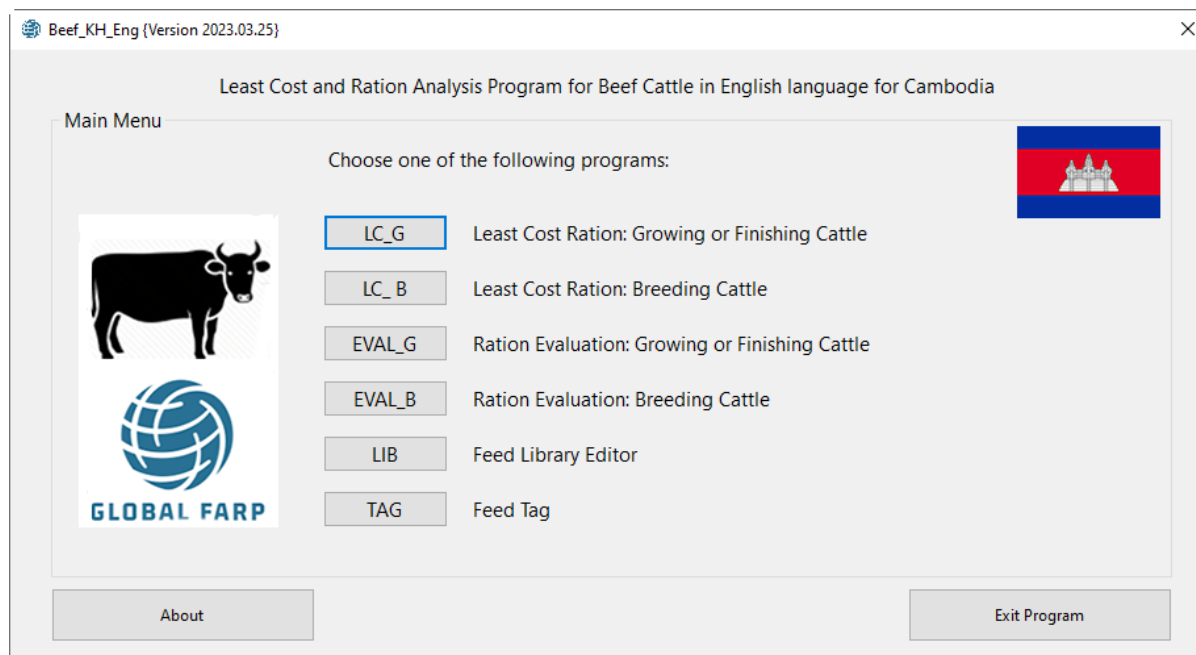




# KH Taurus PC



## Least Cost and Ration Analysis Program for Beef Cattle for Cambodia

2023 © Regents of University of California

### Contact

Global Engagement Software Team  
CA&ES Dean's Office  
College of Agricultural and Environmental Sciences  
University of California, Davis  
1103 Environmental Horticulture Building  
One Shields Avenue | Davis, CA 95616  
USA  
Phone: +1 (530) 754-0275  
Fax: +1 (530) 754-7160  
Email: [global.farp.software@gmail.com](mailto:global.farp.software@gmail.com)  
Web address: <https://GEOsoftware.faculty.ucdavis.edu>

## Recommended Citation

*Beef Cambodia English Users' Manual. (2023). Global Engagement Office, CA&ES Dean's Office, College of Agricultural and Environmental Sciences, University of California, Davis.*

[https://geosoftware.faculty.ucdavis.edu/users\\_manuals/](https://geosoftware.faculty.ucdavis.edu/users_manuals/)

## Authors

Ermias Kebreab, PhD

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](mailto:ekebreab@ucdavis.edu))

Abbas Ahmadi, PhD

Software Developer, Global Engagement Office, University of California, Davis, CA USA ([abahmadi@ucdavis.edu](mailto:abahmadi@ucdavis.edu))

Sath Keo, PhD

Translator, Lecturer and Researcher  
Royal University of Agriculture, Phnom Penh, Cambodia  
[keosth@gmail.com](mailto:keosth@gmail.com)

Sorn Suheang, MSc in Biology

Translator, Lecturer and Researcher  
Royal University of Agriculture (RUA), Phnom Penh, Cambodia  
[sornsuheang@gmail.com](mailto:sornsuheang@gmail.com)

## Copyright Statement

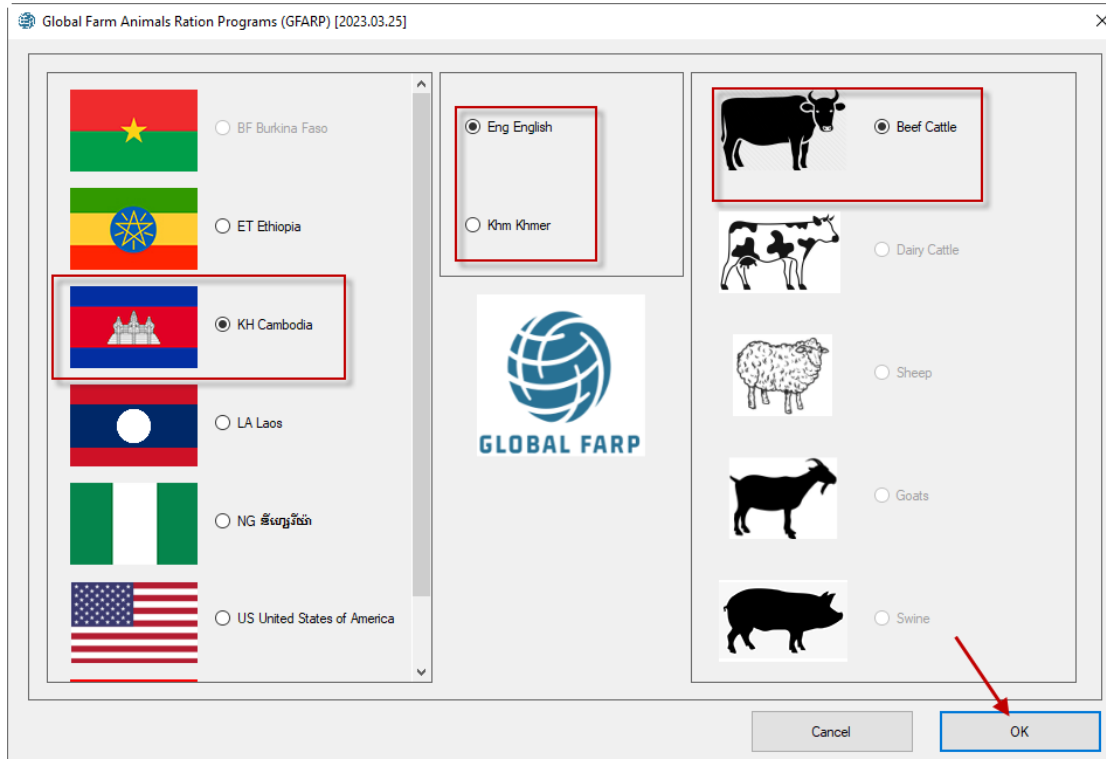
© 2023 Regents of University of California

The Regents of the University of California make no representation or warranties with respect to the contents hereof and specifically disclaim any implied warranties of merchantability or fitness for any particular purpose. Further, the Regents of the University of California reserve the right to revise this software and/or documentation and to make changes from time to time in the content hereof without obligation of the Regents of the University of California to notify any person of such revision or change.

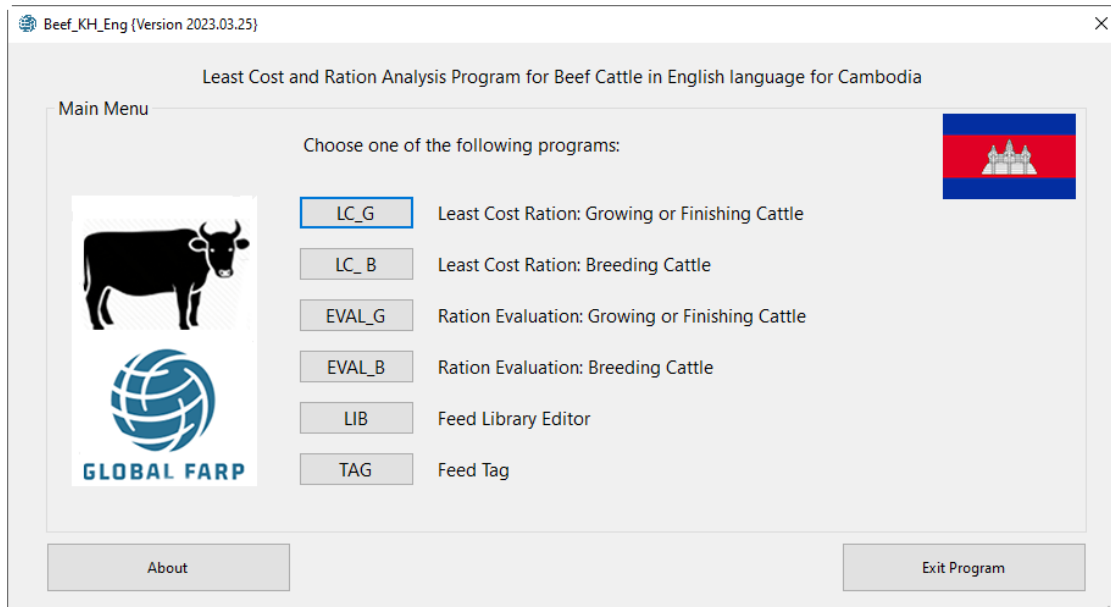
# Operation

## Opening Menu

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



In the countries pane at the left, select the **Cambodia** country. In the farm animals' pane, on the right, select the **Beef** species. In the languages pane at center, select **English** language. Click the OK button. The main menu of the Beef cattle software appears, as shown below:



The main menu supports four buttons to evaluate and formulate rations for breeding or growing finishing beef cattle. It also supports two more buttons for the feed library editor and the Feed Tag program.

- Press the LC\_G button to formulate a least cost ration for growing or finishing beef cattle.
- Press the LC\_B button to formulate a least cost ration for breeding beef cattle.
- Press the EVAL\_G button to evaluate an existing ration for growing or finishing beef cattle.
- Press the EVAL\_B button to enter the feed library editor and manage feed libraries.
- Press the TAG button to enter the feed tag module and estimate the energy values of local feeds.
- Press the Exit button to exit the program.

Before exploring the different modules of the software, click the About button to view information about the program and its authors, as shown below:



Ermias Kebreab, PhD



Abbas Ahmadi, PhD



Sath Keo, PhD



Som Suheang, MSc

Beef-KH-Eng-2021 is a least cost and ration analysis program for beef cattle in English language for Cambodia. It is designed and developed by a team of animal science experts, software engineers, and local Cambodian 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).

