
4. Small breed males (range: 1.1 to 1.5 lb/day, or 0.5 to 0.7 kg/day)

## FEED LIST SCREEN

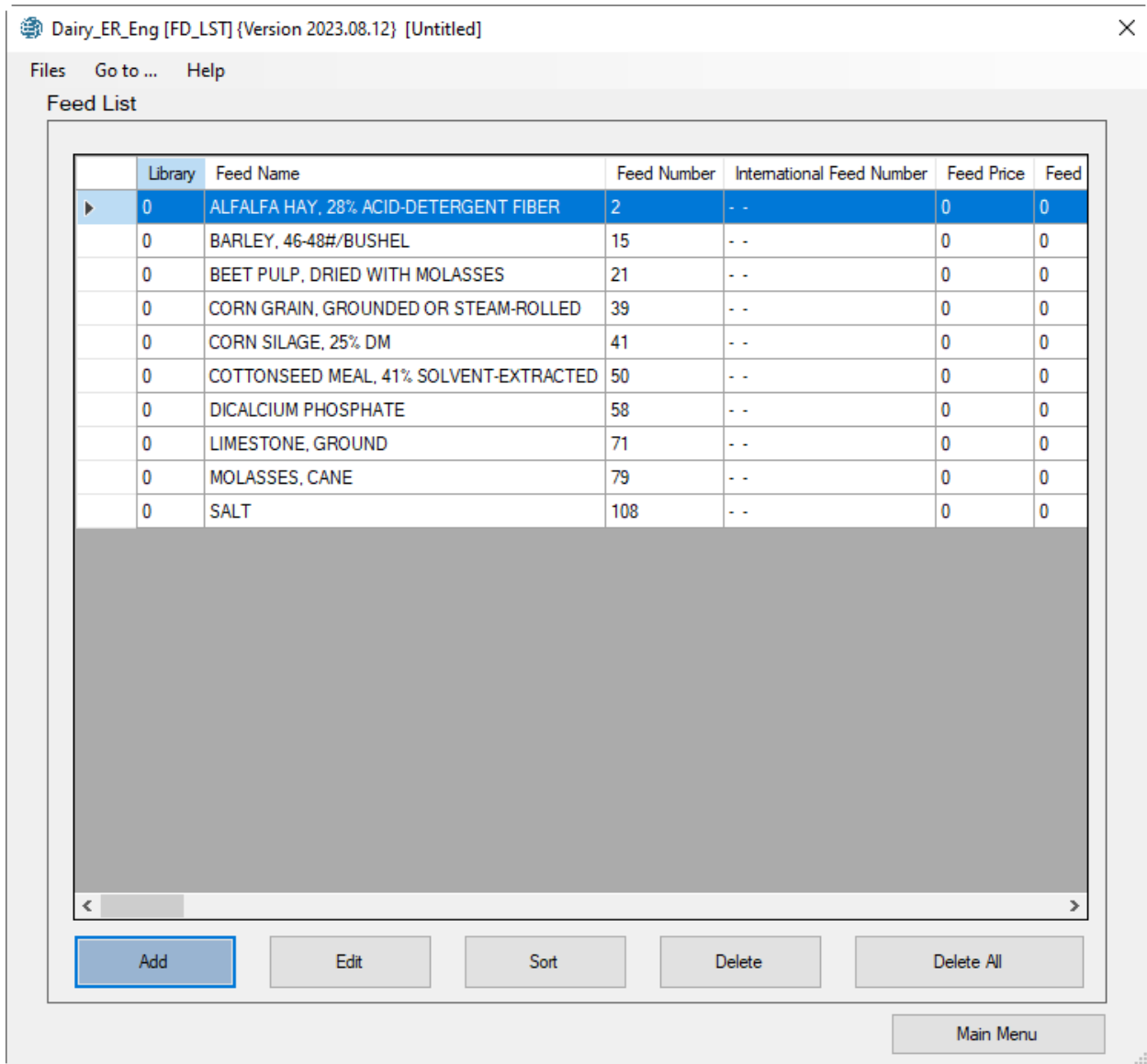


Figure 4. Feed list Screen.

Enter the set of feeds that you wish to consider for ration formulation into the table on this page. If you are evaluating an existing ration, enter all of the feeds that are in the ration.

When you add a feed from the standard or alternate feed libraries to your ration data file, a separate copy of that feed will be added to your ration data file. Change in the feed in your ration data file does not reflect back to the feed in the feed library. Change in the feed in the feed library does not reflect back to the feed in your ration data file. These two feeds remain independent from each other.

You can scroll horizontally to view nutrients for each feed.

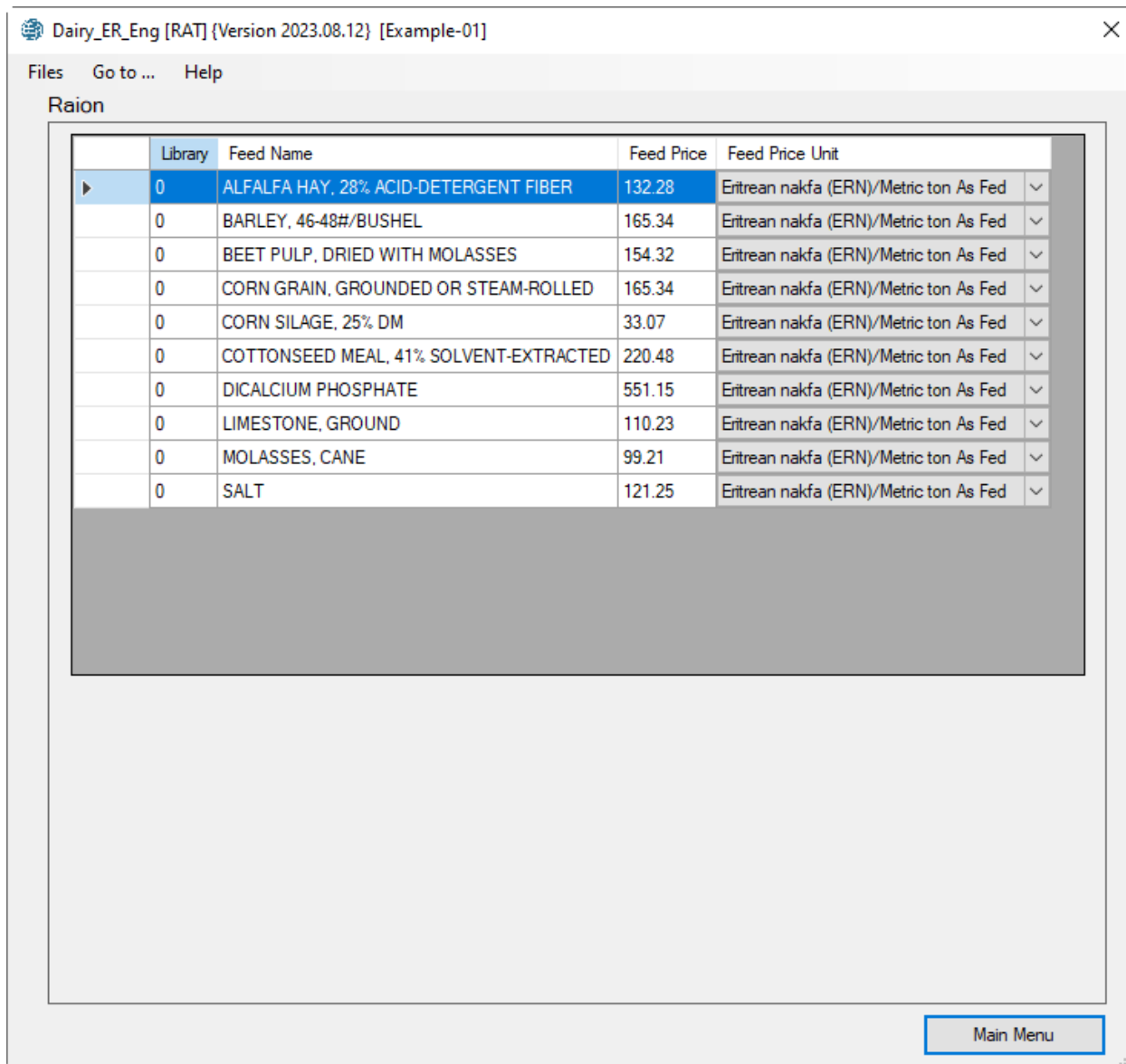
To ADD a feed to the list, press the <Add> button.

To DELETE a feed from the list: use the arrow keys to move to the line in the table containing the feed that you wish to delete. Remove the feed by pressing the <Delete> button.

To EDIT a feed: move to the line that you want to edit and then press the <Edit> button.

- For a list of feed groups see Appendix-01-Feed Groups
- For a list of standard feeds see Appendix-03-Standard Feeds.
- For a list of alternate feeds see Appendix-04-Alternate Feeds.
- For a list of infeasible feeds see Appendix-05-Infeasible Feeds.
- For a list of feed components see Appendix 06-Feed Components.

## RATION SCREEN



Library	Feed Name	Feed Price	Feed Price Unit
0	ALFALFA HAY, 28% ACID-DETERGENT FIBER	132.28	Eritrean nakfa (ERN)/Metric ton As Fed
0	BARLEY, 46-48#/BUSHEL	165.34	Eritrean nakfa (ERN)/Metric ton As Fed
0	BEET PULP, DRIED WITH MOLASSES	154.32	Eritrean nakfa (ERN)/Metric ton As Fed
0	CORN GRAIN, GROUNDED OR STEAM-ROLLED	165.34	Eritrean nakfa (ERN)/Metric ton As Fed
0	CORN SILAGE, 25% DM	33.07	Eritrean nakfa (ERN)/Metric ton As Fed
0	COTTONSEED MEAL, 41% SOLVENT-EXTRACTED	220.48	Eritrean nakfa (ERN)/Metric ton As Fed
0	DICALCIUM PHOSPHATE	551.15	Eritrean nakfa (ERN)/Metric ton As Fed
0	LIMESTONE, GROUND	110.23	Eritrean nakfa (ERN)/Metric ton As Fed
0	MOLASSES, CANE	99.21	Eritrean nakfa (ERN)/Metric ton As Fed
0	SALT	121.25	Eritrean nakfa (ERN)/Metric ton As Fed

Figure 5. Ration screen for the formulation module.

Figure 5 shows the ration screen for the formulation module. The price for each feed is in Eritrean nakfa (ERN) per metric ton on as fed basis. The formulation module will calculate the amount of each feed for a least cost ration. But in the evaluation module the amount of each feed must be entered by the user, as shown in Figure 6. The amount for each feed is in kg per day on as fed basis.

Dairy\_ER\_Eng [RAT] (Version 2023.09.15) [Example-01] X

Files Go to ... Help

Raion

	Library	Feed Name	Amount AS FED	Feed Amount Unit	Feed Price	Feed Price
▶	0	ALFALFA HAY, 28% ACID-DETERGENT FIBER	9.940000	kg	132.28	Eritrean na
	0	BARLEY, 46-48#/BUSHEL	4.280000	kg	165.34	Eritrean na
	0	BEET PULP, DRIED WITH MOLASSES	4.670000	kg	154.32	Eritrean na
	0	CORN GRAIN, GROUNDED OR STEAM-ROLLED	0.000000	kg	165.34	Eritrean na
	0	CORN SILAGE, 25% DM	10.530000	kg	33.07	Eritrean na
	0	COTTONSEED MEAL, 41% SOLVENT-EXTRACTED	2.950000	kg	220.48	Eritrean na
	0	DICALCIUM PHOSPHATE	0.000000	kg	551.15	Eritrean na
	0	LIMESTONE, GROUND	0.000000	kg	110.23	Eritrean na
	0	MOLASSES, CANE	0.000000	kg	99.21	Eritrean na
	0	SALT	0.000000	kg	121.25	Eritrean na

Total Intake As Fed (kg)

Ration Summary

	Library	Feed Name	Feed Number	International Feed Number	Feed Price	Feed Price Unit	Feed Type	Maximum Volu

Figure 6. Ration screen for the evaluation module.

## NUTRIENT CONSTRAINTS SCREEN

	InternalName	DisplayName	Pct_Unit_Metric	Pct_UsrMin	Pct_UsrMax	Amt_Unit_Metric	Amt
▶	DM	Feed Dry Matter	% DM	35.000		kg	
	NEL	Net Energy for La...	Mcal/kg			Mcal	36.78
	CP	Crude Protein	% DM	16.000		kg	3.481
	FAT	Fat or Ether Extract	% DM		8.000	kg	
	ECF	Effective Crude F...	% DM	17.000		kg	
	CA	Calcium	% DM	0.600		kg	0.135
	P	Phosphor	% DM	0.380		kg	0.086
	NPN	Non-Protein Nitro...	% DM		0.500	kg	

Figure 7. Nutrient constraints screen for the formulation module

The nutrient constraints displayed on this page have been calculated based upon the animal information already entered on the previous page. If you wish to change any of these constraints, you may as follow:

To ADD a constraint: Click the [Add] button. A dialog box appears. Enter your new nutrient constraint and then click the [OK] button.

To EDIT a constraint: Move your cursor to the line containing the constraint and click the [Edit] button. A dialog box appears. Modify the existing constraint and then click the [OK] button.



To DELETE a constraint: Move your cursor to the line containing the constraint and click the [Delete] button.

To regenerate default NRC nutrient constraints, click the [Recalculate] button. This will replace all nutrient constraints which you may have changed previously.

#### *Internal Name*

This column contains the nutrient codes.

#### *Display Name*

This column contains the nutrient names. Please refer to Appendix-02-Nutrients for a list of nutrients and their abbreviations.

#### *Pct\_Unit\_Metric*

This column contains the unit for concentration constraints.

#### *Pct\_User\_Min*

This column contains the minimum concentration constraints.

#### *Pct\_User\_Max*

This column contains the maximum concentration constraints.

#### *Amt\_Unit\_Metric*

This column contains the unit for amount constraints.

#### *Amt\_User\_Min*

This column contains the minimum amount constraints.

#### *Amt\_User\_Max*

This column contains the maximum amount constraints.

## FEED CONSTRAINTS SCREEN

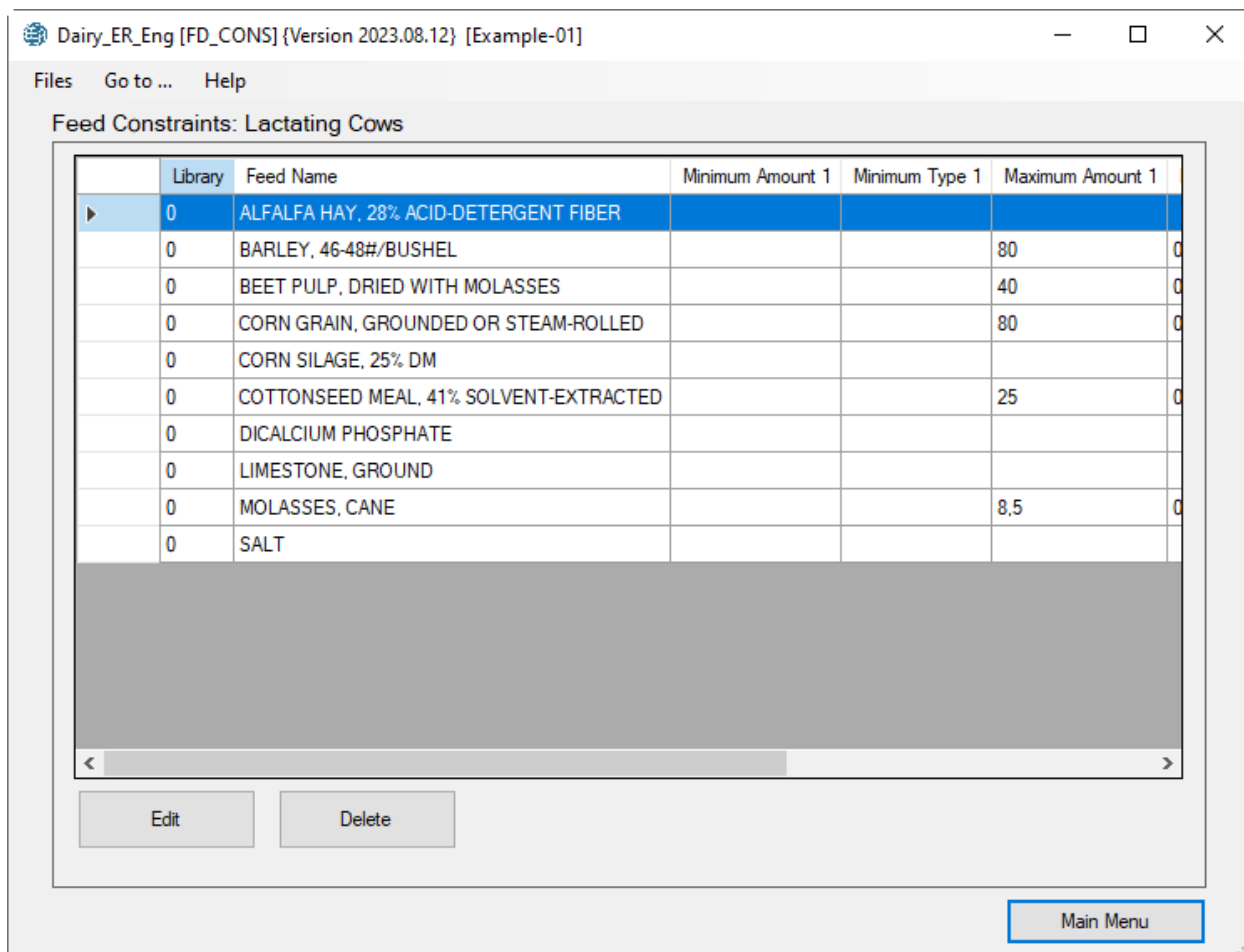


Figure 8. Feed constraints screen.

The user can force in a feed by setting a minimum constraint or limit its use by setting a maximum constraint.

### Minimum amount

You can force a feed to be included in the ration by entering a minimum constraint amount. The program will then include at least this amount and maybe more when formulating the ration. When entering the desired amount, you must identify the type of constraint (i.e. percent or amount). To delete an existing minimum constraint, enter 0 for the amount or set it to blank.

### Maximum amount

You can limit the amount of a feed group in the ration by entering a maximum constraint on that group. When entering the desired amount, you must identify the type of constraint (i.e. percent or amount). Some feeds in the standard library have built-in maximum constraints which will automatically be

displayed in this column. To delete an existing maximum constraint, enter 0 for the amount or set it to blank.

*Constraint unit*

A constraint can have one of the following units:

00 [KGAF] kgs as fed
01 [KGDM] kgs of dry matter
02 [%CDM] % of CONCENTRATE portion of ration on 100% DM basis
03 [%RDM] % of ROUGHAGE portion of ration on 100% DM basis
04 [%TDM] % of TOTAL ration on 100% DM basis
05 [%CAF] % of CONCENTRATE portion of ration on AS FED basis
06 [%RAF] % of ROUGHAGE portion of ration on AS FED basis
07 [%TAF] % of TOTAL ration on AS FED basis

*Animal types*

Each feed can have a different set of limits for different types of animals, such as lactating cows, dry cows, or growing animals. There are three animal types, and each animal type has its own constraints:

1	Lactating Cows	MINAMT1, MAXAMT1
2	Dry Cows	MINAMT2, MAXAMT2
3	Growing Animals	MINAMT3, MAXAMT3

To EDIT a constraint: Move your cursor to the line containing the constraint and click the [Edit] button. A dialog box appears. Modify the existing constraint and then click the [OK] button.

To DELETE a constraint: Move your cursor to the line containing the constraint and click the [Delete] button. This will set the minimum and maximum values for that row to blank, but keeps the row in the list, in case you change your mind and want to constraint it again.

## FEED GROUP CONSTRAINTS SCREEN

	Group Number	Group Name	Feeds in Group	Minimum Amount 1	Minimum Type 1	Minimum Amount 1	Minimum
▶	-2	Roughages	2				
	-1	Concentrates	8				
	3	Barley Products	1			80	02 [%C
	4	Sugar Beet Products	1			40	02 [%C
	8	Corn Products	1			80	02 [%C
	10	Cottonseed Meal Prod	1			25	02 [%C
	14	Molasses Products	1			8.5	02 [%C

Buttons: Add, Edit, Delete, Main Menu

Figure 9. Feed group constraints.

The feeds are groups in 29 groups as listed in Appendix-01-Feed Groups. This screen lists only those groups that are in the feed list screen.

The user can force in a feed group by setting a minimum constraint or limit its use by setting a maximum constraint.

### *Minimum amount*

You can force a feed group to be included in the ration by entering a minimum constraint amount. The program will then include at least this amount and maybe more when formulating the ration. After you enter the desired amount, the program will ask you to identify the type of constraint (i.e. percent or amount). To delete an existing minimum constraint, enter 0 for the amount or set it to blank.

### Maximum amount

You can limit the amount of a feed group in the ration by entering a maximum constraint on that group. After you enter the desired amount, the program will ask you to identify the type of constraint (i.e. amount or percent). Many of the feed groups in the standard library have built-in maximum constraints which will automatically be displayed in this column. To delete an existing maximum constraint, enter 0 for the amount or set it to blank

### Constraint unit

A constraint can have one of the following units:

00 [KGAF] kgs as fed
01 [KGDM] kgs of dry matter
02 [%CDM] % of CONCENTRATE portion of ration on 100% DM basis
03 [%RDM] % of ROUGHAGE portion of ration on 100% DM basis
04 [%TDM] % of TOTAL ration on 100% DM basis
05 [%CAF] % of CONCENTRATE portion of ration on AS FED basis
06 [%RAF] % of ROUGHAGE portion of ration on AS FED basis
07 [%TAF] % of TOTAL ration on AS FED basis

### Animal types

Each feed group can have a different set of limits for different types of animals, such as lactating cows, dry cows, or growing animals. There are three animal types, and each animal type has its own constraints:

1	Lactating Cows	MINAMT1, MAXAMT1
2	Dry Cows	MINAMT2, MAXAMT2
3	Growing Animals	MINAMT3, MAXAMT3

To EDIT a constraint: Move your cursor to the line containing the constraint and click the [Edit] button. A dialog box appears. Modify the existing constraint and then click the [OK] button.

To DELETE a constraint: Move your cursor to the line containing the constraint and click the [Delete] button. This will set the minimum and maximum values for that constraint to blank, but keeps the group in the list, in case you change your mind and want to constraint it again.

You cannot add feed group constraints directly. Feed groups constraints will be added when you add a feed to the Feed List screen. The program automatically adds all the feeds groups of that feed and their default feed group constraints.

