

# **PCDAIRY**

**Least Cost and Ration Analysis Programs  
for Dairy Cattle**

**Version Number 2015**

**Regional Software Dissemination Site: USA**

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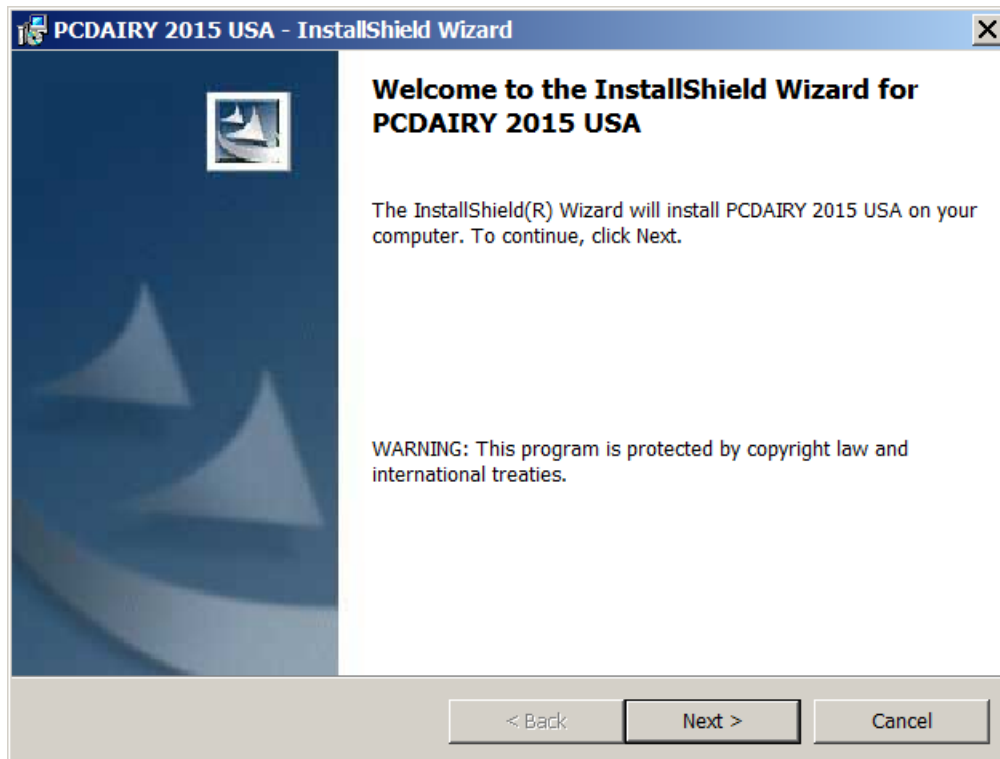
## How to Install?

1. Insert the PCDAIRY CD into the CD-Rom drive.
2. Using your Windows Explore, navigate to the CD and you will see a file called Setup.exe:



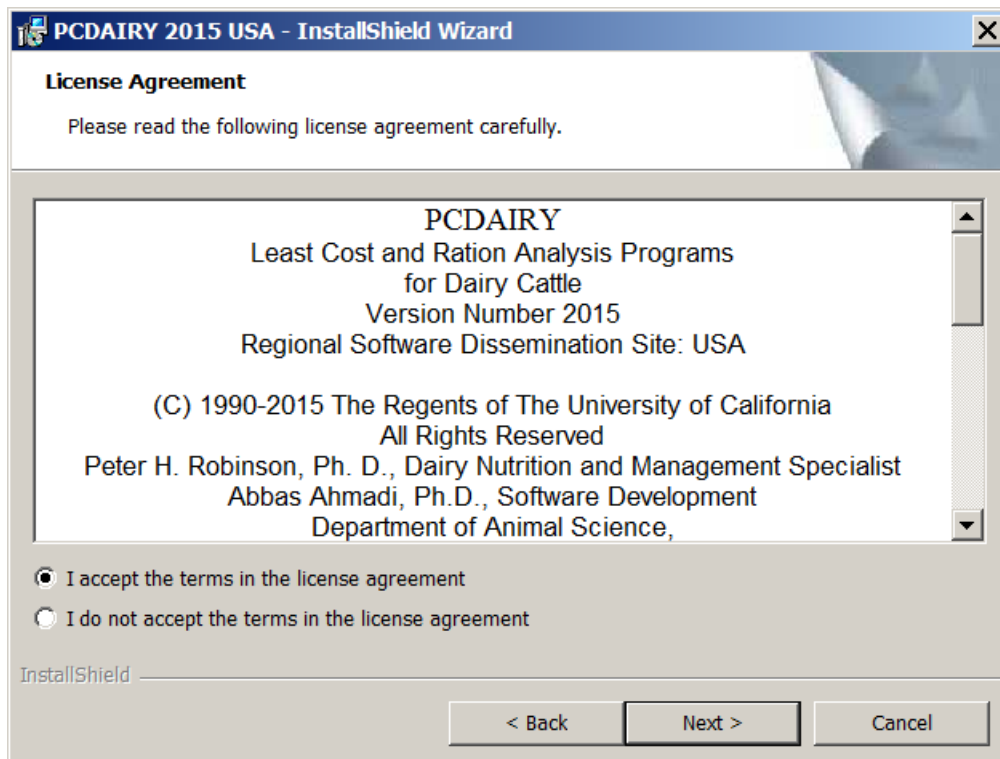
**Setup.exe**

3. Double click Setup.exe. The Welcome dialog box appears:



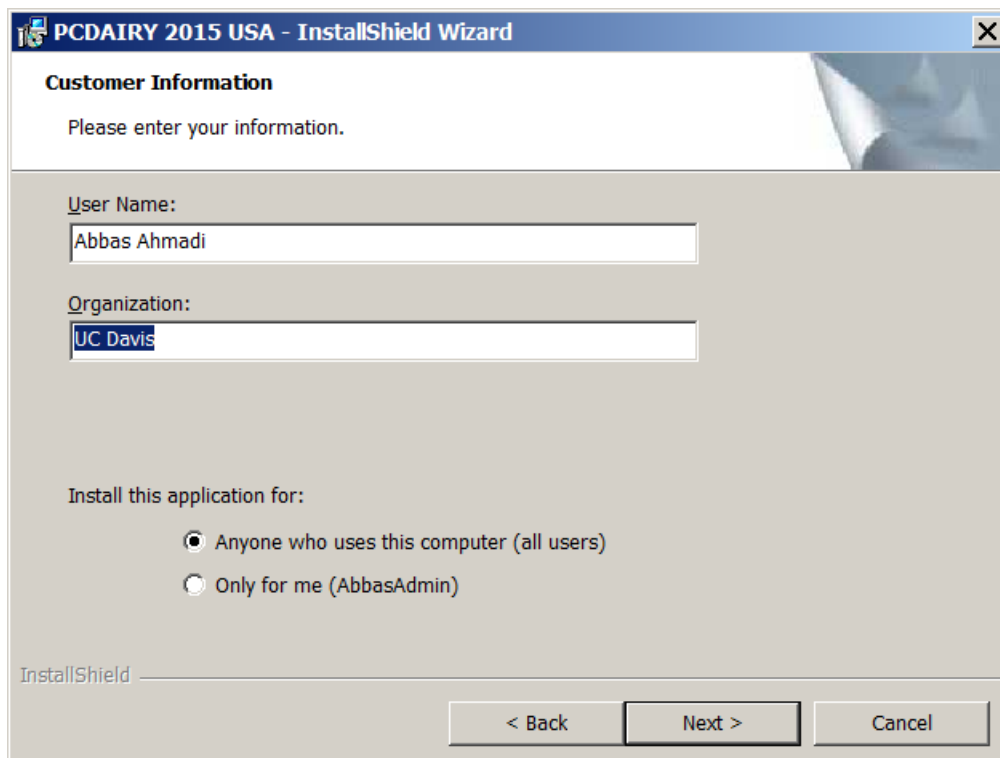
Click the Next button.

4. The License Agreement dialog box appears:



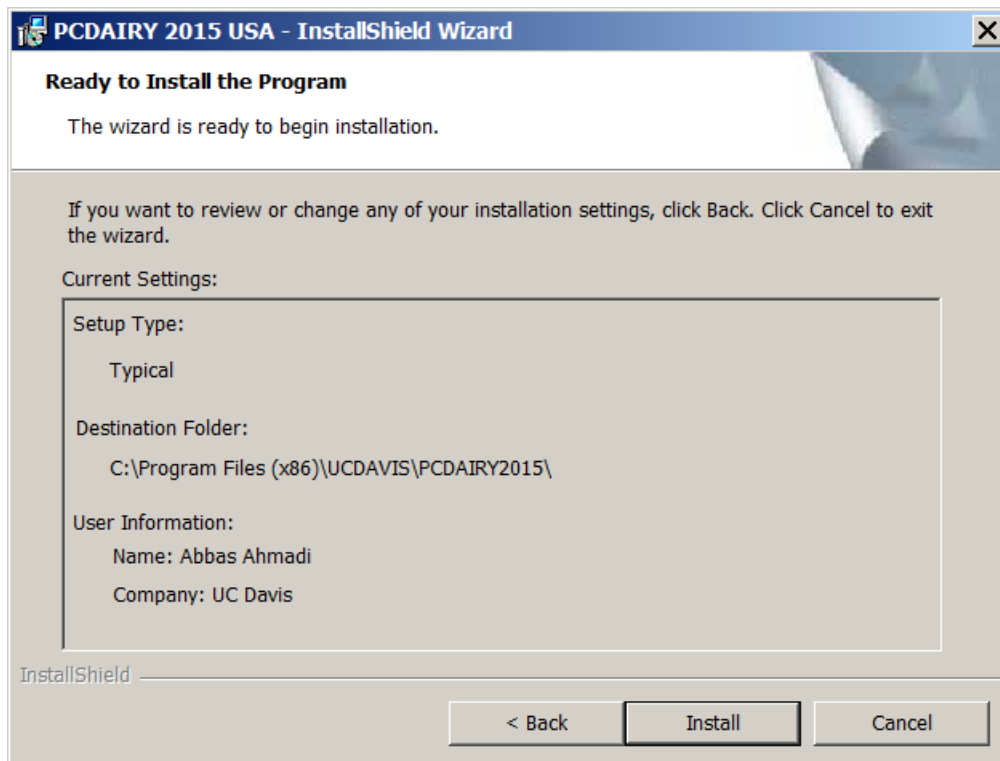
Accept the terms in the license agreement and click the Next button.

5. The Customer Information dialog box appears:



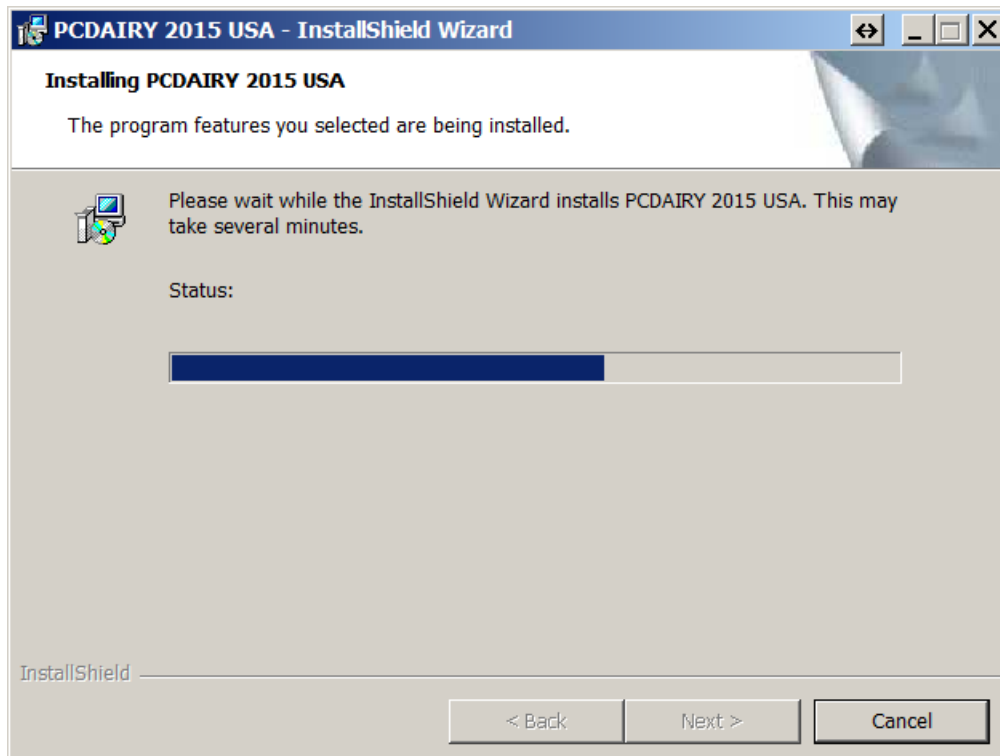
Enter your name and your organization and click the Next button.