Dr. Sath Keo, Translator. Lecturer and Researcher, Royal University of Agriculture, Phnom Penh, Cambodia (keosth@gmail.com)

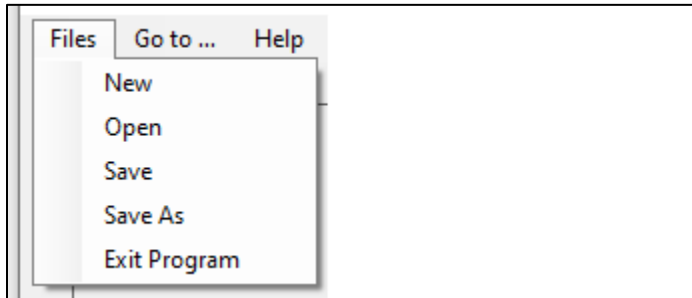
Sorn Suheang, Translator and Researcher, Royal University of Agriculture, Phnom Penh, Cambodia (sornsuheang@gmail.com)

OK

## Navigation Bar

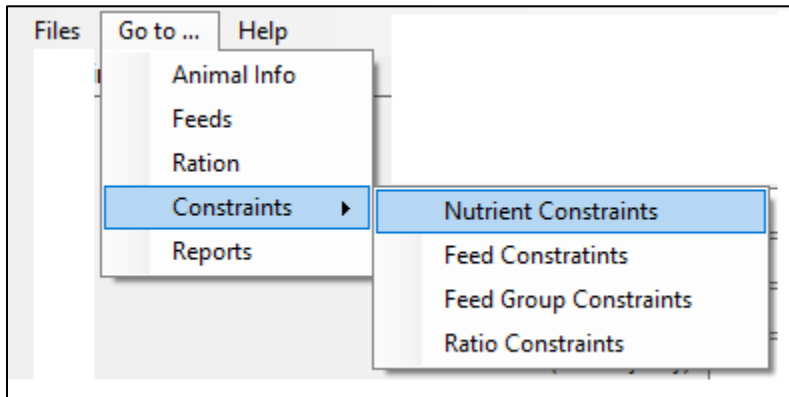
The navigation bar has three main options: Files, Go To, and Help.

### Files Menu



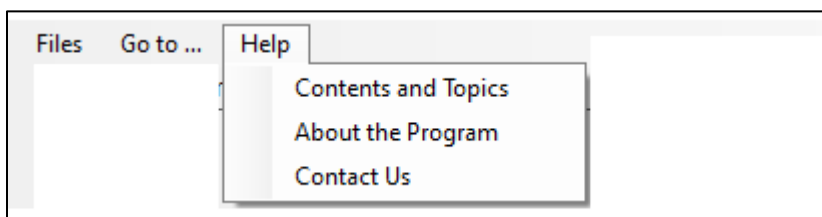
The files menu has five submenus for creating new simulation file, opening an existing simulation file, saving a simulation file, saving a simulation file with different name, and exiting the program.

### 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



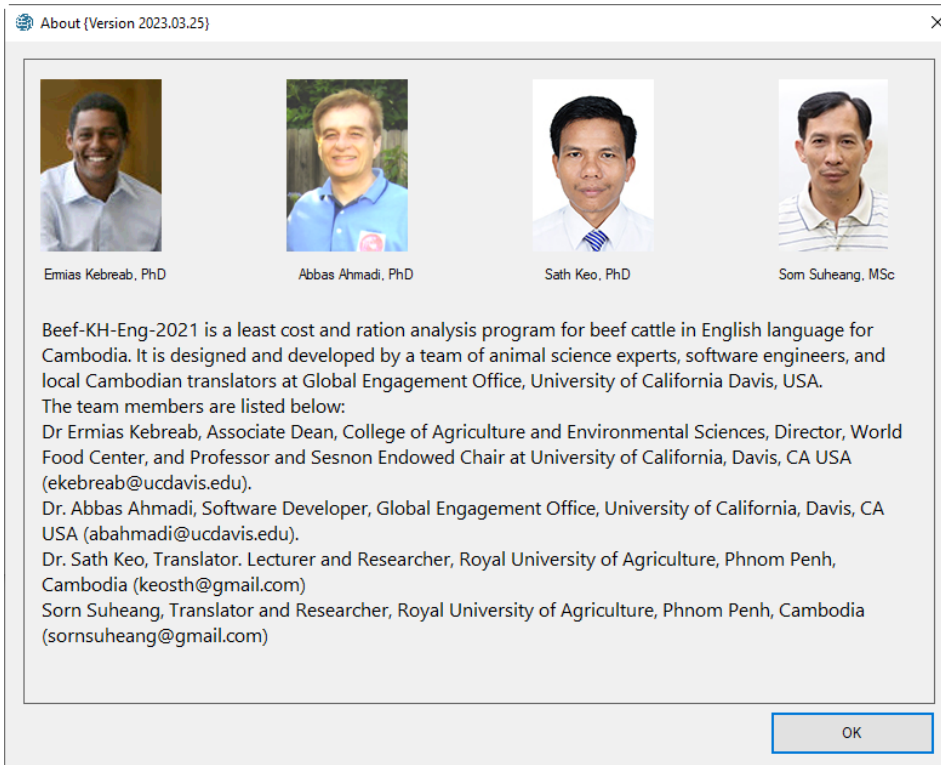
The Help menu has three submenus as listed below:

## Contents and Topics



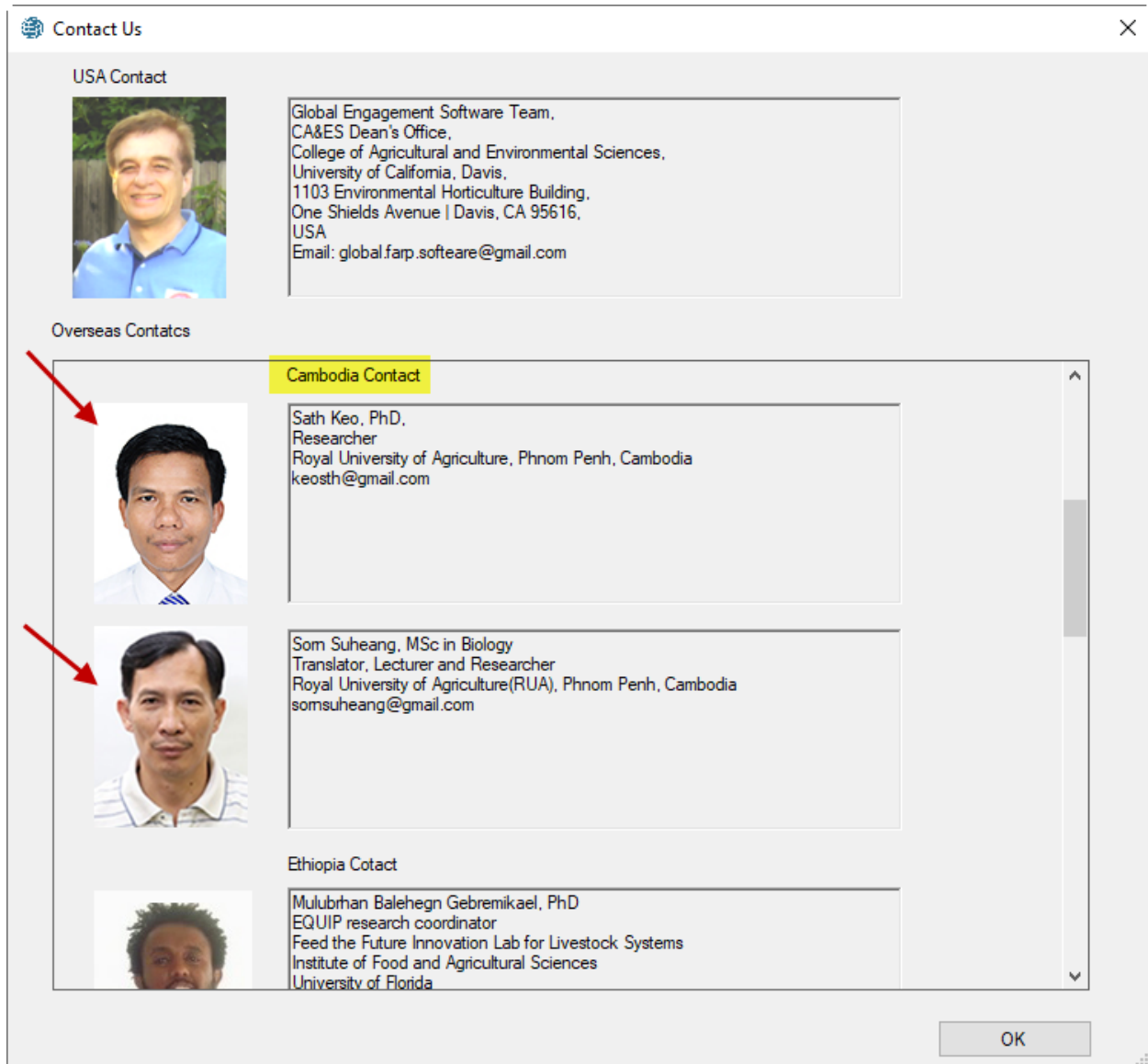
Currently this local web site is empty, but will be populated at the end, after the software is fully developed.

## About the Program



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

## Contact Us



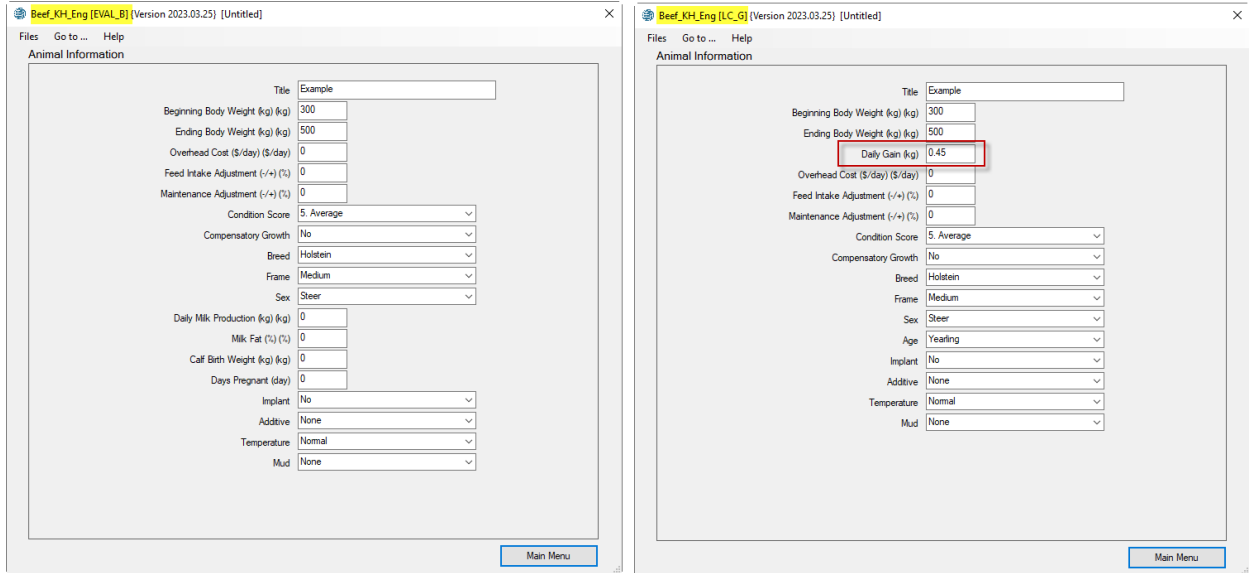
This screen shows the US contact at the top and a scrollable list of our contacts in different countries including Cambodia. Local farmers in Cambodia are encouraged to contact Dr. Sath Keo or Mr. Sorn Suheang and they will contact us if needed.