## RATIO CONSTRAINTS SCREEN

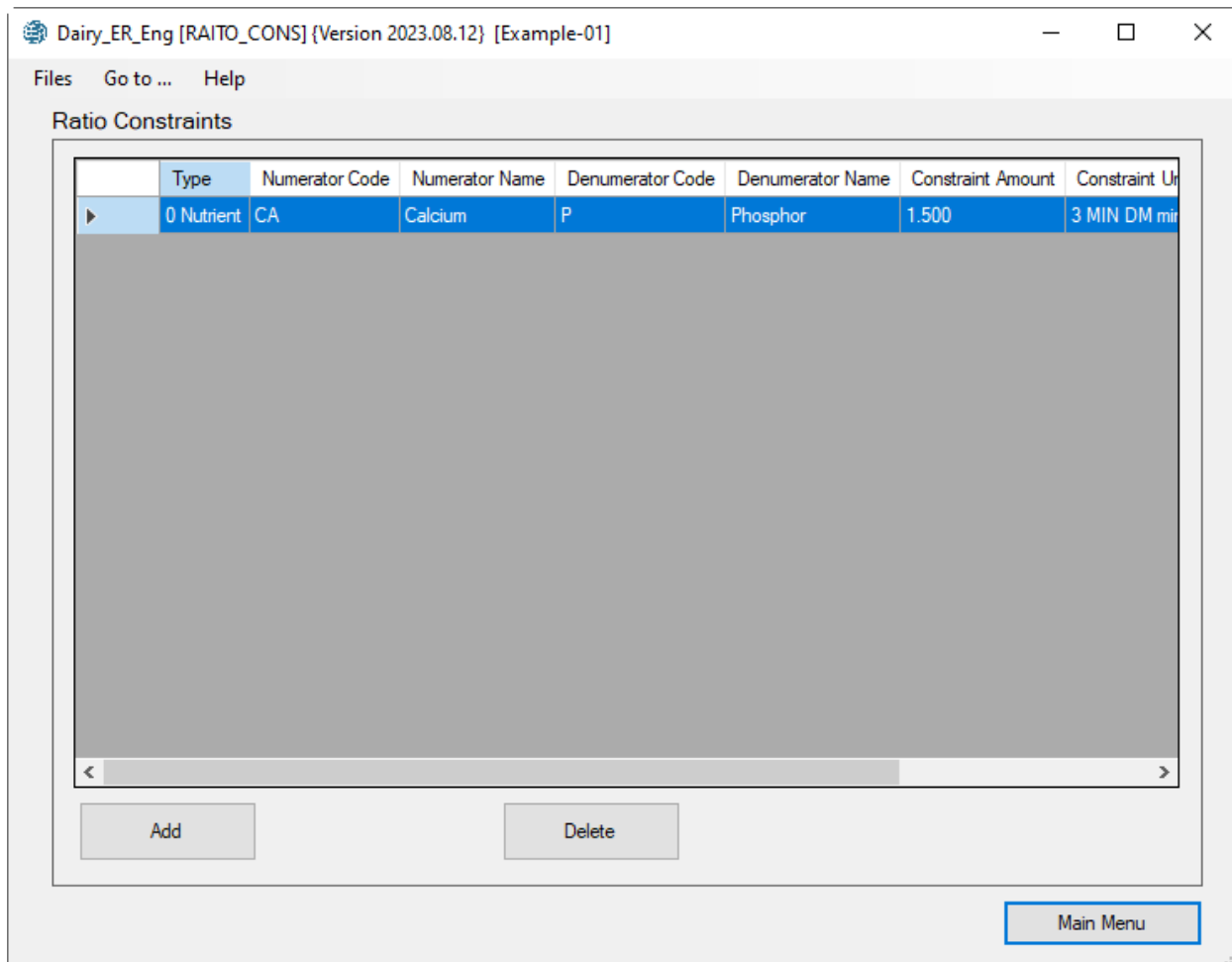


Figure 10. Ratio constraints

In this screen you can define ratio constraints to be used for ration formulation.

To ADD a ratio, click the <Add> button.

To DELETE a ratio from the list: use the arrow keys to move to the line in the table containing the ratio that you wish to delete. Then click the <Delete> button.

To EDIT a ratio: move to the line that you want to edit and then click the <Edit> button.

### Ratio type

Ratio types are as follows:

- 0 - nutrient ratios
- 1 - feed group ratios
- 2 - feed ratios

#### *Numerator code*

Each ratio has two parts: a numerator and a denominator. If, for example, you are defining a calcium to phosphorus ratio, the numerator is calcium, and the denominator is phosphorus.

#### *Denominator code*

Each ratio has two parts: a numerator and a denominator. If, for example, you are defining a calcium to phosphorus ratio, the numerator is calcium, and the denominator is phosphorus.

#### *Constraint amount*

You should enter a ratio constraint amount. For example, if you want to have twice as much calcium as phosphorus in the ration, you will define a calcium to phosphorus ratio of 2.0.

#### *Constraint unit*

Units for ration constraints are listed below:

0 MIN AF minimum constraint, as fed basis
1 MAX AF maximum constraint, as fed basis
2 EQL AF equality constraint, as fed basis
3 MIN DM minimum constraint, 100% dry matter basis
4 MAX DM maximum constraint, 100% dry matter basis
5 EQL DM equality constraint, 100% dry matter basis

Identify the type of ratio constraint by using the arrow keys to move to the desired type. Then press the <Enter> key.

# REPORTS

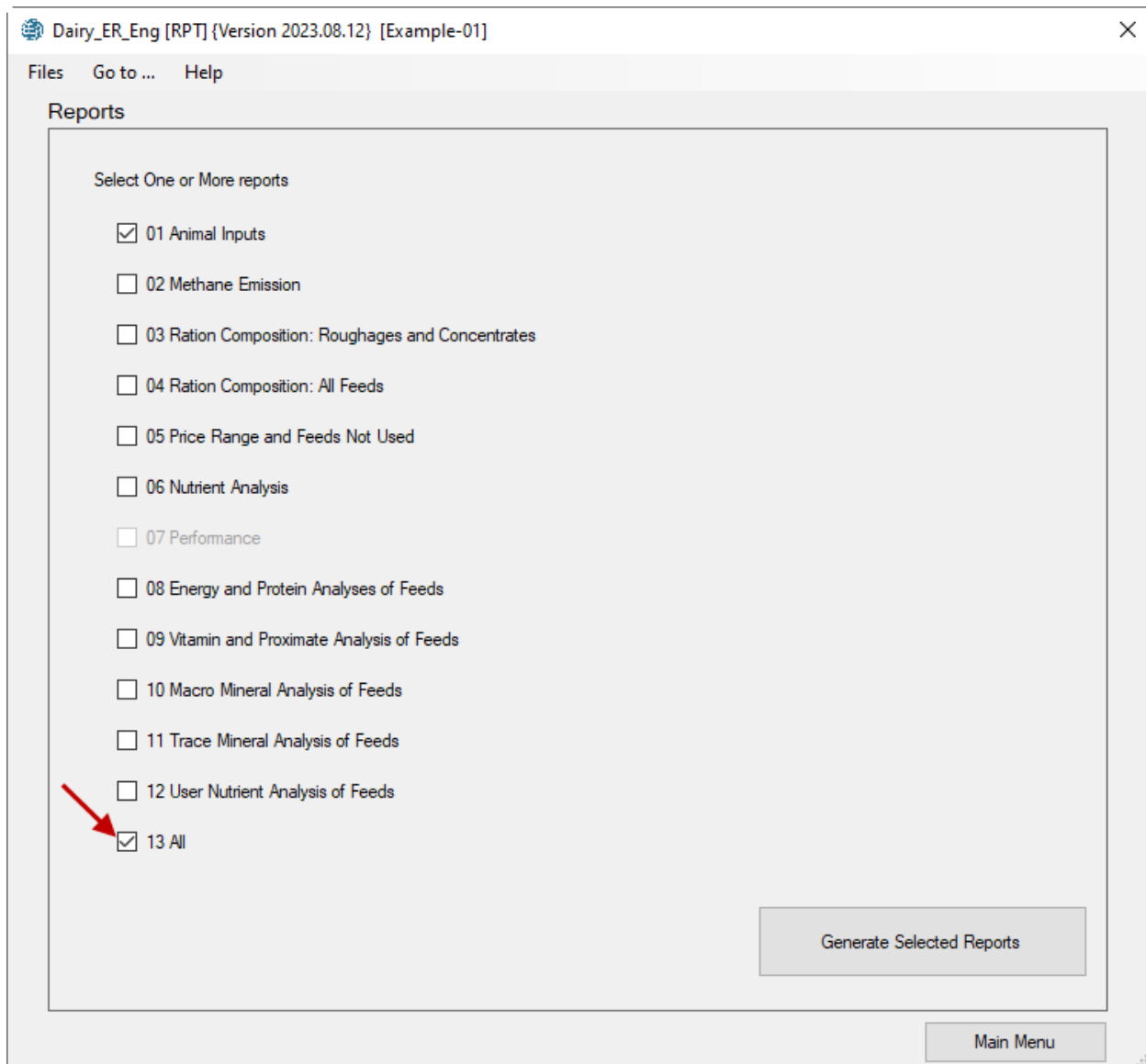


Figure 11. Reports for the Formulation module.

The software package generates 12 output reports in RTF format, which can be displayed by the Windows built-in WordPad program.

Note that some reports are not available for evaluation module or evaluation module.



## Report 01 Animal Input

<b>Report 1. Animal Inputs</b>	
Item	Value
Title	Example
Formulation is based upon fiber and mineral	1) ECF
and protein	1) CA and P only
Cow Weight (kg) (kg)	1) CP
Milk Production (kg) (kg)	635
Milk fat (%) (%)	36
Daily body weight change (kg) (kg)	3.5
NEL added for activity (%) (%)	0
First lactation cows (%) (%)	10
Second lactation cows (%) (%)	30
Average Days In Milk for group	20
	21+

Figure 12. Report 01. Animal Input.

This report shows a list of animal input values.

## Report 02 Methan Emission

Report 2. Methane Emission	
Item	Value
Methane Emission in MJ per day per head (MJ/d)	22.340
Methane Emission in Mcal per day per head (Mcal/d)	5.339
Methane Emission in gram per day per head (g/day)	401.791
Methane Emission in gram per kg of dry matter intake (g/kg)	17.564
Methane Conversion Rate (%)	5.080

(1) The methane conversion rate is the fraction of gross energy in diet converted to methane (percent). Normal Range 2 to 12:  
3.5 Extremely Low  
4.5 Very Low  
5.5 Low  
6.5 Average  
7.5 High  
8.5 Very High  
9.5 Extremely High

Figure 13. Report 02. Methan Emission.

In this report the methane emission for lactating cows, or dry cows, or heifers, or steers, is calculated based on the following paper:

Moraes, L. E., E. Kebreab, A.B. Strathe, J. G. Fadel, and D. P. Casper. 2014. Prediction of enteric methane emissions from cattle. *Global Change Biology*, 20 (7): 2140-2148.

### *Methane Emission for Lactating Cows:*

$$\text{Eq. 1: CH}_4 = -9.311 + 0.042 \times \text{GEI} + 0.094 \times \text{NDF} - 0.381 \times \text{EE} + 0.008 \times \text{BW} + 1.621 \times \text{MF}$$

CH<sub>4</sub>, Methane emissions (MJ/d); GEI, Gross energy intake (MJ/d); NDF, Dietary neutral detergent fiber proportion (% of dry matter); EE, Dietary ether extract proportion (% of dry matter); BW, Body Weight (kg); MF, Milk fat (%).

### *Methane Emission for Dry Cows:*

$$\text{Eq. 2: CH}_4 = 2.880 + 0.053 \times \text{GEI} - 0.190 \times \text{EE}$$

CH<sub>4</sub>, Methane emissions (MJ/d); GEI and EE are defined in equation 1.

### *Methane Emission for Heifers:*

$$\text{Eq. 3: CH}_4 = -1.487 + 0.046 \times \text{GEI} + 0.032 \times \text{NDF} + 0.006 \times \text{BW}$$

CH<sub>4</sub>, Methane emissions (MJ/d); GEI, NDF, and BW are defined in equation 1.

### *Methane Emission for Steers:*

$$\text{Eq. 4: CH}_4 = -0.221 + 0.048 \times \text{GEI} + 0.005 \times \text{BW}$$

CH<sub>4</sub>, Methane emissions (MJ/d); GEI and BW are defined in equation 1.

#### *Energy Intake:*

$$\text{Eq. 5: GEI} = \text{GE} \times \text{DMI}$$

GEI, Gross energy intake (MJ/day); GE, Dietary gross Energy (MJ/kg dry matter);

DMI, Dry matter intake (kg/d).

#### *Gross Energy:*

$$\text{Eq. 6: GE} = 0.263 \times \text{CP} + 0.522 \times \text{EE} + 0.198 \times \text{NDF} + 0.160 \times \text{SR}$$

GE, Dietary gross energy (MJ/kg dry matter); CP, Dietary crude protein (% of dry matter); EE, Dietary ether extract proportion (% of dry matter);

NDF, Dietary neutral detergent fiber proportion (% of dry matter); SR, Dietary soluble residues (% of dry matter).

#### *Soluble Residues:*

$$\text{Eq. 7: SR} = 100 - \text{ASH} - \text{NDF} - \text{CP} - \text{EE}$$

SR, Dietary soluble residues (% of dry matter); ASH, Dietary ash (% of dry matter); NDF, CP, and EE are described in equation 1.

#### *Methane Emission Report:*

The methane emission is reported as follows:

- Methane Emission in MJ per day per head
- Methane Emission in Mcal per day per head
- Methane Emission in gram per day per head
- Methane Emission in gram per kg (or per pound) of dry matter intake
- Methan Conversion Rate (%)

The methane conversion rate is the fraction of gross energy in diet converted to methane (percent).

Normal Range 2-12:

3.5 Extremely Low

4.5 Very Low

5.5 Low

6.5 Average

7.5 High

8.5 Very High

9.5 Extremely High

## Report 03 Ration composition: roughages and concentrates

Report 03. Ration Composition: Roughages and concentrates									
Report 03-1. Roughages									
Library	Feed Name	AMT_AF kg	AMT_DM kg	NEL Mcal	CP kg	ECF kg	ADF kg	CA kg	P kg
0	ALFALFA HAY, 28% ACID-DETERGENT FIBER	9.948498	8.953648	12.437	2.059	1.835	2.507	0.161	0.031
0	CORN SILAGE, 30% DM	10.536187	3.160856	4.669	0.256	0.749	0.885	0.007	0.007
		20.485	12.115	17.105	2.315	2.585	3.392	0.168	0.038
Report 03-2. Concentrates									
Library	Feed Name	AMT_AF kg	AMT_DM kg	NEL Mcal	CP kg	ECF kg	ADF kg	CA kg	P kg
0	BARLEY, 46-48#/BUSHEL	4.280092	3.766481	7.307	0.508	0.215	0.264	0.002	0.014
0	BET PULP, DRIED WITH MOLASSES	4.678858	4.304549	7.688	0.435	0.710	1.076	0.026	0.004
0	CORN GRAIN, GROUNDED OR STEAM-ROLLED	0.000000	0.000000	0.000	0.000	0.000	0.000	0.000	0.000
0	COTTONSEED MEAL, 41% SOLVENT-EXTRACTED	2.956421	2.690343	4.687	1.227	0.379	0.511	0.006	0.033
0	DICALCIUM PHOSPHATE	0.000000	0.000000	0.000	0.000	0.000	0.000	0.000	0.000
0	LIMESTONE, GROUND	0.000000	0.000000	0.000	0.000	0.000	0.000	0.000	0.000
0	MOLASSES, CANE	0.000000	0.000000	0.000	0.000	0.000	0.000	0.000	0.000
0	SALT	0.000000	0.000000	0.000	0.000	0.000	0.000	0.000	0.000
		11.915	10.761	19.681	2.170	1.304	1.851	0.034	0.051

Figure 14. Report 03 Ration composition: roughages and concentrations.

This section displays the roughage and concentrate feeds used in the ration. The following information is included for each feed:

1. The amount of the feed in the ration, lb/day or kg/day, as fed basis.
2. The percentage of the feed in the group (roughages or concentrates), as fed basis.
3. The amount of the feed in the ration, lb/day or kg/day, on a 100% dry matter basis.
4. The percentage of the feed in the group (roughages or concentrates), on a 100% dry matter basis.

This section also calculates the total amount of all feeds in the ration, both as fed and on a 100% dry matter basis.

## Report 04. Ration composition: all feeds

Report 04. Ration Composition: All Feeds								
Library	Feed Name	Intake DM kg	Intake DM %	Intake AF kg	Intake AF %	Price birr/Metric ton As Fed	Price birr/Metric ton Dry Matter	Price birr/day
0	ALFALFA HAY, 28% ACID-DETERGENT FIBER	8.953648	39.140130	9.948498	30.705188	132.28	146.98	1.32
0	BARLEY, 46-48#/BUSHEL	3.766481	16.464859	4.280092	13.210138	165.34	187.89	0.71
0	BEET PULP, DRIED WITH MOLASSES	4.304549	18.816980	4.678858	14.440895	154.32	167.74	0.72
0	CORN GRAIN, GROUNDED OR STEAM-ROLLED	0.000000	0.000000	0.000000	0.000000	165.34	187.89	0.00
0	CORN SILAGE, 30% DM	3.160856	13.817420	10.536187	32.519039	33.07	110.23	0.35
0	COTTONSEED MEAL, 41% SOLVENT-EXTRACTED	2.690343	11.760612	2.956421	9.124740	220.46	242.26	0.65
0	DICALCIUM PHOSPHATE	0.000000	0.000000	0.000000	0.000000	551.15	568.20	0.00
0	LIMESTONE, GROUND	0.000000	0.000000	0.000000	0.000000	110.23	110.23	0.00
0	MOLASSES, CANE	0.000000	0.000000	0.000000	0.000000	99.21	132.28	0.00
0	SALT	0.000000	0.000000	0.000000	0.000000	121.25	121.25	0.00
		22.88	100.00	32.40	100.00	115.61	163.75	3.75

Figure 15. Report 04. Ration composition: all feeds.

This report displays the amounts of all feeds used in the ration. The following information is included for each feed used in the ration:

1. The amount of the feed in the ration, lb/day or kg/day, on a 100% dry matter basis.
2. The percentage of the feed in the ration, on a 100% dry matter basis.
3. The amount of the feed in the ration, lb/day or kg/day, as fed basis.
4. The percentage of the feed in the ration, as fed basis.
5. The feed price in Ethiopian Birr per metric ton on as fed basis
6. The feed price in Ethiopian Birr per metric ton on 100% dry matter basis
7. The feed cost in Ethiopian Birr per head per day

The last row shows the totals for each column, as listed below:

1. The total amount of feeds in the ration, lb/day or kg/day, on a 100% dry matter basis.
2. The total percentage of feeds in the ration, on a 100% dry matter basis.
3. The total amount feeds in the ration, lb/day or kg/day, as fed basis.
4. The total percentage of feeds in the ration, as fed basis.
5. The total feed price in Ethiopian Birr per metric ton on as fed basis
6. The total feed price in Ethiopian Birr per metric ton on 100% dry matter basis
7. The total feed cost in Ethiopian Birr per head per day

## Report 05. Price range and feeds not used

<b>Report 05. Price Range and Feeds Not Used</b>					
<b>Report 05_1. Feeds used in ration</b>					
Lib	Name	Amount Kg as Fed	Price at Formulation birr/Metric ton As Fed	Lower Range Price birr/Metric ton As Fed	Upper Range Price birr/Metric ton As Fed
0	ALFALFA HAY, 28% ACID-DETERGENT FIBER	9.948498	132.28	120.59	7312.86
0	BARLEY, 46-48#/BUSHEL	4.280092	165.34	-58.29	209.36
0	BEET PULP, DRIED WITH MOLASSES	4.678858	154.32	-106487.82	244.80
0	CORN SILAGE, 30% DM	10.536187	33.07	-3674.03	40.11
0	COTTONSEED MEAL, 41% SOLVENT-EXTRACTED	2.956421	220.46	-168552.32	267.89

<b>Report 05_2. Feeds not used in ration</b>			
Lib	Name	Price at formulation birr/Metric ton As Fed	Oppurtunity price birr/Metric ton As Fed
0	CORN GRAIN, GROUNDED OR STEAM-ROLLED	165.34	109.28
0	DICALCIUM PHOSPHATE	551.15	-491.13
0	LIMESTONE, GROUND	110.23	-506.32
0	MOLASSES, CANE	99.21	-18.50
0	SALT	121.25	-506.32

Figure 16. Report 05. Price range and feeds not used.

This report displays the following information for feeds used in the ration:

1. The amount of each feed in the ration, lb/day or kg/day on an as fed basis.
2. The current price of the feed on an as fed basis.
3. The lower range of the feed price. This is the lowest price that the feed can have without affecting its amount used in the ration. If you change the price of a feed below the lower range and then reformulate the ration, the ration composition will change to include more of that feed. Other feeds previously used in the ration may no longer be used. If the lower range is negative, it is not practical to use more of the feed in the ration. A lower range of -999999.99 means minus infinity and the feed amount in the ration cannot be increased due to a maximum constraint on that feed.
4. The upper range of the feed price. This is the highest price that the feed can have without affecting its amount used in the ration. If you change the price of a feed above the upper range and then reformulate the ration, the ration composition will change to include less of that feed, or the feed may be eliminated from the ration. An upper range of 999999.99 means infinity and the feed amount in the ration cannot be decreased due to a minimum constraint on that feed.

For feeds NOT USED in the ration, this report displays the following:

1. The current price of the feed on an as fed basis.
2. The opportunity price of the feed. This is the highest price that the feed can have if it is to be included in the ration without increasing the cost of the ration.

## Report 06. Nutrient analysis of the ration

Report 06. Nutrient Analysis on 100% Dry Matter Basis							
Nutrient	Display Name	Amount	Unit	User Minimum	User Maximum	NRC Minimum	NRC Maximum
DM	Feed Dry Matter	70.604	% DM	35.000			
		22.876	kg				
NEL	Net Energy for Lactation	1.608	Mcal/kg			1.641	
		36.787	Mcal	36.787		36.787	
NEM	Net Energy for Maintenance	1.691	Mcal/kg				
		38.678	Mcal				
NEG	Net Energy for Gain	1.071	Mcal/kg				
		24.506	Mcal				
TDN	Total Digestible Nutrient	70.303	% DM			71.000	
		16.082	kg			15.634	
CP	Crude Protein	19.608	% DM	16.000		16.000	
		4.485	kg	3.481		3.481	
UIP	Undegradable Intake Protein	6.332	% DM			5.700	
		1.448	kg			1.221	
DIP	Degradable Intake Protein	13.276	% DM			9.700	
		3.037	kg			2.122	
FAT	Fat or Ether Extract	2.605	% DM		8.000	3.000	
		0.596	kg				
CF	Crude Fiber	17.000	% DM			17.000	
		3.889	kg				
ECF	Effective Crude Fiber	17.000	% DM	17.000			
		3.889	kg				
ADF	Acid Detergent Fiber	22.919	% DM			21.000	
		5.243	kg				

Figure 17. Report 06. Nutrient analysis of the ration.

This report displays the estimated nutrient content of the total ration. The following information is included:

1. Amount and type. Two lines are displayed for each nutrient: line 1 is the CONCENTRATION (percent, ppm, Mcal/lb, etc.) of the nutrient. Line 2 is the AMOUNT (lb, kg, Mcal, etc.) of the nutrient contained in the ration or in a selected feed group.
2. NRC recommendation. This is the nutrient amount recommended by NRC Nutrient Requirements of Dairy Cattle. These amounts are calculated internally by the program, based upon the data that you supplied on the Animal Information page. By comparing the UCD recommendation with the actual amount of the nutrient in the ration, you can determine if the ration is deficient in that particular nutrient.

If you have just formulated a ration, you will also see the following:

1. Minimum and maximum constraints. These are the nutrient constraints that were used by the program for the ration formulation.



## Report 07. Limiting Factors

Report 07. Limiting Factors		
Item	Value	Unit
Milk production based on supplied NEL, calculated by NRC	35.94	kg/d
3.5 % Fat Corrected Milk production based on supplied NEL, calculated by NRC	35.95	kg/d
Milk production based on supplied Crude Protein, calculated by NRC	47.9	kg/d
3.5 % Fat Corrected Milk production based on supplied Crude Protein, calculated by NRC	47.9	kg/d
Maximum milk production, calculated by NRC	35.94	kg/d
3.5 % Fat Corrected Maximum milk production, calculated by NRC	35.95	kg/d
Milk production limiting factor	NEL	
Dry matter intake, inputted by user	22.85	kg/d
Maximum dry matter intake, calculated by NRC	22.66	kg/d

Figure 18. Report 07. Limiting Factors.

This report is available only for the evaluation module.

For lactating cows: This report lists the maximum daily milk production that is possible with the calculated amounts of NEL and Crude Protein in the ration.

Milk production is basically a function of energy (NEL) and crude protein. In this example, the existing ration has enough crude protein for producing 47.9 kg of milk per day, but the ration has enough energy to produce 35.94 kg of milk per day. So, the limiting factor is NEL.

This report also provides a warning message if the reported feed dry matter intake of the ration exceeds the probable maximum dry matter intake by more than 10 percent.

For growing animals: This report lists the maximum daily weight gain that is possible with the calculated amounts of net energy for maintenance and net energy for gain in the ration.

