BASEcow Excel Add-in for Dairy Production Consultants

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AFnut (DM_ nutrient Density, Dry matter percent)

Category: Nutrition

This function calculates the AS Fed nutrient density from the entered dry matter nutrient density and the dry matter content of the ingredient.

Example: A corn silage sample has a dry matter of 26% and crude protein dry matter percent of 9%. What is the as fed crude protein %.

Afnut(9, 26) = 2.34%

AyrHeiferHT (age in months)

This function calculates the standard height for an Ayrshire heifer at the entered age in months.

Reference: Dairy Reference Manual, 3rd edition, NRAES-63, Page 87
Henrichs et al. Standard of Weight and Height for Ayrshire, Brown Swiss, and Milking Shorthorn Heifers, J Dairy Sci.

Assumptions: Heifers follow standard groups curves.

Example: An Ayrshire heifer is 14 months of age. What should her height be in inches:

Ayrheiferht (14) = 40.1 inches

Bunkalf **(width, height, length, Density)**

This function calculates the tons dry matter (2000 pounds) of alfalfa in a trench silo that has the width, height and length dimensions entered. (when a 0 is entered as density, the dry matter density of alfalfa is 12 lbs/cubic foot.) The formula also assumes that the front of the silo has a 45 degree slope.

Note that the dry matter density is = the dry matter of the feed X the bulk density lbs/cubic foot.

Example:
A trench is 20 feet wide, 10 feet high and 300 feet long. How much alfalfa is in the trench?

Bunkalf (20,10,300,0) = 354 tons of alfalfa dry matter

(Note the 0 value for density, uses 12 lbs/cubic foot as a default.)

Reference: Penn State Dairy Reference Manual, 3rd Edition. NRAES, Cooperative Extension, 152 Riley-Robb Hall, Ithaca, NY 14853-5701. page 164-165.

Bunkcs **(width, height, length, Density)**

This function calculates the tons dry matter (2000 pounds) of corn silage in a trench silo that has the width, height and length dimensions entered. (when a 0 is entered as density, the dry matter density of corn silage is 14 lbs/cubic foot.) The formula also assumes that the front of the silo has a 45 degree slope.

Note that the dry matter density is = the dry matter of the feed X the bulk density lbs/cubic foot.

Example:
A trench is 20 feet wide, 10 feet high and 300 feet long. How much corn silage is in the trench?

Bunkcs (20,10,300,0) = 413 tons of alfalfa dry matter

Reference: Penn State Dairy Reference Manual, 3rd Edition. NRAES, Cooperative Extension, 152 Riley-Robb Hall, Ithaca, NY 14853-5701. page 164-165.

Bushel (lb_grain, grain_name)

This function converts lbs of an entered grain to bushel for the following grain_names:

Grain_name for conventional name
Barley for barley
GEC for ground ear corn
Beetpulp for beet pulp
SBM for soybean meal
SBS for soy bean seeds
Shcrn for shelled corn
Shcrngnd for shelled corn that is ground

Reference: Dairy Reference Manual, 3rd edition, NRAES-63, Page 102

Example: Three hundred pounds of ground ear corn is equivalent to how many bushels.

Bushel(300, "GEC") = 6.6 bushels

CAD(Sodium %, potassium%, Chloride%, Sulfur%)

Calculates the cation and anion difference for the entered values according to the following equation.

CAD = Na% / 0.023 + K% / 0.039 – Cl% / 0.0355 – S% / 0.016

Example:

A ration has a Sodium % = 2
potassium% = 3
Chloride%, = 1
Sulfur% = 2

CAD(2,3,1,2) = 10.7

CHIProb (Cell A, Cell B, Cell C, Cell D)

Where A,B,C,D are the joint frequencies

Conditions	z	W
X	A	B
Y	C	D

Category: Statistics

This function calculates the probability of observing a Chi Square statistic for a 2 by 2 table.