# ANIMAL INFORMATION

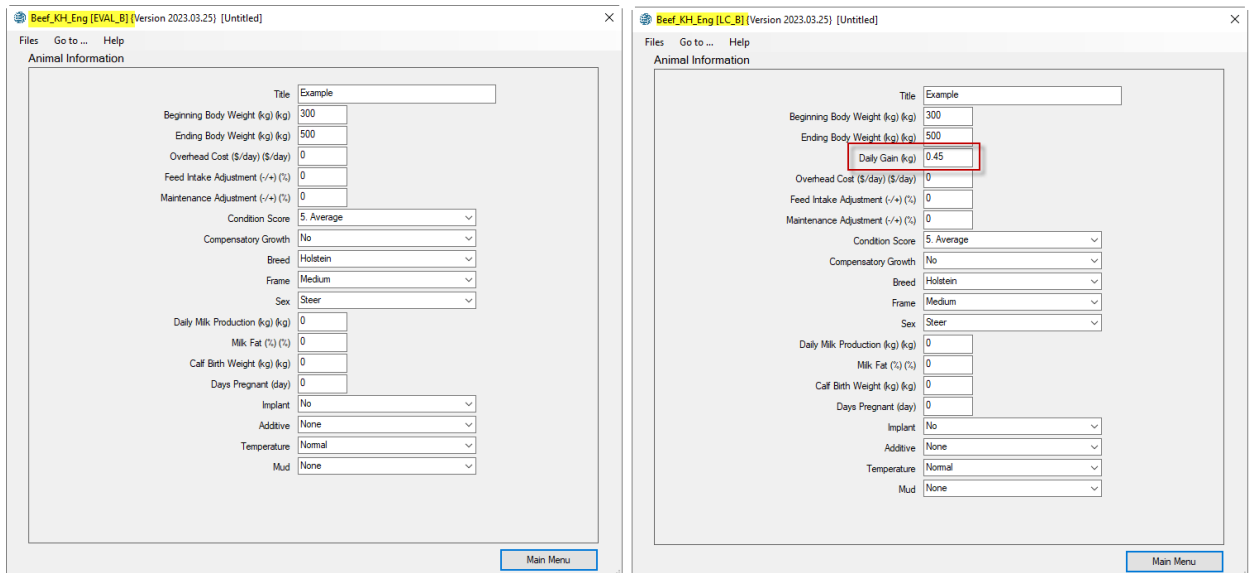
There are four different animal information screens.

## Animal Information Screen for Growing or Finishing Beef cattle



Growing or finishing beef cattle have two animal information screens: one for the evaluation module (EVAL\_G) and the other for the formulation module (LC\_G). These two screens are the same except for one data entry field, the **daily gain**. The formulation module needs the daily gain field to calculate the nutrient requirements, but the formulation module does not need this data entry field, because it will calculate the daily gain based on the existing ration.

## Animal Information Screen for Breeding Beef cattle



Breeding beef cattle have two animal information screens: one for the evaluation module (EVAL\_B) and the other for the formulation module (LC\_B). These two screens are the same except for the daily gain field.

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.

#### *Beginning body weight*

The body weight at the beginning of feeding phase. The weight is based on the live shrunk body weight. It is defined as weight after an overnight feed and water shrink (generally equivalent to about 96 percent of unshrunk weights taken in the early morning). Usually equivalent to feedlot's In-Weight.

#### *Ending body weight*

The desired body weight at the end of feeding phase. The weight is based on the live shrunk body weight. It is defined as weight after an overnight feed and water shrink (generally equivalent to about 96 percent of unshrunk weights taken in the early morning). Usually equivalent to feedlot's selling pay-weight.

#### *Daily gain*

The average daily gain per animal per day during feeding phase. For the pregnant cows and heifers do not include the fetal gain which is 0.9 lb/day (0.4 kg/day). For pregnant females specify maternal gain which is about 0 - 1 lb/day (0 - 0.45 kg/day). Live gain is usually equivalent to feedlot's gain from in-weight to selling-pay-weight.

#### *Daily overhead cost*

The nonfeed costs per head per day using the local currency.

#### *Sex*

Enter Steer, Heifer, Bull, or Cow.

#### *Breed*

Enter English, Holstein, Exotic, Brahman, or Other.

#### *Age*

Enter Calf, Yearling, or Adult.

#### *Frame*

Enter Medium, or Large. Frame score describes the skeletal size of cattle. Frame score depends on age, hip height, and nutrition level.

#### *Condition score*

Enter 1 through 9. Condition score relates to the degree of fatness.

1 = Emaciated

5 = Average

9 = Very fat

### *Compensatory growth*

Enter Yes or No. Adjustment for accelerated growth following a period of limited feed intake.

### *Feed intake adjustment*

Due to certain feeding situations (ration quality, type of cattle, etc.), it may be necessary to adjust the total estimated consumption of the ration without regard of different ingredients.

- An entry of "0" leaves the estimated consumption unadjusted.
- An entry of -20 means that the animals will eat 20% less than normal.
- An entry of +15 implies that the animals will eat 15% more than normal.

### *Maintenance adjustment*

Due to climate, type of cattle, etc., it may be necessary to adjust the Net Energy required for Maintenance (NEm, Mcal/day).

- An entry of "0" leaves the estimated NEm unadjusted.
- An entry of -20 means that the animal requires 20% less than normal.
- An entry of +15 implies that the animal requires 15% more than normal.

### *Sex*

Enter Heifer, Bull, or Cow.

### *Milk PRODUCTION*

Daily milk production expressed as kg/day or lb/day. The normal range is 5 - 10 Kg/day.

### *Milk fat*

Percent fat in milk. Normal range is 3 - 6 %

### *Calf birth weight*

Expected birth weight of calf expressed in kg or lb.

### *Days pregnant*

Days after conception. Gestation period is 285 days.

### *Feed implant*

None-use of feed implant reduces the voluntary intake of cattle by 8% and increases the maintenance energy requirement (NEm) by 8%.

### *Feed additive*

Feed additive effects the energy requirement and voluntary intake of cattle:

Feed Additive	NEm Requirement	Feed Intake
Monensin @ 30g/ton diet	-10%	-10%
Monensin @ 20g/ton diet	-8%	-6%
Lasalocid in diet	-8%	-2%

### *Temperature*

Temperature effects the voluntary intake of cattle:

Temperature	Voluntary Intake
Heat Stress: Above 95 F (35 C) with no night cooling	-5%
Normal: From 41 - 95 F (5 - 35 C)	0%
Cold Stress: Below 41 F (5 C)	+5%

### *Mud*

Mud effects the voluntary intake of cattle:

Mud	Voluntary Intake
Mild mud: 4 - 8 inches (10 - 20 cm)	-15%
Severe mud: 12 - 24 inches (30 - 60 cm)	-30%

## FEED LIST SCREEN

Library	Feed Name	Feed Number	Feed Price	Feed Price Unit	International Feed Number	Feed
0	ALFALFA middlings bloom	18	137.79	0	1-00-063	0
0	ALMOND hulls 15 percent Crude Fiber	30	82.67	0	4-00-359	0
0	BUCKWHEAT grain	154	110.23	0	4-00-994	1
0	CALCIUM phosphate di	162	529.1	0	6-01-080	1
0	CORN grain flaked	231	132.28	0	4-28-244	1
0	FAT animal Hydroponic	267	264.55	0	4-00-376	1
0	MOLASSES cane	383	88.18	0	4-04-696	1
0	OAT hay dough stage	399	110.23	0	1-03-	0
0	OYSTERSHELL ground	430	110.23	0	6-03-481	1
0	RICE hulls	563	0	0	1-08-075	0
0	UREA 45% nitrogen	675	264.55	0	5-05-070	1
0	WHEAT grain Soft red winter (SRW)	692	137.78	0	4-05-294	1

There is only one kind feed list screen for all beef cattle categories and for both evaluation and formulation modules. 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. The amount and price of feeds will be specified in another screen, the Ration screen.

### Delete Feed

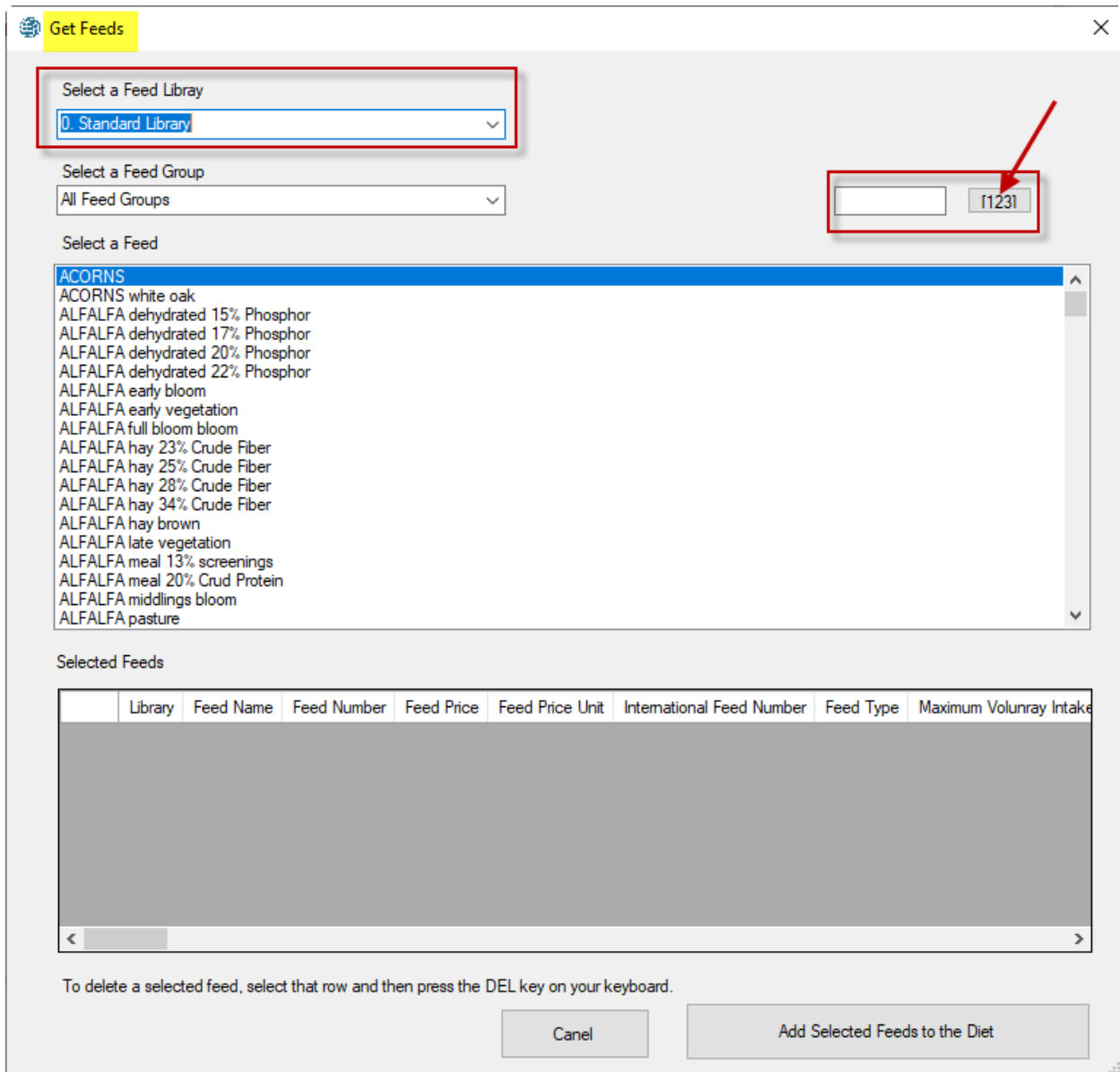
To delete a feed, locate that feed in the feed list and remove the feed by clicking the [Delete] button. To delete all feeds, click the [Delete All] button.

### Sort Feeds

To sort feeds alphabetically on the feed names, click the [Sort] button.

### Add Feed

To add a feed to the list, click the Add button. The [Get Feeds] dialog box appears, as shown below:



First select a feed library. There are two feed libraries: (0) Standard feed library and (1) Alternate feed library. The standard feed library contains 708 standard feeds. Standard feeds are mostly available in the USA. The Alternate feed library contains 546 local feeds from the target country.

You can enter a feed number in the Feed Number slot at the right of the screen and click the [123] button to directly locate that feed in the library.

Once you select a feed you can click on it to add it to the selected feeds table at the bottom of the screen. You can inspect the nutrient contents of the selected feeds and If a feed is selected by mistake, you can delete it from the selected table by simply pressing the Delete key on your keyboard.