## Report 08. Energy and Protein analysis of feeds

Report 08. Energy and Protein Analyses of Feeds									
LIB	Feed Name	DM %	NEL Mcal/kg	NEM Mcal/kg	NEG Mcal/kg	TDN % DM	CP % DM	UIP % DM	DIP % DM
0	ALFALFA HAY, 28% ACID-DETERGENT FIBER	90.00	1.39	1.41	0.83	61.00	23.00	6.44	16.56
0	BARLEY, 46-48#/BUSHEL	88.00	1.94	2.07	1.40	84.00	13.50	3.65	9.86
0	BEEF PULP, DRIED WITH MOLASSES	92.00	1.79	1.90	1.25	78.00	10.10	3.54	6.57
0	CORN GRAIN, GROUNDED OR STEAM-ROLLED	88.00	1.96	2.09	1.42	85.00	10.00	6.00	4.00
0	CORN SILAGE, 30% DM	30.00	1.48	1.63	1.02	65.00	8.10	2.51	5.59
0	COTTONSEED MEAL, 41% SOLVENT-EXTRACTED	91.00	1.74	1.83	1.20	76.00	45.60	18.70	26.90
0	DICALCIUM PHOSPHATE	97.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
0	LIMESTONE, GROUND	100.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
0	MOLASSES, CANE	75.00	1.65	1.70	1.08	72.00	5.80	0.00	0.00
0	SALT	100.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00

Figure 19. Report 08. Energy and Protein analysis of feeds.

This report displays the nutrient content of all feeds that you have selected for this ration formulation or analysis. Analyses are expressed on a 100% dry matter basis.

Report 09. Vitamin and Proximate analysis of feeds

Report 09. Proximate Analysis of Feeds								
LIB	Feed Name	FAT % DM	CF % DM	ECF % DM	ADF % DM	NDF % DM	ASH % DM	NPN % DM
0	ALFALFA HAY, 28% ACID-DETERGENT FIBER	4.00	20.50	20.50	28.00	38.00	10.20	0.00
0	BARLEY, 46-48#/BUSHEL	2.10	5.70	5.70	7.00	19.00	2.60	0.00
0	BEET PULP, DRIED WITH MOLASSES	0.60	16.50	16.50	25.00	44.00	6.10	0.00
0	CORN GRAIN, GROUNDED OR STEAM-ROLLED	4.30	2.60	2.60	3.00	9.00	1.60	0.00
0	CORN SILAGE, 30% DM	3.10	23.70	23.70	28.00	51.00	4.50	0.00
0	COTTONSEED MEAL, 41% SOLVENT-EXTRACTED	1.30	14.10	14.10	19.00	26.00	7.00	0.00
0	DICALCIUM PHOSPHATE	0.00	0.00	0.00	0.00	0.00	86.80	0.00
0	LIMESTONE, GROUND	0.00	0.00	0.00	0.00	0.00	95.80	0.00
0	MOLASSES, CANE	0.10	0.00	0.00	0.00	0.00	13.10	0.00
0	SALT	0.00	0.00	0.00	0.00	0.00	100.00	0.00

Figure 20. Report 09. Vitamin and Proximate analysis of feeds.

This report displays the nutrient content of all feeds that you have selected for this ration formulation or analysis. Analyses are expressed on a 100% dry matter basis.

Report 10. Macro mineral analysis of feeds

<b>Report 10. Macro Mineral Analysis of Feeds</b>								
LIB	Feed Name	CA % DM	P % DM	CL % DM	MG % DM	K % DM	NA % DM	S % DM
0	ALFALFA HAY, 28% ACID-DETERGENT FIBER	1.80	0.35	0.34	0.26	2.21	0.22	0.33
0	BARLEY, 46-48#/BUSHEL	0.05	0.38	0.18	0.15	0.47	0.03	0.17
0	BEET PULP, DRIED WITH MOLASSES	0.61	0.10	0.04	0.16	1.78	0.53	0.42
0	CORN GRAIN, GROUNDED OR STEAM-ROLLED	0.03	0.29	0.05	0.14	0.37	0.03	0.12
0	CORN SILAGE, 30% DM	0.23	0.22	0.00	0.19	0.96	0.01	0.15
0	COTTONSEED MEAL, 41% SOLVENT-EXTRACTED	0.22	1.21	0.04	0.55	1.39	0.04	0.34
0	DICALCIUM PHOSPHATE	22.00	19.30	0.00	0.59	0.07	0.05	1.14
0	LIMESTONE, GROUND	34.00	0.02	0.00	2.06	0.12	0.06	0.04
0	MOLASSES, CANE	1.00	0.11	3.10	0.43	3.84	0.22	0.47
0	SALT	0.00	0.00	60.66	0.00	0.00	39.34	0.00

Figure 21. Report 10. Macro mineral analysis of feeds.

This report displays the nutrient content of all feeds that you have selected for this ration formulation or analysis. Analyses are expressed on a 100% dry matter basis.

## Report 11. Trace mineral analysis of feeds

Report 11. Trace Mineral Analysis of Feeds								
LIB	Feed Name	FE ppm	CO ppm	CU ppm	I ppm	MN ppm	SE ppm	ZN ppm
0	ALFALFA HAY, 28% ACID-DETERGENT FIBER	253.00	0.10	11.00	0.19	45.00	0.37	24.00
0	BARLEY, 46-48#/BUSHEL	85.00	0.10	9.00	0.05	18.00	0.22	19.00
0	BET PULP, DRIED WITH MOLASSES	207.00	0.23	16.00	0.00	27.00	0.00	10.00
0	CORN GRAIN, GROUNDED OR STEAM-ROLLED	30.00	0.05	4.00	0.00	5.00	0.08	14.00
0	CORN SILAGE, 30% DM	260.00	0.06	10.00	0.00	30.00	0.00	21.00
0	COTTONSEED MEAL, 41% SOLVENT-EXTRACTED	223.00	0.82	20.00	0.00	23.00	0.00	69.00
0	DICALCIUM PHOSPHATE	14400.00	10.00	10.00	0.00	300.00	0.00	100.00
0	LIMESTONE, GROUND	3500.00	0.00	0.00	0.00	0.00	0.00	0.00
0	MOLASSES, CANE	250.00	1.21	79.00	2.10	56.00	0.00	30.00
0	SALT	0.00	0.00	0.00	0.00	0.00	0.00	0.00

Figure 22. Report 11. Trace mineral analysis of feeds.

This report displays the nutrient content of all feeds that you have selected for this ration formulation or analysis. Analyses are expressed on a 100% dry matter basis.

## Report 12. User nutrient analysis of feeds

<b>Report 12. Vitamin Analysis of Feeds</b>				
LIB	Feed Name	VITA k IU/kg	VITD k IU/kg	VITE IU/kg
0	ALFALFA HAY, 28% ACID- DETERGENT FIBER	80.00	1.90	26.00
0	BARLEY, 46-48#/BUSHEL	1.00	0.00	25.00
0	BEET PULP, DRIED WITH MOLASSES	0.00	0.60	0.00
0	CORN GRAIN, GROUNDED OR STEAM-ROLLED	1.00	0.00	25.00
0	CORN SILAGE, 30% DM	18.00	0.10	0.00
0	COTTONSEED MEAL, 41% SOLVENT-EXTRACTED	0.00	0.00	35.00
0	DICALCIUM PHOSPHATE	0.00	0.00	0.00
0	LIMESTONE, GROUND	0.00	0.00	0.00
0	MOLASSES, CANE	0.00	0.00	7.00
0	SALT	0.00	0.00	0.00

Figure 23. Report 12. User nutrient analysis of feeds.

This report displays the nutrient content of all feeds that you have selected for this ration formulation or analysis. Analyses are expressed on a 100% dry matter basis.

## Feed library editor

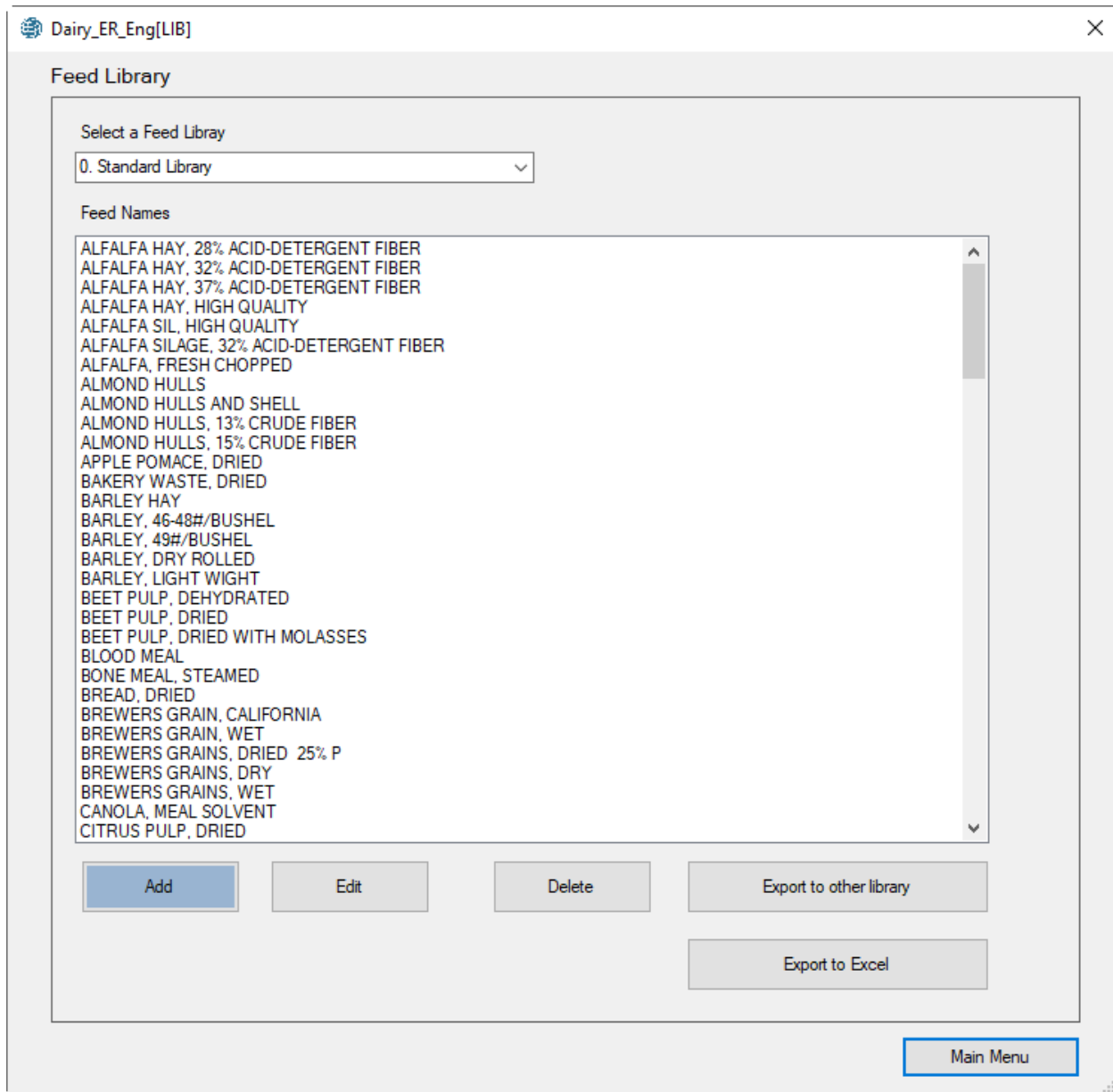


Figure 24. Feed library editor.

There are three feed libraries:

1. Standard feed library with a capacity of 999 feeds.
2. Alternate feed library with a capacity of 999 feeds.

3. Infeasible feed library with a capacity of 999 feeds.

All three feed libraries have the following fields:

#### *Feed number*

Each feed in the feed libraries has a unique number assigned to it. If you are entering information for a new feed, make sure you assign a unique number to it..

#### *International feed number*

Each feed is assigned a 6-digit international feed number (IFN) for identification and computer manipulation. The first digit in IFN represents the international feed classes:

1. Dry forages and roughages
2. Pasture, range plants, and forage fed fresh
3. Silage
4. Energy feeds
5. Protein supplements
6. Mineral supplements
7. Vitamin supplements
8. Additives

#### *Name*

Enter a descriptive name.

#### *Feed price*

Enter the cost of this feed in Ethiopian Birr per metric ton as fed.

#### *Feed price unit*

Valid unit is zero which denotes Ethiopian Birr per metric ton

#### *Feed: minimum amount*

You can force a feed to be included in the ration by entering a minimum constraint amount. The program will then include at least this amount and maybe more when formulating the ration. To delete an existing minimum constraint, enter 0 for the amount or set it to blank.

#### *Feed: minimum unit*

Identify the type of minimum constraint.

#### *Feed: maximum amount*

You can limit the amount of a certain feed in the ration by entering a maximum constraint on that feed. After you enter the desired amount. Many of the feeds in the standard feed library have built-in maximum constraints which will automatically be displayed in this column. To delete an existing maximum constraint, enter 0 for the amount or set it to blank.



#### *Feed: maximum unit*

Identify the type of maximum constraint.

#### *Dry matter (percent as fed)*

The dry matter percentage of a feed is 100 minus the moisture percentage of the feed. If a feed is totally dry, it has 100% dry matter. If, for example, the feed has a 20% moisture content, its dry matter percentage would be 80.

#### *Feed type*

Each feed must be classified as either a roughage or a concentrate. Roughages are feeds containing a high amount of fiber, such as alfalfa hay and corn silage. All other feeds are concentrates.

0 for Roughage

1 for Concentrates

#### *MVI factor*

Each roughage feed has a corresponding maximum voluntary intake (MVI) factor (range: 1.0 to 1.4: excellent quality = 1. fair quality = 1.4). If an MVI factor for a forage is omitted, the default value = 1.4.

#### *Feed groups*

Each feed may be a member of one or more groups of similar feeds. By placing the feed into a group, you can put constraints on the group of feeds for ration formulation. You can also choose to view the nutrient analysis for a particular feed group in the ration display portion of the program. All feeds with an identical group number are considered to be members of the same group.

#### *Dry matter basis*

Set this field to 100. Most feed nutrient analyses are reported on a 100% dry matter basis. However, if you have nutrient data on other than a 100% dry matter basis, you must convert them to 100% dry matter basis before entering them into the feed library.

For a list of nutrients see Appendix-02-Nutrients.docx.

## Feedtag

The screenshot shows a software window titled "Dairy\_ER\_Eng[TAG]" with a close button in the top right corner. The main heading is "Estimate Energy of Feeds". Below this, there are several input fields and a dropdown menu. The "Feed Name" field is empty. The "Feed Group" dropdown menu is set to "Dry forage and roughage legumes". The input fields contain the following values: "Dry Matter of Feed (DM) (%)" is 90, "Crude Protein (CP) (% AF)" is 20, "NPN Protein Equivalent (% AF)" is 0, "Fat or Oil (EE) (% AF)" is 2.7, "Ash (% AF)" is 9.8, and "Crude Fiber (CF) (% AF)" is 23. Below these fields, the text "Energy values on 100% DM Basis" is displayed. Underneath, there are more input fields showing calculated values: "Digestible Energy (DE) (Mcal/kg)" is 2.74, "Metabolizable Energy (ME) (Mcal/kg)" is 2.25, "Net Energy for Maintenance (NEM) (Mcal/kg)" is 1.38, "Net Energy for Gain (NEG) (Mcal/kg)" is 0.94, "Net Energy for Lactation (NEL) (Mcal/kg)" is 1.4, and "Total Digestible Nutrients (TDN) (% DM)" is 62.23. At the bottom of the window, there are four buttons: "Defaults", "Help", "Calculate" (which is highlighted with a blue border), and "Main Menu".

Field	Value
Feed Name	
Feed Group	Dry forage and roughage legumes
Dry Matter of Feed (DM) (%)	90
Crude Protein (CP) (% AF)	20
NPN Protein Equivalent (% AF)	0
Fat or Oil (EE) (% AF)	2.7
Ash (% AF)	9.8
Crude Fiber (CF) (% AF)	23
Energy values on 100% DM Basis	
Digestible Energy (DE) (Mcal/kg)	2.74
Metabolizable Energy (ME) (Mcal/kg)	2.25
Net Energy for Maintenance (NEM) (Mcal/kg)	1.38
Net Energy for Gain (NEG) (Mcal/kg)	0.94
Net Energy for Lactation (NEL) (Mcal/kg)	1.4
Total Digestible Nutrients (TDN) (% DM)	62.23

Figure 25. Feedtag.

This program calculates the energy value of a feed using the proximate analyses of a feed. Description of fields in this screen are listed below:

- Feed Name: Assign a name for feed. Example, ALFALFA
- Feed Group: Select a group for feed. Example, Dry forage and roughage: Legumes
- Dry Matter of Feed: Enter a value between 0 to 100%. Example: 20.00%
- Crude Protein (CP): Enter a value between 0 to 100%. Example: 90.00%
- NPN Protein Equivalent: Enter a value between 0 to 100%. Example: 0.00%
- Fat or Oil (EE): Enter a value between 0 to 100%. Example: 2.70%
- Ash: Enter a value between 0 to 100%. Example: 9.80%
- Crude Fiber (CF): Enter a value between 0 to 100%. Example: 23.00%

After entering input values, click the Calculate button, The program calculates energy values, using the following algorithm:

Step 1. Converts all values to 100% DM basis.

Step 2. Calculates Digestible Energy, Mcal/kg, for different groups:

$$\text{Grp A: DE} = 3.916828 - 0.00812 * \text{CP} + 0.04554 * \text{EE} - 0.0176 * \text{ash} - 0.0422 * \text{CF}$$

$$\text{Grp B: DE} = 2.811904 + 0.0209413 * \text{CP} + 0.006492 * \text{EE} + 0.01302 * \text{ash} - 0.0274 * \text{CF}$$

$$\text{Grp C: DE} = 3.264743 + 0.06363 * \text{CP} - 0.0761 * \text{EE} - 0.0508 * \text{ash} - 0.0283 * \text{CF}$$

$$\text{Grp D: DE} = 3.723255 + 0.002459 * \text{CP} + 0.0815818 * \text{EE} - 0.0211 * \text{ash} - 0.036135 * \text{CF}$$

$$\text{Grp E: DE} = 3.681242 - 0.0130 * \text{CP} + 0.04553 * \text{EE} - 0.0328 * \text{ash} - 0.0284 * \text{CF}$$

$$\text{Grp F: DE} = 3.729697 + 0.008047 * \text{CP} + 0.04582 * \text{EE} - 0.0393 * \text{ash} - 0.0392 * \text{CF}$$

$$\text{Grp G: DE} = 4.706482 - 0.0158 * \text{CP} + 0.034633 * \text{EE} - 0.0241 * \text{ash} - 0.0598 * \text{CF}$$

Step 3. Corrects for Non Protein Nitrogen Protein Equivalent:

$$\text{DE} = \text{DE} * (1 - (\text{CP} * \text{NPN} / 28200))$$

Step 4. All other energy values are calculated by using DE.

Metabolizable Energy, Mcal/kg:

$$\text{ME} = 0.82 * \text{DE}$$

Net Energy for Maintenance, Mcal/kg:

$$\text{NEM} = 1.37 * \text{ME} - 0.138 * \text{ME} * \text{ME} + 0.0105 * \text{ME} * \text{ME} * \text{ME} - 1.12$$

Net Energy for Gain, Mcal/kg:

$$\text{NEG} = 1.42 * \text{ME} - 0.147 * \text{ME} * \text{ME} + 0.0122 * \text{ME} * \text{ME} * \text{ME} - 1.65$$

Total Digestible Nutriments, %:

$$\text{TDN} = 100 * (\text{DE} / 4.4)$$

Net Energy for Lactation, Mcal/kg:

$$\text{NEL} = 0.0245 * \text{TDN} - 0.12$$

Step 5. Converts to English system, if necessary.



15	Ammonium Products			1.00	2						1.00	4
16	Npn Compounds			1.50	2						1.00	4
17	Oat Products			8	2							
18	Rice Products			25.00	2						3	4
19	Safflower Products			2	2						3	4
20	Screening Products			2	2						45.00	4
21	Soybean Products			5	2						3	4
22	Sunflower Products			25.00	2						3	4
23	Wheat Milling Prod			25.00	2						3	4
24	Wheat Products			5	2						3	4
25	Whey Products			2	2						1	4
26	Sorghum Grains			5	2						3	4
27	Pasture											
28	Supplement Concentrate											
29	Supplement Forage											

There are three animal types, and each animal type has its own constraints:

--	--	--

1	Lactating Cows	MINAMT1, MAXAMT1
2	Dry Cows	MINAMT2, MAXAMT2
3	Growing Animals	MINAMT3, MAXAMT3

A constraint can have one of the following units:

00 [KGAF] kgs as fed
01 [KGDM] kgs of dry matter
02 [%CDM] % of CONCENTRATE portion of ration on 100% DM basis
03 [%RDM] % of ROUGHAGE portion of ration on 100% DM basis
04 [%TDM] % of TOTAL ration on 100% DM basis
05 [%CAF] % of CONCENTRATE portion of ration on AS FED basis
06 [%RAF] % of ROUGHAGE portion of ration on AS FED basis
07 [%TAF] % of TOTAL ration on AS FED basis

## Appendix 02. Nutrients

Each feed has 36 nutrients as listed below:

No	Section	Internal Name	Display Name	Unit
		LIB	Library	
		NAME	Feed Name	
		NUMBER	Feed Number	
		TYPE	Feed Type	
		MVI	Maximum Voluntary Intake	%
		DM	Feed Dry Matter	%
1	Energy	NEL	Net Energy for Lactation	Mcal/kg
2	Energy	NEM	Net Energy for Maintenance	Mcal/kg
3	Energy	NEG	Net Energy for Gain	Mcal/kg
4	Energy	TDN	Total Digestible Nutrient	% DM
5	Protein	CP	Crude Protein	% DM
6	Protein	UIP	Undegradable Intake Protein	% DM
7	Protein	DIP	Degradable Intake Protein	% DM
8		FAT	Fat or Ether Extract	% DM
9		CF	Crude Fiber	% DM
10	Fiber	ECF	Effective Crude Fiber	% DM
11	Fiber	ADF	Acid Detergent Fiber	% DM
12	Fiber	NDF	Neutral Diet Fiber	% DM
13		ASH	Ash	% DM
14	Minerals	CA	Calcium	% DM
15	Minerals	P	Phosphor	% DM
16	Minerals	NPN	Non-Protein Nitrogen	% DM
17	Minerals	CL	Chlorine	% DM
18	Minerals	MG	Magnesium	% DM
19	Minerals	K	Potassium	% DM
20	Minerals	NA	Sodium	% DM
21	Minerals	S	Sulfur	% DM
22		FE	Iron	ppm
23		CO	Cobalt	ppm
24		CU	Copper	ppm
25		I	Iodine	ppm



26		MN	Magnesium	ppm
27		SE	Selenium	ppm
28		ZN	Zinc	ppm
29		VITA	Vitamin A	k IU/kg
30		VITD	Vitamin D	k IU/kg
31		VITE	Vitamin E	IU/kg
32		NUT1	Nutrient 1	% DM
33		NUT2	Nutrient 2	% DM
34		NUT3	Nutrient 3	% DM
35		NUT4	Nutrient 4	% DM
36		NUT5	Nutrient 5	% DM

The most important nutrients are grouped into four categories:

## Energy:

The most important nutrient in this category is TDN. Because you can estimate NEL, NEM, and NEG from it.

1	Energy	NEL	Net Energy for Lactation	Mcal/kg
2	Energy	NEM	Net Energy for Maintenance	Mcal/kg
3	Energy	NEG	Net Energy for Gain	Mcal/kg
4	Energy	TDN	Total Digestible Nutrient	% DM

## Protein:

The most important nutrient in this category is CP or Crude protein. CP measures the proportion of nitrogen in a feedstuff multiplied by 6.25 and this includes both true protein and non-protein.

5	Protein	CP	Crude Protein	% DM
6	Protein	UIP	Undegradable Intake Protein	% DM
7	Protein	DIP	Degradable Intake Protein	% DM

Rumen undegradable protein (RUP) is protein that is not digested by the microbes in the rumen and is available for the ruminant animal itself for tissue growth or lactation. This has also been called escape protein, bypass protein, or undegradable intake protein (UIP).

Degradable Intake Protein (DIP) is defined by the US NRC as the fraction of crude protein (CP) consumed which is degraded by rumen microbes. The magnitude of DIP for any particular diet or feed ingredient is dependent upon both the feed itself and the animal to which it is fed.

## Minerals

The most important nutrients in this category are CA and P.