6. The "Ready to Install the Program" dialog box appears:

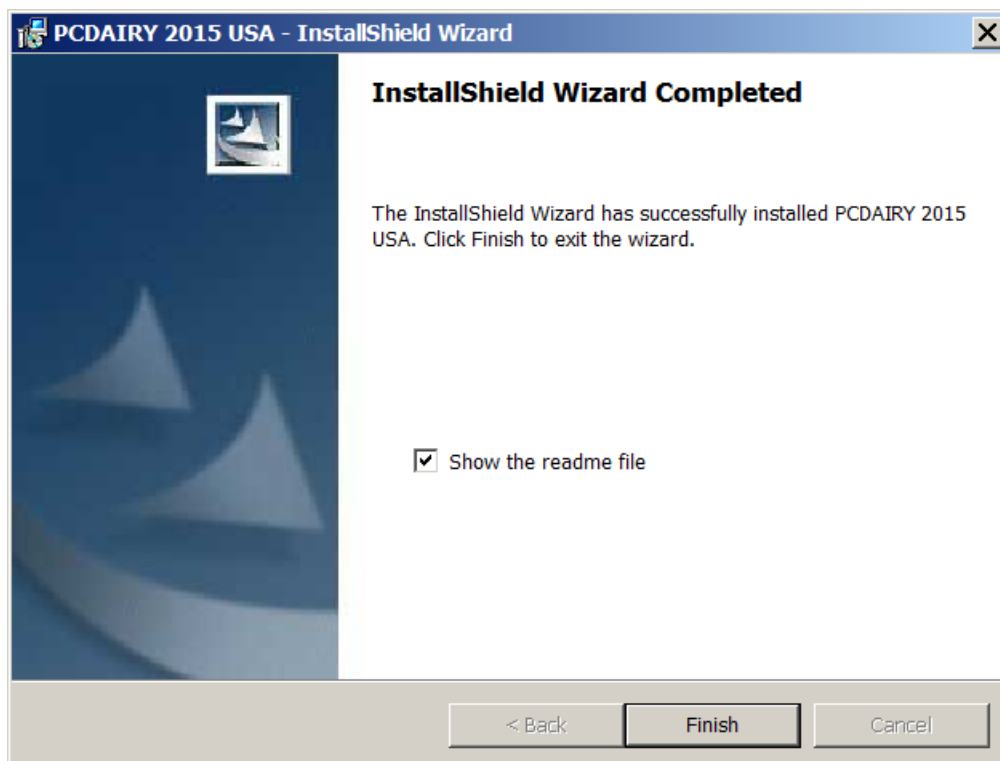


Click the Install button.

7. The wizard will install the PCDAIRY program on your computer. It may take SEVERAL minutes:



8. Finally, the final dialog box appears:



Click the Finish button. The wizard finishes the installation and will place a shortcut to PCDAIRY on your desktop. It also adds the PCDAIRY to your program menu.

9. It will create a folder called "**C:\Program Files\UCDAVIS\PCDAIRY2015\**" and will place the **PCDAIRY.exe** file plus the **demo.pcd** ration file in that folder

---

## ***PCDAIRY folder***

All PCDAIRY files are stored in the following folder:

**C:\Program Files\UCDAVIS\PCDAIRY2015\**

### **Ration Files**

All PCDAIRY ration files have the .PCD extension and are stored, by default, in the above folder.

### **Feed Library Files**

There are four feed library files: (1) COWFEEDS.DBF, standard feed library; (2) COWALT.DBF, alternate feed library; (3) GRPCOW.DBF, feed group library; (4) COWINFEA.DBF, infeasible feed library. These files are stored in the **C:\Program Files\UCDAVIS\PCDAIRY2015\** folder.

### ***PCDAIRY Manual***

The PCDAIRY manual, Manual.pdf, is stored in the PCDAIRY folder. To view and print this file, you need Adobe Acrobat Reader. You can get a free copy of this software by visiting the following web site:

<http://www.adobe.com/products/acrobat/readstep2.html>

The PCDAIRY order form, OrderForm.pdf, is also in the same folder.

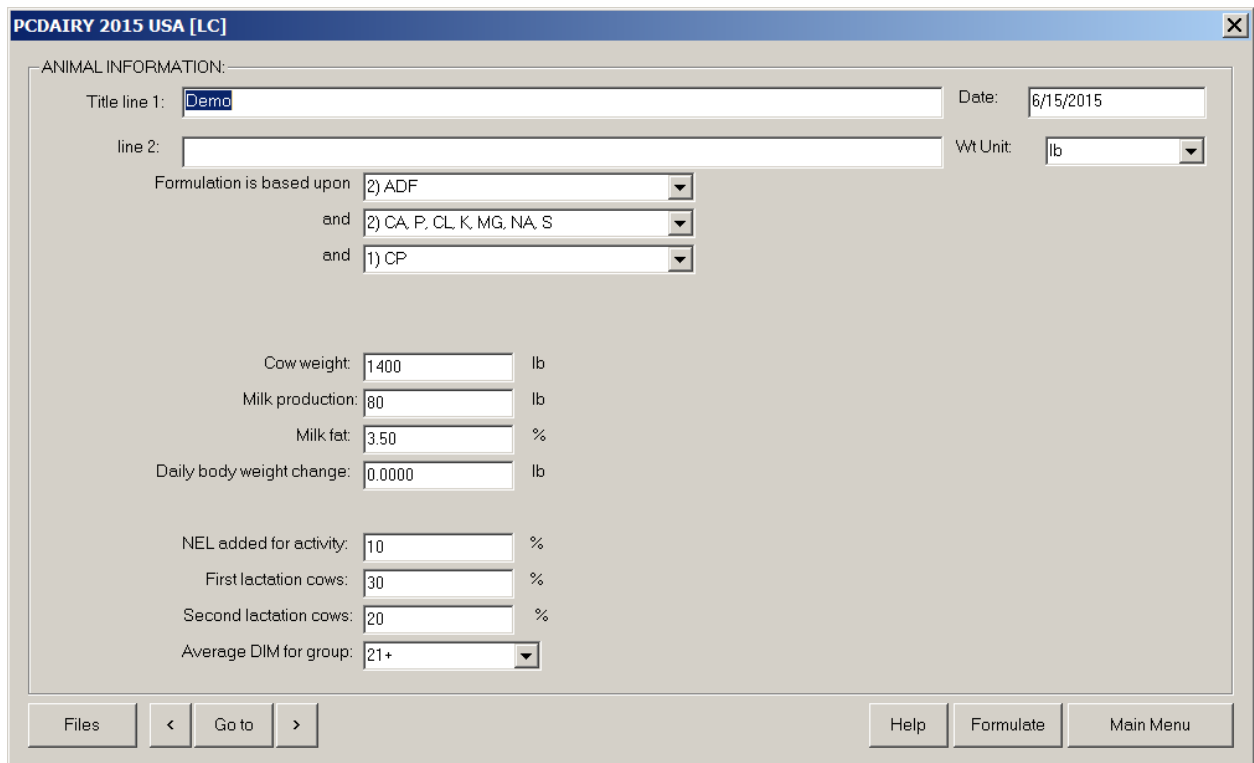
## How to Run?

1. Click the Start button and then choose the "All Programs". A menu list appears.
2. Choose the "UCDAVIS" option. A sub-menu appears.
3. Choose the "PCDAIRY2015" option. Another sub-menu appears. Choose the "Launch PCDAIRY 2015 USA" option. The sign-on banner of PCDAIRY appears. Click the OK button. The main menu of PCDAIRY appears:



Choose the "Least Cost Ration: Growing or Finishing Cattle" option. The Animal Information dialog box appears:

4. Animal Information dialog box:



The dialog box is titled "PCDAIRY 2015 USA [LC]" and contains the following fields and controls:

- ANIMAL INFORMATION:**
  - Title line 1:  Date:
  - line 2:
  - Wt Unit:
  - Formulation is based upon:
    - 2) ADF
    - and 2) CA, P, CL, K, MG, NA, S
    - and 1) CP
  - Cow weight:  lb
  - Milk production:  lb
  - Milk fat:  %
  - Daily body weight change:  lb
  - NEL added for activity:  %
  - First lactation cows:  %
  - Second lactation cows:  %
  - Average DIM for group:

At the bottom, there are buttons: Files, <, Go to, >, Help, Formulate, and Main Menu.

From the "Files" menu, choose the "Open" option. Navigate to C:\Program Files\UCDAVIS\PCDAIRY2015\ folder. Open the Demo.Pcd ration file.

Click the [>] (Next Button). The Nutrient Constraints dialog box appears.



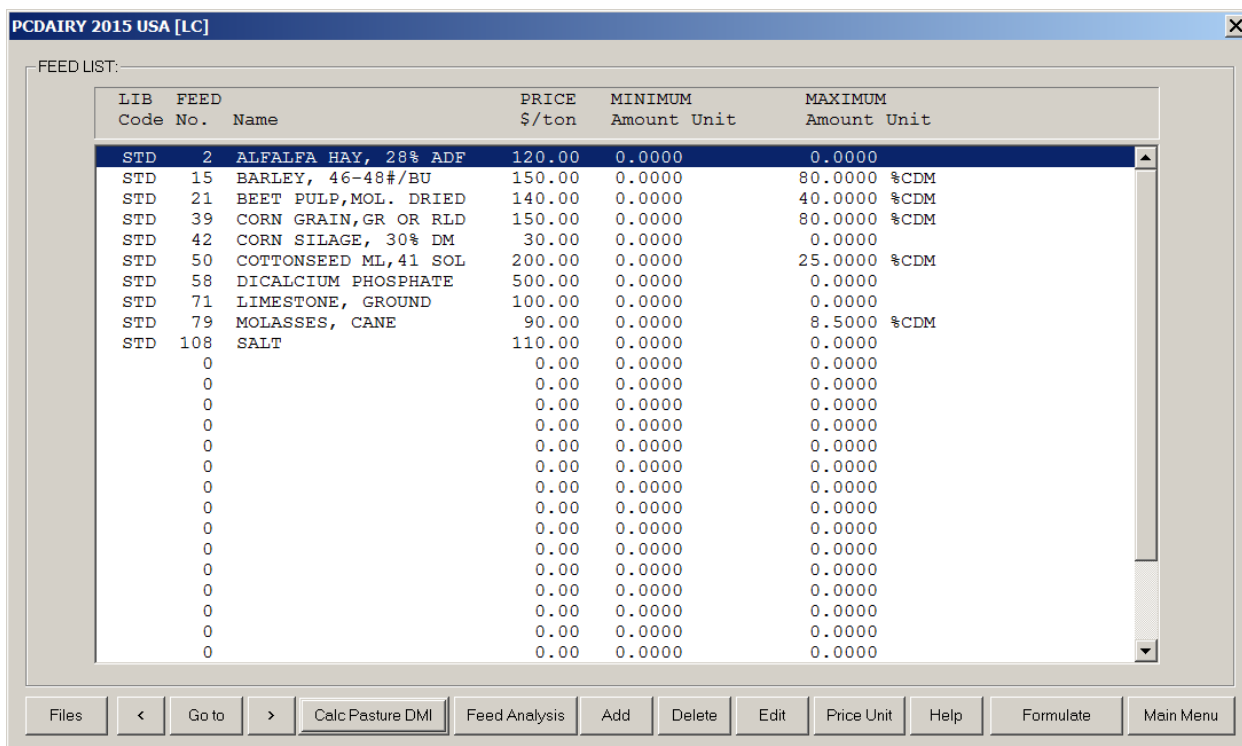
5. The Nutrient Constraints dialog box:

No	Code	Name	MIN Amount Unit	MAX Amount Unit
1	DM	Dry Matter	35.000 %	0.000
2	NEL	Net Energy for Lact	36.985 Mcal	0.000
3	CP	Crude Protein	16.000 %	0.000
4	CP	Crude Protein	7.727 lb	0.000
5	ADF	Acid Detergent Fiber	21.000 %	0.000
6	CA	Calcium	0.600 %	0.000
7	CA	Calcium	0.299 lb	0.000
8	CL	Chlorine	0.250 %	0.000
9	K	Potassium	0.900 %	0.000
10	MG	Magnesium	0.200 %	0.000
11	NA	Sodium	0.180 %	0.000
12	P	Phosphorus	0.380 %	0.000
13	P	Phosphorus	0.190 lb	0.000
14	S	Sulfur	0.200 %	0.000
15	FAT	Crude Fat	0.000	8.000 %
16	NPN	Nonprotein Nitrogen	0.000	0.500 %
17			0.000	0.000
18			0.000	0.000
19			0.000	0.000
20			0.000	0.000
21			0.000	0.000
22			0.000	0.000
23			0.000	0.000
24			0.000	0.000

Here you can click the "ReCalc" button to populate this dialog box with a set of default constraints. You can add, delete or modify any or all of these constraints.

After you are done. Click the Next button. The Feed List Dialog box appears.

6. The Feed List dialog box:



You can add, edit, or delete feeds. You can specify feed price and assign a min or max amount on a feed. You can also edit the nutrient analysis of a feed. These changes remain local to this ration file and will not reflect back to feed libraries. After you are done, click the Next button. The Group Constraints dialog box appears.