You can press the [Add Selected Feeds to the Diet] button to add them to the diet and exit the [Get Feeds] dialog box.

Once a feed is added to your diet, it breaks all its connections to the feed library. Any modification to a feed in the diet does not affect the corresponding feed in the feed library. To modify a feed in the feed library, you must navigate to the main menu and select the Feed Library Editor button. Any modification to a feed in the feed libraries do not affect the corresponding feed in the diet.

### Edit Feed

To edit a feed in the diet, press the [Edit] button. The [Edit Feed] dialog box appears as shown below:

Field	Value
Library	0. Standard Library
Feed Number	18
International Feed Number	1-00-063
Feed Name	ALFALFA middlings bloom
Feed Group	02. Pasture, range plant
Feed Type	1. Roughage
Maximum Voluntary Intake (%)	0
Feed Dry Matter (%)	90
Digestible Energy (Mcal/kg)	2.56
Metabolizable Energy (Mcal/kg)	2.099
Net Energy for Maintenance (Mcal/kg)	1.246
Net Energy for Gain (Mcal/kg)	0.677
Total Digestible Nutrient (% DM)	58
Crude Protein (% DM)	17
Undegradable Intake Protein (% DM)	4.76
Degradable Intake Protein (% DM)	12.24
Non-Protein Nitrogen (% DM)	0
Ether Extract (% DM)	2.6
Ash (% DM)	9.1

### Library

This is a read only field. We have two kinds of feed libraries: (0) Standard Feed Library; (1) Alternate Feed Library.

### Feed number

Each feed in the standard and alternate feed libraries has a unique number assigned to it. We recommend keeping the same number in the diet, but if you want to change it, it must be unique in the diet. Avoid duplicating numbers in the diet.

### *International feed number*

This field is optional. Common feedstuffs are assigned a 6-digit international feed number (IFN) for identification and computer manipulation. The first digit in the 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

### *Feed name*

Each feed in the standard and alternate feed libraries has a unique name assigned to it. We recommend keeping the same name in the diet, but if you want to change it, it must be unique in the diet. Avoid duplicate names in the diet.

### *Feed group*

Each feed can 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. Feeds with an identical group number are members of the same group. There are 13 feed groups, as shown below:

<b>NAME</b>	<b>NUMBER</b>
01. Dry forage, roughage	1
02. Pasture, range plant	2
03. Silage	3
04. Energy feeds	4
05. Protein supplements	5
06. Mineral supplement	6
07. Vitamin supplements	7
08. Additives	8
09. Energy and protein	9
10. By-products	10
11. Fat and oils	11
12. Molasses	12
13. Real Feeds	13

### *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.



### Feed dry matter

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.

The rest of entry fields are for nutrient analysis. The nutrients are arranged in five groups: (1) Basic nutrients; (2) Major minerals; (3) Minor minerals; (4) Vitamins; and (5) Amino acids.

### Basic Nutrients

Basic nutrients are listed below:

DE	Digestible Energy	Mcal/kg
ME	Metabolizable Energy	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
NPN	Non-Protein Nitrogen	% DM
EE	Ether Extract	% DM
ASH	Ash	% DM
CF	Crude Fiber	% DM
CELL	Cellulose	% DM
ADF	Acid Detergent Fiber	% DM
NDF	Neutral Diet Fiber	% DM
NCHO	Non-Structure Carbohydrate	% DM
HC	Hemicellulose	% DM
LIGN	Lignin	% DM

### Major Minerals

Major minerals are listed below:

CA	Calcium	% DM
CL	Chlorine	% DM
MG	Magnesium	% DM
P	Phosphor	% DM
K	Potassium	% DM
NA	Sodium	% DM
S	Sulfur	% DM

## Minor Minerals

Minor minerals are listed below:

CO	Cobalt	ppm
CU	Copper	ppm
I	Iodine	ppm
FE	Iron	ppm
MN	Magnesium	ppm
SE	Selenium	ppm
ZN	Zinc	ppm

## Vitamins

Vitamins are listed below:

VITA	Vitamin A	k IU/kg
VITD	Vitamin D	k IU/kg
VITE	Vitamin E	IU/kg

## Amino Acids

Amino acids are listed below:

ARGI	Arginine	% DM
HIST	Histidine	% DM
LYSI	Lysine	% DM
METH	Methionine	% DM
PHEN	Phenylalanine	% DM
THRE	Threonine	% DM

## Special Nutrients

Special nutrients are listed below. These are for future expansion of feed library.

NUT1	Nutrient 1	% DM
NUT2	Nutrient 2	% DM
NUT3	Nutrient 3	% DM
NUT4	Nutrient 4	% DM

## RATION SCREEN

Beef\_KH\_Eng [RAT] {Version 2023.03.25} [Demo\_EVAL\_G]

Files Go to ... Help

Raion

	Library	Feed Name	Amount AS FED	Feed Amount Unit	Feed Price	Feed Price Unit
▶	0	ALFALFA middlings bloom	0.000000	kg	137.79	Cambodia Riel (ₛ)/Metric t
	0	ALMOND hulls 15 percent Crude Fiber	0.000000	kg	82.67	Cambodia Riel (ₛ)/Metric t
	0	BUCKWHEAT grain	0.000000	kg	110.23	Cambodia Riel (ₛ)/Metric t
	0	CALCIUM phosphate di	0.010280	kg	529.1	Cambodia Riel (ₛ)/Metric t
	0	CORN grain flaked	3.888010	kg	132.28	Cambodia Riel (ₛ)/Metric t
	0	FAT animal Hydroponic	0.533910	kg	264.55	Cambodia Riel (ₛ)/Metric t
	0	MOLASSES cane	0.000000	kg	88.18	Cambodia Riel (ₛ)/Metric t
	0	OAT hay dough stage	0.000000	kg	110.23	Cambodia Riel (ₛ)/Metric t
	0	OYSTERSHELL ground	0.031260	kg	110.23	Cambodia Riel (ₛ)/Metric t
	0	RICE hulls	5.123740	kg	0	Cambodia Riel (ₛ)/Metric t
	0	UREA 45% nitrogen	0.066460	kg	264.55	Cambodia Riel (ₛ)/Metric t
	0	WHEAT grain Soft red winter (SRW)	0.000000	kg	137.78	Cambodia Riel (ₛ)/Metric t

Total Intake As Fed (kg)

Ration Summary

	Library	Feed Name	Feed Number	Feed Price	Feed Price Unit	International Feed Number	Feed Type	Maximum Volu
[Empty table body]								

There are two kinds of Ration screens: One for the evaluation module and the other for the formulation module. In the Evaluation module, the user specifies the amounts of feeds in the existing ration and the program evaluates the ration to see if it meets nutrient requirements. In the formulation model the program formulates a new ration and calculates amounts of feeds in the new ration, which meets nutrient requirements.

### Feed Amount

Enter the feed amount as kg on the “as fed” basis. For the feed amounts, we support up to six decimal places, so the user can enter gram and milligram amounts for trace minerals. If you have the price of feeds on as kg, multiply the price by 1000 to get the price per metric ton.

### *Feed Price*

Enter the feed price as local currency per metric ton on the “as fed” basis.

### *Total Intake*

The evaluation module shows the total intake as kg on the “As Fed” basis. The user can change the total intake by clicking the [Change Total Intake] button. The program automatically adjusts amounts of each feed in the diet to add up to the new feed intake.

You can use this feature to trick the program to enter feed amounts as percentage values. To do this, first enter feed amounts for a 100 kg diet. Then, click the [Change Total Intake] button and change the intake to a more reasonable value such as 10 kg. The program automatically adjusts amounts of each feed in the diet to add up to the new feed intake.

### *Ration Summary*

The evaluation module calculates nutrient concentration of the diet and display it in a scrollable region at the bottom of the screen. Click the [Refresh] button to refresh nutrient concentration in the diet. Currently this feature is not enabled but will eventually be active in future releases of the software.

## NUTRIENT CONSTRAINTS

	InternalName	DisplayName	Pct_Unit_Metric	Pct_UsrMin	Pct_UsrMax	Amt_Unit_Metric	Amt_UsrMin
▶	DM	Feed Dry Matter	% DM			kg	7.725
	NEM	Net Energy for M...	Mcal/kg	1.070	1.070	Mcal	
	CP	Crude Protein	% DM	10.947		kg	
	CA	Calcium	% DM	0.381	2.000	kg	
	P	Phosphor	% DM	0.242	1.000	kg	

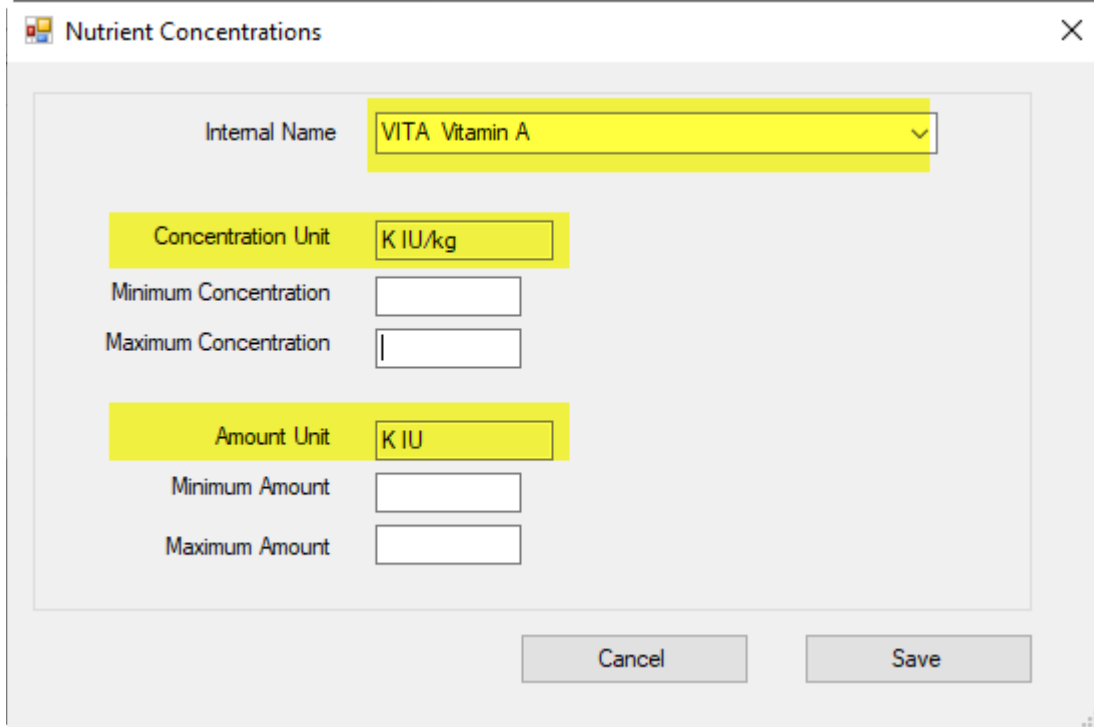
The formulation module has four constraints: (1) Nutrient constraints; (2) Feed constraints; (3) Feed group constraints; and (4) Ration constraints. In this section, we describe the nutrient constraints screen.

Initially this screen is empty. You must click the “Recalculate” button to populate this screen with a set of nutrient requirements for energy (NEM), crude protein (CP), and minerals (calcium and phosphor). If you modify the animal information screen, you must click the “Recalculate” button to recalculate nutrient requirements.

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

## Add

To ADD a constraint, click the Add button. The Nutrients Constraints dialog box appears, as shown below:



The screenshot shows the 'Nutrient Concentrations' dialog box. The 'Internal Name' dropdown is set to 'VITA Vitamin A'. The 'Concentration Unit' dropdown is set to 'K IU/kg'. The 'Amount Unit' dropdown is set to 'K IU'. The 'Minimum Concentration', 'Maximum Concentration', 'Minimum Amount', and 'Maximum Amount' fields are currently empty. The 'Cancel' and 'Save' buttons are visible at the bottom.