14	Minerals	CA	Calcium	% DM
15	Minerals	P	Phosphor	% DM
16	Minerals	NPN	Non-Protein Nitrogen	% DM
17	Minerals	CL	Chlorine	% DM
18	Minerals	MG	Magnesium	% DM
19	Minerals	K	Potassium	% DM
20	Minerals	NA	Sodium	% DM
21	Minerals	S	Sulfur	% DM

## Fiber

The most important nutrient in this category is ECF.

10	Fiber	ECF	Effective Crude Fiber	% DM
11	Fiber	ADF	Acid Detergent Fiber	% DM
12	Fiber	NDF	Neutral Diet Fiber	% DM

Crude Fiber (CF): Crude fiber is a traditional measure of fiber content in feeds. Neutral detergent fiber (NDF) and acid detergent fiber (ADF) are more useful measures of feeding value and should be used to evaluate forages and formulate rations.

Acid Detergent Fiber (ADF): It is a measure of cellulose and lignin. NRC recommendations for milking cows call for a minimum of 19% ADF in the ration dry matter.

Neutral Detergent Fiber (NDF): It is the structural components of the plant, specifically cell wall. NDF is a predictor of voluntary intake because it provides bulk or fill. In general, low NDF values are desired because NDF increases as forages mature

### Appendix 03. Standard Feeds

There are 148 feeds in the standard feed library, as listed below in three sections:

#### Section1: Energy (NEL, NEN, NEG, TDN) and protein (CP, UIP, DIP)

NO	NAME	DM	NEL	NEM	NEG	TDN	CP	UIP	DIP
		%	Mcal/ kg	Mcal/ kg	Mcal/ kg	%DM	% DM	% DM	% DM
1	ALFALFA SILAGE, 32% ACID-DETERGENT FIBER	36.00	1.301	1.323	0.745	58.000	19.000	4.370	14.630
2	ALFALFA HAY, 28% ACID-DETERGENT FIBER	90.00	1.389	1.411	0.825	61.000	23.000	6.440	16.560
3	ALFALFA HAY, 32% ACID-DETERGENT FIBER	90.00	1.301	1.323	0.745	58.000	19.000	5.320	13.680
4	ALFALFA HAY, 37% ACID-DETERGENT FIBER	90.00	1.213	1.146	0.586	55.000	15.000	4.200	10.800
5	ALFALFA HAY, HIGH QUALITY	89.60	1.451	1.550	0.950	67.300	20.000	6.400	13.600
6	ALFALFA SIL, HIGH QUALITY	37.00	1.451	1.550	0.950	67.300	20.000	3.600	16.400
7	ALFALFA, FRESH CHOPPED	22.00	1.470	1.581	0.981	68.200	21.000	4.200	16.800
8	ALMOND HULLS	86.00	1.561	1.671	1.060	71.100	5.700	2.900	2.800
9	ALMOND HULLS AND SHELL	90.00	0.992	0.772	0.243	45.000	1.700	0.000	0.000
10	ALMOND HULLS, 13% CRUDE FIBER	90.00	1.146	1.036	0.487	52.000	2.100	0.000	0.000
11	ALMOND HULLS, 15% CRUDE FIBER	90.00	1.058	0.882	0.346	48.000	1.900	0.000	0.000
12	APPLE POMACE, DRIED	89.00	1.565	1.609	1.001	69.000	4.900	0.000	0.000
13	BAKERY WASTE, DRIED	92.00	2.072	2.205	1.519	89.000	10.700	0.000	0.000
14	BARLEY HAY	87.00	1.257	1.190	0.626	56.000	8.700	0.000	0.000
15	BARLEY, 46-48#/BUSHEL	88.00	1.940	2.072	1.404	84.000	13.500	3.645	9.855
16	BARLEY, 49#/BUSHEL	89.00	1.984	2.116	1.444	86.000	10.800	2.916	7.884
17	BARLEY, DRY ROLLED	90.00	2.079	2.161	1.490	87.400	12.300	2.710	10.820
18	BARLEY, LIGHT WIGHT	89.00	1.764	1.918	1.272	77.000	13.400	3.618	9.782
19	BEET PULP, DEHYDRATED	90.70	2.000	2.070	1.411	84.200	11.100	3.660	7.440
20	BEET PULP, DRIED	91.00	1.786	1.896	1.252	78.000	9.700	4.365	5.335
21	BEET PULP, DRIED WITH MOLASSES	92.00	1.786	1.896	1.252	78.000	10.100	3.535	6.565
22	BLOOD MEAL	88.00	2.240	2.310	1.609	92.400	89.200	73.200	16.000
23	BONE MEAL, STEAMED	97.00	0.265	0.000	0.000	16.000	13.200	0.000	0.000
24	BREAD, DRIED	92.00	2.072	2.205	1.519	89.000	13.300	0.000	0.000
25	BREWERS GRAIN, CALIFORNIA	92.00	1.345	1.609	1.001	60.000	22.200	10.878	11.322
26	BREWERS GRAIN, WET	21.00	1.499	1.521	0.924	66.000	25.400	12.446	12.954
27	BREWERS GRAINS, DRY	88.00	1.991	2.070	1.400	84.000	26.900	8.100	18.800

28	BREWERS GRAINS, WET	27.00	1.951	2.030	1.369	82.000	26.900	9.400	17.500
29	BREWERS GRAINS, DRIED 25% P	92.00	1.499	1.521	0.924	66.000	25.400	12.446	12.954
30	CANOLA, MEAL SOLVENT	89.00	1.750	1.850	1.219	77.000	40.700	13.000	27.700
31	CITRUS PULP, DRIED	91.00	1.764	1.874	1.232	77.000	6.700	0.000	0.000
32	COCONUT MEAL, EXPELLER-EXTRACTED	92.00	1.896	1.786	1.157	82.000	22.400	0.000	0.000
33	COCONUT MEAL, SOLVENT-EXTRACTED	91.00	1.720	2.006	1.349	75.000	23.400	0.000	0.000
34	CORN EARS, GROUND	87.00	1.918	2.028	1.367	83.000	9.000	0.000	0.000
35	CORN GLUTEN FEED, DEHYDRATED	91.50	2.019	2.101	1.431	85.300	22.000	26.440	15.180
36	CORN GLUTEN FEED	90.00	1.918	2.028	1.367	83.000	25.600	6.400	19.200
37	CORN GLUTEN ML, 60% CRUDE PROTEIN	90.00	2.072	2.205	1.519	89.000	67.200	36.960	30.240
38	CORN GRAIN, CRACKED	89.00	1.852	1.940	1.292	80.000	10.000	5.200	4.800
39	CORN GRAIN, GROUNDED OR STEAM-ROLLED	88.00	1.962	2.094	1.424	85.000	10.000	6.000	4.000
40	CORN SILAGE	32.00	1.451	1.541	0.939	64.100	8.100	2.750	5.350
41	CORN SILAGE, 25% DM	25.00	1.477	1.631	1.021	65.000	8.100	2.511	5.589
42	CORN SILAGE, 30% DM	30.00	1.477	1.631	1.021	65.000	8.100	2.511	5.589
43	CORN, CANNERY SILAGE	32.00	1.521	1.543	0.944	67.000	7.700	0.000	0.000
44	CORN, CANNERY WASTE	23.00	1.521	1.631	1.021	67.000	7.700	0.000	0.000
45	CORN, GLUTEN MEAL	91.50	2.019	2.449	1.720	97.200	65.900	51.400	14.500
46	CORN, STEAM FLAKED	87.80	2.359	2.469	1.739	98.200	9.200	5.060	4.140
47	COTTONSEED HULLS	91.00	0.992	0.772	0.243	45.000	4.100	0.000	0.000
48	COTTONSEED MEAL, SOLVENT-EXTRACTED	89.00	2.019	2.101	1.431	85.300	44.800	15.230	29.600
49	COTTONSEED MEAL, 41% EXPELLER-EXTRACTED	93.00	1.786	1.874	1.232	78.000	44.300	22.150	22.150
50	COTTONSEED MEAL, 41% SOLVENT-EXTRACTED	91.00	1.742	1.830	1.195	76.000	45.600	18.696	26.904
51	COTTONSEED MEAL, 50% SOLVENT-EXTRACTED	93.00	1.720	1.786	1.157	75.000	54.000	22.140	31.860
52	COTTONSEED, DELINTED	90.00	2.227	2.425	1.706	96.000	25.000	0.000	0.000
53	COTTONSEED, LINTED	92.70	2.150	2.231	1.541	89.800	24.300	6.800	17.500
54	COTTONSEED, PIMA VARIETY	93.30	2.460	2.579	1.830	101.900	28.800	7.780	18.140
55	COTTONSEED, WITH LINT	92.00	2.227	2.425	1.706	96.000	23.000	0.000	0.000
56	DISTILLER GRAINS, DRIED	88.20	2.410	2.531	1.790	100.100	30.700	15.350	15.350
57	DIAMMONIUM PHOSPHATE	97.00	0.000	0.000	0.000	0.000	115.900	0.000	0.000
58	DICALCIUM PHOSPHATE	97.00	0.000	0.000	0.000	0.000	0.000	0.000	0.000
59	DISODIUM PHOSPHATE	97.00	0.000	0.000	0.000	0.000	0.000	0.000	0.000
60	DISTILLER CORN GRAINS, DRIED	94.00	1.984	2.116	1.444	86.000	23.000	12.420	10.580
61	FAT, ANIMAL	99.00	5.842	4.762	3.536	177.000	0.000	0.000	0.000
62	FAT, RUMEN INERT	98.00	5.031	5.269	3.911	192.000	0.000	0.000	0.000

63	FERMENTATION SOLUBLE	93.00	2.050	1.852	1.215	88.000	29.700	0.000	0.000
64	GRAPE POMACE, DRIED	91.00	0.683	0.331	0.000	33.000	13.000	5.850	7.150
65	GRASS SILAGE	40.00	1.250	1.329	0.750	60.600	12.000	2.520	9.480
66	HEGARI GRAIN	88.00	1.830	1.918	1.272	79.000	13.000	0.000	0.000
67	HIGH MOISTURE CORN	50.00	2.339	2.410	1.660	94.000	9.200	5.900	3.300
68	HOMINY FEED, 5% FAT	90.00	2.006	2.161	1.482	87.000	11.500	0.000	0.000
69	HOMINY FEED, LOW FAT	91.00	1.874	2.094	1.424	85.000	11.300	0.000	0.000
70	KELP, DRIED	91.00	0.661	0.661	0.141	32.000	7.100	0.000	0.000
71	LIMESTONE, GROUND	100.00	0.000	0.000	0.000	0.000	0.000	0.000	0.000
72	LINSEED MEAL	88.00	1.810	1.889	1.250	78.300	32.000	11.200	20.800
73	LINSEED MEAL, 35% EXPELLER-EXTRACTED	91.00	1.896	2.006	1.349	82.000	37.900	13.265	24.635
74	LINSEED MEAL, 35% SOLVENT-EXTRACTED	90.00	1.786	1.874	1.232	78.000	38.300	13.405	24.895
75	MALT, BARLEY, NORTH WEST	91.00	1.764	1.676	1.060	77.000	32.200	0.000	0.000
76	MILO, CALIFORNIA OR MIDWEST	88.00	1.874	1.984	1.329	81.000	7.900	4.266	3.634
77	MILO, SOUTH WEST	88.00	1.830	1.918	1.272	79.000	13.000	7.020	5.980
78	MIXED ALFALFA/GRASS	40.00	1.281	1.360	0.780	61.800	13.500	2.700	10.800
79	MOLASSES, CANE	75.00	1.653	1.698	1.080	72.000	5.800	0.000	0.000
80	MOLASSES, LIQUID	65.00	2.141	2.231	1.541	89.800	9.800	0.000	9.800
81	MOLASSES,CANE, 3% PHOSPHATE	75.00	1.587	1.653	1.041	70.000	4.200	0.000	0.000
82	MONOAMMONIUM PHOSPHATE	97.00	0.000	0.000	0.000	0.000	70.200	0.000	0.000
83	MONOSODIUM PHOSPHATE	97.00	0.000	0.000	0.000	0.000	0.000	0.000	0.000
84	OAT AND VETCH HAY	88.00	1.301	1.168	0.606	58.000	14.100	0.000	0.000
85	OAT HAY	90.40	1.171	1.239	0.670	58.000	6.900	2.350	4.550
86	OAT HAY, DOUGH STAGE	90.00	1.190	1.080	0.527	53.000	11.500	0.000	0.000
87	OAT SILAGE, BOOT	22.00	1.653	1.698	1.080	72.000	17.500	0.000	0.000
88	OAT SILAGE, DOUGH	30.00	1.190	1.080	0.527	53.000	11.500	0.000	0.000
89	OATS, LIGHT WT	91.00	1.499	1.521	0.924	66.000	13.100	0.000	0.000
90	OATS, PACIFIC COAST	91.00	1.786	1.874	1.232	78.000	10.000	1.700	8.300
91	ORANGE PULP, DRIED	88.00	1.786	1.896	1.252	78.000	8.500	0.000	0.000
92	OYSTERSHELL FLOUR	99.00	0.000	0.000	0.000	0.000	1.000	0.000	0.000
93	PEAS, CULL	89.00	2.006	2.161	1.482	87.000	25.300	5.566	19.734
94	PINEAPPLE BRAN	87.00	1.543	1.565	0.963	68.000	4.600	0.000	0.000
95	PINEAPPLE GREENCHOP	18.00	1.257	1.168	0.606	56.000	7.600	0.000	0.000
96	PINEAPPLE PRESSCAKE	21.00	1.631	1.676	1.060	71.000	5.300	0.000	0.000
97	PINEAPPLE STUMPMEAL	46.00	1.455	1.433	0.844	64.000	3.000	0.000	0.000
98	POTATOES, DRIED	91.00	1.874	1.984	1.329	81.000	8.900	0.000	0.000
99	RICE BRAN	91.00	2.381	2.500	1.759	98.900	14.000	7.000	7.000

100	RICE BRAN AND HULLS	91.00	0.683	1.477	0.884	33.000	6.700	0.000	0.000
101	RICE BRAN, 13% FAT	91.00	1.609	1.631	1.021	70.000	14.100	0.000	0.000
102	RICE BRAN, SOL	90.00	1.411	1.279	0.705	62.000	15.900	0.000	0.000
103	RICE GRAIN, POLISHED	89.00	2.050	2.205	1.519	88.000	8.200	0.000	0.000
104	RYE GRAIN	88.00	1.940	2.072	1.404	84.000	13.800	2.622	11.178
105	SAFFLOWER MEAL, 20% SOLVENT-EXTRACTED	92.00	1.279	1.213	0.646	57.000	25.400	0.000	0.000
106	SAFFLOWER MEAL, 42% SOLVENT-EXTRACTED	92.00	1.676	1.742	1.118	73.000	46.900	0.000	0.000
107	SAFFLOWER SEEDS	94.00	2.072	2.205	1.519	89.000	17.400	0.000	0.000
108	SALT	100.00	0.000	0.000	0.000	0.000	0.000	0.000	0.000
109	SCREENINGS, GOOD GREEN	89.00	1.852	1.940	1.292	80.000	13.100	0.000	0.000
110	SCREENINGS, REFUSE	90.00	1.257	1.168	0.606	56.000	11.500	0.000	0.000
111	SODIUM TRIPOLYPHOSPHATE	96.00	0.000	0.000	0.000	0.000	0.000	0.000	0.000
112	SORGHUM SILAGE	35.00	1.120	1.179	0.619	56.200	11.000	2.310	8.690
113	SORGHUM SILAGE, DOUGH	28.00	1.235	1.323	0.745	55.000	6.000	0.000	0.000
114	SOYBEAN MEAL, 44% SOLVENT-EXTRACTED	89.00	1.940	2.072	1.404	84.000	49.900	17.465	32.435
115	SOYBEAN MEAL, 48 %SOLVENT-EXTRACTED	90.00	2.006	2.161	1.482	87.000	55.100	19.285	35.815
116	SOYBEAN MEAL, 48% SOLVENT-EXTRACTED	91.00	2.141	2.231	1.541	89.800	53.000	18.000	35.000
117	SOYBEAN MEAL, EXPELLER-EXTRACTED	90.00	2.200	2.240	1.550	90.000	44.000	16.700	27.300
118	SOYBEAN, HULLS	91.00	2.150	2.200	1.519	88.700	12.600	4.030	8.570
119	SOYBEANS, ROASTED	94.00	2.641	2.769	1.980	109.000	43.000	18.500	24.500
120	SUDANGRASS HAY	91.00	1.257	1.190	0.626	56.000	8.000	0.000	0.000
121	SUGARCANE BAGASSE	91.00	0.970	0.573	0.060	44.000	1.500	0.000	0.000
122	SUGARCANE STRIPPINGS	45.00	0.970	0.750	0.223	44.000	3.600	0.000	0.000
123	SUNFLOWER MEAL	88.00	1.570	1.691	1.080	72.000	33.000	7.900	25.100
124	SUNFLOWER MEAL, EXPELLER-EXTRACTED	93.00	1.698	1.764	1.138	74.000	44.600	11.596	33.004
125	SUNFLOWER MEAL, SOLVDENT-EXTRACTED	93.00	1.477	1.477	0.884	65.000	49.800	12.948	36.852
126	TALLOW	98.00	5.659	6.120	4.601	214.900	0.000	0.000	0.000
127	UREA, 46% NITROGEN	99.00	0.000	0.000	0.000	0.000	287.500	0.000	0.000
128	UREA-CORN SILAGE	30.00	1.477	1.543	0.944	65.000	12.700	0.000	0.000
129	WHEAT BRAN	89.00	1.609	1.631	1.021	70.000	17.100	4.959	12.141
130	WHEAT MILL RUN	90.00	1.830	1.918	1.272	79.000	17.200	0.000	0.000
131	WHEAT SILAGE, WINTER	32.00	1.360	1.451	0.871	64.400	10.600	1.800	8.800
132	WHEAT STRAW	92.00	1.010	1.041	0.489	52.100	8.100	2.750	5.350
133	WHEAT, MIDDINGS	91.00	1.779	1.881	1.239	77.800	19.600	3.330	16.300
134	WHEAT, SOFT, PACIFIC COAST	89.00	2.072	2.205	1.519	89.000	11.300	2.486	8.814
135	WHEY PRODUCT, DRIED	93.00	1.830	1.918	1.272	79.000	17.900	0.000	0.000
136	WHEY, LIQUID	7.00	1.874	1.984	1.329	81.000	14.200	0.000	0.000

137	WHEY, PERMEATE LIQUID	22.00		1.920	1.971	1.321	81.000		13.000	0.400	12.600
138	WHEY, COND, 42% SOLIDS	42.00		1.874	1.874	1.232	81.000		14.200	0.000	0.000
139	YEAST, BREWERS, DRIED	93.00		1.830	1.918	1.272	79.000		46.900	19.698	27.202
140	LEGUME PASTURE, HIGH QUALITY	24.00		1.601	1.682	1.160	66.700		24.000	5.000	16.000
141	LEGUME PASTURE, MEDIUM QUALITY	20.00		1.731	1.819	1.254	72.100		22.000	4.600	16.300
142	LEGUME PASTURE, LOW QUALITY	22.00		1.470	1.545	1.065	61.300		21.000	4.200	15.900
143	MIXED PASTURE, HIGH QUALITY	22.00		1.770	1.861	1.283	73.800		20.500	3.700	14.200
144	MIXED PASTURE, MEDIUM QUALITY	22.00		1.770	1.861	1.283	73.800		19.000	3.400	14.600
145	MIXED PASTURE, LOW QUALITY	22.00		1.470	1.545	1.065	61.300		18.000	3.300	15.000
146	GRASS PASTURE, HIGH QUALITY	20.00		1.940	2.039	1.407	80.900		17.000	2.500	12.300
147	GRASS PASTURE, MEDIUM QUALITY	24.00		1.821	1.914	1.318	75.900		16.000	2.400	12.700
148	GRASS PASTURE, LOW QUALITY	22.00		1.470	1.545	1.065	61.300		15.000	2.500	14.100

## Section 2: Minerals (CP, P, NPN, CL, MG, K, NA, S)

NO	NAME	CA	P	NPN	CL	MG	K	NA	S
		% DM	% DM	% DM	% DM	% DM	% DM	% DM	% DM
1	ALFALFA SILAGE, 32% ACID-DETERGENT FIBER	1.410	0.220	0.000	0.380	0.330	2.520	0.140	0.280
2	ALFALFA HAY, 28% ACID-DETERGENT FIBER	1.800	0.350	0.000	0.340	0.260	2.210	0.220	0.330
3	ALFALFA HAY, 32% ACID-DETERGENT FIBER	1.410	0.220	0.000	0.380	0.330	2.520	0.140	0.280
4	ALFALFA HAY, 37% ACID-DETERGENT FIBER	1.250	0.220	0.000	0.350	0.310	1.530	0.110	0.270
5	ALFALFA HAY, HIGH QUALITY	1.400	0.300	0.000	0.800	0.300	2.400	0.200	0.300
6	ALFALFA SIL, HIGH QUALITY	1.400	0.300	0.000	0.800	0.300	2.400	0.200	0.300
7	ALFALFA, FRESH CHOPPED	1.400	0.300	0.000	0.800	0.300	2.400	0.200	0.300
8	ALMOND HULLS	0.250	0.120	0.000	0.110	0.110	2.260	0.020	0.040
9	ALMOND HULLS AND SHELL	0.230	0.110	0.000	0.000	0.130	0.530	0.020	0.110
10	ALMOND HULLS, 13% CRUDE FIBER	0.230	0.110	0.000	0.000	0.130	0.530	0.020	0.110
11	ALMOND HULLS, 15% CRUDE FIBER	0.230	0.110	0.000	0.000	0.130	0.530	0.020	0.110
12	APPLE POMACE, DRIED	0.130	0.110	0.000	0.000	0.070	0.460	0.120	0.020
13	BAKERY WASTE, DRIED	0.140	0.260	0.000	1.610	0.260	0.530	1.240	0.020
14	BARLEY HAY	0.230	0.260	0.000	0.000	0.180	1.180	0.140	0.170
15	BARLEY, 46-48#/BUSHEL	0.050	0.380	0.000	0.180	0.150	0.470	0.030	0.170
16	BARLEY, 49#/BUSHEL	0.060	0.390	0.000	0.170	0.140	0.580	0.020	0.160
17	BARLEY, DRY ROLLED	0.070	0.360	0.000	0.150	0.120	0.550	0.020	0.140
18	BARLEY, LIGHT WIGHT	0.050	0.370	0.000	0.180	0.140	0.600	0.020	0.180
19	BEET PULP, DEHYDRATED	0.630	0.110	0.000	0.570	0.230	1.810	0.460	0.260
20	BEET PULP, DRIED	0.690	0.100	0.000	0.040	0.270	0.200	0.210	0.220
21	BEET PULP, DRIED WITH MOLASSES	0.610	0.100	0.000	0.040	0.160	1.780	0.530	0.420
22	BLOOD MEAL	0.320	0.260	0.000	0.300	0.240	0.100	0.350	0.370
23	BONE MEAL, STEAMED	30.710	12.860	0.000	0.010	0.330	0.190	5.690	2.510
24	BREAD, DRIED	0.090	0.160	0.000	1.610	0.260	0.530	1.240	0.020
25	BREWERS GRAIN, CALIFORNIA	0.290	0.540	0.000	0.170	0.160	0.090	0.230	0.320
26	BREWERS GRAIN, WET	0.330	0.550	0.000	0.170	0.160	0.090	0.230	0.320
27	BREWERS GRAINS, DRY	0.200	0.620	0.000	0.080	0.260	0.260	0.050	0.310
28	BREWERS GRAINS, WET	0.200	0.200	0.000	0.080	0.260	0.260	0.050	0.310
29	BREWERS GRAINS, DRIED 25% P	0.330	0.550	0.000	0.170	0.160	0.090	0.230	0.320
30	CANOLA, MEAL SOLVENT	0.850	1.230	0.000	0.110	0.600	1.510	0.060	0.760
31	CITRUS PULP, DRIED	1.840	0.120	0.000	0.000	0.170	0.790	0.090	0.080