Example Application: Two breeders, Tom and Bill have both breed 100 cows. The cows that Tom bred had a 60% conception rate, while the cows that bill bred have a 45% conception rate. What is the Chi Square value:

Breeder	Pregnant	Open	total
Tom	60	40	100
Bill	45	55	100
Total	105	95	

ChiProb = (60,40,45,55) = 4.7

The probability of observing the Chi Square value for this table is: .047 or 4.7%

CHIsquare (Cell A, Cell B, Cell C, Cell D)

Where A,B,C,D are the joint frequencies

Conditions	z	W
X	A	B
Y	C	D

Category: Statistics

This function calculates the Chi Square statistic for a 2 by 2 table.

Example Application: Two breeders, Tom and Bill have both breed 100 cows. The cows that Tom bred had a 60% conception rate, while the cows that bill bred have a 45% conception rate. What is the Chi Square value:

Breeder	Pregnant	Open	total
Tom	60	40	100
Bill	45	55	100
Total	105	95	

ChiSquare = (60,40,45,55) = 3.9

(note that this is greater the 3.8 and so there is a significant difference between the breeders. The chance of observing this pattern by random chance is less then 5%.)

DIJK **(DayInMilk, Lactation)**

Category CULLING

This function is based on the culling model presented by Dr. A. Dijkhuizen at the Penn Conference. The model requires that the day in milk for the cow of interest be entered as well as her lactation number. The critical percent of herd ME required for the producer to what to continue breeding this cow is calculated. If the cow's ME as a percent of the herd ME is below this level – she might be considered to be a cull animal.

Assumptions: Shape of net economic returns are similar to Dutch cows as well as survival characteristics and economic values of cost inputs and outputs.
Reference: Prev. Vet Med

Example application: A 3'rd lactation cow is 200 days in milk. What should her ME milk production be, as a percent of the herd ME to warrant continued breeding?

= DIJK (200,3) = 97.5%

DMnut (AS_ Fed_ nutrient Density, Dry matter percent)

Category: Nutrition

This function calculates the Dry Matter Fed nutrient density from the entered AS fed nutrient density and the dry matter content of the ingredient.

Example: A corn silage sample has a dry matter of 26% and crude protein as fed percent of 2.34%. What is the dry matter crude protein %.

DMnut (3, 26) = 9%

Feedcost44**(SBM Cost/ton, Shelled Corn Cost/ton, Feed Crude Protein, Feed NE/lb)**

This program calculates the cost of a mix of soybean meal (44%) and shelled corn to equal the protein and energy content of a feed with the entered crude protein and energy value.

Example; Soybean meal 44% cost $ 240 a ton and shelled corn cost $ 130 a ton. A protein mix with 18% crude protein and .78 Mcals of Net L energy /lb cost $180/ton. What would a mix of soy and corn cost that would have the same amount of protein and energy as the mix.

Feedcost44(240,130,20,.78) =$189

Reference: DairyLP

Feedcost48**(SBM Cost/ton, Shelled Corn Cost/ton, Feed Crude Protein, Feed NE/lb)**

This program calculates the cost of a mix of soybean meal (48%) and shelled corn to equal the protein and energy content of a feed with the entered crude protein and energy value.

Example; Soybean meal 48% cost $ 240 a ton and shelled corn cost $ 130 a ton. A protein mix with 18% crude protein and .78 Mcals of Net L energy /lb cost $180/ton. What would a mix of soy and corn cost that would have the same amount of protein and energy as the mix.

Feedcost48(240,130,20,.78) =$189

Reference: DairyLP

GAMCUM **(intercept, Lndim,, dimcoef, startday, end day)**

This function calculates the area under the gamma curve specified by the parameters entered.

The following Gamma curve is specified for a lactation curve;

$Y = e^{(\text{Intercept})} * \text{Day in milk}^{(\ln \text{DIM})} * e^{(\text{dimcoef} * \text{DIM})}$

Y = milk yield/day
Where intercept = the intercept value
Lndim = the LnDim value
Dimcoef = the day in milk coefficient value
Day in milk = the day in milk of the lactation curve

Example: A linear regression has been fit to LN(milk) = Ln(day in milk) + day in milk + intercept

Where: intercept = 2.9
Ln DIM coefficient = .13
Day in milk coefficient = -.003
Start Day in milk = 1
End Day in milk = 305

How much milk is being over 305 days in milk?