Navigate to the [Internal Name] list box and select a nutrient from the drop-down list of all nutrients. For example, select [VITA Vitamin A]. The program automatically populates the units for concentration and amount of the selected nutrients. You can set the minimum and maximum concentrations or amounts.

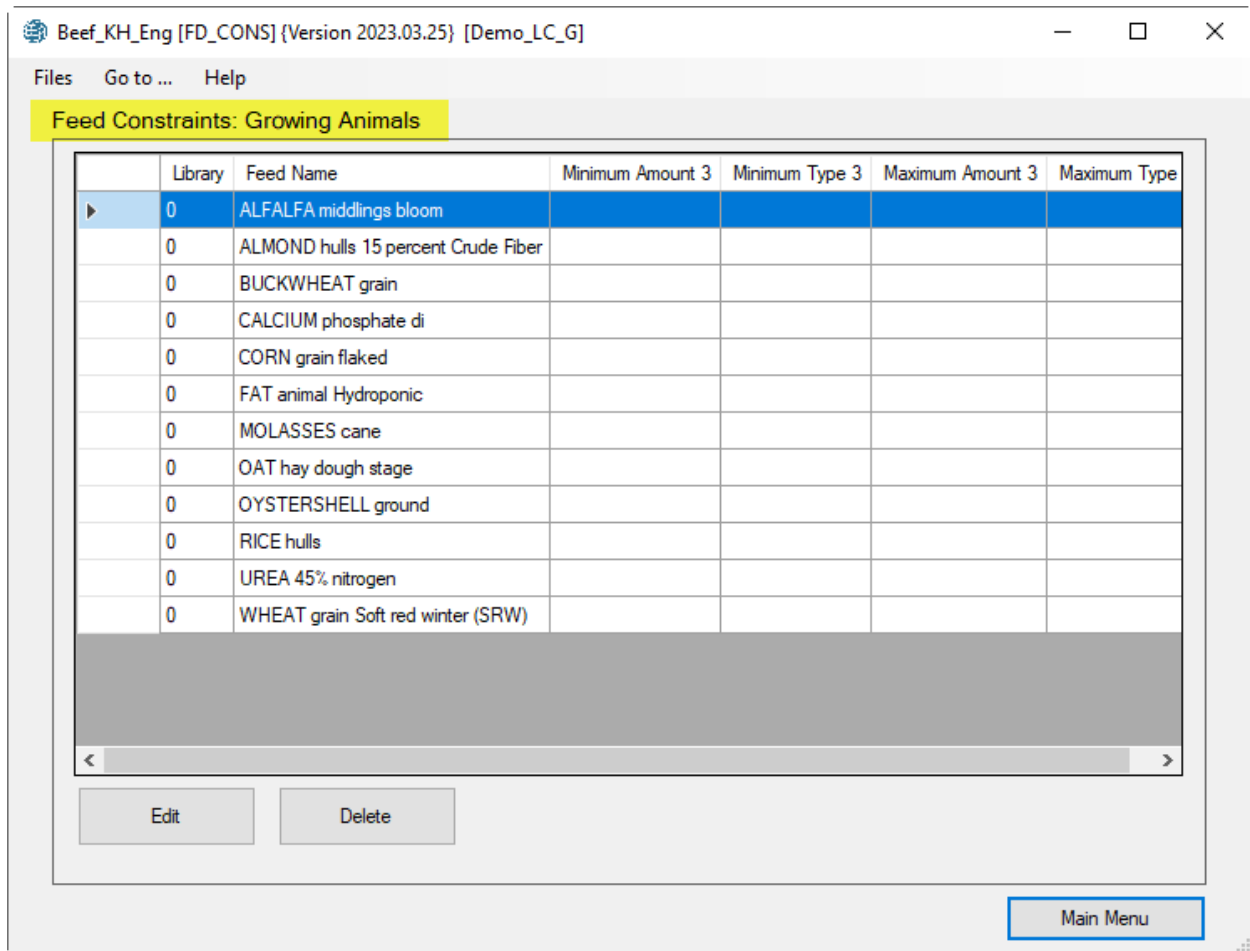
## Delete

To delete a constraint, move to the line in the table containing the constraint that you wish to delete. Then click the "Delete" button to remove the constraint.

## Edit

First select a nutrient from the list and then click the edit button. The Nutrients Constraints dialog box appears, as shown above, with the difference that the nutrient name is grayed out and cannot be changed but you can change the minimum and maximum concentrations or amounts.

## FEED CONSTRAINTS



This screen lists all the feeds that have been specified in the feed list. There are three categories of animals: (1) Lactating animals; (2) Dry animals; (3) Growing or finishing animals. Each of these categories has their own feed constraints.

### Add

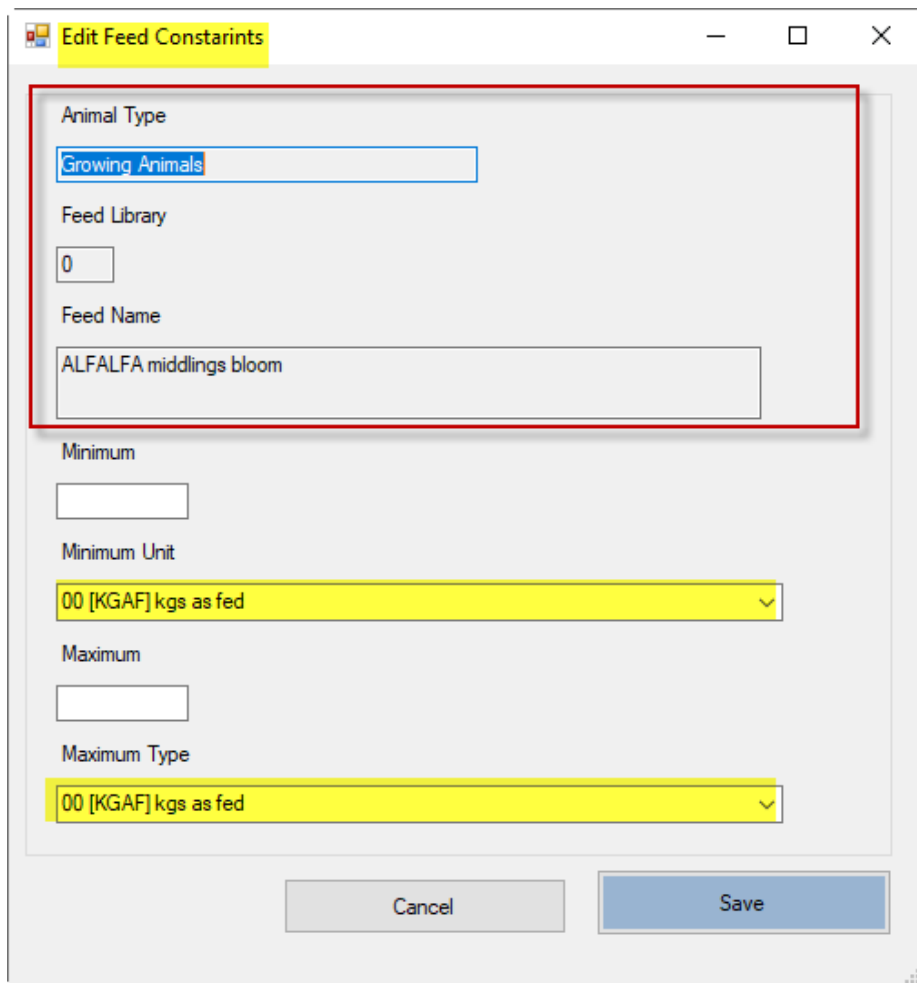
You cannot add a new feed to this screen, but you can edit or delete feed constraints. To add a new feed, you must go to the Feed screen and add a feed in that screen.

### Delete

To delete an existing feed constraint, navigate to that constraint and click the “Delete” button. This action clears both the minimum and maximum constraints for the selected feed.

### Edit

To edit a feed constraint, navigate to that feed and then click the “Edit” button. The Edit Feed Constraints dialog box appears, as shown below:



The Animal Type, Feed Library, and Feed Name are grayed out and cannot be changed, but you can change the minimum and maximum constraints and their units.

#### *Minimum constraint*

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. After you enter the desired amount, you must specify a unit for the constraint by selecting one of the eight choices shown below. The commonly used unit is **00 [KGAF] kgs as fed**.

- 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



You can set a feed constraint as amount (kg) or as percent (%) of ration based on 100% dry matter or on as fed basis. In case of the percent constraints, you can choose the percent of concentrate portion of ration, or percent of roughage portion of ration, or percent of total ration.

#### *Maximum constraint*

You can limit the amount of feed in the ration by entering a maximum constraint on that feed. After you enter the desired amount, you must specify a unit for the constraint by selecting one of the eight choices shown below. The commonly used unit is **00 [KGAF] kgs as fed**.

To delete an existing minimum or maximum constraint, enter 0 for the amount.

## FEED GROUPS CONSTRAINTS

	Group Number	Group Name	Feeds in Group	Minimum Amount 3	Minimum Type 3	Minimum Amount 3	Minir
▶	-2	Roughages	4				
	-1	Concentrates	8				
	1	1. Dry forage, roughage	3				
	10	10. By-products	3				
	11	11. Fat and oils	1				
	12	12. Molasses	1				
	13	13. Real Feeds	12				
	4	4. Energy feeds	6				
	5	5. Protein supplements	1				
	6	6. Mineral supplement	2				

This screen lists all the feed groups that have been specified in the feed list. There are three categories of animals: (1) Lactating animals; (2) Dry animals; (3) Growing or finishing animals. Each of these groups have their own feed group constraints.

### Add

You cannot add a new feed group to this screen, but you can edit or delete feed group constraints. To add a new feed group, you must go to the Feed screen and add a feed of that group in that screen.

### Delete

To delete an existing feed group constraint, navigate to that constraint and click the “Delete” button. This action clears both the minimum and maximum constraints for the selected feed group.

### Edit

To edit a feed group constraint, navigate to that feed group and then click the “Edit” button. The Edit Feed Group Constraints dialog box appears, as shown below:

The Animal Type, Feed Group Number, and Feed Group Name are grayed out and cannot be changed, but you can change the minimum and maximum constraints and their units.

#### *Minimum constraint*

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, you must specify a unit for the constraint by selecting one of the eight choices shown below. The commonly used unit is **07 [%TAF] % of TOTAL Ration AS FED basis**.