32	COCONUT MEAL, EXPELLER-EXTRACTED	0.220	0.660	0.000	0.030	0.330	1.620	0.040	0.360
33	COCONUT MEAL, SOLVENT-EXTRACTED	0.190	0.660	0.000	0.030	0.360	1.630	0.040	0.370
34	CORN EARS, GROUND	0.070	0.270	0.000	0.050	0.140	0.530	0.020	0.160
35	CORN GLUTEN FEED, DEHYDRATED	0.030	0.900	0.000	0.180	0.350	1.300	0.110	0.400
36	CORN GLUTEN FEED	0.360	0.820	0.000	0.250	0.360	0.640	1.050	0.230
37	CORN GLUTEN ML, 60% CRUDE PROTEIN	0.080	0.540	0.000	0.100	0.090	0.210	0.060	0.720
38	CORN GRAIN, CRACKED	0.030	0.290	0.000	0.050	0.140	0.370	0.030	0.120
39	CORN GRAIN, GROUNDED OR STEAM-ROLLED	0.030	0.290	0.000	0.050	0.140	0.370	0.030	0.120
40	CORN SILAGE	0.200	0.300	0.000	0.040	0.200	1.250	0.010	0.100
41	CORN SILAGE, 25% DM	0.230	0.220	0.000	0.000	0.190	0.960	0.010	0.150
42	CORN SILAGE, 30% DM	0.230	0.220	0.000	0.000	0.190	0.960	0.010	0.150
43	CORN, CANNERY SILAGE	0.300	0.900	0.000	0.000	0.240	1.150	0.030	0.150
44	CORN, CANNERY WASTE	0.300	0.900	0.000	0.000	0.240	1.150	0.030	0.150
45	CORN, GLUTEN MEAL	0.080	0.540	0.000	0.100	0.090	0.210	0.060	0.720
46	CORN, STEAM FLAKED	0.020	0.240	0.000	0.110	0.090	0.330	0.010	0.110
47	COTTONSEED HULLS	0.150	0.090	0.000	0.020	0.140	0.870	0.020	0.090
48	COTTONSEED MEAL, SOLVENT-EXTRACTED	0.170	1.000	0.000	0.040	0.550	1.390	0.040	0.340
49	COTTONSEED MEAL, 41% EXPELLER-EXTRACTED	0.210	1.160	0.000	0.050	0.580	1.450	0.050	0.430
50	COTTONSEED MEAL, 41% SOLVENT-EXTRACTED	0.220	1.210	0.000	0.040	0.550	1.390	0.040	0.340
51	COTTONSEED MEAL, 50% SOLVENT-EXTRACTED	0.190	1.240	0.000	0.050	0.500	1.560	0.060	0.560
52	COTTONSEED, DELINTED	0.120	0.540	0.000	0.000	0.410	1.180	0.010	0.000
53	COTTONSEED, LINTED	0.200	0.720	0.000	0.110	0.370	1.160	0.030	0.270
54	COTTONSEED, PIMA VARIETY	0.190	1.010	0.000	0.090	0.440	1.280	0.010	0.310
55	COTTONSEED, WITH LINT	0.210	0.640	0.000	0.050	0.460	1.000	0.010	0.260
56	DISTILLER GRAINS, DRIED	0.020	0.700	0.000	0.150	0.300	0.940	0.140	0.590
57	DIAMMONIUM PHOSPHATE	0.520	20.600	18.540	0.000	0.460	0.010	0.050	0.160
58	DICALCIUM PHOSPHATE	22.000	19.300	0.000	0.000	0.590	0.070	0.050	1.140
59	DISODIUM PHOSPHATE	0.000	21.800	0.000	0.000	0.000	0.000	32.360	0.000
60	DISTILLER CORN GRAINS, DRIED	0.110	0.430	0.000	0.080	0.070	0.180	0.100	0.460
61	FAT, ANIMAL	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000
62	FAT, RUMEN INERT	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000
63	FERMENTATION SOLUBLE	0.350	1.370	0.000	0.280	0.650	1.800	0.250	0.400
64	GRAPE POMACE, DRIED	0.610	0.060	0.000	0.010	0.000	0.620	0.090	0.000
65	GRASS SILAGE	0.430	0.200	0.000	0.500	0.140	1.650	0.180	0.180
66	HEGARI GRAIN	0.040	0.360	0.000	0.100	0.140	0.380	0.010	0.130
67	HIGH MOISTURE CORN	0.020	0.240	0.000	0.240	0.090	0.330	0.010	0.110
68	HOMINY FEED, 5% FAT	0.050	0.570	0.000	0.060	0.260	0.650	0.090	0.030

69	HOMINY FEED, LOW FAT	0.050	0.570	0.000	0.060	0.260	0.650	0.090	0.030
70	KELP, DRIED	2.720	0.310	0.000	0.000	0.000	0.000	0.000	0.000
71	LIMESTONE, GROUND	34.000	0.020	0.000	0.000	2.060	0.120	0.060	0.040
72	LINSEED MEAL	0.430	0.890	0.000	0.040	0.660	1.530	0.150	0.430
73	LINSEED MEAL, 35% EXPELLER-EXTRACTED	0.450	0.960	0.000	0.040	0.640	1.340	0.120	0.410
74	LINSEED MEAL, 35% SOLVENT-EXTRACTED	0.430	0.890	0.000	0.040	0.660	1.530	0.150	0.430
75	MALT, BARLEY, NORTH WEST	3.220	0.570	0.000	0.390	0.200	0.230	1.260	0.850
76	MILO, CALIFORNIA OR MIDWEST	0.030	0.320	0.000	0.100	0.190	0.380	0.050	0.180
77	MILO, SOUTH WEST	0.040	0.360	0.000	0.100	0.140	0.380	0.010	0.130
78	MIXED ALFALFA/GRASS	0.900	0.250	0.000	0.650	0.220	2.000	0.190	0.240
79	MOLASSES, CANE	1.000	0.110	0.000	3.100	0.430	3.840	0.220	0.470
80	MOLASSES, LIQUID	1.000	0.110	0.000	3.100	0.430	3.840	0.220	0.470
81	MOLASSES,CANE, 3% PHOSPHATE	1.000	0.950	0.000	0.000	0.430	3.840	0.220	0.470
82	MONOAMMONIUM PHOSPHATE	0.280	24.740	11.300	0.000	0.460	0.010	0.060	1.460
83	MONOSODIUM PHOSPHATE	0.000	22.500	0.000	0.000	0.000	0.000	16.680	0.000
84	OAT AND VETCH HAY	0.720	0.290	0.000	0.000	0.220	1.670	0.340	0.220
85	OAT HAY	0.290	0.280	0.000	0.870	0.130	2.100	0.270	0.100
86	OAT HAY, DOUGH STAGE	0.260	0.240	0.000	0.000	0.180	1.230	0.170	0.300
87	OAT SILAGE, BOOT	0.470	0.240	0.000	0.000	0.180	1.230	0.170	0.300
88	OAT SILAGE, DOUGH	0.260	0.240	0.000	0.000	0.180	1.230	0.170	0.300
89	OATS, LIGHT WT	0.070	0.340	0.000	0.130	0.190	0.420	0.070	0.220
90	OATS, PACIFIC COAST	0.110	0.340	0.000	0.130	0.190	0.420	0.070	0.220
91	ORANGE PULP, DRIED	0.710	0.110	0.000	0.000	0.160	0.620	0.090	0.020
92	OYSTERSHELL FLOUR	38.000	0.070	0.000	0.010	0.300	0.100	0.210	0.000
93	PEAS, CULL	0.150	0.440	0.000	0.060	0.140	1.130	0.050	0.000
94	PINEAPPLE BRAN	0.230	0.130	0.000	0.000	0.000	0.000	0.000	0.000
95	PINEAPPLE GREENCHOP	0.280	0.080	0.000	0.000	0.000	0.000	0.000	0.000
96	PINEAPPLE PRESSCAKE	0.280	0.080	0.000	0.000	0.000	0.000	0.000	0.000
97	PINEAPPLE STUMPMEAL	0.280	0.080	0.000	0.000	0.000	0.000	0.000	0.000
98	POTATOES, DRIED	0.080	0.220	0.000	0.400	0.120	2.150	0.010	0.090
99	RICE BRAN	0.070	1.780	0.000	0.090	0.810	1.570	0.030	0.190
100	RICE BRAN AND HULLS	0.080	0.590	0.000	0.000	0.000	0.000	0.000	0.000
101	RICE BRAN, 13% FAT	0.080	1.700	0.000	0.080	1.040	1.920	0.040	0.200
102	RICE BRAN, SOL	0.070	1.620	0.000	0.080	1.040	1.920	0.040	0.200
103	RICE GRAIN, POLISHED	0.030	0.130	0.000	0.040	0.020	0.120	0.020	0.090
104	RYE GRAIN	0.070	0.370	0.000	0.030	0.140	0.520	0.030	0.170
105	SAFFLOWER MEAL, 20% SOLVENT-EXTRACTED	0.370	0.810	0.000	0.180	0.370	0.820	0.050	0.140

106	SAFFLOWER MEAL, 42% SOLVENT-EXTRACTED	0.380	1.400	0.000	0.180	1.110	1.190	0.050	0.220
107	SAFFLOWER SEEDS	0.260	0.670	0.000	0.000	0.360	0.790	0.060	0.060
108	SALT	0.000	0.000	0.000	60.660	0.000	0.000	39.340	0.000
109	SCREENINGS, GOOD GREEN	0.340	0.330	0.000	0.000	0.140	0.750	0.020	0.150
110	SCREENINGS, REFUSE	0.460	0.320	0.000	0.000	0.140	1.380	0.020	0.150
111	SODIUM TRIPOLYPHOSPHATE	0.000	25.000	0.000	0.000	0.000	0.000	31.000	0.000
112	SORGHUM SILAGE	0.300	0.250	0.000	0.250	0.300	1.200	0.020	0.120
113	SORGHUM SILAGE, DOUGH	0.290	0.260	0.000	0.110	0.270	0.020	0.030	0.140
114	SOYBEAN MEAL, 44% SOLVENT-EXTRACTED	0.300	0.680	0.000	0.080	0.300	1.980	0.030	0.370
115	SOYBEAN MEAL, 48 %SOLVENT-EXTRACTED	0.290	0.700	0.000	0.050	0.320	2.300	0.030	0.480
116	SOYBEAN MEAL, 48% SOLVENT-EXTRACTED	0.510	0.800	0.000	0.060	0.320	2.410	0.010	0.420
117	SOYBEAN MEAL, EXPELLER-EXTRACTED	0.300	0.690	0.000	0.060	0.310	2.100	0.030	0.420
118	SOYBEAN, HULLS	0.630	0.140	0.000	0.030	0.220	1.430	0.010	0.110
119	SOYBEANS, ROASTED	0.270	0.650	0.000	0.030	0.290	1.820	0.020	0.240
120	SUDANGRASS HAY	0.550	0.300	0.000	0.000	0.510	1.870	0.020	0.060
121	SUGARCANE BAGASSE	0.900	0.290	0.000	0.000	0.100	0.500	0.200	0.100
122	SUGARCANE STRIPPINGS	0.350	0.270	0.000	0.000	0.000	0.000	0.000	0.000
123	SUNFLOWER MEAL	0.440	0.980	0.000	0.150	0.770	1.140	0.240	0.330
124	SUNFLOWER MEAL, EXPELLER-EXTRACTED	0.420	1.140	0.000	0.200	0.780	1.140	0.240	0.330
125	SUNFLOWER MEAL, SOLVDENT-EXTRACTED	0.440	0.980	0.000	0.110	0.770	1.140	0.240	0.330
126	TALLOW	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000
127	UREA, 46% NITROGEN	0.000	0.000	46.000	0.000	0.000	0.000	0.000	0.000
128	UREA-CORN SILAGE	0.230	0.220	0.770	0.000	0.190	0.960	0.010	0.150
129	WHEAT BRAN	0.130	1.380	0.000	0.050	0.600	1.560	0.040	0.250
130	WHEAT MILL RUN	0.110	1.130	0.000	0.050	0.520	1.330	0.240	0.340
131	WHEAT SILAGE, WINTER	0.280	0.310	0.000	0.540	0.130	1.850	0.040	0.140
132	WHEAT STRAW	0.500	0.100	0.000	0.900	0.100	2.300	0.150	0.200
133	WHEAT, MIDLINGS	0.160	1.120	0.000	0.130	0.370	1.060	0.010	0.180
134	WHEAT, SOFT, PACIFIC COAST	0.070	0.360	0.000	0.090	0.130	0.460	0.040	0.160
135	WHEY PRODUCT, DRIED	1.710	1.120	0.000	1.100	0.230	3.160	1.540	1.150
136	WHEY, LIQUID	0.730	0.650	0.000	0.080	0.140	2.750	0.700	1.120
137	WHEY, PERMEATE LIQUID	0.920	0.820	0.000	0.080	0.140	1.230	0.700	1.120
138	WHEY, COND, 42% SOLIDS	0.730	0.650	0.000	0.080	0.140	2.750	0.700	1.120
139	YEAST, BREWERS, DRIED	0.130	1.490	0.000	0.080	0.270	1.790	0.080	0.450
140	LEGUME PASTURE, HIGH QUALITY	1.400	0.300	0.000	0.800	0.300	2.400	0.200	0.300
141	LEGUME PASTURE, MEDIUM QUALITY	1.400	0.300	0.000	0.800	0.300	2.400	0.200	0.300
142	LEGUME PASTURE, LOW QUALITY	1.400	0.300	0.000	0.800	0.300	2.400	0.200	0.300

143	MIXED PASTURE, HIGH QUALITY	0.920	0.250	0.000	0.650	0.220	2.030	0.190	0.240
144	MIXED PASTURE, MEDIUM QUALITY	0.920	0.250	0.000	0.650	0.220	2.030	0.190	0.240
145	MIXED PASTURE, LOW QUALITY	0.920	0.250	0.000	0.650	0.220	2.030	0.190	0.240
146	GRASS PASTURE, HIGH QUALITY	0.430	0.200	0.000	0.500	0.140	1.650	0.180	0.180
147	GRASS PASTURE, MEDIUM QUALITY	0.430	0.200	0.000	0.500	0.140	1.650	0.180	0.180
148	GRASS PASTURE, LOW QUALITY	0.430	0.200	0.000	0.500	0.140	1.650	0.180	0.180

### Section 3. Fiber (ECF, ADF, NDF)

NO	NAME	ECF	ADF	NDF
		% DM	% DM	% DM
1	ALFALFA SILAGE, 32% ACID-DETERGENT FIBER	24.000	32.000	43.000
2	ALFALFA HAY, 28% ACID-DETERGENT FIBER	20.500	28.000	38.000
3	ALFALFA HAY, 32% ACID-DETERGENT FIBER	24.000	32.000	43.000
4	ALFALFA HAY, 37% ACID-DETERGENT FIBER	29.000	37.000	50.000
5	ALFALFA HAY, HIGH QUALITY	0.000	31.800	40.400
6	ALFALFA SIL, HIGH QUALITY	0.000	34.700	40.400
7	ALFALFA, FRESH CHOPPED	0.000	33.000	45.000
8	ALMOND HULLS	0.000	28.700	34.700
9	ALMOND HULLS AND SHELL	11.000	36.000	40.000
10	ALMOND HULLS, 13% CRUDE FIBER	7.000	28.000	32.000
11	ALMOND HULLS, 15% CRUDE FIBER	9.000	32.000	36.000
12	APPLE POMACE, DRIED	17.000	26.000	26.000
13	BAKERY WASTE, DRIED	1.000	13.000	18.000
14	BARLEY HAY	27.500	32.000	32.000
15	BARLEY, 46-48#/BUSHEL	5.700	7.000	19.000
16	BARLEY, 49#/BUSHEL	7.100	9.000	21.000
17	BARLEY, DRY ROLLED	0.000	8.400	18.000
18	BARLEY, LIGHT WIGHT	8.000	11.000	23.000
19	BEET PULP, DEHYDRATED	0.000	21.600	40.000
20	BEET PULP, DRIED	19.800	33.000	54.000
21	BEET PULP, DRIED WITH MOLASSES	16.500	25.000	44.000
22	BLOOD MEAL	0.000	0.000	0.000
23	BONE MEAL, STEAMED	2.000	3.000	0.000
24	BREAD, DRIED	1.000	13.000	18.000
25	BREWERS GRAIN, CALIFORNIA	20.000	29.000	56.000
26	BREWERS GRAIN, WET	14.900	23.000	42.000
27	BREWERS GRAINS, DRY	0.000	15.000	34.000
28	BREWERS GRAINS, WET	0.000	15.000	34.000
29	BREWERS GRAINS, DRIED 25% P	14.900	24.000	46.000
30	CANOLA, MEAL SOLVENT	0.000	19.000	28.000
31	CITRUS PULP, DRIED	12.700	22.000	23.000

32	COCONUT MEAL, EXPPELLER-EXTRACTED	12.800	19.000	19.000
33	COCONUT MEAL, SOLVENT-EXTRACTED	16.000	24.000	24.000
34	CORN EARS, GROUND	9.400	11.000	28.000
35	CORN GLUTEN FEED, DEHYDRATED	0.000	10.700	36.000
36	CORN GLUTEN FEED	9.700	12.000	45.000
37	CORN GLUTEN ML, 60% CRUDE PROTEIN	2.200	5.000	14.000
38	CORN GRAIN, CRACKED	2.600	3.000	9.000
39	CORN GRAIN, GROUNDED OR STEAM-ROLLED	2.600	3.000	9.000
40	CORN SILAGE	0.000	30.800	52.000
41	CORN SILAGE, 25% DM	23.700	28.000	51.000
42	CORN SILAGE, 30% DM	23.700	28.000	51.000
43	CORN, CANNERY SILAGE	27.000	34.000	34.000
44	CORN, CANNERY WASTE	22.000	29.000	29.000
45	CORN, GLUTEN MEAL	0.000	2.000	5.000
46	CORN, STEAM FLAKED	0.000	4.000	12.000
47	COTTONSEED HULLS	47.800	73.000	90.000
48	COTTONSEED MEAL, SOLVENT-EXTRACTED	0.000	21.000	30.000
49	COTTONSEED MEAL, 41% EXPPELLER-EXTRACTED	12.800	20.000	28.000
50	COTTONSEED MEAL, 41% SOLVENT-EXTRACTED	14.100	19.000	26.000
51	COTTONSEED MEAL, 50% SOLVENT-EXTRACTED	8.800	12.000	17.000
52	COTTONSEED, DELINTED	17.200	26.000	37.000
53	COTTONSEED, LINTED	0.000	40.000	46.000
54	COTTONSEED, PIMA VARIETY	0.000	31.000	44.600
55	COTTONSEED, WITH LINT	24.000	34.000	44.000
56	DISTILLER GRAINS, DRIED	0.000	14.400	28.100
57	DIAMMONIUM PHOSPHATE	0.000	0.000	0.000
58	DICALCIUM PHOSPHATE	0.000	0.000	0.000
59	DISODIUM PHOSPHATE	0.000	0.000	0.000
60	DISTILLER CORN GRAINS, DRIED	12.100	17.000	43.000
61	FAT, ANIMAL	0.000	0.000	0.000
62	FAT, RUMEN INERT	0.000	0.000	0.000
63	FERMENTATION SOLUBLE	5.000	7.000	23.000
64	GRAPE POMACE, DRIED	17.000	54.000	55.000
65	GRASS SILAGE	0.000	42.000	60.000
66	HEGARI GRAIN	2.000	9.000	18.000
67	HIGH MOISTURE CORN	0.000	4.000	12.000
68	HOMINY FEED, 5% FAT	6.700	13.000	55.000

69	HOMINY FEED, LOW FAT	6.700	13.000	55.000
70	KELP, DRIED	7.000	10.000	10.000
71	LIMESTONE, GROUND	0.000	0.000	0.000
72	LINSEED MEAL	0.000	16.000	25.000
73	LINSEED MEAL, 35% EXPELLER-EXTRACTED	9.600	17.000	25.000
74	LINSEED MEAL, 35% SOLVENT-EXTRACTED	10.100	19.000	25.000
75	MALT, BARLEY, NORTH WEST	18.000	24.000	46.000
76	MILO, CALIFORNIA OR MIDWEST	2.000	9.000	18.000
77	MILO, SOUTH WEST	2.000	9.000	18.000
78	MIXED ALFALFA/GRASS	0.000	35.000	53.000
79	MOLASSES, CANE	0.000	0.000	0.000
80	MOLASSES, LIQUID	0.000	0.000	0.000
81	MOLASSES,CANE, 3% PHOSPHATE	0.000	0.000	0.000
82	MONOAMMONIUM PHOSPHATE	0.000	0.000	0.000
83	MONOSODIUM PHOSPHATE	0.000	0.000	0.000
84	OAT AND VETCH HAY	31.000	40.000	56.000
85	OAT HAY	0.000	41.500	64.000
86	OAT HAY, DOUGH STAGE	27.000	34.000	56.000
87	OAT SILAGE, BOOT	29.000	35.000	58.000
88	OAT SILAGE, DOUGH	27.000	34.000	56.000
89	OATS, LIGHT WT	15.900	20.000	36.000
90	OATS, PACIFIC COAST	12.300	16.000	32.000
91	ORANGE PULP, DRIED	9.600	16.000	21.000
92	OYSTERSHELL FLOUR	0.000	0.000	0.000
93	PEAS, CULL	6.900	9.000	9.000
94	PINEAPPLE BRAN	18.000	37.000	73.000
95	PINEAPPLE GREENCHOP	27.000	35.000	35.000
96	PINEAPPLE PRESSCAKE	26.000	34.000	34.000
97	PINEAPPLE STUMPMEAL	22.000	30.000	30.000
98	POTATOES, DRIED	2.300	3.000	3.000
99	RICE BRAN	0.000	9.200	22.000
100	RICE BRAN AND HULLS	17.000	53.000	53.000
101	RICE BRAN, 13% FAT	12.800	18.000	33.000
102	RICE BRAN, SOL	13.000	17.000	17.000
103	RICE GRAIN, POLISHED	0.700	1.000	16.000
104	RYE GRAIN	2.500	3.000	9.000
105	SAFFLOWER MEAL, 20% SOLVENT-EXTRACTED	17.000	41.000	58.000

106	SAFFLOWER MEAL, 42% SOLVENT-EXTRACTED	13.000	20.000	30.000
107	SAFFLOWER SEEDS	16.000	40.000	40.000
108	SALT	0.000	0.000	0.000
109	SCREENINGS, GOOD GREEN	9.000	12.000	0.000
110	SCREENINGS, REFUSE	16.000	40.000	0.000
111	SODIUM TRIPOLYPHOSPHATE	0.000	0.000	0.000
112	SORGHUM SILAGE	0.000	35.000	70.000
113	SORGHUM SILAGE, DOUGH	27.900	38.000	38.000
114	SOYBEAN MEAL, 44% SOLVENT-EXTRACTED	7.000	10.000	13.000
115	SOYBEAN MEAL, 48 %SOLVENT-EXTRACTED	3.700	6.000	8.000
116	SOYBEAN MEAL, 48% SOLVENT-EXTRACTED	0.000	6.700	11.000
117	SOYBEAN MEAL, EXPELLER-EXTRACTED	0.000	3.000	8.000
118	SOYBEAN, HULLS	0.000	46.000	63.000
119	SOYBEANS, ROASTED	0.000	3.000	8.000
120	SUDANGRASS HAY	36.000	42.000	68.000
121	SUGARCANE BAGASSE	49.000	61.000	61.000
122	SUGARCANE STRIPPINGS	45.000	51.000	51.000
123	SUNFLOWER MEAL	0.000	24.000	40.000
124	SUNFLOWER MEAL, EXPELLER-EXTRACTED	13.100	16.400	16.400
125	SUNFLOWER MEAL, SOLVDENT-EXTRACTED	12.200	15.200	15.200
126	TALLOW	0.000	0.000	0.000
127	UREA, 46% NITROGEN	0.000	0.000	0.000
128	UREA-CORN SILAGE	23.700	28.000	51.000
129	WHEAT BRAN	11.300	15.000	51.000
130	WHEAT MILL RUN	9.200	13.000	44.000
131	WHEAT SILAGE, WINTER	0.000	37.500	52.000
132	WHEAT STRAW	0.000	42.500	63.100
133	WHEAT, MIDLINGS	0.000	12.600	39.000
134	WHEAT, SOFT, PACIFIC COAST	2.600	4.000	14.000
135	WHEY PRODUCT, DRIED	0.200	0.200	0.200
136	WHEY, LIQUID	0.200	0.200	0.200
137	WHEY, PERMEATE LIQUID	0.000	1.000	6.000
138	WHEY, COND, 42% SOLIDS	0.200	0.200	0.200
139	YEAST, BREWERS, DRIED	3.100	4.000	4.000
140	LEGUME PASTURE, HIGH QUALITY	0.000	0.000	40.000
141	LEGUME PASTURE, MEDIUM QUALITY	0.000	0.000	35.000
142	LEGUME PASTURE, LOW QUALITY	0.000	0.000	45.000



143	MIXED PASTURE, HIGH QUALITY	0.000	0.000	47.500
144	MIXED PASTURE, MEDIUM QUALITY	0.000	0.000	47.500
145	MIXED PASTURE, LOW QUALITY	0.000	0.000	55.000
146	GRASS PASTURE, HIGH QUALITY	0.000	0.000	55.000
147	GRASS PASTURE, MEDIUM QUALITY	0.000	0.000	60.000
148	GRASS PASTURE, LOW QUALITY	0.000	0.000	65.000

## Appendix 04. Alternate Feeds

There are 277 feeds in the alternate feed library, as listed below in three sections:

### Section1: Energy (NEL, NEN, NEG, TDN) and protein (CP, UIP, DIP)

Note that all columns for energy nutrients are populated, but only the CP column for protein nutrients is populated. Therefore, when formulation rations, do not formulated on UIP and DIP. Instead formulate on CP.