7. The Group Constraints dialog box:

**PCDAIRY 2015 USA [LC]**

FEED GROUP LIST:

GROUP No	Name	MINIMUM		MAXIMUM	
		Amount	Unit	Amount	Unit
-2	ROUGHAGES	18.9000	LBDM	0.0000	
-1	CONCENTRATES	0.0000		0.0000	
3	BARLEY PRODUCTS	0.0000		80.0000	%CDM
8	CORN PRODUCTS	0.0000		80.0000	%CDM
10	COTTONSEED MEAL PROD	0.0000		25.0000	%CDM
28	SUPPLEMENT CONCENT	0.0000		0.0000	
30	REAL FEEDS	0.0000		0.0000	
0		0.0000		0.0000	
0		0.0000		0.0000	
0		0.0000		0.0000	
0		0.0000		0.0000	
0		0.0000		0.0000	
0		0.0000		0.0000	
0		0.0000		0.0000	
0		0.0000		0.0000	
0		0.0000		0.0000	
0		0.0000		0.0000	
0		0.0000		0.0000	
0		0.0000		0.0000	
0		0.0000		0.0000	
0		0.0000		0.0000	
0		0.0000		0.0000	
0		0.0000		0.0000	
0		0.0000		0.0000	
0		0.0000		0.0000	

Files < Go to > Add Edit Delete Show Feeds Help Formulate Main Menu

you can specify a min or max for feed groups. When you are done, click the next button. The Ratio Constraints dialog box appears. .

8. The Ratio Constraints dialog box:

[illegible]

You can specify a min or max to the ratio of any two nutrients, or any two feeds, or any two feed groups.

When you are done click the Formulate button. The program will enter the formulation mode and will formulate the ration and will show the output dialog box.

## 9. The Output Screen

PCDAIRY 2015 USA [LC]

OUTPUT

California Dairy Cattle Ranch  
One Shields Avenue, Davis, CA 95616  
Phone: (530) 752-1278 FAX: (530) 752-0175 http://animalscience.ucdavis.edu

R A T I O N   C O M P O S I T I O N							
ROUGHAGES AND CONCENTRATES							
ROUGHAGES in the ration	AS FED BASIS:		DRY MATTER BASIS:		---Constraints---		
	lb/day	%	lb/day	%	As fed -lb/day-	100% DM -%Rough-	
					min	max	min max
CORN SILAGE, 30% DM	44.424	83.657	13.327	63.049			
ALFALFA HAY, 28% ADF	8.679	16.343	7.811	36.951			
Group total.....	53.103		21.138				

CONCENTRATES in the ration	AS FED BASIS:		DRY MATTER BASIS:		---Constraints---		
	lb/day	%	lb/day	%	As fed -lb/day-	100% DM -%Conc.-	
					min	max	min max
BEEF PULP, MOL. DRIED	11.920	37.563	10.966	38.917			40.0
BARLEY, 46-48#/BU	10.425	32.852	9.174	32.557			80.0
COTTONSEED ML, 41 SOL	6.096	19.211	5.547	19.687			25.0
MOLASSES, CANE	3.194	10.064	2.395	8.500			8.5
DICALCIUM PHOSPHATE	0.094	0.295	0.091	0.322			
SALT	0.005	0.015	0.005	0.017			
Group total.....	31.732		28.178				

Files < Goto > Combine DM Basis Feed Group Help Input Main Menu

By clicking the "Go to" button you can view the following screens:

OUTPUT: GO TO

Choose an option and then click the OK button:

Go to:

- Concentrates/Roughages, Methane Emission
- Ration Composition
- Price Ranges / Feeds Not Used
- Nutrient Analysis
- Energy & Protein Analysis of Feeds
- Vitamin & Proximate Analysis of Feeds
- Major Mineral Analysis of Feeds
- Trace Mineral Analysis of Feeds
- User Nutrient Analysis of Feeds

Cancel OK

You can also view the results for all feeds or for a specific feed group on 100% DM basis or on AS Fed basis.

You can also print the out put or go back to the input screens and modify some entries and re-formulate the ration.

## CONFIGURATION AND CUSTOMIZATION

This program has two configuration files:

1. COMPANY.CFG To configure the heading for all printouts.
2. TAUSERSETUP.CFG To configure user-defined nutrients.

WARNING WARNING WARNING WARNING WARNING WARNING WARNING WARNING!!!

Please copy these files in another folder, such as C:\BACKUP\ as backup. This is very important. Because if you mess up any of these configuration files, you will be able to restore them by copying the configuration files from the backup folder onto the main folder for this application.

DO NOT EDIT ANY OF THESE CONFIGURATION FILES WITHOUT MAKING BACKUPS!!!!!!

## 1. COMPANY.CFG

This file is used to configure the heading for all printouts.  
This is a text file. It is located in the main folder for this application.  
Do not use Microsoft Word to open this file. Use Notepad program to edit it.  
This file has originally the following content:

California Beef Cattle Ranch  
One Shields Avenue, Davis, CA 95616  
Phone: (530) 752-1278 FAX: (530) 752-0175 <http://animalscience.ucdavis.edu>

This file has exactly four lines. Each line has exactly 78 characters. The first line shows the name of your company. The second line shows your address. The third line shows your phone, fax, email, and web address. The fourth line must be blank to keep a blank line between the heading and the body of printouts. Use space bar to center the text. Do not use tab.

You must re-start the program for your modification to take effect.

## 2. PCDSETUP.CFG

This file is used to configure user-defined nutrients.  
This is a text file. It is located in the main folder for this application.  
Do not use Microsoft Word to open this file. Use Notepad program to edit it.  
This file has originally the following content:

```

|*COMMENTS
|The NUTIENTS section has four columns: NO, CODE, NAME, and CLASS:
|
|NO      - Maximum width of this column is two digits. Do not change these
|          numbers: 43, 44, 45, and 46.
|CODE    - Maximum width of this field is four characters. User upper case
|          letters. Enter an abbreviation for your nutrient, for example
|          IRON or PROT
|NAME    - Maximum width of this column is 12 characters. Enter a description
|          for your nutrient.
|CLASS   - Maximum width of this column is one digit. Enter a number between
|          1 and 5 in this field to specify the unit for your nutrient. The
|          class of a nutrient can be one of the following:
|              1 = {%}
|              2 = {Mcal/lb or Mcal/kg}
|              3 = {IU/lb or IU/kg }
|              4 = {ppm}
|              5 = {Unit/lb or Unit/kg}
|              6 = {k IU/lb or k IU/kg}
|There should be a comma between columns and all values must be aligned.

```

```

|
|The PAGE EHEADING section has a single line. The maximum width of page
|heading is 31 characters. Enter a description for your user-defined
|nutrients.
|
|*NUTRIENTS
|NO CODE NAME          CLASS
|==,====,=====,=
|33,NUT1,User Nut 1  ,1
|34,NUT2,User Nut 2  ,1
|35,NUT3,User NUT 3  ,1
|36,NUT4,User NUT 4  ,1
|37,NUT5,User NUT 5  ,1
|
|*PAGE HEADING
|User-defined Nutrients
+-----+

```

This file has three sections: COMMENTS, NUTRIENTS, and PAGE HEADING. The Comments section shows how to modify the other two sections.

You must re-start the program for your modification to take effect.

## **PRINTOUTS**

The program creates various text files for printouts. Although these are not used in configuration or customization of the program, but you can open them in your text editor and reformat and print them as you wish. These files will be constantly overwritten by the program, so save them under different names to keep them from being overwritten by the program.

You can use a text editor, such as notepad or Microsoft word to open these text files. Please, Use "Courier New" font to keep the spacing and alignment. Do not use "Times New Roman" or "Arial" or any other font.

### Printout for Ration Formulation and Devaluation

-----  
Each time you print the formulation or evaluation of a ration, the program creates a text file which contains the same information as in the printout. This text file is called PRINTOUT.TXT and is located in the main folder of the application.

### Printout for Loading and Unloading

-----  
Each time you run the delivery module and print the output, the program creates a series of text files, which contain the same information as the printouts. These files are located in the main folder of the application.

HEADT.LST - This contains the loading or unloading heading.  
BODY.LST - This contains the loading or unloading printout



## ANIMAL INFORMATION SCREEN

PCDAIRY 2015 USA [LC]

ANIMAL INFORMATION:

Title line 1:  Date:

line 2:

Formulation is based upon  and  and

Cow weight:  lb

Milk production:  lb

Milk fat:  %

Daily body weight change:  lb

NEL added for activity:  %

First lactation cows:  %

Second lactation cows:  %

Average DIM for group:

Files < Go to > Help Formulate Main Menu

### NAVIGATION

[Files] Create, open, or save ration.  
 [<] Previous screen.  
 [Goto] Jump to another input section.  
 [>] Next screen.  
 [Help] Display help message.  
 [Formulate] Formulate ration.  
 [Evaluate] Evaluate ration.  
 [Main Menu] Exit and return to main menu

This is a general help message for the animal information screen in the following modules:

MAXIMIZE Profit...Maximizing Dairy Ration  
 LC.....Least Cost Ration for Lactating/Dry Cow  
 GROWING.....Least Cost Ration for Growing Animals  
 ANLSIS\_L.....Ration Analysis for Lactating/Dry Cow  
 ANLSIS\_G.....Ration Analysis for Growing Animals

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.

### RATION TITLE

Enter a name and/or address or other identification for your ration on these two lines. The title will be displayed at the top of all printed output for this ration.

### UNIT OF MEASURE

You may choose to enter data using either the English or the metric system.

Enter lb to display all input and output in English units.  
Enter kg to display all input and output in metric units.

The program will automatically convert any data already entered  
to the unit selected.

#### 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:

Effective Crude Fiber(ECF) OR  
Acid Detergent Fiber(ADF) OR  
Neutral Detergent Fiber(NDF) OR  
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:

Crude Protein CP) OR  
Undegradable and Degradable Intake Protein (UIP and DIP) OR  
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:

Net Energy for Maintenance and for Gain (NEM and NEG)OR  
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.

#### PRODUCTION CURVE MAXIMUM

-----  
Press Escape key, then press F2 key for the list of available choices. Select the desired Production Curve Maximum by moving the cursor to it and then press the Enter key.

Milk production is 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.

#### MILK BLEND PRICE

-----  
Enter the current milk blend price in dollars per hundred weight, or dollars per kg (range: \$1.00 to \$100.00 per 100 lb, or \$0.0221 to \$2.2050 per kg).

#### 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)

-----

Press Escape key, then press F2 key for a list of available choices.

For Dry Cows, DIM = 0.

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.

Large breed females (range: 200 to 1300 lb, or 100 to 600 kg)

Small breed females (range: 200 to 1000 lb, or 100 to 450 kg)

Large breed males (range: 200 to 1800 lb, or 100 to 800 kg)

Small breed males (range: 200 to 1300 lb, or 100 to 600 kg)

#### DAILY GAIN

-----

Enter the desired average gain per animal per day.

Large breed females (range: 1.3 to 1.7 lb/day, or 0.6 to 0.8 kg/day)

Small breed females (range: 0.9 to 1.3 lb/day, or 0.4 to 0.6 kg/day)

Large breed males (range: 1.8 to 2.2 lb/day, or 0.8 to 1.0 kg/day)

Small breed males (range: 1.1 to 1.5 lb/day, or 0.5 to 0.7 kg/day)

## NUTRIENT CONSTRAINTS LIST

PCDAIRY 2015 USA [LC]

NUTRIENT CONSTRAINTS:

No	Code	Name	MIN Amount Unit	MAX Amount Unit
1	DM	Dry Matter	35.000 %	0.000
2	NEL	Net Energy for Lact	36.985 Mcal	0.000
3	CP	Crude Protein	16.000 %	0.000
4	CP	Crude Protein	7.727 lb	0.000
5	ADF	Acid Detergent Fiber	21.000 %	0.000
6	CA	Calcium	0.600 %	0.000
7	CA	Calcium	0.299 lb	0.000
8	CL	Chlorine	0.250 %	0.000
9	K	Potassium	0.900 %	0.000
10	MG	Magnesium	0.200 %	0.000
11	NA	Sodium	0.180 %	0.000
12	P	Phosphorus	0.380 %	0.000
13	P	Phosphorus	0.190 lb	0.000
14	S	Sulfur	0.200 %	0.000
15	FAT	Crude Fat	0.000	8.000 %
16	NPN	Nonprotein Nitrogen	0.000	0.500 %
17			0.000	0.000
18			0.000	0.000
19			0.000	0.000
20			0.000	0.000
21			0.000	0.000
22			0.000	0.000
23			0.000	0.000
24			0.000	0.000

Files < Go to > Add Edit Delete ReCalc Help Formulate Main Menu

### NAVIGATION

[Files]	Create, open, or save ration.
[<]	Previous screen.
[Goto]	Jump to another input section.
[>]	Next screen.
[Add]	Add new constraint.
[Edit]	Edit existing constraint.
[Dbl Click]	Double click on a row in the list box invokes Edit button.
[Delete]	Delete existing constraint.
[Help]	Display help message.
[ReCalc]	Recalculate NRC requirements.
[Formulate]	Formulate ration.
[Main Menu]	Exit and return to main menu

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 follows:

To ADD a constraint: Move your cursor to a blank line and 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 [ReCalc] button. This will replace all nutrient constraints which you may have changed previously. Alternatively, any change in the Animal

Information screen, such as changing the animal weight, will have the same effect as clicking the [ReCalc] button.

#### CODE

-----

This column contains the nutrient codes.

#### NAME

-----

This column contains the nutrient names.