- 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

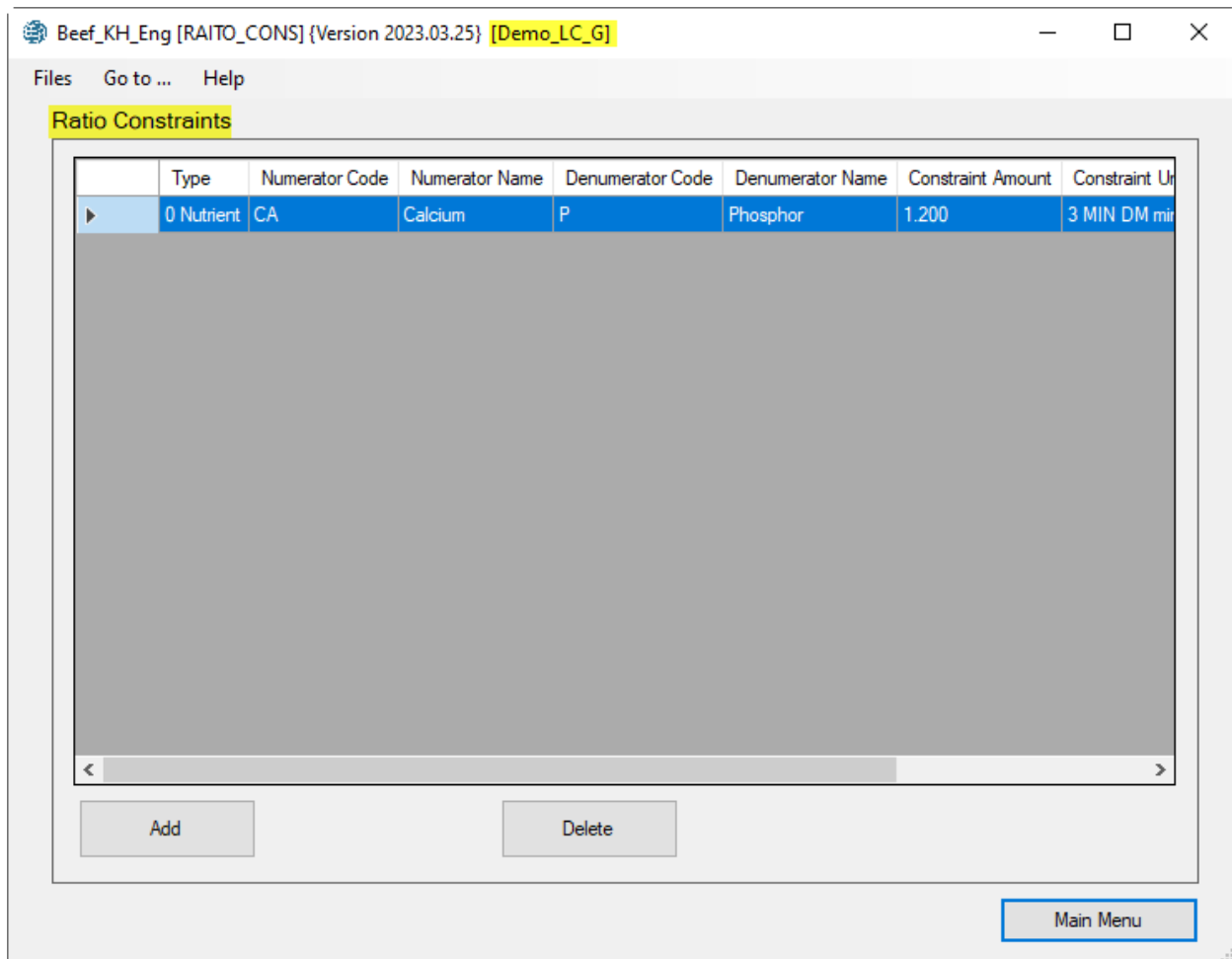
You can set a feed constraint as amount (kg) or as percent (%) of ration based on 100% dry matter or on as fed basis. In case of the percent constraints, you can choose the percent of concentrate portion of ration, or percent of roughage portion of ration, or percent of total ration.

#### *Maximum constraint*

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, you must specify a unit for the constraint by selecting one of the eight choices shown below. The commonly used unit is **07 [%TAF] % of TOTAL Ration AS FED basis**.

To delete an existing minimum or maximum constraint, enter 0 for the amount.

## RATIO CONSTRAINTS



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

### Delete

To delete a ratio constraint, navigate to that constraint and click the “Delete” button.

### Edit

There is no button to edit a ration constraint. To edit a ratio constraint, you must delete it and then add it with new values.

### Add

To add a ratio to the list, click the “Add” button. The “Add Ratio Constraints” dialog box appears, as shown below:

The screenshot shows a 'Ratio Constraints' dialog box with the following fields:

- Type:** A dropdown menu with '0 Nutrient' selected.
- Numerator:** A dropdown menu with 'DE: Digestible Energy' selected.
- Denominator:** A dropdown menu with 'DE: Digestible Energy' selected.
- Amount:** An empty text input field.
- Unit:** A dropdown menu with '0 MIN AF minimum constraint, as fed basis' selected.

At the bottom of the dialog are 'Cancel' and 'Save' buttons.

### *Type*

Ratio types are as follows:

- 0 Nutrient ratios
- 1 Feed ratios
- 2 Feed group ratios

### *Numerator*

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. Select a numerator from the drop-down list. For nutrient ratios, this list is populated by a list of nutrients. For feed ratios, this list is populated by a list of feeds in the diet. For feed group ratios, this list is populated by a list of feed groups in the diet.

### *Denominator*

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. Select a denominator from the drop-down list. For nutrient ratios, this list is populated by a list of nutrients. For feed ratios, this list is populated by a list of feeds in the diet. For feed group ratios, this list is populated by a list of feed groups in the diet.

### *Amount*

You should enter a ratio constraint amount as a ratio of numerator to denominator and not as a percentage. 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.

### *Unit*

Identify the type of ratio constraint by selecting a unit from the drop-down list. The program supports six units as listed below:

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

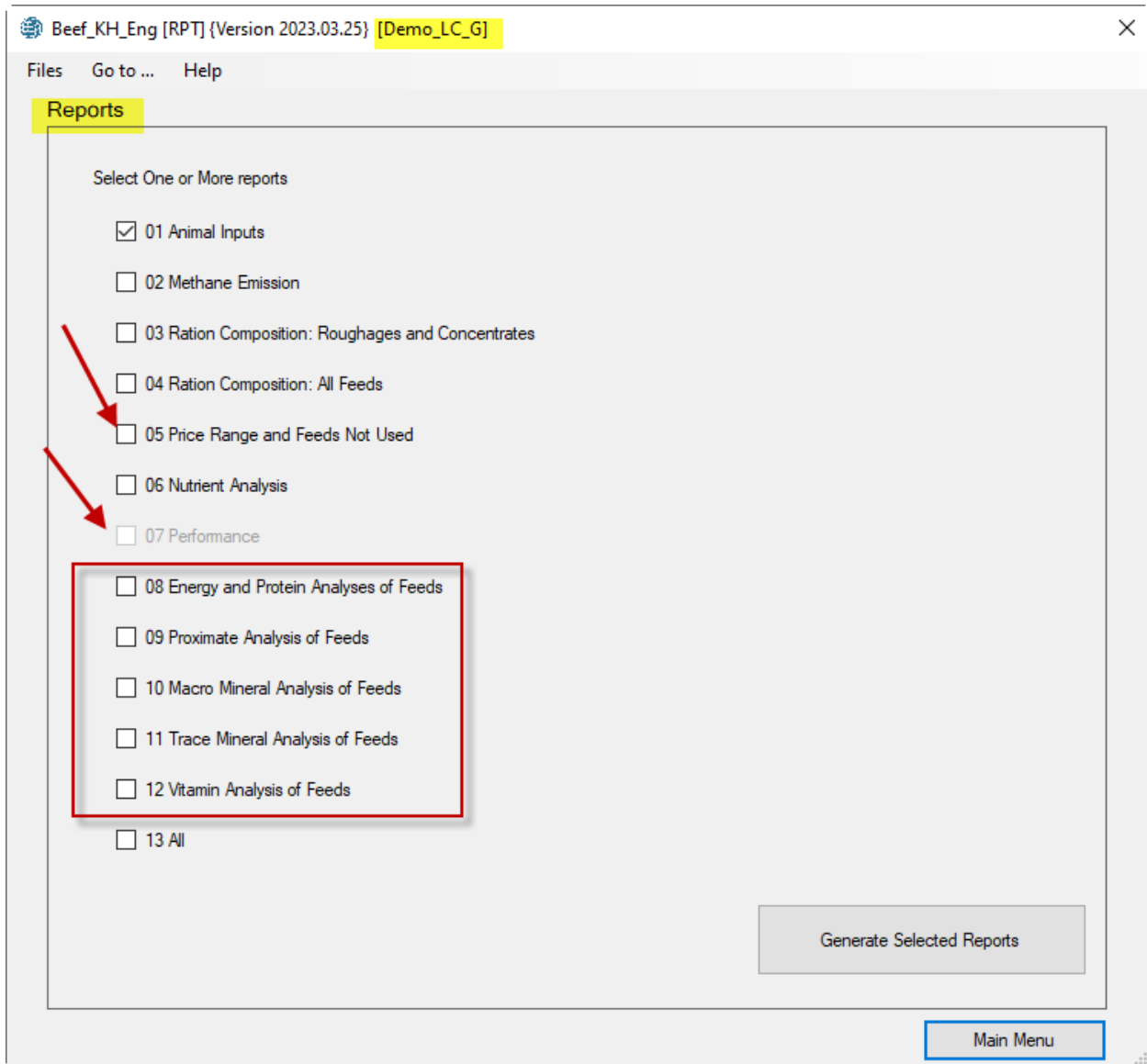
A minimum ratio constraint forces the ration to contain at least the minimum ratio or may be more.

A maximum ratio constraint forces the ration to contain at most the maximum ratio or may be less.

An equality ratio constraint forces the ration to contain exactly the specified ratio and nothing more nor nothing less.

The minimum, maximum, and equality ratio constraints can be on 100% dry matter basis or on as fed basis.

## Reports



The software supports 12 reports. Report 05 “Price Rane and Feeds Not Used” is only available in the formulation module. Report 07 “Performance” is only available in the evaluation module. The format of Report 06 “Nutrient analysis” is different in evaluation module than the formulation module. The columns for user constraints are available for formulation module. Because only in the formulation module the user can specify constraints.



## Report 01. Animal Inputs

Item	Value
Title	Example
Beginning Body Weight (kg) (kg)	300
Ending Body Weight (kg) (kg)	500
Daily Gain (kg)	0.45
Overhead Cost (\$/day) (\$/day)	0
Feed Intake Adjustment (-/+ ) (%)	0
Maintenance Adjustment (-/+ ) (%)	0
Condition Score	5. Average
Compensatory Growth	No
Breed	Holstein
Frame	Medium
Sex	Steer
Age	Yearling
Implant	No
Additive	None
Temperature	Normal
Mud	None

This report lists input entries for the animal information screen.

## Report 02. Methane Emissions

Item	Value
Methane Emission in MJ per day per head (MJ/d)	7.177
Methane Emission in Mcal per day per head (Mcal/d)	1.715
Methane Emission in gram per day per head (g/day)	129.075
Methane Emission in gram per kg of dry matter intake (g/kg)	16.709
<b>Methane Conversion Rate (%)</b>	<b>5.368</b>

(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

This report displays information about Methane emission. The most important index is the Methane Conversion Rate (%), which ranges from 2 to 20 percent.

Global warming potential (GWP) is the heat absorbed by any greenhouse gas in the atmosphere, as a multiple of the heat that would be absorbed by the same mass of carbon dioxide (CO<sub>2</sub>). GWP is 1 for CO<sub>2</sub>. For other gases it depends on the gas and the time frame. Carbon dioxide equivalent (CO<sub>2</sub>e or CO<sub>2</sub>eq or CO<sub>2</sub>-e) is calculated from GWP. For any gas, it is the mass of CO<sub>2</sub> that would warm the earth as much as the mass of that gas. Thus, it provides a common scale for measuring the climate effects of different gases. It is calculated as GWP times mass of the other gas. Methane has GWP (over 100 years) of 27.2 meaning that, for example, a leak of a ton of methane is equivalent to emitting 27.2 tons of

carbon dioxide. Similarly, a ton of nitrous oxide, from manure for example, is equivalent to 273 tons of carbon dioxide. The most recent Intergovernmental Panel on Climate Change (IPCC) report values for methane's 20-year GWP at 86 and 100-year GWP at 27.2.