NO	LIB	NAME	DM	NEL	NEM	NEG	TDN	CP	UIP	DIP
			%	Mcal/kg	Mcal/kg	Mcal/kg	%DM	% DM	% DM	% DM
1	1	Bean hulls	90.2	0.8	0.53	0.05	38	5.23	0	0
2	1	Bean middling	88.3	1.6	1.68	1.25	71.7	0	0	0
3	1	Bentonite	88.2	0	0	0	0	0	0	0
4	1	Calci Block	95.6	1.1	1.01	0.55	51.2	0	0	0
5	1	Calci Chick	99.4	1.1	1	0.54	51.1	0	0	0
6	1	Calci Tex	99.7	1.1	0.97	0.51	50.3	0	0	0
7	1	Cassava middling	88.4	1.9	2.06	1.65	84.3	2.22	0	0
8	1	Cereal fermented	87	2	2.14	1.73	86.9	0	0	0
9	1	Cereal ferment mango	87.4	2	2.15	1.74	87.1	0	0	0
10	1	Chickpea hulls mix	89.5	1.1	0.96	0.5	49.9	12.4	0	0
11	1	Choline Choloriac	92.8	2.1	2.21	1.81	89.2	0	0	0
12	1	Cotton gin BYPRODUCT 01	90.3	1.8	1.83	1.4	76.3	27.5	0	0
13	1	Cotton gin BYPRODUCT 02	88.3	1.3	1.24	0.8	58.2	7.61	0	0
14	1	Cottonseed cake MEAL 01	93.6	1.6	1.65	1.21	70.6	24.2	0	0
15	1	Cottonseed cake MEAL 02	94	1.4	1.38	0.94	62.3	33.3	0	0
16	1	Cottonseed cake MEAL 03	90.7	1.5	1.54	1.1	67.2	34.9	0	0
17	1	Cottonseed cake WHOLE 04	90.8	0.7	0.37	-0.1	34	7.03	0	0
18	1	Cottonseed cake CRACKED 05	89.5	1.4	1.36	0.91	61.5	24	0	0
19	1	Cottonseed cake MEAL 06	94	1.4	1.33	0.88	60.7	37.9	0	0
20	1	Cottonseed cake MEAL 07	90.3	1.4	1.3	0.86	60	33	0	0
21	1	Cottonseed cake CRACKED 08	92.4	1.2	1.11	0.65	54.1	21.9	0	0
22	1	Cottonseed cake CRACKED 09	89.7	1.3	1.29	0.84	59.4	25	0	0
23	1	Cottonseed cake 01	91.9	1.2	1.09	0.63	53.5	22.6	0	0
24	1	Cottonseed cake 02	91.1	1.2	1.15	0.69	55.3	36.7	0	0
25	1	Cottonseed cake 03	90.3	2.3	2.45	2.06	97.7	0	0	0

26	1	Cottonseed cake 04	91.7		1.2	1.06	0.61	52.9		19.9	0	0
27	1	Cottonseed cake 05	91.4		1.3	1.18	0.73	56.4		22.7	0	0
28	1	Cottonseed cake 06	91.3		1.2	1.16	0.71	55.7		18	0	0
29	1	Cottonseed cake 07	90.5		1.1	0.94	0.48	49.4		20	0	0
30	1	Cottonseed cake 08	90.3		1	0.79	0.33	45.2		20.5	0	0
31	1	Cottonseed cake 09	92.4		1.4	1.36	0.92	61.8		19.4	0	0
32	1	Fish meal[meal]	90.8		1.7	1.76	1.34	74.4		41.2	0	0
33	1	Full fat soya	90.4		2.2	2.38	1.99	95.3		38.1	0	0
34	1	Lentil husk	89.2		1.5	1.52	1.08	66.6		20.4	0	0
35	1	Limestone[meal] 01	99.7		1.1	0.93	0.47	49.2		0	0	0
36	1	Limestone[meal] 02	99.4		1.1	0.95	0.49	49.5		0	0	0
37	1	Limestone[meal] 03	99.6		1.2	1.13	0.68	54.8		0	0	0
38	1	Limestone[meal] 04	99.7		1.1	0.94	0.48	49.3		0	0	0
39	1	Limestone[meal] 05	99		1.1	0.97	0.52	50.3		0	0	0
40	1	Limestone[meal] 06	99.2		1.1	0.94	0.48	49.4		0	0	0
41	1	Limestone[meal] 07	97.9		1.1	0.94	0.48	49.4		0	0	0
42	1	Limestone[meal] 08	99.7		1.1	0.93	0.47	49.1		0	0	0
43	1	Limestone[meal] 09	98.1		1.1	0.93	0.47	49.1		0	0	0
44	1	Limestone[meal] 10	99.2		1.1	0.94	0.48	49.3		0	0	0
45	1	Limestone[meal] 11	99.6		1.1	0.93	0.47	49.1		0	0	0
46	1	Limestone[meal] 12	100		1.1	0.93	0.47	49.1		0	0	0
47	1	Limestone[meal] 13	96		1.1	0.94	0.48	49.2		0	0	0
48	1	Limestone[meal] 14	97.3		1.1	0.95	0.49	49.5		0	0	0
49	1	Limestone[meal] 15	99.2		1.1	0.94	0.48	49.4		0	0	0
50	1	Limestone[block] 16	79.6		1.2	1.14	0.69	55		0	0	0
51	1	Limestone 01	99.4		1.2	1.06	0.61	52.9		0	0	0
52	1	Limestone 02	99.2		0	0	0	0		0	0	0
53	1	Limestone 03	100		1.1	0.96	0.5	50		0	0	0
54	1	Limestone 04	99.1		1.1	0.95	0.49	49.7		0	0	0
55	1	Limestone 05	99.3		1.1	0.96	0.5	49.8		0	0	0
56	1	Limestone 06	99.5		1.1	0.96	0.5	49.8		0	0	0
57	1	Limestone 07	99.3		1.1	1.02	0.56	51.6		0	0	0
58	1	Limestone 08	99.6		0	0	0	0		0	0	0
59	1	Limestone 09	99.9		0	0	0	0		0	0	0
60	1	Limestone 10	99.7		0	0	0	0		0	0	0
61	1	Limestone 11	99.9		0	0	0	0		0	0	0
62	1	Limestone 12	99		0	0	0	0		0	0	0

63	1	Limestone 13	99.1		0	0	0	0		0	0	0
64	1	Limestone 14	99.9		0	0	0	0		0	0	0
65	1	Limestone 15	99.8		0	0	0	0		0	0	0
66	1	Limestone 16	99.6		0	0	0	0		0	0	0
67	1	Limestone 17	95.2		0	0	0	0		0	0	0
68	1	Limestone 18	99.2		0	0	0	0		0	0	0
69	1	Limestone 19	98.3		0	0	0	0		0	0	0
70	1	Linseed cake 01	92.6		2	2.07	1.65	84.4		29.3	0	0
71	1	Linseed cake 02	92.7		1.9	2.01	1.59	82.3		28.8	0	0
72	1	Linseed cake 03	89.3		1.2	1.08	0.62	53.2		9.8	0	0
73	1	Linseed cake 04	90.1		1.8	1.86	1.44	77.4		25.5	0	0
74	1	Linseed cake 05	90		1.7	1.78	1.35	74.8		22.4	0	0
75	1	Linseed cake 06	91		1.8	1.85	1.42	77.1		25.8	0	0
76	1	Linseed cake 07	89.6		1.8	1.86	1.44	77.4		23.7	0	0
77	1	Lupin seed	88.5		1.7	1.72	1.29	73		29.4	0	0
78	1	Maize + soybean MEAL	91.5		2.1	2.26	1.86	91		15.6	0	0
79	1	Maize bran 01	89.3		1.1	0.98	0.52	50.4		5.88	0	0
80	1	Maize bran 02	88.6		1.8	1.87	1.44	77.7		13.2	0	0
81	1	Maize byproduct MEAL	89.6		1.6	1.59	1.15	68.8		8.91	0	0
82	1	Maize flour 01	87.8		2.1	2.22	1.81	89.4		6.86	0	0
83	1	Maize flour 02	87.3		2.1	2.24	1.83	90.1		7.21	0	0
84	1	Maize grain WHOLE 01	86.1		2.1	2.2	1.8	88.9		10.2	0	0
85	1	Maize grain WHOLE 02	88.2		2.1	2.24	1.84	90.3		8.47	0	0
86	1	Maize grain WHOLE 03	87.5		2.1	2.2	1.79	88.8		10.2	0	0
87	1	Maize grain WHOLE 04	87.9		2.1	2.22	1.81	89.5		9.75	0	0
88	1	Maize grain 01	86.8		2.2	2.35	1.95	94		0	0	0
89	1	Maize grain 02	87.8		2.2	2.35	1.96	94.2		0	0	0
90	1	Maize grain 03	88.2		2.2	2.35	1.95	93.9		0	0	0
91	1	Maize grain 04	86.1		2.2	2.34	1.94	93.6		0	0	0
92	1	Maize grain 05	86		2.2	2.34	1.94	93.6		0	0	0
93	1	Maize grain 06	87.3		2.1	2.27	1.86	91.1		7.86	0	0
94	1	Maize grain 07	85.9		2.1	2.25	1.85	90.6		9.37	0	0
95	1	Maize grain 08	89.1		2.1	2.26	1.86	90.9		7.47	0	0
96	1	Maize grain 09	87.5		2.1	2.21	1.8	89.2		7.2	0	0
97	1	Maize grain 10	87.2		2.1	2.25	1.85	90.8		7.63	0	0
98	1	Maize grain 11	89		2.1	2.25	1.85	90.5		7.08	0	0
99	1	Maize soya mix	93.8		2.1	2.2	1.8	89		8.21	0	0

100	1	Meat & bone meal 01	97	1.7	1.74	1.32	73.7	53.8	0	0
101	1	Meat & bone meal 02	95.3	1.9	1.95	1.53	80.5	60.4	0	0
102	1	Meat & bone meal 03	93.8	2.2	2.36	1.96	94.4	0	0	0
103	1	Meat & bone meal 04	95.2	1.9	1.99	1.58	81.8	48.7	0	0
104	1	Meat & bone meal 05	95.5	1.8	1.9	1.48	78.8	49.9	0	0
105	1	Meat & bone meal 06	94.1	1.9	1.98	1.57	81.6	47.5	0	0
106	1	Meat & bone meal 07	93	2.1	2.21	1.8	89.1	0	0	0
107	1	Mixed oilseed cake 01	90.4	0	0	0	0	0	0	0
108	1	Mixed oilseed cake 02	90.7	0	0	0	0	0	0	0
109	1	Mixed oilseed cake 03	87.8	0	0	0	0	0	0	0
110	1	Mixed oilseed cake 04	88.5	1.7	1.71	1.27	72.4	35.7	0	0
111	1	Mixed oilseed cake 05	91.6	2	2.09	1.68	85.2	39.3	0	0
112	1	Mixed oilseed cake 06	90.9	1.8	1.87	1.45	77.9	41.9	0	0
113	1	Molasses[liquid] 01	69.5	1.8	1.89	1.47	78.4	4.66	0	0
114	1	Molasses[liquid] 02	66.7	1.8	1.91	1.49	79.1	4.47	0	0
115	1	Molasses[liquid] 03	67.5	1.8	1.9	1.47	78.7	4.36	0	0
116	1	Molasses[liquid] 04	72.3	1.8	1.88	1.46	78.1	2.99	0	0
117	1	Molasses 01	55.4	0	0	0	0	0	0	0
118	1	Molasses 02	54.9	0	0	0	0	1.3	0	0
119	1	Molasses 03	59.2	0	0	0	0	1.18	0	0
120	1	Molasses 04	62.4	0	0	0	0	2.39	0	0
121	1	Noug + sunflower CRACKED	91.8	0	0	0	0	0	0	0
122	1	Noug cake 01	91.8	1.3	1.28	0.84	59.3	23.9	0	0
123	1	Noug cake 02	93.5	1.4	1.36	0.91	61.5	38	0	0
124	1	Noug cake 03	91.4	1.1	0.95	0.49	49.5	24.8	0	0
125	1	Noug cake 04	95	1.2	1.14	0.69	55.2	25.1	0	0
126	1	Noug cake 05	91.9	1.5	1.44	1	64.2	35.4	0	0
127	1	Noug cake 06	94.5	1.5	1.47	1.03	64.9	34	0	0
128	1	Noug cake 07	93.6	1.4	1.4	0.96	63	36.3	0	0
129	1	Noug cake 08	92.6	1.5	1.5	1.07	66.1	39	0	0
130	1	Noug cake 09	91.4	1.4	1.34	0.89	60.9	30.2	0	0
131	1	Noug cake 10	92.4	1.5	1.48	1.04	65.3	34	0	0
132	1	Noug cake 11	92.6	1.6	1.66	1.23	71	32.3	0	0
133	1	Noug cake 12	92.9	1.5	1.46	1.02	64.8	36.9	0	0
134	1	Noug cake 13	92.8	1.5	1.52	1.08	66.5	45.1	0	0
135	1	Noug cake 14	90.9	1.2	1.15	0.69	55.3	27.4	0	0
136	1	Noug cake 15	89	1.7	1.8	1.38	75.6	42.9	0	0

137	1	Noug cake 16	92.4		1.7	1.71	1.28	72.6		43	0	0
138	1	Noug cake 17	90.5		1.5	1.48	1.04	65.4		43.9	0	0
139	1	Noug cake 18	91.1		1.6	1.63	1.2	70.2		37.5	0	0
140	1	Noug cake 19	88.3		1.4	1.42	0.97	63.4		0	0	0
141	1	Noug cake 20	91.8		0	0	0	0		0	0	0
142	1	Noug cake 21	89.2		1.7	1.72	1.29	72.9		47.5	0	0
143	1	Noug cake 22	92.4		0	0	0	0		0	0	0
144	1	Noug cake 23	87.3		1.6	1.57	1.13	68.1		0	0	0
145	1	Noug cake 24	91.4		1.3	1.28	0.83	59.2		27.1	0	0
146	1	Noug cake 25	89.5		0	0	0	0		0	0	0
147	1	Noug cake 26	90.2		1.4	1.33	0.88	60.7		0	0	0
148	1	Noug cake 27	88.1		0	0	0	0		0	0	0
149	1	Noug cake 28	89.2		0	0	0	0		0	0	0
150	1	Noug cake 29	90.4		0	0	0	0		0	0	0
151	1	Noug cake 30	92.4		1.6	1.61	1.18	69.5		30.1	0	0
152	1	Noug cake 31	89.4		1.2	1.14	0.68	55		30.3	0	0
153	1	Noug cake 32	89.9		1.3	1.26	0.81	58.6		30.4	0	0
154	1	Noug cake 33	90		1.3	1.26	0.81	58.5		26.5	0	0
155	1	Noug cake 34	90.7		1.4	1.39	0.94	62.4		24.3	0	0
156	1	Noug cake 35	90.4		1.2	1.12	0.67	54.5		39	0	0
157	1	Noug cake 36	89.3		1.3	1.2	0.75	56.8		34.1	0	0
158	1	Noug cake 37	91		1.3	1.18	0.72	56.1		23.2	0	0
159	1	Noug cake 38	90.3		1.7	1.73	1.3	73.2		24.5	0	0
160	1	Noug cake 39	89.6		1.4	1.41	0.96	63		27	0	0
161	1	Noug cake 40	91.2		1.8	1.85	1.43	77.3		32.8	0	0
162	1	Noug cake 41	90.4		1.5	1.56	1.12	67.8		39.9	0	0
163	1	Noug cake 42	90.5		1.8	1.82	1.39	76.1		32.3	0	0
164	1	Noug cake 43	92		1.8	1.92	1.5	79.5		35	0	0
165	1	Oat hulls	90.6		1	0.73	0.27	43.6		3.81	0	0
166	1	Pea hulls MIDLING BYPRODUCT	92.5		1.2	1.16	0.71	55.7		16.4	0	0
167	1	Peanut cake	89.3		1.8	1.85	1.42	77		45.3	0	0
168	1	Plum dried	60.5		2	2.1	1.69	85.5		0	0	0
169	1	Rapeseed cake 01	89.8		2	2.14	1.73	86.9		23.6	0	0
170	1	Rapeseed cake 02	90.1		2	2.13	1.72	86.4		18.8	0	0
171	1	Rearing feed	88.1		1.8	1.85	1.42	77		15.2	0	0
172	1	Red kidney bean	87.1		2.1	2.21	1.8	89.1		0	0	0
173	1	Rice bran 01	89.4		1	0.87	0.4	47.2		4.78	0	0

174	1	Rice bran 02	88.2		1.3	1.25	0.8	58.4		7.2	0	0
175	1	Rice bran 03	89.6		1.1	0.92	0.46	48.7		6.02	0	0
176	1	Rice bran 04	90.1		1	0.73	0.27	43.6		6.43	0	0
177	1	Rice hull 05	90.2		1.2	1.03	0.57	51.8		5.51	0	0
178	1	Sesame cake 01	91.5		0	0	0	0		0	0	0
179	1	Sesame cake 02	89.8		1.8	1.92	1.5	79.3		38.5	0	0
180	1	Sesame cake 03	91.2		2.2	2.4	2.01	95.9		31.9	0	0
181	1	Sorghum grain 01	89		2	2.15	1.75	87.3		15.8	0	0
182	1	Sorghum grain 02	89.8		2.1	2.21	1.8	89.2		11.9	0	0
183	1	Soy hipo	90.9		1.8	1.89	1.47	78.4		44.4	0	0
184	1	Soybean + sesame CRACKED	87.1		0	0	0	0		0	0	0
185	1	Soybean cake 01	93.6		1.8	1.92	1.5	79.3		50.5	0	0
186	1	Soybean cake 02	94.4		1.8	1.94	1.52	80.1		49.7	0	0
187	1	Soybean cake 03	92.4		0	0	0	0		0	0	0
188	1	Soybean cake 04	89.3		0	0	0	0		0	0	0
189	1	Soybean cake 05	86.5		2.2	2.34	1.94	93.7		0	0	0
190	1	Soybean cake 06	85.8		2.2	2.42	2.02	96.4		0	0	0
191	1	Soybean cake 07	90.6		1.9	1.97	1.55	81		44.7	0	0
192	1	Soybean cake 08	93.8		0	0	0	0		0	0	0
193	1	Soybean cake 09	92.6		1.8	1.92	1.5	79.4		44.6	0	0
194	1	Soybean cake 10	92.5		1.9	1.97	1.55	81.2		42.7	0	0
195	1	Soybean cake 11	88.5		1.9	1.98	1.56	81.5		45	0	0
196	1	Soybean cake 12	91.4		1.9	1.96	1.54	80.8		44.3	0	0
197	1	Sunflower cake	88.6		0	0	0	0		0	0	0
198	1	Wheat bran[meal] 01	86.8		1.8	1.9	1.48	78.7		16.7	0	0
199	1	Wheat bran[meal] 02	87.4		1.8	1.93	1.51	79.9		18.4	0	0
200	1	Wheat bran[meal] 03	86		1.8	1.88	1.46	78.1		17.6	0	0
201	1	Wheat bran[meal] 04	89.8		1.9	2.03	1.62	83.1		18.8	0	0
202	1	Wheat bran[meal] 05	89.9		1.6	1.66	1.22	70.9		14.6	0	0
203	1	Wheat bran[meal] 06	84.1		1.8	1.92	1.5	79.5		15.9	0	0
204	1	Wheat bran[meal] 07	90.1		1.8	1.85	1.42	77		18.5	0	0
205	1	Wheat bran[meal] 08	91.1		1.9	1.98	1.56	81.5		17.1	0	0
206	1	Wheat bran[meal] 09	90.4		1.9	1.96	1.54	80.7		19.1	0	0
207	1	Wheat bran[meal] 10	89		1.8	1.88	1.46	78.2		17.1	0	0
208	1	Wheat bran[meal] 11	87.5		1.8	1.88	1.45	78		17	0	0
209	1	Wheat bran[meal] 12	86.8		1.8	1.84	1.42	76.9		18.3	0	0
210	1	Wheat bran[meal] 13	88.7		1.9	1.97	1.56	81.2		17.6	0	0

211	1	Wheat bran[meal] 14	87.2		1.8	1.87	1.45	77.8		17.3	0	0
212	1	Wheat bran[meal] 15	90		1.8	1.93	1.51	79.8		16.4	0	0
213	1	Wheat bran[meal] 16	89.9		1.8	1.92	1.5	79.4		18.4	0	0
214	1	Wheat bran[meal] 17	87.2		1.9	1.96	1.55	80.9		19.1	0	0
215	1	Wheat bran[meal] 18	87.8		1.9	1.96	1.55	80.9		19.3	0	0
216	1	Wheat bran[meal] 19	86		1.8	1.9	1.48	78.8		16.9	0	0
217	1	Wheat bran 01	85.8		1.9	2.03	1.62	83.2		14.7	0	0
218	1	Wheat bran 02	86		1.8	1.86	1.44	77.6		15.3	0	0
219	1	Wheat bran 03	86.6		1.9	2.02	1.6	82.8		14.2	0	0
220	1	Wheat bran 04	86.9		1.9	1.95	1.53	80.3		13.5	0	0
221	1	Wheat bran 05	85.2		1.8	1.84	1.42	77		14.7	0	0
222	1	Wheat bran 06	85.5		1.8	1.86	1.43	77.3		15.6	0	0
223	1	Wheat bran 07	83.8		1.8	1.83	1.41	76.6		15.2	0	0
224	1	Wheat bran 08	83		1.8	1.89	1.47	78.4		16.4	0	0
225	1	Wheat bran 09	85.4		0	0	0	0		0	0	0
226	1	Wheat bran 10	86		1.8	1.9	1.48	78.8		13.6	0	0
227	1	Wheat bran 11	87.2		1.8	1.87	1.45	78		15.3	0	0
228	1	Wheat bran 12	88.5		1.8	1.9	1.48	78.7		15	0	0
229	1	Wheat bran 13	88		1.8	1.86	1.43	77.3		16	0	0
230	1	Wheat bran 14	85.1		1.8	1.92	1.5	79.4		17.5	0	0
231	1	Wheat bran 15	86.6		1.8	1.87	1.44	77.7		12.1	0	0
232	1	Wheat bran 16	85.6		1.8	1.87	1.45	77.7		15.4	0	0
233	1	Wheat bran 17	84.9		1.9	1.98	1.56	81.3		15.6	0	0
234	1	Wheat bran 18	86.3		1.8	1.89	1.47	78.4		14.9	0	0
235	1	Wheat bran 19	87.9		1.8	1.93	1.51	79.7		14.9	0	0
236	1	Wheat bran 20	87.2		1.7	1.76	1.34	74.3		15.1	0	0
237	1	Wheat bran 21	86.7		1.8	1.86	1.44	77.6		15.2	0	0
238	1	Wheat bran 22	86.4		1.7	1.81	1.39	75.9		15.4	0	0
239	1	Wheat bran 23	88.2		1.7	1.77	1.34	74.5		26	0	0
240	1	Wheat bran 24	88.8		1.9	1.94	1.52	80.2		12.3	0	0
241	1	Wheat bran 25	87.6		1.9	2	1.58	82.1		13.1	0	0
242	1	Wheat bran 26	86.4		1.9	1.94	1.53	80.3		15.6	0	0
243	1	Wheat bran 27	86.5		1.8	1.93	1.51	79.9		13.9	0	0
244	1	Wheat bran 28	87.4		1.8	1.91	1.48	79		13.4	0	0
245	1	Wheat bran 29	86.1		1.8	1.89	1.47	78.6		15.6	0	0
246	1	Wheat bran 30	88.4		1.8	1.89	1.47	78.6		14.5	0	0
247	1	Wheat bran 31	86.1		1.8	1.83	1.4	76.3		15.6	0	0