The following is a list of nutrients and their abbreviations:

ADF	Acid Detergent Fiber
ASH	Ash
CA	Calcium
CL	Chlorine
CO	Cobalt
CU	Copper
FAT	Crude Fat
CF	Crude Fiber
CP	Crude Protein
DIP	Degrad Intake Prot
DM	Dry Matter
ECF	Eff Crude Fiber
I	Iodine
FE	Iron
MG	Magnesium
MN	Manganese
NDF	Neutral Det Fiber
NEG	Net Energy for Gain
NEM	Net Energy for Maint
NPN	Nonprotein Nitrogen
P	Phosphorus
K	Potassium
SE	Selenium
NA	Sodium
S	Sulfur
TDN	Total Digestible Nut
UIP	Undegrad Intake Prot
VITA	Vitamin A
VITD	Vitamin D
VITE	Vitamin E
ZN	Zinc
NUT1	1st User Nut
NUT2	2nd User Nut
NUT3	3rd User Nut
NUT4	4th User Nut
NUT5	5th User Nut

#### MINIMUM

-----

This column contains the minimum amount of the selected nutrient that will be included in the ration. It also displays the type of minimum constraint.

#### MAXIMUM

-----

This column contains the maximum amount of the selected nutrient that will be included in the ration. It also displays the type of maximum constraint.

### FEED LIST (FORMULATION MODULES)

[illegible]

## NAVIGATION

[Files]	Create, open, or save ration.
[<]	Previous screen.
[Goto]	Jump to another input section.
[>]	Next screen.
[Calc Pasture DMI]	calculates pasture dry matter intake.
[Feed Analysis]	View or edit nutrient analysis of feed.
[Add]	Add new feed.
[Edit]	Edit existing feed.
[Dbl Click]	Double click on a row in the list box invokes Edit button.
[Delete]	Delete existing feed.
[Price Unit]	Select the feed price unit.
[Help]	Display help message.
[Formulate]	Formulate ration.
[Main Menu]	Exit and return to main menu

## ADDING FEED

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.

When you add a new feed, make sure to set its fourth feed group to 13, which specifies the real feeds. This is useful in the output section for viewing only the real feeds and excluding all the infeasible feeds.

## LIBRARY CODE

-----

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 as well as the amounts as fed per day.

To ADD a feed to the list: use the arrow keys to move to a blank line in the table. Then press the <Add> button.

Feed library codes are as follows:

- STD - the information for this feed is stored in the standard library of feeds supplied by the program.
- ALT - the feed information is contained in an alternate feed library which has been created or modified by you, the program user.
- NEW - the feed information is not contained in any existing feed library. You must enter into the program the entire nutrient analysis for a new feed, since the information is not stored anywhere else.

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.

#### FEED NUMBER

-----

Each feed in the standard and alternate feed libraries has a unique number assigned to it. If you are entering information for a new feed, you may assign it any number you wish. If you are selecting a feed from one of the existing feed libraries and you do not know its corresponding number, press the arrow in the choice list to get a list of all feed numbers and names in the selected library. You can then use the arrow keys to move to the feed that you want.

#### FEED NAME

-----

Enter a descriptive name for the feed.

#### FEED PRICE

-----

Enter the cost of this feed in the units specified:

dollars per ton:	English ton	( = 2000 lb),	OR
cwt:	hundred weight	( = 100 lb),	OR
met ton:	metric ton	( = 1000 kg),	OR
kg:	kilogram		

If you wish to enter the feed price in a unit different from the one specified, press the <Price Unit> button. After you select the desired price unit, the program will automatically convert any data already entered to the unit selected.

#### 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. After you enter the desired amount, the program will ask you to identify the type of constraint (i.e. percent, lbs) by displaying a menu of choices. Use the arrow keys to move to the desired constraint type, and then press <Enter>.

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

#### MINIMUM UNIT

-----



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

#### MAXIMUM AMOUNT

-----

You can limit the amount of a feed in the ration by entering a maximum constraint on that feed. After you enter the desired amount, the program will ask you to identify the type of constraint (i.e. percent, lbs) by displaying a menu of choices. Use the arrow keys to move to the desired constraint type, and then press <Enter>.

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.

#### MAXIMUM UNIT

-----

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

#### FEED ANALYSIS

-----

If you wish to view or edit the nutrient analysis for a particular feed, press the <Feed Analysis> button. The program will then display the entire nutrient analysis for the feed.

If you are entering information for a NEW feed, you must fill in the entire nutrient analysis, since the information for a new feed is not already stored in one of the feed libraries.

All changes are local to this particular ration data file and does not change the nutrient analysis of that particular feed in the standard or alternate feed libraries.

#### INTERNATIONAL FEED NUMBER

-----

This field is optional. Common feed stuffs 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

#### 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.

#### MVI FACTOR

-----

Each roughage feed has a corresponding maximum voluntary intake (MVI)

factor (range: 1.0 to 1.4: excellent quality = 1.0, 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

-----

This field allows you to choose the dry matter basis to use for editing the nutrient analysis of the feed. 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, enter the dry matter percentage used for the analysis and corresponding nutrient data, and the program will convert everything to 100% dry matter internally.

If you wish to enter data on an "as fed" basis, enter 0, and the program will insert the correct basis, as fed.

## PASTURE

**GRAZING: PCDAIRY 2015 USA [LC] DEMO.PCD** [X]

Calculate Pasture Dry Matter Intake

Group Name:

Pasture Data

Pasture Type:

Pasture Quality:

Pasture Mass:  lb DM/acre

Herd Data

Number of Cows in Group:  cows

Paddock Size for Group of Cows:  acre

Total Daily Herbage Allowance:  lb DM/cow/day

Morning Grazing Session:  hours/day

Afternoon Grazing Session:  hours/day

Supplemental Concentrate:  lb DM/cow/day

Supplemental Forage:  lb DM/cow/day

Weather Data

Morning Session Temperature:  °F Morning Session Humidity:  %

Afternoon Session Temperature:  °F Afternoon Session Humidity:  %

Pasture Dry Matter Intake:  lb DM/cow/day

Enter this Dry Matter Intake as the upper limit constraint for the pasture in your feed list.

## PASTURE

### NAVIGATION

[Help] Displays help message.  
 [Defaults] Sets all fields to default values.  
 [Calculate Maximum Pasture Dry Matter Intake]  
 [Close] Closes the dialog box and returns to previous screen.

### GROUP NAME

Specify a name for the group of cows. The default value is [High Producing Cows]

### PASTURE TYPE

Specify a type for your pasture. The valid options are:

1. Grass Based Pasture
2. Mixed Grass-Legume Based Pasture
3. Legume Based Pasture

The default value is Grass Based Pasture.

#### PASTURE QUALITY

-----

Select a quality for your pasture. The valid options are:

1. High Quality Pasture
2. Medium Quality Pasture
3. Low Quality Pasture

The default value is Medium Quality Pasture.

#### PASTURE MASS

-----

Pasture mass is the amount of above ground dry matter (DM) present in a pasture and is expressed in kg DM/hectare or lb DM/acre.

Pasture mass can be estimated by visual observations, or by cutting and drying quadrates which are representative of the pasture to be grazed. Calibrations for pasture mass are generally measured by cutting quadrates to ground level. While cows cannot harvest pasture to such a low height, cutting to ground level provides a standard reference point for all pasture sampling.

Knowing pasture mass allows you to determine pasture allowance, the amount of pasture DM offered to each cow each day (kg DM/cow/day), which is a key determinant of pasture intake.

The default value is 2,000 kg DM/hectare or about 1,785 lb DM/acre.

#### NUMBER OF COWS IN GROUP

-----

Specify the number of cows in the group. The default value is 100 cows.

#### Paddock Size

-----

A paddock is a fenced area used for grazing cows. Specify the paddock size for the group of cows. The default value is 1 hectare or about 2.5 acre.

#### GRAZING SESSIONS

-----

Grazing usually takes place during two daily sessions: Morning grazing session and afternoon grazing session. The default value for the morning grazing session is 6 hours and the default value for the afternoon grazing session is 8 hours. The total hours of both sessions can not exceed 24 hours.

#### SUPPLEMENTS

-----

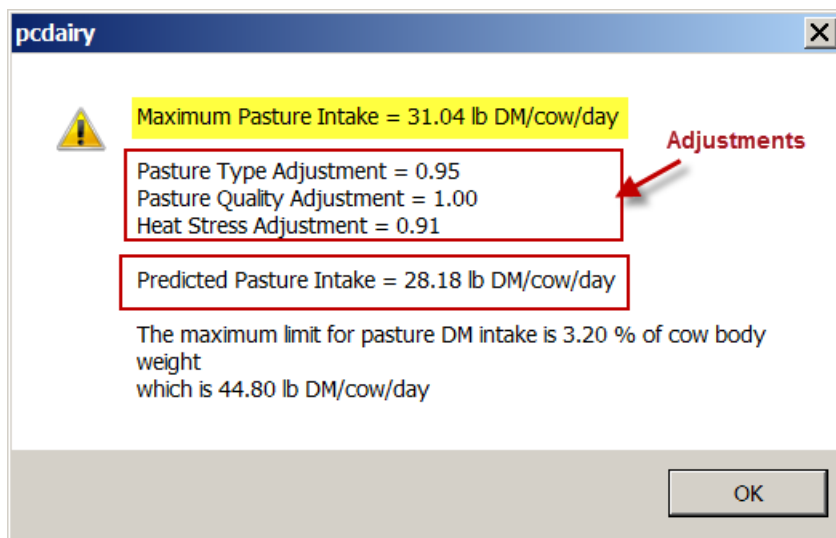
Specify the amount of concentrate and forage supplements. The default value for concentrate supplement is 2 kg DM/cow/day or 4.4 lb DM/cow/day. The default value for forage supplement is 3 kg DM/cow/day or 6.7 lb DM/cow/day.

#### WEATHER DATA

-----

The weather data is used to adjust the dry matter intake by heat stress. The default value for maximum daily temperature is 25 oC or 77 oF. The default value for minimum daily temperature is 10 oC or 50 oF. The default value for humidity at max daily temperature is 60%. The default value for humidity at min daily temperature is 80%.

## CALCULATE MAXIMUM PASTURE DRY MATTER INTAKE



When you click this button. A dialog box appears showing the following values:

Maximum Pasture Intake  
 Pasture Type Adjustment  
 Pasture Quality Adjustments  
 Heat Stress Adjustment  
 Predicted Pasture Intake, which is calculated by multiplying the Maximum Pasture Intake by the three adjustments for pasture type, pasture Quality, and heat stress.  
 Maximum pasture dry matter intake, expressed as kg or lb DM/cow/day.  
 The maximum pasture dry matter intake cannot exceed 3% of cow body weight. For example, for a cow with body weight of 635 kg, the limit is about 19 kg DM/cow/day.

The user then adds this pasture feed to the feed list and sets its minimum and maximum amount to the predicated pasture intake.

The standard feed library has nine pasture feeds as follows:

Feed Number	Feed Name
140	LEGUME PASTURE HIGH
141	LEGUME PASTURE MID
142	LEGUME PASTURE LOW
143	MIXED PASTURE HIGH
144	MIXED PASTURE HIGH
145	MIXED PASTURE HIGH
146	GRASS PASTURE HIGH
147	GRASS PASTURE HIGH
148	GRASS PASTURE HIGH

You can modify the nutrient composition of these pasture feeds or add your Own pasture feed to the standard feed library.

## FEED LIST (ANALYSIS MODULES)

[illegible]

## NAVIGATION

[Files]	Create, open, or save ration.
[<]	Previous screen.
[Goto]	Jump to another input section.
[>]	Next screen.
[Feed Unit]	Select feed unit.
[Feed Analysis]	View or edit nutrient analysis of feed.
[Add]	Add new feed.
[Edit]	Edit existing feed.
[Dbl Click]	Double click on a row in the list box invokes Edit button.
[Delete]	Delete existing feed.
[Price Unit]	Select the feed price unit.
[Help]	Display help message.
[Evaluate]	Evaluate ration.
[Main Menu]	Exit and return to main menu

## ADDING FEED

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.

When you add a new feed, make sure to set its fourth feed group to 13, which specifies the real feeds. This is useful in the output section for viewing only the real feeds and excluding all the infeasible feeds.

## LIBRARY CODE

-----

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 as well as the amounts as fed per day.

To ADD a feed to the list: use the arrow keys to move to a blank line in the table. Then press the <Add> button.

Feed library codes are as follows:

- STD - the information for this feed is stored in the standard library of feeds supplied by the program.
- ALT - the feed information is contained in an alternate feed library which has been created or modified by you, the program user.
- NEW - the feed information is not contained in any existing feed library. You must enter into the program the entire nutrient analysis for a new feed, since the information is not stored anywhere else.

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.

## FEED NUMBER

-----

Each feed in the standard and alternate feed libraries has a unique number assigned to it. If you are entering information for a new feed, you may assign it any number you wish. If you are selecting a feed from one of the existing feed libraries and you do not know its corresponding number, press the arrow in the choice list to get a list of all feed numbers and names in the selected library. You can then use the arrow keys to move to the feed that you want.

## FEED NAME

-----

Enter a descriptive name for the feed.