Gammilk (2.9,.13,-.003,1,305) = 6,567 kgs of milk.

(Note: the units of milk will be what ever were entered on which the regression was done.)

Reference:

GAMmilk **(intercept, Lndim,, dimcoef, Day in milk)**

This functions calculates the milk production/day for a cow at the entered days in milk under the gamma curve specified by the parameters entered.

The following Gamma curve is specified for a lactation curve;

$Y = e^{(Intercept)} * \text{Day in milk}^{(\ln DIM)} * e^{(dimcoef * DIM)}$

Y = milk yield/day
Where intercept = the intercept value
Lndim = the LnDim value
Dimcoef = the day in milk coefficient value
Day in milk = the day in milk of the lactation curve

Example: A linear regression has been fit to LN(milk) = Ln(day in milk) + day in milk + intercept
Where: intercept = 2.9
Ln DIM coefficient = .13
Day in milk coefficient = -.003
Day in milk = 21

How much milk is being produced on day 21?

Gammilk (2.9,.13,-.003,21) = 21 kgs of milk.

(Note the units of milk will be what ever were entered on which the regression was done.

Reference:

GAMpeak **(intercept, Lndim,, dimcoef)**

This function calculates the peak milk for the gamma curve specified by the parameters entered.

The following Gamma curve is specified for a lactation curve;

$Y = e^{(Intercept)} * \text{Day in milk}^{(\ln DIM)} * e^{(dimcoef * DIM)}$

Y = milk yield/day
Where intercept = the intercept value
Lndim = the LnDim value
Dimcoef = the day in milk coefficient value
Day in milk = the day in milk of the lactation curve

Example: A linear regression has been fit to LN(milk) = Ln(day in milk) + day in milk + intercept

Where: intercept = 2.9
Ln DIM coefficient = .13
Day in milk coefficient = -.003

Start Day in milk = 1
End Day in milk = 305

What is the peak milk production:

Gammilk (2.9,.13,-.003) = 26.05 kgs of milk.

(Note: the units of milk will be what ever were entered on which the regression was done.)

Reference:

GAMpeakday **(intercept, Lndim,, dimcoef)**

This function calculates the day in milk of peak milk for the gamma curve specified by the parameters entered.

The following Gamma curve is specified for a lactation curve;

$Y = e^{(Intercept)} * \text{Day in milk}^{(\ln DIM)} * e^{(dimcoef * DIM)}$

Y = milk yield/day
Where intercept = the intercept value
Lndim = the LnDim value
Dimcoef = the day in milk coefficient value
Day in milk = the day in milk of the lactation curve

Example: A linear regression has been fit to LN(milk) = Ln(day in milk) + day in milk + intercept

Where: intercept = 2.9
Ln DIM coefficient = .13
Day in milk coefficient = -.003
Start Day in milk = 1
End Day in milk = 305

When does the peak milk production occur?

Gammilk (2.9,.13,-.003) = 43 days in milk

Reference:

GroupNEG **(Sensitivity, Specificity, Prevalence, number sampled negative)**

Category Epidemiology

This function calculates the probability that a group of animals that have tested negative to a test (with a sensitivity and specificity entered) are truly negative. The calculations assumes that the underlying prevalence of the condition of interest is entered.

Reference: Noordhuizen et al, Application of Quantitative Methods in Veterinary Epidemiology. 1997 Wageningen. Page 76

Example: A group of 30 cows test negative to Johne's Elisa test. The sensitivity and specificity of the test is 45% and 99% respectively while the underlying prevalence is 5%. What is the probability that the group is truly negative.

GroupNEG (.45,.99.,05, 30) = 42 %

Assumptions: Baysian calculations

GroupPOS **(Sensitivity, Specificity, Prevalence number sampled negative)**

Category Epidemiology

This function calculates the probability that at least one or more animals in the group are infected given that all have tested negative to a test (with a sensitivity and specificity entered).

Reference: Noordhuizen et al, Application of Quantitative Methods in Veterinary Epidemiology. 1997 Wageningen. Page 76

Example: A group of 30 cows test negative to Johne's Elisa test. The sensitivity and specificity of the test is 45% and 99% respectively while the underlying prevalence is 5%. What is the probability that 1 or more of the cows is positive for Johnes?