248	1	Wheat bran 32	86.9		1.9	1.97	1.56	81.2		15.8	0	0
249	1	Wheat bran 33	88.9		1.8	1.91	1.49	79.2		13.4	0	0
250	1	Wheat bran 34	87.5		1.9	1.96	1.54	80.9		12.4	0	0
251	1	Wheat bran 35	87		1.8	1.9	1.48	78.9		14.1	0	0
252	1	Wheat bran 36	87.1		1.8	1.9	1.48	78.7		15.5	0	0
253	1	Wheat bran 37	86.3		1.7	1.82	1.39	76		15.4	0	0
254	1	Wheat bran 38	86.9		1.8	1.93	1.51	79.8		13.9	0	0
255	1	Wheat bran 39	87.3		1.8	1.91	1.49	79.1		14.4	0	0
256	1	Wheat bran 40	87.8		1.8	1.9	1.47	78.6		15.3	0	0
257	1	Wheat bran 41	85.6		1.8	1.9	1.48	78.8		15.7	0	0
258	1	Wheat bran 42	82		1.9	1.96	1.54	80.7		15.2	0	0
259	1	Wheat bran 43	87.3		1.8	1.92	1.5	79.6		16.7	0	0
260	1	Wheat bran 44	87.7		1.8	1.85	1.42	77.1		16.2	0	0
261	1	Wheat bran 45	89.1		1.8	1.86	1.43	77.4		17.7	0	0
262	1	Wheat bran 46	87.2		1.8	1.91	1.49	79		16.7	0	0
263	1	Wheat bran 47	87.6		1.9	2.05	1.63	83.7		13.7	0	0
264	1	Wheat bran 48	85.9		1.8	1.92	1.5	79.5		13.5	0	0
265	1	Wheat bran 49	87		1.8	1.86	1.44	77.4		13.4	0	0
266	1	Wheat bran 50	87		1.8	1.9	1.48	78.9		14.8	0	0
267	1	Wheat bran 51	88.1		1.8	1.86	1.44	77.5		13.4	0	0
268	1	Wheat bran 52	86.4		1.7	1.82	1.39	76		14.1	0	0
269	1	Wheat bran 53	85.8		1.8	1.94	1.52	80		16.1	0	0
270	1	Wheat bran 54	85.8		1.8	1.89	1.47	78.5		15.9	0	0
271	1	Wheat middling MEAL 01	89		2	2.18	1.77	88.2		16.7	0	0
272	1	Wheat middling MEAL 02	86.1		2	2.13	1.72	86.5		13.6	0	0
273	1	Wheat middling MEAL 03	87.2		2	2.13	1.72	86.3		14.5	0	0
274	1	Wheat middling MEAL 04	86.1		1.8	1.93	1.51	79.6		15.7	0	0
275	1	Wheat middling MEAL 05	84.6		1.8	1.9	1.48	78.7		18.4	0	0
276	1	Wheat middling 01	87		0	0	0	0		0	0	0
277	1	Wheat middling 02	87.8		1.9	1.96	1.54	80.8		25.3	0	0

## Section 2: Minerals (CP, P, NPN, CL, MG, K, NA, S)

Note that the columns for NPN, CL, NA, and S are not populated. Therefore, do not formulate on these columns. Instead formulated on CA and P.

NO	LIB	NAME	CA	P	NPN	CL	MG	K	NA	S
			% DM	% DM	% DM	% DM	% DM	% DM	% DM	% DM
1	1	Bean hulls	0.421	0.052	0	0	0.781	0.865	0	0
2	1	Bean middling	0.155	0.313	0	0	0.838	1.082	0	0
3	1	Bentonite	9.089	0.033	0	0	10.612	0.359	0	0
4	1	Calci Block	20.947	0.069	0	0	0.943	0.052	0	0
5	1	Calci Chick	22.817	0.032	0	0	3.523	0.056	0	0
6	1	Calci Tex	25.548	0.024	0	0	1.565	0.037	0	0
7	1	Cassava middling	0.127	0.119	0	0	0.133	1.15	0	0
8	1	Cereal fermented	0.237	0.336	0	0	0.285	0.768	0	0
9	1	Cereal ferment mango	0.304	0.31	0	0	0.547	0.589	0	0
10	1	Chickpea hulls mix	0.736	0.239	0	0	0.616	0.8	0	0
11	1	Choline Choloriac	0.354	0.01	0	0	0.212	0.248	0	0
12	1	Cotton gin BYPRODUCT 01	0.461	0.706	0	0	0.886	1.052	0	0
13	1	Cotton gin BYPRODUCT 02	3.303	0.363	0	0	0.566	1.062	0	0
14	1	Cottonseed cake MEAL 01	0.097	0.589	0	0	0.297	1.384	0	0
15	1	Cottonseed cake MEAL 02	0.016	1.134	0	0	0.566	1.483	0	0
16	1	Cottonseed cake MEAL 03	0.015	0.021	0	0	0.565	1.42	0	0
17	1	Cottonseed cake WHOLE 04	0.012	0.004	0	0	0.165	0.874	0	0
18	1	Cottonseed cake CRACKED 05	0.09	1.174	0	0	0.562	1.582	0	0
19	1	Cottonseed cake MEAL 06	0.012	1.273	0	0	0.552	1.396	0	0
20	1	Cottonseed cake MEAL 07	0.014	1.127	0	0	0.629	1.634	0	0
21	1	Cottonseed cake CRACKED 08	0.011	0.738	0	0	0.398	1.177	0	0
22	1	Cottonseed cake CRACKED 09	0.015	1.148	0	0	0.612	1.684	0	0
23	1	Cottonseed cake 01	0.183	0.667	0	0	0.494	1.433	0	0
24	1	Cottonseed cake 02	0.215	0.665	0	0	0.498	1.426	0	0
25	1	Cottonseed cake 03	0.442	0.431	0	0	0.664	1.64	0	0
26	1	Cottonseed cake 04	0.113	0.578	0	0	0.586	1.509	0	0
27	1	Cottonseed cake 05	0.161	0.662	0	0	0.625	1.604	0	0
28	1	Cottonseed cake 06	0.153	0.681	0	0	0.589	1.533	0	0
29	1	Cottonseed cake 07	0.155	0.605	0	0	0.52	1.455	0	0

30	1	Cottonseed cake 08	0.554	0.579	0	0	1.772	1.181	0	0
31	1	Cottonseed cake 09	0.635	0.758	0	0	0.476	1.534	0	0
32	1	Fish meal[meal]	2.197	4.307	0	0	0.271	0.481	0	0
33	1	Full fat soya	0.155	0.484	0	0	0.39	1.715	0	0
34	1	Lentil husk	0.314	0.287	0	0	0.264	0.71	0	0
35	1	Limestone[meal] 01	22.207	0	0	0	0	0	0	0
36	1	Limestone[meal] 02	38.898	0	0	0	0	0	0	0
37	1	Limestone[meal] 03	64.44	0	0	0	0	0	0	0
38	1	Limestone[meal] 04	49.424	0	0	0	0	0	0	0
39	1	Limestone[meal] 05	58.787	0	0	0	0	0	0	0
40	1	Limestone[meal] 06	37.777	0	0	0	0	0	0	0
41	1	Limestone[meal] 07	5.8	0	0	0	0	0	0	0
42	1	Limestone[meal] 08	52.802	0	0	0	0	0	0	0
43	1	Limestone[meal] 09	47.783	0	0	0	0	0	0	0
44	1	Limestone[meal] 10	48.126	0	0	0	0	0	0	0
45	1	Limestone[meal] 11	48.117	0	0	0	0	0	0	0
46	1	Limestone[meal] 12	17.362	0	0	0	0	0	0	0
47	1	Limestone[meal] 13	12.671	0	0	0	0	0	0	0
48	1	Limestone[meal] 14	17.965	0	0	0	0	0	0	0
49	1	Limestone[meal] 15	15.554	0	0	0	0	0	0	0
50	1	Limestone[block] 16	20.293	0	0	0	0	0	0	0
51	1	Limestone 01	22.907	0.016	0	0	0.967	0.032	0	0
52	1	Limestone 02	39.036	0.009	0	0	1.202	0.027	0	0
53	1	Limestone 03	29.357	0.012	0	0	1.501	0.031	0	0
54	1	Limestone 04	22.863	0.029	0	0	1.916	0.028	0	0
55	1	Limestone 05	19.258	0.051	0	0	2.206	0.022	0	0
56	1	Limestone 06	25.811	0.031	0	0	3.117	0.032	0	0
57	1	Limestone 07	0.371	0.008	0	0	0.111	0.025	0	0
58	1	Limestone 08	39.75	0.012	0	0	1.255	0.018	0	0
59	1	Limestone 09	41.291	0.024	0	0	1.502	0.018	0	0
60	1	Limestone 10	40.964	0.012	0	0	1.003	0.028	0	0
61	1	Limestone 11	41.708	0.007	0	0	1.251	0.058	0	0
62	1	Limestone 12	40.676	0.028	0	0	1.052	0.082	0	0
63	1	Limestone 13	42.466	0.011	0	0	1.261	0.038	0	0
64	1	Limestone 14	42.526	0.015	0	0	1.501	0.018	0	0
65	1	Limestone 15	42.577	0.013	0	0	1.002	0.017	0	0
66	1	Limestone 16	40.594	0.01	0	0	1.502	0.02	0	0

67	1	Limestone 17	42.437	0.002	0	0	1.575	0.016	0	0
68	1	Limestone 18	39.829	0.024	0	0	1.126	0.032	0	0
69	1	Limestone 19	38.057	0.014	0	0	1.433	0.056	0	0
70	1	Linseed cake 01	0.112	0.948	0	0	0.436	1.174	0	0
71	1	Linseed cake 02	0.124	0.689	0	0	0.403	1.025	0	0
72	1	Linseed cake 03	3.081	0.84	0	0	0.784	1.961	0	0
73	1	Linseed cake 04	0.058	0.707	0	0	1.016	0.962	0	0
74	1	Linseed cake 05	0.058	0.703	0	0	1.121	1	0	0
75	1	Linseed cake 06	0.077	0.682	0	0	1.074	1.044	0	0
76	1	Linseed cake 07	0.097	0.752	0	0	1.067	1.041	0	0
77	1	Lupin seed	0.282	0.309	0	0	0.621	0.696	0	0
78	1	Maize + soybean MEAL	0.045	0.247	0	0	0.182	0.826	0	0
79	1	Maize bran 01	0.376	0.281	0	0	0.188	1.083	0	0
80	1	Maize bran 02	0.282	0.894	0	0	1.016	1.11	0	0
81	1	Maize byproduct MEAL	0.107	0.26	0	0	0.254	0.726	0	0
82	1	Maize flour 01	0.16	0.186	0	0	0.211	0.247	0	0
83	1	Maize flour 02	0.147	0.168	0	0	0.135	0.239	0	0
84	1	Maize grain WHOLE 01	0.003	1.135	0	0	0.085	0.308	0	0
85	1	Maize grain WHOLE 02	0.079	0.646	0	0	0.096	0.284	0	0
86	1	Maize grain WHOLE 03	0.002	1.258	0	0	0.121	0.33	0	0
87	1	Maize grain WHOLE 04	0.004	1.01	0	0	0.109	0.295	0	0
88	1	Maize grain 01	0.153	0.223	0	0	0.321	0.272	0	0
89	1	Maize grain 02	0.151	0.237	0	0	0.182	0.298	0	0
90	1	Maize grain 03	0.15	0.216	0	0	0.226	0.263	0	0
91	1	Maize grain 04	0.154	0.21	0	0	0.139	0.193	0	0
92	1	Maize grain 05	0.154	0.271	0	0	0.139	0.25	0	0
93	1	Maize grain 06	0.045	0.205	0	0	0.124	0.276	0	0
94	1	Maize grain 07	0.04	0.198	0	0	0.132	0.247	0	0
95	1	Maize grain 08	0.031	0.165	0	0	0.113	0.327	0	0
96	1	Maize grain 09	0.059	0.15	0	0	0.119	0.295	0	0
97	1	Maize grain 10	0.056	0.201	0	0	0.168	0.354	0	0
98	1	Maize grain 11	0.055	0.275	0	0	0.165	0.384	0	0
99	1	Maize soya mix	0.149	0.378	0	0	0.179	0.8	0	0
100	1	Meat & bone meal 01	5.914	6.249	0	0	0.281	0.379	0	0
101	1	Meat & bone meal 02	2.738	3.693	0	0	0.184	0.646	0	0
102	1	Meat & bone meal 03	7.455	5.536	0	0	1.619	1.462	0	0
103	1	Meat & bone meal 04	9.633	4.54	0	0	1.051	0.464	0	0

104	1	Meat & bone meal 05	9.601	4.565	0	0	0.786	0.449	0	0
105	1	Meat & bone meal 06	9.297	5.15	0	0	0.797	0.518	0	0
106	1	Meat & bone meal 07	0.143	5.296	0	0	0.428	0.571	0	0
107	1	Mixed oilseed cake 01	0.289	0.955	0	0	1.408	1.272	0	0
108	1	Mixed oilseed cake 02	0.418	0.828	0	0	0.774	1.375	0	0
109	1	Mixed oilseed cake 03	0.195	0.665	0	0	0.679	1.894	0	0
110	1	Mixed oilseed cake 04	1.741	1.046	0	0	0.532	1.243	0	0
111	1	Mixed oilseed cake 05	0.64	0.562	0	0	0.384	2.001	0	0
112	1	Mixed oilseed cake 06	1.291	0.665	0	0	0.387	1.908	0	0
113	1	Molasses[liquid] 01	0.026	0.059	0	0	0.247	7	0	0
114	1	Molasses[liquid] 02	0.029	0.048	0	0	0.258	6.879	0	0
115	1	Molasses[liquid] 03	0.028	0.038	0	0	0.257	6.514	0	0
116	1	Molasses[liquid] 04	1.013	0.514	0	0	0.171	5.802	0.282	0
117	1	Molasses 01	1.439	0.068	0	0	0.36	6.345	0	0
118	1	Molasses 02	0.915	0.014	0	0	0.137	7.967	0	0
119	1	Molasses 03	1.234	0.013	0	0	0.148	6.157	0	0
120	1	Molasses 04	0.624	0.307	0	0	0.374	2.678	0	0
121	1	Noug + sunflower CRACKED	0.219	0.445	0	0	0.47	0.617	0	0
122	1	Noug cake 01	0.156	0.838	0	0	0.378	1.082	0	0
123	1	Noug cake 02	0.18	1.324	0	0	0.459	1.23	0	0
124	1	Noug cake 03	0.144	0.983	0	0	0.334	0.924	0	0
125	1	Noug cake 04	0.178	0.704	0	0	0.342	0.763	0	0
126	1	Noug cake 05	0.18	1.194	0	0	0.411	0.972	0	0
127	1	Noug cake 06	0.265	1.097	0	0	0.449	1.158	0	0
128	1	Noug cake 07	0.177	1.236	0	0	0.451	1.369	0	0
129	1	Noug cake 08	0.191	0.37	0	0	0.493	1.114	0	0
130	1	Noug cake 09	0.2	0.477	0	0	0.461	1.278	0	0
131	1	Noug cake 10	0.169	1.009	0	0	0.554	1.353	0	0
132	1	Noug cake 11	0.185	0.969	0	0	0.478	1.215	0	0
133	1	Noug cake 12	0.168	0.976	0	0	0.46	1.318	0	0
134	1	Noug cake 13	0.126	0.981	0	0	0.514	1.374	0	0
135	1	Noug cake 14	0.223	0.956	0	0	0.454	0.877	0	0
136	1	Noug cake 15	0.124	1.17	0	0	0.399	1.103	0	0
137	1	Noug cake 16	0.139	0.897	0	0	0.401	1.183	0	0
138	1	Noug cake 17	0.135	1.002	0	0	0.357	1.025	0	0
139	1	Noug cake 18	0.199	1.344	0	0	0.489	1.144	0	0
140	1	Noug cake 19	0.751	1.172	0	0	0.869	1.515	0	0

141	1	Noug cake 20	0.377	0.778	0	0	0.851	1.045	0	0
142	1	Noug cake 21	0.28	0.829	0	0	1.065	1.233	0	0
143	1	Noug cake 22	0.453	1	0	0	1.338	1.197	0	0
144	1	Noug cake 23	0.626	1.127	0	0	1.019	1.579	0	0
145	1	Noug cake 24	0.919	1.127	0	0	0.57	1.405	0	0
146	1	Noug cake 25	0.472	1.237	0	0	1.025	1.517	0	0
147	1	Noug cake 26	1.035	1.227	0	0	0.576	1.484	0	0
148	1	Noug cake 27	0.433	0.789	0	0	0.603	1.479	0	0
149	1	Noug cake 28	0.548	1.107	0	0	1.061	1.274	0	0
150	1	Noug cake 29	0.318	0.502	0	0	0.36	0.681	0	0
151	1	Noug cake 30	1.353	1.096	0	0	1.408	1.245	0	0
152	1	Noug cake 31	1.026	1.109	0	0	1.227	1.436	0	0
153	1	Noug cake 32	1.205	1.315	0	0	1.39	1.39	0	0
154	1	Noug cake 33	1.112	1.013	0	0	1.278	1.186	0	0
155	1	Noug cake 34	0.556	1.241	0	0	1.297	1.415	0	0
156	1	Noug cake 35	0.96	1.149	0	0	0.576	1.382	0	0
157	1	Noug cake 36	0.839	1.249	0	0	1.231	1.213	0	0
158	1	Noug cake 37	0.554	0.71	0	0	0.461	1.135	0	0
159	1	Noug cake 38	0.736	1.164	0	0	0.707	1.421	0	0
160	1	Noug cake 39	0.344	1.309	0	0	1.012	1.655	0	0
161	1	Noug cake 40	0.799	1.277	0	0	1.493	1.426	0	0
162	1	Noug cake 41	1.935	1.122	0	0	1.659	1.253	0	0
163	1	Noug cake 42	0.464	0.794	0	0	0.464	1.4	0	0
164	1	Noug cake 43	0.957	0.942	0	0	0.67	1.74	0	0
165	1	Oat hulls	0.076	0.263	0	0	1.512	0.936	0	0
166	1	Pea hulls MIDLING BYPRODUCT	0.273	0.087	0	0	0.145	0.919	0	0
167	1	Peanut cake	0.251	0.581	0	0	0.602	1.717	0	0
168	1	Plum dried	0.109	0.121	0	0	0.131	0.722	0	0
169	1	Rapeseed cake 01	0.904	1.217	0	0	0.655	1.578	0	0
170	1	Rapeseed cake 02	0.87	1.135	0	0	0.559	1.405	0	0
171	1	Rearing feed	0.34	0.351	0	0	0.25	1.059	0	0
172	1	Red kidney bean	0.15	0.377	0	0	0.316	0.282	0	0
173	1	Rice bran 01	0.116	0.251	0	0	0.789	0.967	0	0
174	1	Rice bran 02	0.117	0.416	0	0	0.866	0.826	0	0
175	1	Rice bran 03	0.077	0.306	0	0	0.716	0.926	0	0
176	1	Rice bran 04	0.114	0.543	0	0	0.828	0.925	0	0
177	1	Rice hull 05	0.062	0.366	0	0	0.186	0.628	0	0

178	1	Sesame cake 01	0.707	0.817	0	0	1.229	1.144	0	0
179	1	Sesame cake 02	1.764	1.093	0	0	1.95	0.78	0	0
180	1	Sesame cake 03	2.251	1.11	0	0	1.351	0.95	0	0
181	1	Sorghum grain 01	0.037	0.292	0	0	1.854	0.375	0	0
182	1	Sorghum grain 02	0.054	0.304	0	0	0.163	0.427	0	0
183	1	Soy hipro	0.458	0.593	0	0	0.825	1.903	0	0
184	1	Soybean + sesame CRACKED	0.765	0.793	0	0	0.321	1.99	0	0
185	1	Soybean cake 01	0.105	0.78	0	0	0.252	1.975	0	0
186	1	Soybean cake 02	0.168	0.569	0	0	0.277	1.959	0	0
187	1	Soybean cake 03	0.216	0.548	0	0	0.39	2.133	0	0
188	1	Soybean cake 04	0.742	0.593	0	0	0.045	2.004	0	0
189	1	Soybean cake 05	0.616	0.572	0	0	0.231	1.964	0	0
190	1	Soybean cake 06	0.466	0.609	0	0	0.373	1.899	0	0
191	1	Soybean cake 07	0.278	0.565	0	0	0.334	2.06	0	0
192	1	Soybean cake 08	0.427	0.597	0	0	0.469	2.062	0	0
193	1	Soybean cake 09	0.151	0.53	0	0	0.454	2.178	0	0
194	1	Soybean cake 10	0.121	0.531	0	0	0.472	2.161	0	0
195	1	Soybean cake 11	0.348	0.627	0	0	0.361	2.09	0	0
196	1	Soybean cake 12	0.642	0.488	0	0	0.193	2.152	0	0
197	1	Sunflower cake	0.21	0.608	0	0	0.567	1.016	0	0
198	1	Wheat bran[meal] 01	0.005	0.834	0	0	0.297	1.015	0	0
199	1	Wheat bran[meal] 02	0.005	0.79	0	0	0.312	0.923	0	0
200	1	Wheat bran[meal] 03	0.005	0.911	0	0	0.327	0.952	0	0
201	1	Wheat bran[meal] 04	0.006	0.907	0	0	0.345	1.009	0	0
202	1	Wheat bran[meal] 05	0.023	0.613	0	0	0.259	0.869	0	0
203	1	Wheat bran[meal] 06	0.005	0.606	0	0	0.236	0.855	0	0
204	1	Wheat bran[meal] 07	0.005	1.069	0	0	0.657	1.207	0	0
205	1	Wheat bran[meal] 08	0.005	0.864	0	0	0.305	0.906	0	0
206	1	Wheat bran[meal] 09	0.004	0.755	0	0	0.318	0.871	0	0
207	1	Wheat bran[meal] 10	0.005	0.736	0	0	0.286	0.913	0	0
208	1	Wheat bran[meal] 11	0.006	0.951	0	0	0.344	1.014	0	0
209	1	Wheat bran[meal] 12	0.006	0.951	0	0	0.33	0.951	0	0
210	1	Wheat bran[meal] 13	0.006	0.774	0	0	0.276	0.853	0	0
211	1	Wheat bran[meal] 14	0.005	0.921	0	0	0.339	1.126	0	0
212	1	Wheat bran[meal] 15	0.005	1.02	0	0	0.375	1.041	0	0
213	1	Wheat bran[meal] 16	0.006	0.957	0	0	0.355	0.96	0	0
214	1	Wheat bran[meal] 17	0.01	0.607	0	0	0.4	1.061	0	0