## FEED PRICE

-----

Enter the cost of this feed in the units specified:

dollars per ton:	English ton	( = 2000 lb),	OR
cwt:	hundred weight	( = 100 lb),	OR
met ton:	metric ton	( = 1000 kg),	OR
kg:	kilogram		

If you wish to enter the feed price in a unit different from the one specified, press the <Price Unit> button. After you select the desired price unit, the program will automatically convert any data already entered to the unit selected.

## PERCENT IN RATION (as fed basis)

-----

You can edit the actual percentage of the feed in the ration and thus change the content and nutrient analysis of the ration. This option allows you to view the content of various rations without formulating.

You should enter all feed percentages on an as fed basis.

The total parentage of all feeds in ration can not exceed 100 percent. If you enter a value for a feed that causes to exceed this limit, the program rejects the new value and keeps the old value.

If the total percentage of all feeds in ration is less than 100 percent,

the program proceeds to evaluation section and adjusts the amount of feeds in ration accordingly.

#### FEED ANALYSIS

-----

If you wish to view or edit the nutrient analysis for a particular feed, press the <Feed Analysis> button. The program will then display the entire nutrient analysis for the feed.

If you are entering information for a NEW feed, you must fill in the entire nutrient analysis, since the information for a new feed is not already stored in one of the feed libraries.

All changes are local to this particular ration data file and does not change the nutrient analysis of that particular feed in the standard or alternate feed libraries.

#### INTERNATIONAL FEED NUMBER

-----

This field is optional. Common feed stuffs 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

#### 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.

#### MVI FACTOR

-----

Each roughage feed has a corresponding maximum voluntary intake (MVI) factor (range: 1.0 to 1.4: excellent quality = 1.0, 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

-----

This field allows you to choose the dry matter basis to use for editing the nutrient analysis of the feed. 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, enter the dry matter percentage used for the analysis and corresponding nutrient data, and the program will convert everything to 100% dry matter internally.

If you wish to enter data on an "as fed" basis, enter 0, and the program will insert the correct basis, as fed.

## FEED GROUP CONSTRAINTS LIST

[illegible]

## NAVIGATION

[Files]	Create, open, or save ration.
[<]	Previous screen.
[Goto]	Jump to another input section.
[>]	Next screen.
[Add]	Add new constraint.
[Edit]	Edit existing constraint. Not available in Evaluation module.
[Dbl Click]	Double click on a row in the list box invokes Edit button.
[Delete]	Delete existing constraint.
[Help]	Display help message.
[Show Feeds]	Show feeds in a feed group.
[Formulate]	Formulate ration.
[Evaluate]	Evaluate ration.
[Main Menu]	Exit and return to main menu

## GROUP NUMBER

This table lists all of the feed groups that have been specified in the feed list.

To ADD a group to the list: You can not add a feed group directly. The programs adds groups automatically when a feed which belongs to that group is added in the previous screen.

To DELETE a group from the list: You can not delete a feed group directly. The programs deletes groups automatically when all feeds which belongs to that group are deleted in the previous screen.

Two exceptions are the pre-defined Roughage and Concentrate groups, which are built in to the program and can never be deleted.

## GROUP NAME

-----

Enter a descriptive name for the feed group.

#### 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, lbs) by displaying a menu of choices. Use the arrow keys to move to the desired constraint type, and then press <Enter>.

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

#### MINIMUM UNIT

-----

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

#### 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. lbs, percent) by displaying a menu of choices. Use the arrow keys to move to the desired constraint type, and then press <Enter>.

Many of the feed groups in the standard library have built-in maximum constraints which will automatically be displayed in this column.

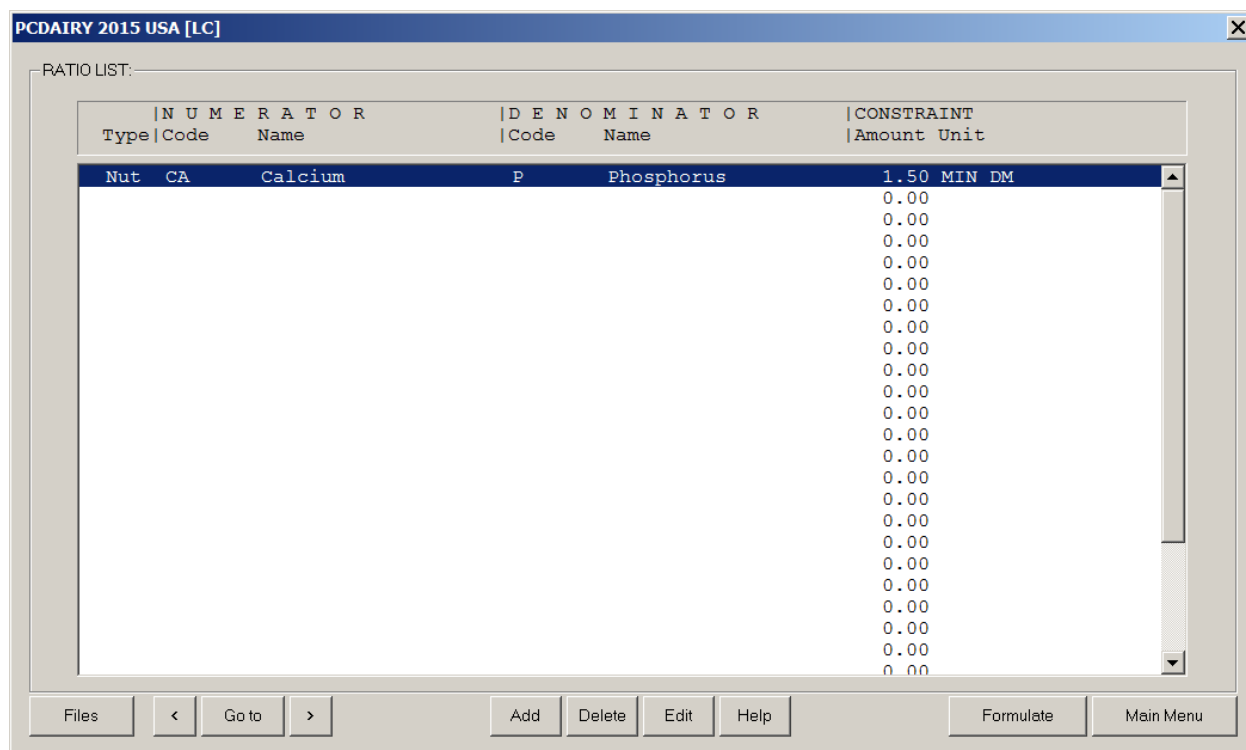
To delete an existing maximum constraint, enter 0 for the amount.

#### MAXIMUM UNIT

-----

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

## RATIO CONSTRAINTS LIST



## NAVIGATION

[Files]	Create, open, or save ration.
[<]	Previous screen.
[Goto]	Jump to another input section.
[>]	Next screen.
[Add]	Add new constraint.
[Edit]	Edit existing constraint. Not available in Evaluation module.
[Dbl Click]	Double click on a row in the list box invokes Edit button.
[Delete]	Delete existing constraint.
[Help]	Display help message.
[Formulate]	Formulate ration.
[Evaluate]	Evaluate ration.
[Main Menu]	Exit and return to main menu

## RATIO TYPE

In this table you can define ratio constraints to be used for ration formulation, or you can simply specify a set of ratios to automatically be calculated by the program when displaying the contents of the ration.

To ADD a ratio to the list: use the arrow keys to move to a blank line in the table and click the <Add> button.

Ratio types are as follows:

Nut - nutrient ratios  
Fd - feed ratios  
Grp - feed group ratios

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.

#### 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.

Enter the code for the numerator in this column.

#### 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 as x.xx to 1, where the x's represent the ratio of the numerator to the denominator. For example, if you want to have twice as much calcium as phosphorus in the ration, you would define a calcium to phosphorus ratio of 2 to 1, where 2 is the number that you would specify for the constraint amount.

If you do not want to enter a constraint for formulation but you do want to have the actual ratio calculated by the program when displaying the contents of the ration, enter 0 for the constraint amount.

#### CONSTRAINT UNIT

-----

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

## OUTPUT (RATION)

PCDAIRY 2015 USA [LC]

OUTPUT

California Dairy Cattle Ranch  
One Shields Avenue, Davis, CA 95616  
Phone: (530) 752-1278 FAX: (530) 752-0175 http://animalscience.ucdavis.edu

R A T I O N   C O M P O S I T I O N							
ROUGHAGES AND CONCENTRATES							
ROUGHAGES		AS FED		DRY MATTER		---Constraints---	
in the ration		BASIS:		BASIS:		As fed   100% DM	
	lb/day	%	lb/day	%	lb/day	%	min   max   min   max
-----							
CORN SILAGE, 30% DM	44.424	83.657	13.327	63.049			
ALFALFA HAY, 28% ADF	8.679	16.343	7.811	36.951			
-----							
Group total.....	53.103		21.138				
CONCENTRATES		AS FED		DRY MATTER		---Constraints---	
in the ration		BASIS:		BASIS:		As fed   100% DM	
	lb/day	%	lb/day	%	lb/day	%	min   max   min   max
-----							
BEEF PULP, MOL. DRIED	11.920	37.563	10.966	38.917			40.0
BARLEY, 46-48#/BU	10.425	32.852	9.174	32.557			80.0
COTTONSEED ML, 41 SOL	6.096	19.211	5.547	19.687			25.0
MOLASSES, CANE	3.194	10.064	2.395	8.500			8.5
DICALCIUM PHOSPHATE	0.094	0.295	0.091	0.322			
SALT	0.005	0.015	0.005	0.017			
-----							
Group total.....	31.732		28.178				

Files   <   Goto   >   Combine   DM Basis   Feed Group   Help   Input   Main Menu

### NAVIGATION

[Files]	Create, open, or save profit projection files. The print option is under Files button.
[<]	Previous screen.
[Goto]	Jump to another output section.
[Dbl Click]	Double click on a row in the list box invokes Goto button.
[>]	Next screen.
[Combine]	Combine feeds in mix. Available only in LC_G and LCB modules.
[Feed Group]	Select feed group to display.
[DM Basis]	Select dry matter basis.
[Help]	Display help message.
[Input]	Jump to input screen.
[Main Menu]	Exit and return to main menu.

### RATION COMPOSITION: ROUGHAGES AND CONCENTRATES

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; and the roughage - concentrate

ratio, on a 100% dry matter basis.

#### Milk production and feed cost information

The MAXIMIZE program displays the optimum milk production (lb/day or kg/day) and the milk income (\$/cow/day). The current milk blend price with upper and lower price ranges also are displayed. If the milk blend price drops below the lower range, the optimum level of milk production will decrease, and the composition of the ration will change. If the milk price increases above the upper range, the optimum level of milk production will increase (if it is not already at the production curve maximum) and the ration composition will change as well.

#### METHANE EMISSION

The screenshot shows the PCDAIRY 2015 USA [LC] software window. The title bar reads "PCDAIRY 2015 USA [LC]". The main window has a menu bar with "Files", "<", "Goto", ">", "Combine", "DM Basis", "Feed Group", "Help", "Input", and "Main Menu". The output area displays the following information:

California Dairy Cattle Ranch  
One Shields Avenue, Davis, CA 95616  
Phone: (530) 752-1278 FAX: (530) 752-0175 <http://animalscience.ucdavis.edu>

Total Ration..... 84.835 49.316

Roughage:Concentrate Ratio = 43:57 (DM)

Cost Analysis \$ per cow per day

Roughages	1.19
Concentrates	2.39
Total Ration	3.58

**METHANE EMISSION**  
Lactating Cows

Methane Emission in MJ per day per head.....	21.669 MJ/d
Methane Emission in Mcal per day per head .....	5.179 Mcal/d
Methane Emission in gram per day per head .....	389.733 g/day
Methane Emission in gram per lb dry matter intake ..	7.903 g/lb
Methane Conversion Rate .....	5.155 Percentage

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.

A red arrow points to the "METHANE EMISSION" section with the text "New module for this version of PCDAIRY".

In this section 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 the equation 1.

#### Methane Emission for Heifers:

-----  
Eq. 3:  $CH_4 = -1.487 + 0.046 \times GEI + 0.032 \times NDF + 0.006 \times BW$   
CH<sub>4</sub>, Methane emissions (MJ/d); GEI, NDF, and BW are defined in the equation 1.

Methane Emission for Steers:

-----  
Eq. 4:  $CH_4 = -0.221 + 0.048 \times GEI + 0.005 \times BW$   
CH<sub>4</sub>, Methane emissions (MJ/d); GEI and BW are defined in the equation 1.

Energy Intake:

-----  
Eq. 5:  $GEI = GE \times DMI$   
GEI, Gross energy intake (MJ/day); GE, Dietary gross Energy (MJ/kg dry matter);  
DMI, Dry matter intake (kg/d).

Gross Energy:

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

-----  
Eq. 7:  $SR = 100 - ASH - NDF - CP - EE$   
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 the methane emission is reported as follows:

Methane Emission in MJ per day per haed  
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.