### Report 03. Ration Composition (Important nutrients)

Report 03-1. Roughages									
Library	Feed Name	AMT_AF kg	AMT_DM kg	DE Mcal	CP kg	CF kg	ADF kg	CA kg	P kg
0	ALFALFA middlings bloom	2.266753	2.040078	5.223	0.347	0.530	0.714	0.029	0.005
0	ALMOND hulls 15 percent Crude Fiber	0.000000	0.000000	0.000	0.000	0.000	0.000	0.000	0.000
0	OAT hay dough stage	0.000000	0.000000	0.000	0.000	0.000	0.000	0.000	0.000
0	RICE hulls	2.502326	2.302140	1.220	0.076	0.988	1.658	0.002	0.002
		4.769	4.342	6.443	0.423	1.518	2.372	0.031	0.007

Report 03-2. Concentrates									
Library	Feed Name	AMT_AF kg	AMT_DM kg	DE Mcal	CP kg	CF kg	ADF kg	CA kg	P kg
0	BUCKWHEAT grain	3.843945	3.382672	10.726	0.423	0.399	0.000	0.004	0.013
0	CALCIUM phosphate di	0.000000	0.000000	0.000	0.000	0.000	0.000	0.000	0.000
0	CORN grain flaked	0.000000	0.000000	0.000	0.000	0.000	0.000	0.000	0.000
0	FAT animal Hydroponic	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	OYSTERSHELL ground	0.000000	0.000000	0.000	0.000	0.000	0.000	0.000	0.000
0	UREA 45% nitrogen	0.000000	0.000000	0.000	0.000	0.000	0.000	0.000	0.000
0	WHEAT grain Soft red winter (SRW)	0.000000	0.000000	0.000	0.000	0.000	0.000	0.000	0.000
		3.844	3.383	10.726	0.423	0.399	0.000	0.004	0.013

Report 03-3. Total Ration									
Library	Feed Name	AMT_AF kg	AMT_DM kg	DE Mcal	CP kg	CF kg	ADF kg	CA kg	P kg
0	ALFALFA middlings bloom	2.266753	2.040078	5.223	0.347	0.530	0.714	0.029	0.005
0	ALMOND hulls 15 percent Crude Fiber	0.000000	0.000000	0.000	0.000	0.000	0.000	0.000	0.000
0	BUCKWHEAT grain	3.843945	3.382672	10.726	0.423	0.399	0.000	0.004	0.013
0	CALCIUM phosphate di	0.000000	0.000000	0.000	0.000	0.000	0.000	0.000	0.000
0	CORN grain flaked	0.000000	0.000000	0.000	0.000	0.000	0.000	0.000	0.000
0	FAT animal Hydroponic	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	OAT hay dough stage	0.000000	0.000000	0.000	0.000	0.000	0.000	0.000	0.000
0	OYSTERSHELL ground	0.000000	0.000000	0.000	0.000	0.000	0.000	0.000	0.000
0	RICE hulls	2.502326	2.302140	1.220	0.076	0.988	1.658	0.002	0.002
0	UREA 45% nitrogen	0.000000	0.000000	0.000	0.000	0.000	0.000	0.000	0.000
0	WHEAT grain Soft red winter (SRW)	0.000000	0.000000	0.000	0.000	0.000	0.000	0.000	0.000
		8.613	7.725	17.169	0.846	1.917	2.372	0.035	0.019

This report lists the amounts of important nutrients such as energy (DE), crude protein (CP), fiber (CF, ADF), and minerals (CA, P) for each feed. The list is generated separately for roughages, concentrates, and total ration. The last row of each report shows the total amount of nutrients in the diet. In this example, we have 17.169 Mcal of Digestible Energy (DE), 846 grams of crude protein, 1.917 kg of crude fiber (CF), 35 grams of Calcium, and 19 grams of phosphorus. The dry matter intake is 7.725 kg per day per head, which is equivalent to 8.613 daily intake on an as-fed basis. The diet consists mostly from alfalfa, buckwheat grain, and rice hull.

## Report 04. Ration Composition

Report 04. Ration Composition: All Feeds								
Library	Feed Name	Intake DM kg	Intake DM %	Intake AF kg	Intake AF %	Price €/Metric ton As Fed	Price €/Metric ton Dry Matter	Price €/day
0	ALFALFA middlings bloom	2.040078	26.409152	2.266753	26.317737	137.79	153.10	0.31
0	ALMOND hulls 15 percent Crude Fiber	0.000000	0.000000	0.000000	0.000000	82.67	91.86	0.00
0	BUCKWHEAT grain	3.382672	43.789257	3.843945	44.629447	110.23	125.26	0.42
0	CALCIUM phosphate di	0.000000	0.000000	0.000000	0.000000	529.10	545.46	0.00
0	CORN grain flaked	0.000000	0.000000	0.000000	0.000000	132.28	148.63	0.00
0	FAT animal Hydroponic	0.000000	0.000000	0.000000	0.000000	264.55	267.22	0.00
0	MOLASSES cane	0.000000	0.000000	0.000000	0.000000	88.18	117.57	0.00
0	OAT hay dough stage	0.000000	0.000000	0.000000	0.000000	110.23	122.48	0.00
0	OYSTERSHELL ground	0.000000	0.000000	0.000000	0.000000	110.23	111.34	0.00
0	RICE hulls	2.302140	29.801591	2.502326	29.052816	0.00	0.00	0.00
0	UREA 45% nitrogen	0.000000	0.000000	0.000000	0.000000	264.55	267.22	0.00
0	WHEAT grain Soft red winter (SRW)	0.000000	0.000000	0.000000	0.000000	137.78	156.57	0.00
		7.72	100.00	8.61	100.00	85.46	95.28	0.74

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, as fed basis.
2. The percentage of the feed in the ration (or group), 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 ration (or group), on a 100% dry matter basis.

In this example, The ration consists of 26% of alfalfa and 45% of buckweat grain, and 29% of rice hulls on “as fed” basis. The intake is 7.72 kg on “100% dry matter” basis or 8.61 kg on “as fed” basis. The ration price is 85.46 local currency per metric ton on “as fed” basis, or 95.78 local currency per metric ton on “100% dry matter” basis. The ration cost is about 0.74 local currency per head per day.

## Report 05. Price Range

<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 ¢/Metric ton As Fed	Lower Range Price ¢/Metric ton As Fed	Upper Range Price ¢/Metric ton As Fed
0	ALFALFA middlings bloom	2.266753	137.79	112.72	150.17
0	BUCKWHEAT grain	3.843945	110.23	93.79	121.79
0	RICE hulls	2.502326	0.00	-115.26	62.88

<b>Report 05_2. Feeds not used in ration</b>			
Lib	Name	Price at formulation ¢/Metric ton As Fed	Oppurtunity price ¢/Metric ton As Fed
0	ALMOND hulls 15 percent Crude Fiber	82.67	14.76
0	CALCIUM phosphate di	529.10	-28.14
0	CORN grain flaked	132.28	108.05
0	FAT animal Hydroponic	264.55	124.08
0	MOLASSES cane	88.18	49.77
0	OAT hay dough stage	110.23	90.26
0	OYSTERSHELL ground	110.23	-28.72
0	UREA 45% nitrogen	264.55	215.83
0	WHEAT grain Soft red winter (SRW)	137.78	108.94

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 feed to a price 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. If the lower range is -999999.99, 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 feed to a price 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. If the upper range is 999999.99, the feed amount in the ration cannot be decreased due to a minimum constraint on that feed.

Report 05\_2 displays the following information for feeds not used in the ration:

1. The current price of feeds on an as fed basis.
2. The opportunity price of feeds. This is the price that the feed must drop into in order for it to be used in the ration. If you add a feed with a price of \$10000 per cwt to the feed list and then formulate the ration, the feed will not be included unless it contains some necessary nutrients that are not available from any other feed. If the feed is not used, it would become a good buy if its cost were less than or equal to the opportunity price.

## Report 06. Nutrient Analysis of 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	89.688	% DM				
		7.725	kg	*	7.725	7.725	7.725
DE	Digestible Energy	2.223	Mcal/kg				
		17.169	Mcal				
ME	Metabolizable Energy	1.822	Mcal/kg				
		14.079	Mcal				
NEM	Net Energy for Maintenance	1.070	Mcal/kg		1.070	1.070	1.070
		8.269	Mcal	*			8.269
NEG	Net Energy for Gain	0.651	Mcal/kg			0.518	
		5.028	Mcal				0.000
TDN	Total Digestible Nutrient	50.422	% DM				
		3.895	kg				
CP	Crude Protein	10.947	% DM		10.947	10.947	
		0.846	kg	*			0.846
CA	Calcium	0.552	kg				
		0.450	% DM		0.381	2.000	0.381
CL	Chlorine	0.035	kg				0.029
		0.146	% DM				
MG	Magnesium	0.011	kg				
		0.382	% DM			0.100	0.400
P	Phosphor	0.029	kg				
		0.249	% DM		0.242	1.000	0.242
		0.019	kg			0.019	

This report displays nutrient analysis for all feeds in the 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.
- 2. NRC recommendation.** This is the nutrient amount recommended by the National Research Council. These amounts are calculated internally by the program, based upon the data that you supplied on the Animal Information page. Not all NRC amounts are used as constraints for ration formulation. By comparing the NRC recommendation with the actual amount of the nutrient in the ration, you can determine if the ration is deficient in that particular nutrient.

In the formulation module, you will also see the following:

- 3. Minimum and maximum constraints.** These are the constraints which were used by the program when the ration was formulated.

In this example, NRC requirement for dry matter intake of 7.725 kg is satisfied. NRC requirement of 1.07 Mcal/kg of Net Energy for Maintenance and 0.58 Mcal/kg of Net Energy for Gain are satisfied. NRC requirement of 0.846 kg of Crude Protein is satisfied. NRC requirement of 29 g of Calcium and 16 g of Phosphor are satisfied. NRC requirement of 0.846 kg of Crude Protein is satisfied. In terms of energy, crude protein and minerals this is a balance ration.

*Report 07 displays the performance information.*

*Report 08 lists basic nutrient analysis of feeds.*

*Report 09 lists major minerals analysis of feeds*

*Report 10 lists minor minerals analysis of feeds.*

*Report 11 lists vitamins analysis of feeds.*

*Report 12 lists Amino Acids Analysis of Feeds.*

## FEED TAG

Feed Name	<input type="text"/>
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

This module calculates the energy values of a feed using the basic nutrient analysis of feeds, which consists of crude protein (CP), non-protein nitrogen protein equivalent, fat or oil or ether extract (EE), ash, and crude fiber (CF). For air-dried feeds the dry matter of feed is usually about 90%.

The input entries are on “as fed” basis, but the output values are on 100% dry matter basis. The program provides a “Default” button to populate the input entries with default values. We recommend that you used this button and then modify the input entries.

### *Feed Name*

Assign a name for feed. Example, ALFALFA. The feed name is not used in the energy calculation. It is just for identification.

### *Feed Group*

Select a group for feed. Example, Dry forage and roughage: Legumes. The feed group is used for energy calculations. The program support seven feed groups as listed below:

1. General
2. Dry forage and roughage, legumes
3. Dry forage and roughage, non-legumes
4. Pasture and range plant

5. Silage
6. Energy feeds
7. Protein Supplements feeds

If you do not know the feed group, select the General option.

#### *Dry Matter of Feed*

Enter a value between 1 to 100%. Example: 90.00%

#### *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:

General:

$$DE= 3.916828 - 0.00812 *CP+0.04554 * EE-0.0176 * ash-0.0422 * CF$$

Dry forage and roughage, legumes:

$$DE= 2.811904 + 0.0209413*CP + 0.006492 *EE + 0.01302*ash - 0.0274 *CF$$

Dry forage and roughage, non-legumes:

$$DE= 3.264743 + 0.06363 *CP - 0.0761 * EE - 0.0508 *ash -0 .0283 *CF$$

Pasture and range plant:

$$DE= 3.723255 + 0.002459 *CP + 0.0815818*EE - 0.0211 *ash - 0.036135 *CF$$

Silage

$$DE= 3.681242 - 0.0130 *CP + 0.04553 *EE - 0.0328 *ash - 0.0284 *CF$$

Energy feeds



$$DE = 3.729697 + 0.008047 * CP + 0.04582 * EE - 0.0393 * ash - 0.0392 * CF$$

Protein Supplements feeds

$$DE = 4.706482 - 0.0158 * CP + 0.034633 * EE - 0.0241 * ash - 0.0598 * CF$$

### Step 3

Corrects for Non-Protein Nitrogen Protein Equivalent:

$$DE = DE * (1 - (CP * NPN / 28200))$$

### Step 4

All other energy values are calculated by using DE.