215	1	Wheat bran[meal] 18	0.007	0.636	0	0	0.255	0.84	0	0
216	1	Wheat bran[meal] 19	0.008	0.817	0	0	0.304	1.003	0	0
217	1	Wheat bran 01	0.155	0.787	0	0	0.42	1.127	0	0
218	1	Wheat bran 02	0.16	0.776	0	0	0.792	1.231	0	0
219	1	Wheat bran 03	0.084	0.637	0	0	0.386	0.693	0	0
220	1	Wheat bran 04	0.161	0.82	0	0	0.348	0.805	0	0
221	1	Wheat bran 05	0.078	0.743	0	0	0.564	1.291	0	0
222	1	Wheat bran 06	0.195	0.832	0	0	0.491	1.111	0	0
223	1	Wheat bran 07	0.124	0.671	0	0	0.742	1.17	0	0
224	1	Wheat bran 08	0.124	0.767	0	0	0.571	1.114	0	0
225	1	Wheat bran 09	0.08	0.7	0	0	0.869	0.986	0	0
226	1	Wheat bran 10	0.16	0.51	0	0	0.455	0.959	0	0
227	1	Wheat bran 11	0.161	0.952	0	0	0.578	0.918	0	0
228	1	Wheat bran 12	0.127	0.929	0	0	0.494	1.036	0	0
229	1	Wheat bran 13	0.095	0.832	0	0	0.535	0.947	0	0
230	1	Wheat bran 14	0.204	0.967	0	0	0.293	1.136	0	0
231	1	Wheat bran 15	0.097	0.38	0	0	0.355	0.616	0	0
232	1	Wheat bran 16	0.164	0.819	0	0	0.667	0.954	0	0
233	1	Wheat bran 17	0.264	0.823	0	0	0.554	0.824	0	0
234	1	Wheat bran 18	0.097	0.7	0	0	0.837	0.773	0	0
235	1	Wheat bran 19	0.159	0.994	0	0	0.688	0.796	0	0
236	1	Wheat bran 20	0.161	0.941	0	0	0.482	1.032	0	0
237	1	Wheat bran 21	0.258	0.933	0	0	0.62	0.98	0	0
238	1	Wheat bran 22	0.065	0.628	0	0	0.622	0.637	0	0
239	1	Wheat bran 23	0.378	1.034	0	0	3.231	1.115	0	0
240	1	Wheat bran 24	0.095	0.566	0	0	0.322	0.938	0	0
241	1	Wheat bran 25	0.132	0.433	0	0	0.449	0.551	0	0
242	1	Wheat bran 26	0.162	0.814	0	0	0.778	1.003	0	0
243	1	Wheat bran 27	0.129	0.736	0	0	0.544	0.982	0	0
244	1	Wheat bran 28	0.096	0.791	0	0	0.615	0.991	0	0
245	1	Wheat bran 29	0.163	0.921	0	0	0.546	0.929	0	0
246	1	Wheat bran 30	0.157	0.773	0	0	0.518	1.414	0	0
247	1	Wheat bran 31	0.193	0.733	0	0	0.697	0.697	0	0
248	1	Wheat bran 32	0.097	0.709	0	0	0.444	0.959	0	0
249	1	Wheat bran 33	0.126	0.758	0	0	0.435	1.106	0	0
250	1	Wheat bran 34	0.134	0.425	0	0	0.392	0.61	0	0
251	1	Wheat bran 35	0.161	0.825	0	0	0.502	0.958	0	0



252	1	Wheat bran 36	0.225	0.83	0	0	0.829	0.937	0	0
253	1	Wheat bran 37	0.13	0.667	0	0	0.389	1.062	0	0
254	1	Wheat bran 38	0.146	0.583	0	0	0.399	0.748	0	0
255	1	Wheat bran 39	0.16	0.906	0	0	0.462	0.954	0	0
256	1	Wheat bran 40	0.096	0.891	0	0	0.612	0.93	0	0
257	1	Wheat bran 41	0.131	0.777	0	0	0.608	0.857	0	0
258	1	Wheat bran 42	0.137	0.646	0	0	0.491	0.609	0	0
259	1	Wheat bran 43	0.289	0.934	0	0	0.558	1.126	0	0
260	1	Wheat bran 44	0.285	1.016	0	0	0.912	1.254	0	0
261	1	Wheat bran 45	1.122	0.926	0	0	1.346	1.328	0	0
262	1	Wheat bran 46	0.159	0.826	0	0	0.31	0.936	0	0
263	1	Wheat bran 47	0.168	0.866	0	0	0.503	1.237	0	0
264	1	Wheat bran 48	0.171	0.832	0	0	0.615	1.397	0	0
265	1	Wheat bran 49	0.337	0.861	0	0	0.506	1.322	0	0
266	1	Wheat bran 50	0.337	0.888	0	0	0.405	1.303	0	0
267	1	Wheat bran 51	0.166	0.639	0	0	0.399	0.908	0	0
268	1	Wheat bran 52	0.339	0.641	0	0	0.305	1.022	0	0
269	1	Wheat bran 53	0.162	0.687	0	0	0.679	0.932	0	0
270	1	Wheat bran 54	0.12	0.729	0	0	0.577	0.944	0	0
271	1	Wheat middling MEAL 01	0.004	0.471	0	0	0.167	0.52	0	0
272	1	Wheat middling MEAL 02	0.005	0.322	0	0	0.103	0.37	0	0
273	1	Wheat middling MEAL 03	0.006	0.403	0	0	0.123	0.588	0	0
274	1	Wheat middling MEAL 04	0.009	0.587	0	0	0.263	1.031	0	0
275	1	Wheat middling MEAL 05	0.007	0.77	0	0	0.362	1.138	0	0
276	1	Wheat middling 01	0.119	0.709	0	0	0.427	1.122	0	0
277	1	Wheat middling 02	0.167	0.685	0	0	0.401	1.006	0	0

### Section 3. Fiber (ECF, ADF, NDF)

Note that the columns for ADF and NDF are not populated. Therefore, do not formulate on these columns. Instead formulated on ECF.

NO	LIB	NAME	ECF	ADF	NDF
			%DM	%DM	%DM
1	1	Bean hulls	51.79	0	0
2	1	Bean middling	16.64	0	0
3	1	Bentonite	0	0	0
4	1	Calci Block	0	0	0
5	1	Calci Chick	0	0	0
6	1	Calci Tex	0	0	0
7	1	Cassava middling	4.87	0	0
8	1	Cereal fermented	0	0	0
9	1	Cereal ferment mango	0	0	0
10	1	Chickpea hulls mix	39.31	0	0
11	1	Choline Choloriac	0	0	0
12	1	Cotton gin BYPRODUCT 01	14.29	0	0
13	1	Cotton gin BYPRODUCT 02	22.65	0	0
14	1	Cottonseed cake MEAL 01	22.6	0	0
15	1	Cottonseed cake MEAL 02	30.08	0	0
16	1	Cottonseed cake MEAL 03	24.96	0	0
17	1	Cottonseed cake WHOLE 04	61.34	0	0
18	1	Cottonseed cake CRACKED 05	23	0	0
19	1	Cottonseed cake MEAL 06	31.03	0	0
20	1	Cottonseed cake MEAL 07	22.95	0	0
21	1	Cottonseed cake CRACKED 08	38.26	0	0
22	1	Cottonseed cake CRACKED 09	24.4	0	0
23	1	Cottonseed cake 01	38.19	0	0
24	1	Cottonseed cake 02	35.99	0	0
25	1	Cottonseed cake 03	0	0	0
26	1	Cottonseed cake 04	39.27	0	0
27	1	Cottonseed cake 05	37.08	0	0
28	1	Cottonseed cake 06	37.68	0	0
29	1	Cottonseed cake 07	42.55	0	0
30	1	Cottonseed cake 08	46.84	0	0
31	1	Cottonseed cake 09	34.21	0	0

32	1	Fish meal[meal]	2.3	0	0
33	1	Full fat soya	7.75	0	0
34	1	Lentil husk	17.26	0	0
35	1	Limestone[meal] 01	0	0	0
36	1	Limestone[meal] 02	0	0	0
37	1	Limestone[meal] 03	0	0	0
38	1	Limestone[meal] 04	0	0	0
39	1	Limestone[meal] 05	0	0	0
40	1	Limestone[meal] 06	0	0	0
41	1	Limestone[meal] 07	0	0	0
42	1	Limestone[meal] 08	0	0	0
43	1	Limestone[meal] 09	0	0	0
44	1	Limestone[meal] 10	0	0	0
45	1	Limestone[meal] 11	0	0	0
46	1	Limestone[meal] 12	0	0	0
47	1	Limestone[meal] 13	0	0	0
48	1	Limestone[meal] 14	0	0	0
49	1	Limestone[meal] 15	0	0	0
50	1	Limestone[block] 16	0	0	0
51	1	Limestone 01	0	0	0
52	1	Limestone 02	0	0	0
53	1	Limestone 03	0	0	0
54	1	Limestone 04	0	0	0
55	1	Limestone 05	0	0	0
56	1	Limestone 06	0	0	0
57	1	Limestone 07	0	0	0
58	1	Limestone 08	0	0	0
59	1	Limestone 09	0	0	0
60	1	Limestone 10	0	0	0
61	1	Limestone 11	0	0	0
62	1	Limestone 12	0	0	0
63	1	Limestone 13	0	0	0
64	1	Limestone 14	0	0	0
65	1	Limestone 15	0	0	0
66	1	Limestone 16	0	0	0
67	1	Limestone 17	0	0	0
68	1	Limestone 18	0	0	0

69	1	Limestone 19	0	0	0
70	1	Linseed cake 01	7.45	0	0
71	1	Linseed cake 02	11.11	0	0
72	1	Linseed cake 03	26.89	0	0
73	1	Linseed cake 04	16.09	0	0
74	1	Linseed cake 05	15.12	0	0
75	1	Linseed cake 06	14.17	0	0
76	1	Linseed cake 07	16.73	0	0
77	1	Lupin seed	18.64	0	0
78	1	Maize + soybean MEAL	4.89	0	0
79	1	Maize bran 01	37.42	0	0
80	1	Maize bran 02	11.63	0	0
81	1	Maize byproduct MEAL	18.98	0	0
82	1	Maize flour 01	2.28	0	0
83	1	Maize flour 02	2.63	0	0
84	1	Maize grain WHOLE 01	2.4	0	0
85	1	Maize grain WHOLE 02	1.47	0	0
86	1	Maize grain WHOLE 03	2.8	0	0
87	1	Maize grain WHOLE 04	2.5	0	0
88	1	Maize grain 01	0	0	0
89	1	Maize grain 02	0	0	0
90	1	Maize grain 03	0	0	0
91	1	Maize grain 04	0	0	0
92	1	Maize grain 05	0	0	0
93	1	Maize grain 06	1.72	0	0
94	1	Maize grain 07	2.21	0	0
95	1	Maize grain 08	1.91	0	0
96	1	Maize grain 09	1.37	0	0
97	1	Maize grain 10	2.18	0	0
98	1	Maize grain 11	2.02	0	0
99	1	Maize soya mix	2.77	0	0
100	1	Meat & bone meal 01	2.7	0	0
101	1	Meat & bone meal 02	1.47	0	0
102	1	Meat & bone meal 03	0	0	0
103	1	Meat & bone meal 04	2.21	0	0
104	1	Meat & bone meal 05	2.51	0	0
105	1	Meat & bone meal 06	2.76	0	0

106	1	Meat & bone meal 07	0	0	0
107	1	Mixed oilseed cake 01	0	0	0
108	1	Mixed oilseed cake 02	0	0	0
109	1	Mixed oilseed cake 03	0	0	0
110	1	Mixed oilseed cake 04	16.84	0	0
111	1	Mixed oilseed cake 05	7.57	0	0
112	1	Mixed oilseed cake 06	7.59	0	0
113	1	Molasses[liquid] 01	0	0	0
114	1	Molasses[liquid] 02	0	0	0
115	1	Molasses[liquid] 03	0	0	0
116	1	Molasses[liquid] 04	0	0	0
117	1	Molasses 01	0	0	0
118	1	Molasses 02	0	0	0
119	1	Molasses 03	0	0	0
120	1	Molasses 04	0	0	0
121	1	Noug + sunflower CRACKED	0	0	0
122	1	Noug cake 01	27.33	0	0
123	1	Noug cake 02	22.25	0	0
124	1	Noug cake 03	34.37	0	0
125	1	Noug cake 04	32.54	0	0
126	1	Noug cake 05	24.3	0	0
127	1	Noug cake 06	21.17	0	0
128	1	Noug cake 07	25.74	0	0
129	1	Noug cake 08	20.31	0	0
130	1	Noug cake 09	27.67	0	0
131	1	Noug cake 10	24.36	0	0
132	1	Noug cake 11	20.08	0	0
133	1	Noug cake 12	23.24	0	0
134	1	Noug cake 13	19.61	0	0
135	1	Noug cake 14	32.9	0	0
136	1	Noug cake 15	15.7	0	0
137	1	Noug cake 16	15	0	0
138	1	Noug cake 17	23.5	0	0
139	1	Noug cake 18	20.2	0	0
140	1	Noug cake 19	28.43	0	0
141	1	Noug cake 20	0	0	0
142	1	Noug cake 21	12.1	0	0

143	1	Noug cake 22	0	0	0
144	1	Noug cake 23	26.23	0	0
145	1	Noug cake 24	23.97	0	0
146	1	Noug cake 25	0	0	0
147	1	Noug cake 26	29.93	0	0
148	1	Noug cake 27	0	0	0
149	1	Noug cake 28	0	0	0
150	1	Noug cake 29	0	0	0
151	1	Noug cake 30	18.41	0	0
152	1	Noug cake 31	34.57	0	0
153	1	Noug cake 32	28.36	0	0
154	1	Noug cake 33	31.29	0	0
155	1	Noug cake 34	28.98	0	0
156	1	Noug cake 35	26.65	0	0
157	1	Noug cake 36	31.12	0	0
158	1	Noug cake 37	36.81	0	0
159	1	Noug cake 38	16.94	0	0
160	1	Noug cake 39	28.34	0	0
161	1	Noug cake 40	8.45	0	0
162	1	Noug cake 41	15.59	0	0
163	1	Noug cake 42	12.6	0	0
164	1	Noug cake 43	14.03	0	0
165	1	Oat hulls	41.83	0	0
166	1	Pea hulls MIDLING BYPRODUCT	31.58	0	0
167	1	Peanut cake	8.51	0	0
168	1	Plum dried	0	0	0
169	1	Rapeseed cake 01	8.69	0	0
170	1	Rapeseed cake 02	5.66	0	0
171	1	Rearing feed	11.22	0	0
172	1	Red kidney bean	0	0	0
173	1	Rice bran 01	37.33	0	0
174	1	Rice bran 02	26.52	0	0
175	1	Rice bran 03	36.62	0	0
176	1	Rice bran 04	41.75	0	0
177	1	Rice hull 05	33.48	0	0
178	1	Sesame cake 01	0	0	0
179	1	Sesame cake 02	17.58	0	0

180	1	Sesame cake 03	5.92	0	0
181	1	Sorghum grain 01	1.91	0	0
182	1	Sorghum grain 02	0.56	0	0
183	1	Soy hipro	6.93	0	0
184	1	Soybean + sesame CRACKED	0	0	0
185	1	Soybean cake 01	6.8	0	0
186	1	Soybean cake 02	7.2	0	0
187	1	Soybean cake 03	0	0	0
188	1	Soybean cake 04	0	0	0
189	1	Soybean cake 05	0	0	0
190	1	Soybean cake 06	0	0	0
191	1	Soybean cake 07	7.17	0	0
192	1	Soybean cake 08	0	0	0
193	1	Soybean cake 09	7.45	0	0
194	1	Soybean cake 10	5.3	0	0
195	1	Soybean cake 11	6.21	0	0
196	1	Soybean cake 12	5.58	0	0
197	1	Sunflower cake	0	0	0
198	1	Wheat bran[meal] 01	10.37	0	0
199	1	Wheat bran[meal] 02	8.93	0	0
200	1	Wheat bran[meal] 03	10.7	0	0
201	1	Wheat bran[meal] 04	6.46	0	0
202	1	Wheat bran[meal] 05	17.02	0	0
203	1	Wheat bran[meal] 06	9.4	0	0
204	1	Wheat bran[meal] 07	11.87	0	0
205	1	Wheat bran[meal] 08	6.81	0	0
206	1	Wheat bran[meal] 09	7.52	0	0
207	1	Wheat bran[meal] 10	10.11	0	0
208	1	Wheat bran[meal] 11	11.77	0	0
209	1	Wheat bran[meal] 12	12.68	0	0
210	1	Wheat bran[meal] 13	7.33	0	0
211	1	Wheat bran[meal] 14	11.74	0	0
212	1	Wheat bran[meal] 15	9.55	0	0
213	1	Wheat bran[meal] 16	8.68	0	0
214	1	Wheat bran[meal] 17	7.2	0	0
215	1	Wheat bran[meal] 18	6.7	0	0
216	1	Wheat bran[meal] 19	10.2	0	0

217	1	Wheat bran 01	5.77	0	0
218	1	Wheat bran 02	11.85	0	0
219	1	Wheat bran 03	6.47	0	0
220	1	Wheat bran 04	9.55	0	0
221	1	Wheat bran 05	13.15	0	0
222	1	Wheat bran 06	12.16	0	0
223	1	Wheat bran 07	12.77	0	0
224	1	Wheat bran 08	10.49	0	0
225	1	Wheat bran 09	11.59	0	0
226	1	Wheat bran 10	11.35	0	0
227	1	Wheat bran 11	11.93	0	0
228	1	Wheat bran 12	13	0	0
229	1	Wheat bran 13	12.5	0	0
230	1	Wheat bran 14	12.34	0	0
231	1	Wheat bran 15	10.81	0	0
232	1	Wheat bran 16	12.97	0	0
233	1	Wheat bran 17	7.77	0	0
234	1	Wheat bran 18	9.39	0	0
235	1	Wheat bran 19	10.69	0	0
236	1	Wheat bran 20	14.2	0	0
237	1	Wheat bran 21	11.3	0	0
238	1	Wheat bran 22	12.88	0	0
239	1	Wheat bran 23	11.56	0	0
240	1	Wheat bran 24	10.59	0	0
241	1	Wheat bran 25	8.34	0	0
242	1	Wheat bran 26	10.99	0	0
243	1	Wheat bran 27	12.25	0	0
244	1	Wheat bran 28	12.01	0	0
245	1	Wheat bran 29	10.34	0	0
246	1	Wheat bran 30	12.44	0	0
247	1	Wheat bran 31	12.67	0	0
248	1	Wheat bran 32	8.28	0	0
249	1	Wheat bran 33	11.47	0	0
250	1	Wheat bran 34	9.03	0	0
251	1	Wheat bran 35	12.07	0	0
252	1	Wheat bran 36	11.48	0	0
253	1	Wheat bran 37	12.52	0	0



254	1	Wheat bran 38	10.13	0	0
255	1	Wheat bran 39	10.99	0	0
256	1	Wheat bran 40	11.05	0	0
257	1	Wheat bran 41	11.57	0	0
258	1	Wheat bran 42	9.63	0	0
259	1	Wheat bran 43	9.73	0	0
260	1	Wheat bran 44	12.65	0	0
261	1	Wheat bran 45	10.55	0	0
262	1	Wheat bran 46	10.43	0	0
263	1	Wheat bran 47	7.08	0	0
264	1	Wheat bran 48	11.64	0	0
265	1	Wheat bran 49	13.45	0	0
266	1	Wheat bran 50	11.27	0	0
267	1	Wheat bran 51	11.8	0	0
268	1	Wheat bran 52	14.28	0	0
269	1	Wheat bran 53	8.56	0	0
270	1	Wheat bran 54	10.97	0	0
271	1	Wheat middling MEAL 01	1.01	0	0
272	1	Wheat middling MEAL 02	2.32	0	0
273	1	Wheat middling MEAL 03	2.3	0	0
274	1	Wheat middling MEAL 04	9.2	0	0
275	1	Wheat middling MEAL 05	9.6	0	0
276	1	Wheat middling 01	11.6	0	0
277	1	Wheat middling 02	7.4	0	0

## Appendix 05. Infeasible Feeds

There are 13 feeds in this feed library, as listed below:

NO	LIB	NAME	DM	TDN	CP	CA	P	ECF
			%	% DM	% DM	% DM	% DM	% DM
1	2	Energy Glut	100.00	99.000	0.000	0.000	0.000	0.000
2	2	Crude Protein Power	100.00	0.000	100.000	0.000	0.000	0.000
3	2	UIP-DIP Power	100.00	0.000	0.000	0.000	0.000	0.000
4	2	Fiber Chew	100.00	0.000	0.000	0.000	0.000	100.000
5	2	Calcium Strength	100.00	0.000	0.000	100.000	0.000	0.000
6	2	Major Minerals	100.00	0.000	0.000	0.000	100.000	0.000
7	2	Minor Minerals	100.00	0.000	0.000	0.000	0.000	0.000
8	2	Vitamin Juice	100.00	0.000	0.000	0.000	0.000	0.000
9	2	Fat Slob	100.00	0.000	0.000	0.000	0.000	0.000
10	2	Nonfat	100.00	0.000	0.000	0.000	0.000	0.000
11	2	Negative NPN	100.00	0.000	0.000	0.000	0.000	0.000
12	2	Roughage Bulk	100.00	0.000	0.000	0.000	0.000	0.000
13	2	DM Filler	100.00	0.000	0.000	0.000	0.000	0.000

These are special feeds that are used by the software program to compensate for nutrients which are missing in the list of feeds supplied by the user. The price for these feeds is extremely high, Therefore the software program do not used them unless it is absolutely necessary to formulate a least cost ration. If you see any of these feeds in the formulated ration, it means that there is something wrong. For example, inclusion of infeasible feed number 1 (Energy Glut) indicates that your feeds do not have energy. Or inclusion of infeasible feed number 2 (Crude Protein Power) indicates that your feeds are deficient in protein content. Or inclusion of infeasible feed number 4 (Calcium Strength) indicates that your feeds are deficient in calcium.

Appendix 06. Feed Database Structure

InternalName	DisplayName	Unit_Metric	Item_00	Item_01	Item_02
LIB	Library		0. Standard Library	1. Alternate Library	2. Infeasible Library
NAME	Feed Name				
NUMBER	Feed Number				
INTFEEDNO	International Feed Number				
PRICE	<b>Feed Price</b>				
PRICEUNIT	Feed Price Unit		0. \$/Metric tonne As Fed	1. \$/100 kg As Fed	2. \$/kg As Fed
TYPE	Feed Type		0. Roughage	1. Concentrate	
MVI	Maximum Voluntary Intake	%			
DM	Feed Dry Matter	%			
DMBASIS	Dry Matter Basis	%			
G1	Feed Group				
G2	Second Feed Group				
G3	Third Feed Group				
G4	Fourth Feed Group		Real Feed	Not Real Feed	
MINAMT1	Minimum Amount 1				
MINTYPE1	Minimum Type 1				
MAXAMT1	Maximum Amount 1				
MAXTYPE1	Maximum Type 1				
MINAMT2	Minimum Amount 2				
MINTYPE2	Minimum Type 2				
MAXAMT2	Maximum Amount 2				
MAXTYPE2	Maximum Type 2				
MINAMT3	Minimum Amount 3				
MINTYPE3	Minimum Type 3				
MAXAMT3	Maximum Amount 3				
MAXTYPE3	Maximum Type 3				

AMT_AF	Amount AS FED	kg			
AMT_DM	Amount DM	kg			
PCT_AF	Percent AS FED	%			
PCT_DM	Percent DM	%			
AMOUNTUNIT	Feed Amount Unit		kg	g	mg
LOCKED	Locked				
NEL	Net Energy for Lactation	Mcal/kg			
NEM	Net Energy for Maintenance	Mcal/kg			
NEG	Net Energy for Gain	Mcal/kg			
TDN	Total Digestible Nutrient	% DM			
CP	Crude Protein	% DM			
UIP	Undegradable Intake Protein	% DM			
DIP	Degradable Intake Protein	% DM			
FAT	Fat or Ether Extract	% DM			
CF	Crude Fiber	% DM			
ECF	Effective Crude Fiber	% DM			
ADF	Acid Detergent Fiber	% DM			
NDF	Neutral Diet Fiber	% DM			
ASH	Ash	% DM			
CA	Calcium	% DM			
P	Phosphor	% DM			
NPN	Non-Protein Nitrogen	% DM			
CL	Chlorine	% DM			
MG	Magnesium	% DM			
K	Potassium	% DM			
NA	Sodium	% DM			
S	Sulfur	% DM			
FE	Iron	ppm			

CO	Cobalt	ppm			
CU	Copper	ppm			
I	Iodine	ppm			
MN	Magnesium	ppm			
SE	Selenium	ppm			
ZN	Zinc	ppm			
VITA	Vitamin A	k IU/kg			
VITD	Vitamin D	k IU/kg			
VITE	Vitamin E	IU/kg			
NUT1	Nutrient 1	% DM			
NUT2	Nutrient 2	% DM			
NUT3	Nutrient 3	% DM			
NUT4	Nutrient 4	% DM			
NUT5	Nutrient 5	% DM			



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