---



# RATION (OR FEED GROUP) COMPOSITION

PCDAIRY 2015 USA [LC]

OUTPUT

California Dairy Cattle Ranch  
One Shields Avenue, Davis, CA 95616  
Phone: (530) 752-1278 FAX: (530) 752-0175 http://animalscience.ucdavis.edu

R A T I O N   C O M P O S I T I O N  
ALL FEEDS

ALL FEEDS in the ration	AS FED BASIS:		DRY MATTER BASIS:		---Constraints---			
	lb/day	%	lb/day	%	As fed -lb/day-	100% DM -%Total-	min	max
CORN SILAGE, 30% DM	44.424	52.365	13.327	27.024				
BET PULP, MOL. DRIED	11.920	14.050	10.966	22.236				
BARLEY, 46-48#/BU	10.425	12.288	9.174	18.602				
ALFALFA HAY, 28% ADF	8.679	10.230	7.811	15.838				
COTTONSEED ML, 41 SOL	6.096	7.186	5.547	11.249				
MOLASSES, CANE	3.194	3.764	2.395	4.857				
DICALCIUM PHOSPHATE	0.094	0.110	0.091	0.184				
SALT	0.005	0.006	0.005	0.010				
Total Ration.....	84.835		49.316					
Cost, \$/day.....	3.58							
Cost, \$/ton.....	84.41		145.20					

Files   <   Goto   >   Combine   DM Basis   Feed Group   Help   Input   Main Menu

This section displays the amounts of all feeds used in the ration, or the amounts for a feed group selected by using the <F3> function key. The following information is included for each feed used in the ration (or group):

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.
5. Feed and feed group ratios. If you previously defined any feed or group ratios on the Ratios List, the program will calculate the ratio amounts in the ration (or feed group) and display them in this section. Feed ratios will be displayed only if both feeds are used in the ration (or group). Group ratios are displayed only when viewing the composition of ALL FEEDS in the ration.

# PRICES AND FEEDS NOT USED

PCDAIRY 2015 USA [LC]					
OUTPUT					
California Dairy Cattle Ranch One Shields Avenue, Davis, CA 95616 Phone: (530) 752-1278 FAX: (530) 752-0175 http://animalscience.ucdavis.edu					
P R I C E   R A N G E S   \$/ton   A S   F E D					
Feeds used in ration		lbs per day	Price	Lower range	Upper range
STD	2 ALFALFA HAY, 28% ADF	8.67866	120.00	113.97	120.27
STD	15 BARLEY, 46-48#/BU	10.42481	150.00	145.51	150.75
STD	21 BEET PULP, MOL. DRIED	11.91974	140.00	139.05	151.45
STD	42 CORN SILAGE, 30% DM	44.42424	30.00	29.82	33.72
STD	50 COTTONSEED ML, 41 SOL	6.09603	200.00	199.37	212.71
STD	58 DICALCIUM PHOSPHATE	0.09359	500.00	-26.58	530.32
STD	79 MOLASSES, CANE	3.19350	90.00	84.18	96.28
STD	108 SALT	0.00469	110.00	-47.87	410.85
----- Price as fed, \$/ton -----					
F E E D S   N O T   U S E D		At formulation		Opportunity	
STD	39 CORN GRAIN, GR OR RLD	150.00		144.81	
STD	71 LIMESTONE, GROUND	100.00		93.72	

This section 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 section 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, or decreasing the income over feed cost.

# NUTRIENT ANALYSIS OF THE RATION (OR FEED GROUP)

PCDAIRY 2015 USA [LC]

OUTPUT

California Dairy Cattle Ranch  
One Shields Avenue, Davis, CA 95616  
Phone: (530) 752-1278 FAX: (530) 752-0175 http://animalscience.ucdavis.edu

NUTRIENT ANALYSIS:		ENTIRE RATION		100.00% DM BASIS	
Nutrient	Amount and Type	-User Constraints- Minimum	Maximum	UCD Recommendation Minimum	Maximum
DM	58.132 % 49.316 lb	35.000			
NEL	0.750 Mcal/lb 36.985 Mcal		36.985	0.745 36.985	
TDN	72.243 % 35.627 lb			71.000 34.656	
CP	16.000 % 7.891 lb	16.000		16.000	
UIP	5.266 % 2.597 lb	7.727		7.727 5.700	
DIP	10.453 % 5.155 lb			2.706 9.700	
CF	15.967 % 7.874 lb			4.706 17.000	
ECF	15.967 % 7.874 lb				
ADF	21.000 % 10.356 lb	21.000		21.000	
NDF	36.044 % 17.775 lb			28.000	
FAT	2.146 % 1.059 lb		8.000	3.000	

Files < Goto > Combine DM Basis Feed Group Help Input Main Menu

This section displays the estimated nutrient content of the total ration, or for a feed group selected by using the <F3> function key. 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. UCD recommendation. This is the nutrient amount recommended by UCD 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.
3. Nutrient ratios. If you previously defined any nutrient ratios on the Ratios List, the program will calculate the ratio amounts in the ration (or feed group) and display them in this section.

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

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

By pressing the <DM Basis> button, you can change the dry matter basis for calculation of the nutrient analysis. The dry matter basis affects the concentration of the nutrients, but not the actual amounts or ratios of nutrients in the ration. The nutrient constraints and the NRC minimum requirements also are affected by the dry matter basis if they represent nutrient concentrations and not actual amounts or ratios.

# NUTRIENT ANALYSIS OF FEEDS IN THE RATION DATA FILE

PCDAIRY 2015 USA [LC]

OUTPUT

California Dairy Cattle Ranch  
One Shields Avenue, Davis, CA 95616  
Phone: (530) 752-1278 FAX: (530) 752-0175 http://animalscience.ucdavis.edu

ENERGY & PROTEIN ANALYSIS OF FEEDS									
100.00 % DRY MATTER BASIS									
Library		DM	NEL	NEM	NEG	TDN	CP	UIP	DIP
Number	Feed Name	%	Mcal /lb	Mcal /lb	Mcal /lb	%	%	%	%
STD 2	ALFALFA HAY, 28% ADF	90.00	0.63	0.64	0.37	61	23.0	6.4	16.6
STD 15	BARLEY, 46-48#/BU	88.00	0.88	0.94	0.64	84	13.5	3.6	9.9
STD 21	BET PULP, MOL. DRIED	92.00	0.81	0.86	0.57	78	10.1	3.5	6.6
STD 39	CORN GRAIN, GR OR RLD	88.00	0.89	0.95	0.65	85	10.0	6.0	4.0
STD 42	CORN SILAGE, 30% DM	30.00	0.67	0.74	0.46	65	8.1	2.5	5.6
STD 50	COTTONSEED ML, 41 SOL	91.00	0.79	0.83	0.54	76	45.6	18.7	26.9
STD 58	DICALCIUM PHOSPHATE	97.00	0.00	0.00	0.00	0	0.0	0.0	0.0
STD 71	LIMESTONE, GROUND	100.00	0.00	0.00	0.00	0	0.0	0.0	0.0
STD 79	MOLASSES, CANE	75.00	0.75	0.77	0.49	72	5.8	0.0	0.0
STD 108	SALT	100.00	0.00	0.00	0.00	0	0.0	0.0	0.0

Files < Go to > Combine DM Basis Feed Group Help Input Main Menu

This section 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 unless changed by the user.

By pressing the <DM Basis> button, you can change the dry matter basis for expressing the nutrient analysis. Enter 0 to express the analysis for all feeds on an as fed basis.

If an asterisk (\*) appears in any column, the nutrient amount for the feed in question is too large to be printed inside that column. You can view the actual amount by looking at the nutrient analysis within the feed list page in the input section of this program.

## LIMITING NUTRIENTS

For lactating cows:

This section lists the maximum daily milk production that is possible with the calculated amounts of NEL and Crude Protein in the ration.

This section 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 section 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.

COMBINE FEEDS INTO A MIX: FEED NUMBER

The Combine feeds option allows you to combine some, or all, of the feeds used in this ration into a single feed mix. You must specify a feed number and a name for the new feed mix, along with the amount of each feed to be included in the new feed mix.

The program will calculate the price and nutrient content of the new feed mix and add it to the feed list of the current ration file.

Allowable numbers for the new mix feed range from 1 to 999.

#### FEED NAME

-----

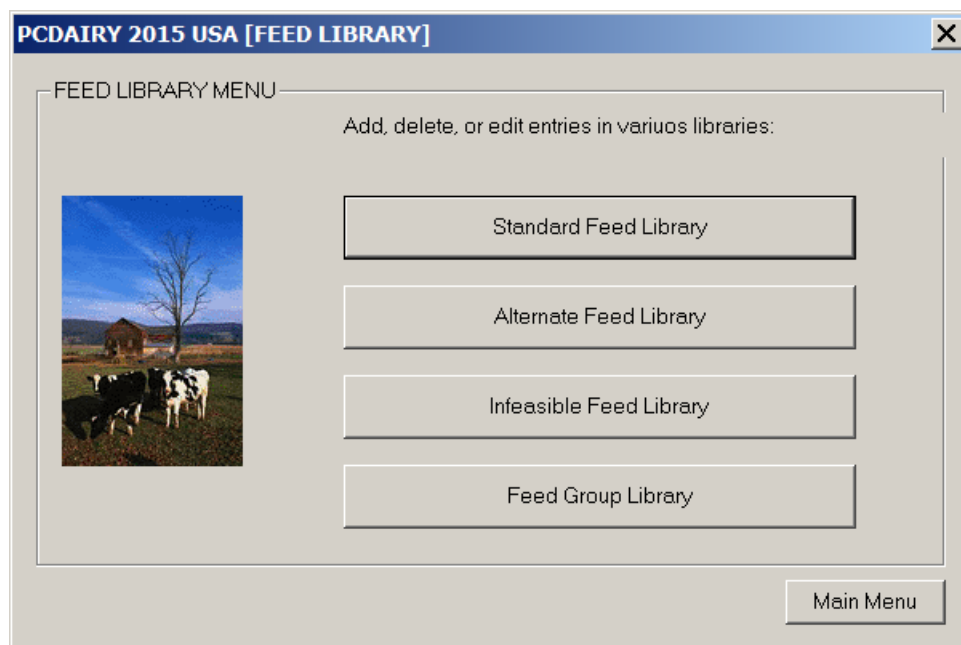
Enter a descriptive name for the new feed mix.

#### AMOUNT IN MIX

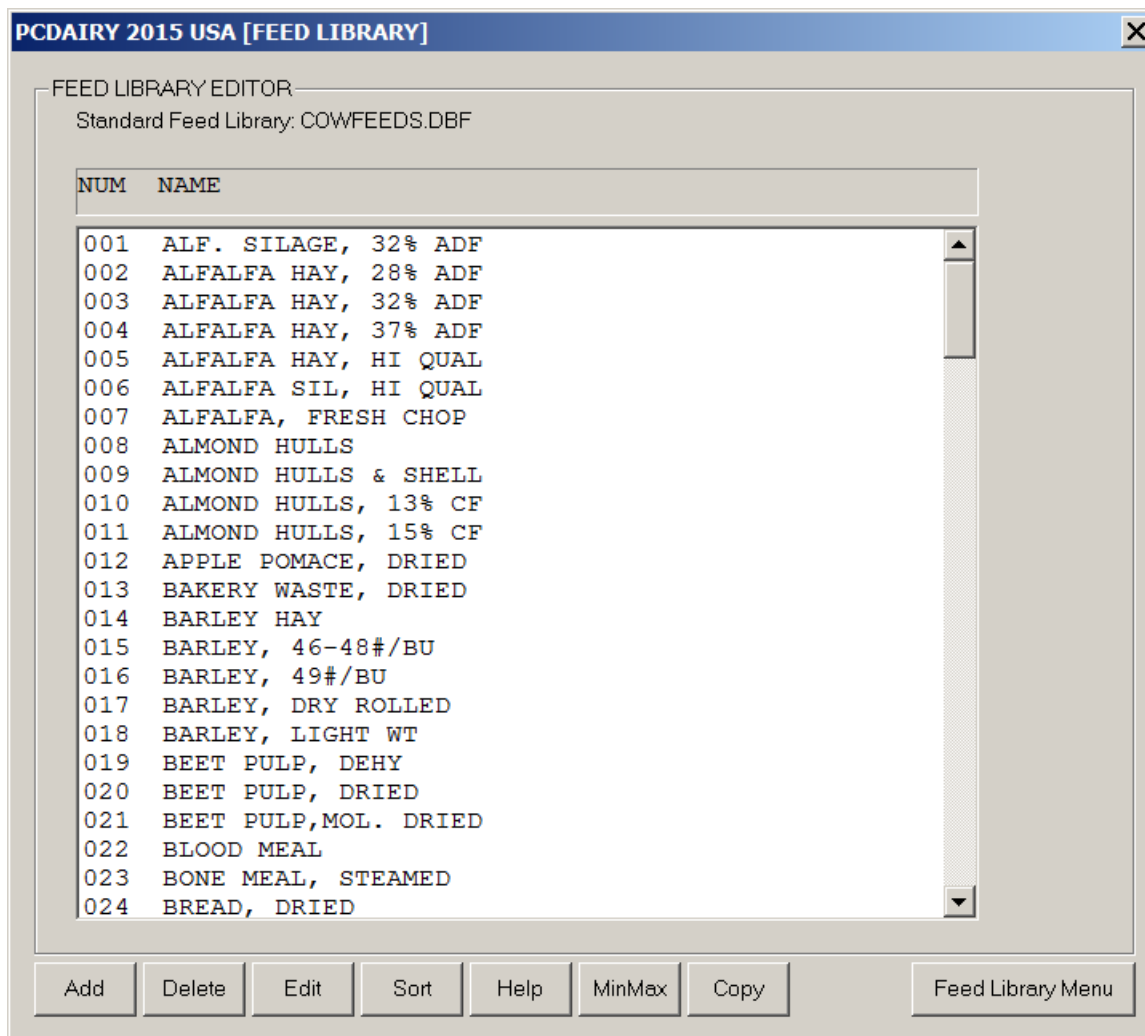
-----

Enter the amount of this feed to be included in the new feed mix.  
You should enter all feed amounts on an as fed basis.