Metabolizable Energy, Mcal/kg:

$$ME = 0.82 * DE$$

Net Energy for Maintenance, Mcal/kg:

$$NEM = 1.37 * ME - 0.138 * ME * ME + 0.0105 * ME * ME * ME - 1.12$$

Net Energy for Gain, Mcal/kg:

$$NEG = 1.42 * ME - 0.147 * ME * ME + 0.0122 * ME * ME * ME - 1.65$$

Total Digestible Nutrients, %:

$$TDN = 100 * (DE / 4.4)$$

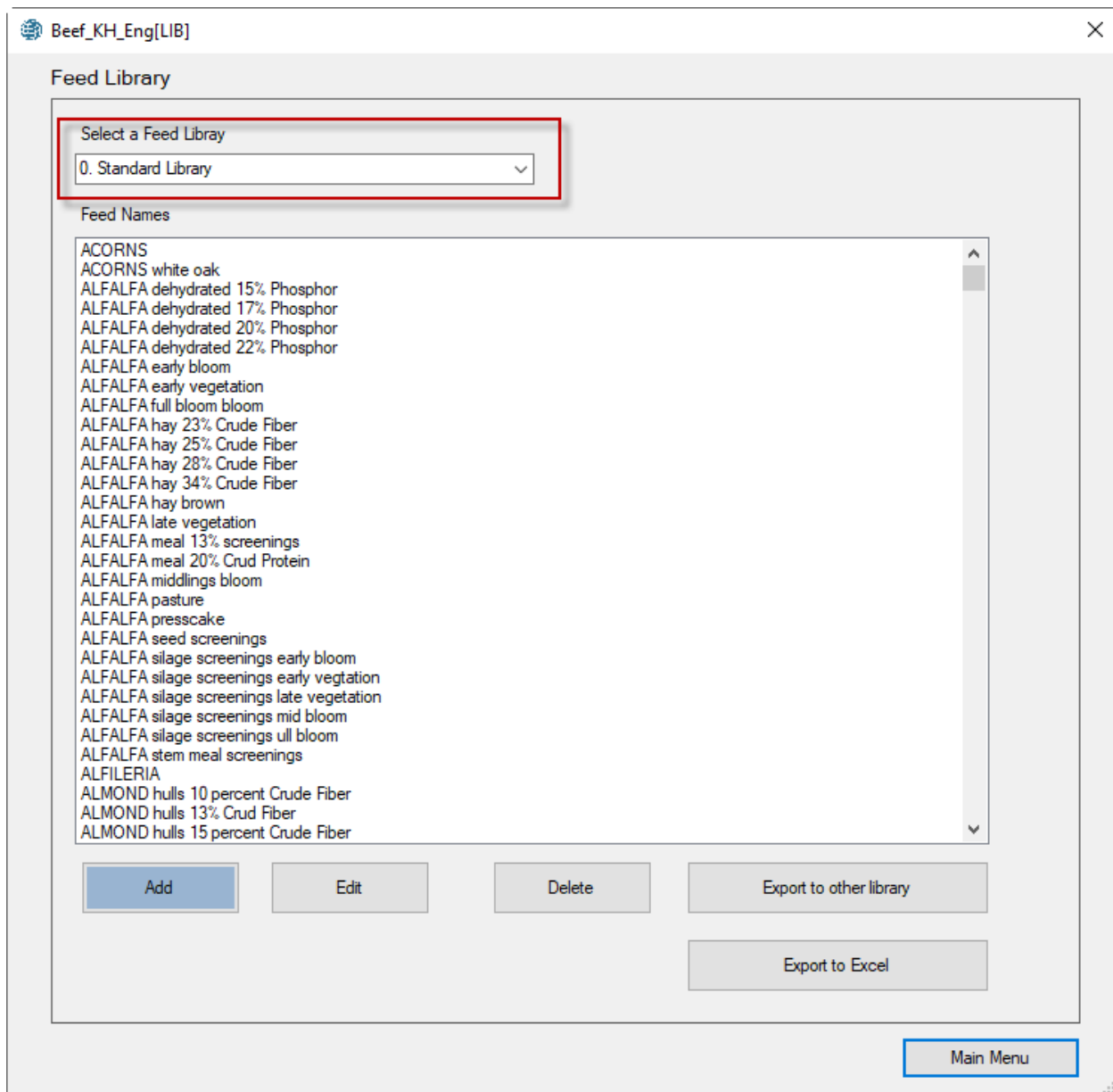
Net Energy for Lactation, Mcal/kg:

$$NEL = 0.0245 * TDN - 0.12$$

### Step 5

Converts to English system, if necessary.

## FEED LIBRARY EDITOR



There are three feed libraries:

- 0 Standard Feed Library
- 1 Alternate Feed Library
- 2 Infeasible Feed Library

The standard feed library contains 708 standard feeds. Standard feeds are mostly available in the USA. The Alternate feed library is populated with local feeds from Cambodia. The infeasible feed library contains special feeds that are used to trouble shoot the least cost formulation results.

## Edit

To edit a feed, navigate to that feed and then press the [Edit] button. The [Feed Nutrient Analysis] dialog box appears as shown below:

The screenshot shows the 'Feed Nutrient Analysis' dialog box with the 'Edit Feed' tab selected. The form is divided into two main sections: a yellow background for general feed information and a green background for nutrient analysis data. At the bottom are 'Cancel' and 'Save' buttons.

Field	Value
Library	0. Standard Library
Feed Number	708
International Feed Number	6-05-555
Feed Name	ZINC sulfate
Feed Group	3. Silage
Feed Type	2. Concentrate
Maximum Voluntary Intake (%)	0
Feed Dry Matter (%)	99
Digestible Energy (Mcal/kg)	0
Metabolizable Energy (Mcal/kg)	0
Net Energy for Maintenance (Mcal/kg)	0
Net Energy for Gain (Mcal/kg)	0
Total Digestible Nutrient (% DM)	0
Crude Protein (% DM)	0
Undegradable Intake Protein (% DM)	0
Degradable Intake Protein (% DM)	0
Non-Protein Nitrogen (% DM)	0
Ether Extract (% DM)	0
Ash (% DM)	0

For description of entries in this screen, please refer to the Feed List section of this manual.

## Add

To add a new feed, press the [ADD] button. The [Feed Nutrient Analysis] dialog box appears. The data entries are like ones described for the Edit operation, described above.

## Delete

All feeds in the standard and infeasible libraries are locked and cannot be deleted. But if you add your own feeds to these libraries, you can delete them because they will not be locked.

## Export to another library

You can export feeds from the standard library to the alternate library and then modify them in the new library. This is one way to populate the alternate library with feeds from the standard library and then modify them to match the local feeds.

## Export to Excel

You can export feed libraries to Excel and inspect them in Excel. The exported files will be store in the “xls” subdirector of the main folder of the at: C:\Program Files (x86)\UCDAVIS\GlobalFARP\xls\

If the export operation is successful, the program displays a message, telling the user where to find the exported Excel file.

The file name for the standard feed library for Cambodia in English is TauStd\_KH\_Eng.xls, The file name for the standard feed library for Cambodia in Khmer is TauStd\_KH\_Khr.xls.

## Structure of feed libraries

Each feed library has 77 columns as listed below:

Column	Internal Name	Display Name	Metric Unit
1	LIB	Library	
2	NAME	Feed Name	
3	NUMBER	Feed Number	
4	PRICE	Feed Price	
5	PRICEUNIT	Feed Price Unit	
6	INTFEEDNO	International Feed Number	
7	TYPE	Feed Type	
8	MVI	Maximum Voluntary Intake	%
9	DM	Feed Dry Matter	%
10	DMBASIS	Dry Matter Basis	%
11	G1	Feed Group	
12	G2	Second Feed Group	
13	G3	Third Feed Group	
14	G4	Fourth Feed Group	
15	MINAMT1	Minimum Amount 1	
16	MINTYPE1	Minimum Type 1	
17	MAXAMT1	Maximum Amount 1	
18	MAXTYPE1	Maximum Type 1	
19	MINAMT2	Minimum Amount 2	
20	MINTYPE2	Minimum Type 2	
21	MAXAMT2	Maximum Amount 2	
22	MAXTYPE2	Maximum Type 2	
23	MINAMT3	Minimum Amount 3	
24	MINTYPE3	Minimum Type 3	
25	MAXAMT3	Maximum Amount 3	
26	MAXTYPE3	Maximum Type 3	
27	AMT_AF	Amount AS FED	kg
28	AMT_DM	Amount DM	kg
29	PCT_AF	Percent AS FED	%

30	PCT_DM	Percent DM	%
31	AMOUNTUNIT	Feed Amount Unit	
32	LOCKED	Locked	
33	DE	Digestible Energy	Mcal/kg
34	ME	Metabolizable Energy	Mcal/kg
35	NEM	Net Energy for Maintenance	Mcal/kg
36	NEG	Net Energy for Gain	Mcal/kg
37	TDN	Total Digestible Nutrient	% DM
38	CP	Crude Protein	% DM
39	UIP	Undegradable Intake Protein	% DM
40	DIP	Degradable Intake Protein	% DM
41	NPN	Non-Protein Nitrogen	% DM
42	EE	Ether Extract	% DM
43	ASH	Ash	% DM
44	CF	Crude Fiber	% DM
45	CELL	Cellulose	% DM
46	ADF	Acid Detergent Fiber	% DM
47	NDF	Neutral Diet Fiber	% DM
48	NCHO	Non Structure Carbohydrate	% DM
49	HC	Hemicellulose	% DM
50	LIGN	Lignin	% DM
51	CA	Calcium	% DM
52	CL	Chlorine	% DM
53	MG	Magnesium	% DM
54	P	Phosphor	% DM
55	K	Potassium	% DM
56	NA	Sodium	% DM
57	S	Sulfur	% DM
58	CO	Cobalt	ppm
59	CU	Copper	ppm
60	I	Iodine	ppm
61	FE	Iron	ppm
62	MN	Magnesium	ppm
63	SE	Selenium	ppm
64	ZN	Zinc	ppm
65	VITA	Vitamin A	k IU/kg
66	VITD	Vitamin D	k IU/kg
67	VITE	Vitamin E	IU/kg
68	ARGI	Arginine	% DM
69	HIST	Histidine	% DM
70	LYSI	Lysine	% DM

71	METH	Methionine	% DM
72	PHEN	Phenylalanine	% DM
73	THRE	Threonine	% DM
74	NUT1	Nutrient 1	% DM
75	NUT2	Nutrient 2	% DM
76	NUT3	Nutrient 3	% DM
77	NUT4	Nutrient 4	% DM

## Feed Groups

The program supports 13 feed groups as listed below:

NAME	NUMBER
01. Dry forage, roughage	1
02. Pasture, range plant	2
03. Silage	3
04. Energy feeds	4
05. Protein supplements	5
06. Mineral supplement	6
07. Vitamin supplements	7
08. Additives	8
09. Energy and protein	9
10. By-products	10
11. Fat and oils	11
12. Molasses	12
13. Real Feeds	13

The program currently does not provide any utility to modify this database, but we are planning to add this capacity in future releases of the software.