## FEED LIBRARY EDITOR



## FEED LIBRARY: STANDARD FEED LIBRARY



### ----- NAVIGATION

[Add]	Add a new record.
[Delete]	Delete existing record.
[Edit]	Edit existing record.
[Dbl Click]	Double click on a row in the list box invokes Edit button.
[Sort]	Sort library on number or name.
[MinMax]	Enter the default minimum and maximum.
[Copy]	Copy a feed from standard library to alternate library. It is available only in the standard feed library dialog box.
[Help]	Display help message.
[Fd Lib Menu]	Exit and return to Feed Library Menu.

-----

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, you may assign it any

number you wish.

#### 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 dollars per English ton, or dollars per hundred lbs, or dollars per metric ton, or dollars per kg.

#### FEED PRICE UNIT

-----

Valid units are:

TON	English ton	(= 2000 lb)
CWT	hundredweight	(= 100 lb)
MET TON	metric ton	(= 1000 kg)
KG	kilogram	(= 2.205 lb)

#### 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. After you enter the desired amount, the program will ask you to identify the type of constraint (i.e. percent, lbs) by displaying a menu of choices. To delete an existing minimum constraint, enter 0 for the amount.

#### FEED: MINIMUM UNIT

-----

Identify the type of minimum constraint.

#### FEED: MAXIMUM AMOUNT

-----

You can limit the amount of a feed in the ration by entering a maximum constraint on that feed. After you enter the desired amount, the program will ask you to identify the type of constraint (i.e. percent, lbs) by displaying a menu of choices.

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.

#### 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.

R for Roughage

C 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

-----

This line allows you to choose the dry matter basis to use for editing the nutrient analysis of the feed. 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, enter the dry matter percentage used for the analysis and corresponding nutrient data, and the program will convert everything to 100% dry matter internally.

If you wish to enter data on an 'as fed' basis, enter and the program will insert the correct basis, as fed.

**PCDAIRY 2015 USA [FEED LIBRARY]**

FEED ANALYSIS:

Feed Number:  Library:  International Feed Number:

Feed Name:  Price: \$  per ton

DM as fed:  % Type:  MVI:  Group:  ,  ,  ,

NUTRIENT ANALYSIS:  % DRY MATTER BASIS

NEL	<input type="text" value="0.480"/>	Mcal/lb	CA	<input type="text" value="0.230"/>	%	NUT4	<input type="text" value="0.000"/>	%
NEM	<input type="text" value="0.400"/>	Mcal/lb	CL	<input type="text" value="0.000"/>	%	NUT5	<input type="text" value="0.000"/>	%
NEG	<input type="text" value="0.157"/>	Mcal/lb	K	<input type="text" value="0.530"/>	%			
TDN	<input type="text" value="48.000"/>	%	MG	<input type="text" value="0.130"/>	%			
CP	<input type="text" value="1.900"/>	%	NA	<input type="text" value="0.020"/>	%			
UIP	<input type="text" value="0.000"/>	%	P	<input type="text" value="0.110"/>	%			
DIP	<input type="text" value="0.000"/>	%	S	<input type="text" value="0.110"/>	%			
CF	<input type="text" value="17.000"/>	%	CO	<input type="text" value="0.300"/>	ppm			
ECF	<input type="text" value="9.000"/>	%	CU	<input type="text" value="11.000"/>	ppm			
ADF	<input type="text" value="32.000"/>	%	FE	<input type="text" value="301.000"/>	ppm			
NDF	<input type="text" value="36.000"/>	%	I	<input type="text" value="0.000"/>	ppm			
FAT	<input type="text" value="2.600"/>	%	MN	<input type="text" value="21.000"/>	ppm			
ASH	<input type="text" value="7.600"/>	%	SE	<input type="text" value="0.000"/>	ppm			
NPN	<input type="text" value="0.000"/>	%	ZN	<input type="text" value="24.000"/>	ppm			
VITA	<input type="text" value="0.000"/>	k IU/lb	NUT1	<input type="text" value="0.000"/>	%			
VITD	<input type="text" value="0.000"/>	k IU/lb	NUT2	<input type="text" value="0.000"/>	%			
VITE	<input type="text" value="0.000"/>	IU/lb	NUT3	<input type="text" value="0.000"/>	%			

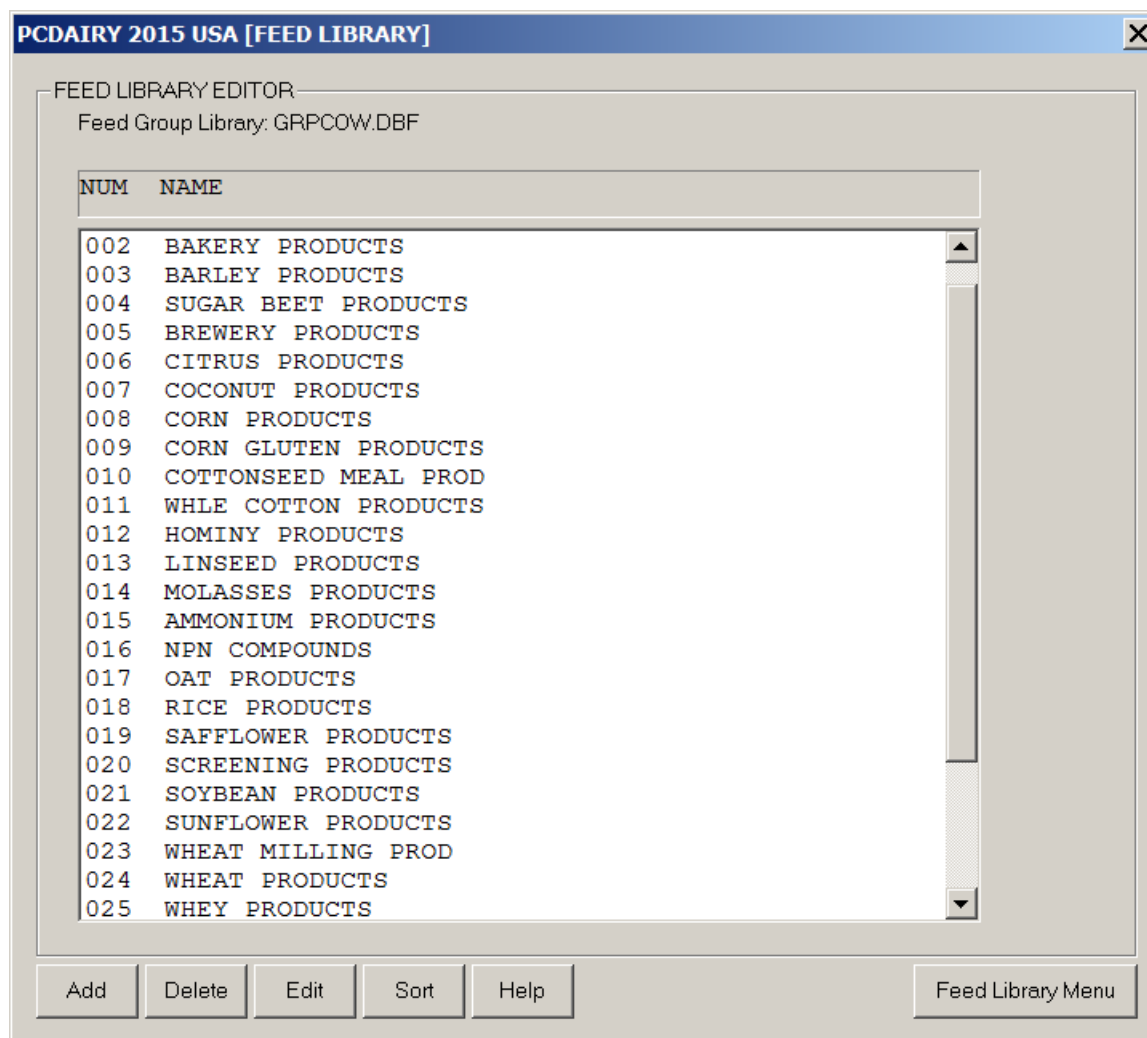
Enter feed number

The following is a list of nutrients and their abbreviations:

ADF	Acid Detergent Fiber
ASH	Ash
CA	Calcium
CL	Chlorine
CO	Cobalt
CU	Copper
FAT	Crude Fat or Ether Extract (EE)
CF	Crude Fiber
CP	Crude Protein
DIP	Degrad Intake Prot
DM	Dry Matter
ECF	Eff Crude Fiber
I	Iodine
FE	Iron
MG	Magnesium
MN	Manganese
NDF	Neutral Det Fiber
NEG	Net Energy for Gain
NEM	Net Energy for Maint
NPN	Nonprotein Nitrogen
P	Phosphorus
K	Potassium
SE	Selenium
NA	Sodium
S	Sulfur
TDN	Total Digestible Nut
UIP	Undegrad Intake Prot
VITA	Vitamin A
VITD	Vitamin D
VITE	Vitamin E

ZN	Zinc
NUT1	1st User Nut
NUT2	2nd User Nut
NUT3	3rd User Nut
NUT4	4th User Nut
NUT5	5th User Nut

## FEED LIBRARY: FEED GROUP LIBRARY



### ----- NAVIGATION

[Add]            Add a new record.  
[Delete]        Delete existing record.  
[Edit]          Edit existing record.  
[Dbl Click]     Double click on a row in the list box invokes Edit button.  
[Sort]          Sort library on number or name.  
[Help]          Display help message.  
[Fd Lib Menu]   Exit and return to Feed Library Menu.

-----  
There is one feed group library with a capacity of 99 groups.

### GROUP NUMBER

-----  
Each feed group should have a unique number between 1-99.

### GROUP NAME

-----  
Enter a descriptive name for the feed group.

### 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, lbs) by displaying a menu of choices. Use the arrow keys to move to the desired constraint type, and then press the <Enter> key.

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

#### MINIMUM UNIT

-----

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

#### 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. lbs, percent) by displaying a menu of choices. Use the arrow keys to move to the desired constraint type, and then press the <Enter> key.

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.

#### MAXIMUM UNIT

-----

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

## DELIVERY MODULE: GENERAL INFORMATION

**PCDAIRY 2015 USA [DELIVERY]**

DELIVERY INFORMATION:

Title line 1:  Date:

line 2:  Wt Unit:

Loading Information

Schedule for:

Minimum:  animals

Maximum:  animals

Increment:  animals

Unloading Information

Schedule for:

Minimum:  animals

Maximum:  animals

Increment:  animals

Feeds used in mix will be fed  times per day

Scale weights will be rounded to the nearest  lb

Files < Go to > Help Show Sched. Main Menu

### NAVIGATION

[Files] Create, open, or save ration.  
 [<] Previous screen.  
 [Goto] Jump to another input section.  
 [>] Next screen.  
 [Help] Display help message.  
 [Show Sched] Display schedules.  
 [Main Menu] Exit and return to main menu

### TITLE

Enter a name and/or address or other identification for your ration on these two lines. The title will be displayed at the top of all printed output for this ration.

### Wt Unit

You may choose to enter data using either the English or the metric system.

Enter lb to display all input and output in English units.  
 Enter kg to display all input and output in metric units.

The program will automatically convert any data already entered to the unit selected.

### LOADING SCHEDULE TYPE

You may choose to calculate the loading schedules based upon the total number of animals to be fed OR the total amount of feed (lb or kg per feeding per day) to be added to the mix. Total feed amounts do NOT include feeds in the ration that are fed separately

from the mix.

If all feeds in the ration are to be fed separately (there is no mix to be created), the total amount (lb or kg) that you enter on this line will correspond to the total amount of feeds fed separately (lb or kg per feeding per day).

#### FEED LOADING MINIMUM AMOUNT

-----

Feed loading schedules are calculated for a range of the total number of animals to be fed. Enter the minimum number of animals to be fed on this line (range: 0 to 45000 animals).

If you have specified lb or kg instead of animals as the schedule type, enter the minimum amount of mix to be created (lb or kg per feeding per day; range: 0 to 45000 lb, or 0 to 20400 kg).

#### FEED LOADING MAXIMUM AMOUNT

-----

Feed loading schedules are calculated for a range of the total number of animals to be fed. Enter the maximum number of animals to be fed on this line (range: 0 to 45000 animals).

If you have specified lb or kg instead of animals as the schedule type, enter the maximum amount of mix to be created (lb or kg per feeding per day; range: 0 to 45000 lb, or 0 to 20400 kg).

#### FEED LOADING INCREMENT

-----

Feed loading schedules are calculated for a range of the total number of animals to be fed. Enter the number of animals that you want to use as an increment for calculating each of the schedules (range: 0 to 45000 animals).

If you have specified lb or kg instead of animals as the schedule type, enter the increment for the total amount of mix to be created (lb or kg per feeding per day; range: 0 to 45000 lb, or 0 to 20400 kg).

The program will calculate a maximum of twelve schedules.

#### UNLOADING SCHEDULE TYPE

-----

You may choose to calculate the unloading schedules based upon the total number of animals to be fed OR the total amount (lb or kg per feeding per day) to be unloaded from the mix. Total amounts do NOT include feeds in the ration that are fed separately from the mix.

If all feeds in the ration are to be fed separately (there is no mix feed), the total amount (lb or kg) that you enter on this line will correspond to the total amount of feeds fed separately (lb or kg per feeding per day).

#### FEED UNLOADING MINIMUM AMOUNT

-----

Feed unloading schedules are calculated for a range of the total number of animals to be fed. Enter the minimum number of animals to be fed on this line (range: 0 to 45000 animals).

If you have specified lb or kg instead of animals as the schedule type, enter the minimum amount of mix to be unloaded (lb or kg per feeding per day; range: 0 to 45000 lb, or 0 to 20400 kg).

#### FEED UNLOADING MAXIMUM AMOUNT

-----

Feed unloading schedules are calculated for a range of the total number of animals to be fed. Enter the maximum number of animals to be fed on this line (range: 0 to 45000 animals).

If you have specified lb or kg instead of animals as the schedule type, enter the maximum amount of mix to be unloaded (lb or kg per feeding per day; range: 0 to 45000 lb, or 0 to 20400 kg).

#### FEED UNLOADING INCREMENT

-----  
Feed unloading schedules are calculated for a range of the total number of animals to be fed. Enter the number of animals that you want to use as an increment for calculating each of the schedules (range: 0 to 45000 animals).

If you have specified lb or kg instead of animals as the schedule type, enter the increment for the total amount of mix to be unloaded (lb or kg per feeding per day; range: 0 to 45000 lb, or 0 to 20400 kg).

The program will calculate a maximum of twelve schedules.

#### MIX FEEDS: NUMBER OF FEEDINGS PER DAY

-----  
Enter the number of times per day that the animals are to be given ration feeds included in a mix (range: 1 to 9 feedings per day).

#### ROUNDING FACTOR FOR SCALE WEIGHTS

-----  
Enter the rounding factor used to display the scale weights in the loading and unloading schedules. You have the following choices for rounding factors:

1	nearest	one lb (kg)	(158.347 displays as 158)
10	nearest	ten lb (kg)	(158.347 displays as 160)
0.1	nearest	tenth lb (kg)	(158.347 displays as 158.3)
0.01	nearest	hundredth lb (kg)	(158.347 displays as 158.35)



## DELIVERY MODULE: SEPARATE FEED LIST

PCDAIRY 2015 USA [DELIVERY] X

SEP FEED LIST:

Lib Code	Feed No.	Name	RATION AMOUNT lb/day as fed	FED SEPARATELY lb/day as fed	FEEDINGS times/day
STD	2	ALFALFA HAY, 28% ADF	8.67866	8.67866	1
STD	15	BARLEY, 46-48#/BU	10.42481	10.42481	1

Files   <   Goto   >   Edit   Help   Show Sched.   Main Menu

### NAVIGATION

```

[Files]      Create, open, or save ration.
[<]         Previous screen.
[Goto]       Jump to another input section.
[>]        Next screen.
[Edit]       Edit separate amount.
[Dbl Click] Double click on a row in the list box invokes Edit button.
[Help]      Display help message.
[Show Schdl] Display loading and unloading schedules.
[Main Menu] Exit and return to main menu
  
```

### LIBRARY CODE

Feed library codes are as follows:

- STD - the information for this feed is stored in the standard library of feeds supplied by the program.
- ALT - the feed information is contained in an alternate feed library which has been created or modified by you, the program user.
- NEW - the feed information is not contained in any existing feed library. You must enter into the program the entire nutrient analysis for a new feed, since the information is not stored anywhere else.

### FEED NUMBER

Each feed in the standard and alternate feed libraries has a unique number assigned to it.

### FEED NAME

Each feed has a descriptive name..

#### AMOUNT IN RATION

-----

This field shows the actual amount of the feed in the ration.

#### AMOUNT FED SEPARATELY

-----

Enter the amount of this feed that is to be fed separately from the mix.

You should enter all feed amounts on an as fed basis, lbs or kgs  
per day.

## DELIVERY MODULE: Mix FEED LIST

PCDAIRY 2015 USA [DELIVERY] X

MIX FEED LIST:

Lib Code	Feed No.	Name	RATION AMOUNT lb/day as fed	AMOUNT IN MIX lb/day as fed	ORDER in mix
STD	42	CORN SILAGE, 30% DM	44.42424	44.42424	1
STD	21	BEET PULP, MOL. DRIED	11.91974	11.91974	2
STD	50	COTTONSEED ML, 41 SOL	6.09603	6.09603	3
STD	79	MOLASSES, CANE	3.19350	3.19350	4
STD	58	DICALCIUM PHOSPHATE	0.09359	0.09359	5
STD	108	SALT	0.00469	0.00469	6
STD	71	LIMESTONE, GROUND	0.00000	0.00000	7
STD	39	CORN GRAIN, GR OR RLD	0.00000	0.00000	8

Files   <   Go to   >   Edit   Up ^   Dn v   Help   Show Sched.   Main Menu

### NAVIGATION

```

[Files]      Create, open, or save ration.
[<]         Previous screen.
[Goto]       Jump to another input section.
[>]         Next screen.
[Edit]       Edit mix amount.
[Dbl Click]  Double click on a row in the list box invokes Edit button.
[Up]         Move up existing feed.
[Dn]         Move down existing feed.
[Help]       Display help message.
[Show Schdl] Display loading and unloading schedules.
[Main Menu]  Exit and return to main menu
  
```

### LIBRARY CODE

Feed library codes are as follows:

- STD - the information for this feed is stored in the standard library of feeds supplied by the program.
- ALT - the feed information is contained in an alternate feed library which has been created or modified by you, the program user.
- NEW - the feed information is not contained in any existing feed library. You must enter into the program the entire nutrient analysis for a new feed, since the information is not stored anywhere else.

### FEED NUMBER

Each feed in the standard and alternate feed libraries has a unique number assigned to it.

#### FEED NAME

-----

Each feed has a descriptive name..

#### AMOUNT IN RATION

-----

This field shows the actual amount of the feed in the ration.

#### AMOUNT IN MIX

-----

Enter the amount of this feed that is to be included in the mix.

You should enter all feed amounts on an as fed basis, lbs or kgs per day.

#### ORDER IN MIX

-----

The order in mix specifies the order that this feed is to be loaded onto the mixer.

Press the <Up> button to move up the feed in the list. Press the <Dn> button to move down the feed in the list.

## DELIVERY MODULE: OUTPUT

PCDAIRY 2015 USA [DELIVERY] X

---

OUTPUT

California Dairy Cattle Ranch  
One Shields Avenue, Davis, CA 95616  
Phone: (530) 752-1278 FAX: (530) 752-0175 <http://animalscience.ucdavis.edu>

LOADING SCHEDULE

ALL FEEDS in the ration

---

```

*****
*      190 animals *      195 animals *      200 animals *
* ----- * ----- * ----- *
* lb per * lb per * lb per *
FED SEPARATELY * feeding * feeding * feeding *
* ----- * ----- * ----- *
ALFALFA HAY, 28% ADF * 1649 (1/day) * 1692 (1/day) * 1736 (1/day) *
BARLEY, 46-48#/BU * 1981 (1/day) * 2033 (1/day) * 2085 (1/day) *
* ----- * ----- * ----- *
*          scale *          scale *          scale *
FED AS MIX (3/day) * reading * reading * reading *
* ----- * ----- * ----- *
CORN SILAGE, 30% DM * 2814 2814 * 2888 2888 * 2962 2962 *
BEET PULP,MOL. DRIED * 755 3569 * 775 3663 * 795 3757 *
COTTONSEED ML,41 SOL * 386 3955 * 396 4059 * 406 4163 *
MOLASSES, CANE * 202 4157 * 208 4267 * 213 4376 *
DICALCIUM PHOSPHATE * 6 4163 * 6 4273 * 6 4382 *
SALT * 0 4163 * 0 4273 * 0 4382 *
*****
          
```

Files
<
Goto
>
Feed Group
Help
Input
Main Menu

### NAVIGATION

```

-----
[Files]      Create, open, or save profit projection files.
              The print option is under Files button.
[<]         Previous screen.
[Goto]       Jump to another output section.
[Dbl Click] Double click on a row in the list box invokes Goto button.
[>]         Next screen.
[Feed Group] Select feed group to display.
[Help]       Display help message.
[Input]      Jump to input screen.
[Main Menu]  Exit and return to main menu.
-----
          
```

### LOADING SCHEDULE

This section displays the loading schedules for all feeds used in the ration, or for a feed group selected by using the <Feed Group> button.

Loading schedules are displayed for both mix feeds and feeds fed separately from the mix. A maximum of twelve schedules will be printed.

For each feed fed separately, the schedule shows the amount to be fed at each feeding.

For each feed in the mix, the schedule shows the actual amount of the feed to be added to the mixer, along with the mixer scale reading that will be obtained after the feed has been added. Mix feeds are added in the order that you previously specified on the Mix Feed List form.

## UNLOADING SCHEDULE

PCDAIRY 2015 USA [DELIVERY] DEMO.PCD

OUTPUT

California Dairy Cattle Ranch  
One Shields Avenue, Davis, CA 95616  
Phone: (530) 752-1278 FAX: (530) 752-0175 http://animalscience.ucdavis.edu

UNLOADING SCHEDULE  
ALL FEEDS in the ration

```

*****
*          96 animals *          98 animals *          100 animals *
* ----- * ----- * ----- *
*  lb per *  lb per *  lb per
RATION INGREDIENTS * feeding * feeding * feeding *
* ----- * ----- * ----- *
ALFALFA HAY, 28% ADF * 833 (1/day) * 851 (1/day) * 868 (1/day) *
BARLEY, 46-48#/BU * 1001 (1/day) * 1022 (1/day) * 1042 (1/day) *
FEEDS IN MIX * 2103 (3/day) * 2147 (3/day) * 2191 (3/day) *
*****
*****
*          102 animals *          104 animals *
* ----- * ----- *
*  lb per *  lb per
RATION INGREDIENTS * feeding * feeding *
* ----- * ----- *
ALFALFA HAY, 28% ADF * 885 (1/day) * 903 (1/day) *
BARLEY, 46-48#/BU * 1063 (1/day) * 1084 (1/day) *
FEEDS IN MIX * 2235 (3/day) * 2279 (3/day) *
*****

```

Files < Goto > Feed Group Help Input Main Menu

This section displays the unloading schedules for all feeds used in the ration, or for a feed group selected by using the <Feed Group> button.

Unloading schedules are displayed for the mix feed, along with all feeds fed separately from the mix. A maximum of twelve schedules will be printed.

For each feed fed separately and for the mix, the schedule shows the amount to be unloaded for each feeding.

The number of feedings per day is displayed in parentheses after the amount to be unloaded.

## FEEDTAG

**PCDAIRY 2015 USA [FEED TAG]**

**Feed Tag**

First enter the chemical analysis of your feed and then click the "Calculate" button. The program calculates energy values.

Feed Name:

Select Feed Group:

**Chemical Analysis**

Dry Matter of Feed:  %

Crude Protein (CP):  % As Fed

NPN Protein Equivalent:  % As Fed

Fat or Oil (EE):  % As Fed

Ash:  % As Fed

Crude Fiber (CF):  % As Fed

**Energy Values**

Energy values on 100% DM Basis

DE:  Mcal/lb

ME:  Mcal/lb

NEM:  Mcal/lb

NEG:  Mcal/lb

TDN:  %

NEL:  Mcal/lb

Defaults Help Calculate Main Menu

### NAVIGATION

[Defaults] Set the input fields to default values.  
 [Help] Display help message.  
 [Calculate] Calculate energy values.  
 [Main Menu] Exit and return to main menu.

### Description of fields in this screen:

Feed Name: Assign a name for feed.  
 Example, ALFALFA

Feed Group: Select a group for feed.  
 Example, B.Dry forage and roughage:Legumes(1)

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:

Grp A: DE= 3.916828-0.00812 \*CP+0.04554 \*EE-0.0176 \*ash-0.0422 \*CF  
Grp B: DE= 2.811904+0.0209413\*CP+0.006492 \*EE+0.01302\*ash-0.0274 \*CF  
Grp C: DE= 3.264743+0.06363 \*CP-0.0761 \*EE-0.0508 \*ash-0.0283 \*CF  
Grp D: DE= 3.723255+0.002459 \*CP+0.0815818\*EE-0.0211 \*ash-0.036135\*CF  
Grp E: DE= 3.681242-0.0130 \*CP+0.04553 \*EE-0.0328 \*ash-0.0284 \*CF  
Grp F: DE= 3.729697+0.008047 \*CP+0.04582 \*EE-0.0393 \*ash-0.0392 \*CF  
Grp G: 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.