GroupPOS (.45, .99, .05, 30) = 58%

Assumptions: Baysian calculations

HeiferHT **(age in months)**

This function calculates the standard height for a Holstein heifer at the entered age in months.

Reference: Penn State Manual
Reference: Dairy Reference Manual, 3rd edition, NRAES-63, Page 87
Henrichs et al. Standard of Weight and Height for Ayshire, Brown Swiss, and Milking Shorthorn Heifers, J Dairy Sci.

Assumptions: Heifers follow standard group curves.

Example: A Holstein heifer is 14 months of age. What should her height be in inches:

heiferht (14) = 48.2 inches

HeiferNumber **(Herd size, % culls, age month at first calving, culling in heifers, mortality in heifers)**

This function calculated the number of heifers required to be raised to maintain the herd size entered, given the culling rate of the herd, the age at first calving of heifers and the culling and mortality rate in the heifers.

Assumptions: The culling and mortality rate are for the age at first calving entered – not the annual rate.

Example: A herd of 100 cows has an annual culling rate of 30% and calves the heifers at 27 months of age for the first time. About 2% of heifers are culled for various reasons and 3% of heifer die. What is the number of heifers required to maintain herd size?

Heifernumber(100,.30,27,.03,.02) = 71 heifers

MilkMargin **(Milk Level, Ration Cost, Dry Cow ration Cost)**

Category ECONOMIC

This function calculates the marginal cost of milk production ($/lb).

Assumptions: This calculation, assumes that the dry cow ration cost is an approximate estimate of the maintenance cost for the cow. The calculation further assumes that the marginal cost is constant and linear over the range of milk production from 1 to the milk level entered.

Reference: John Fetrow.

Example Application: A cow milking 80 lbs cost $4.00 to feed/day. A dry cow has a daily ration cost of $1.50/day. What is the marginal cost of producing an additional pound of milk?

MilkMargin (80, 4, 1.50) = .031

NegFREQ (Sensitivity, Specificity, prevalence)

This function calculates the frequency of negative test results given the entered sensitivity, specificity and prevalence of the condition of interest.

Reference: Noordhuizen et al, Application of Quantitative Methods in Veterinary Epidemiology. 1997 Wageningen. Page 76

Assumptions: Baysian Calculations

Example: An Elisa test for Johne’s disease has a sensitivity and specificity of 45% and 99%. What is the frequency of Negative test results, if the underlying prevalence of Johne’s is 5%.

NegFreq (.45,.99,.05) = 97%

NitratePCT **(percent of nitrate nitrogen)**

This function is a guide to the feeding of forages with varying levels of nitrate nitrogen (NO_3-N) expressed a ppm.

Example:
A forage feed sample has 1% nitrate nitrogen. How can it be used.

NitratePpct(1) = Feed should be limited to 30-40% of the forage intake.

Reference:

NitratePPM **(ppm of nitrate nitrogen)**

This function is a guide to the feeding of forages with varying levels of nitrate nitrogen (NO_3-N) expressed a ppm.

Example:
A forage feed sample has 3000 ppm nitrate nitrogen. How can it be used.

NitratePPM (3000) = Feed should be limited to 30-40% of the forage intake.

Reference:

NormalD (mean, standard deviation)

Category Statistics

This function returns a sample value from the entered mean and standard deviation. The function assumes a normal distribution specified by the mean and standard deviation.

Reference: Box-Muller Transformation

Example: A population of cows have an average milk production of 90 lbs and a standard deviation equaling 20 lbs.

A cow randomly sampled from this population could have a production of:

Normald (90, 20) = 88.1
Or
Normald (90, 20) = 101

Assumptions: Properties of a normal distribution

POSFREQ **(Sensitivity, Specificity, prevalence)**

This function calculates the frequency of positive test results given the entered sensitivity, specificity, and prevalence of the condition of interest.

Reference: Noordhuizen et al, Application of Quantitative Methods in Veterinary Epidemiology. 1997 Wageningen. Page 76

Assumptions: Baysian Calculations

Example: An Elisa test for Johne's disease has a sensitivity and specificity of 45% and 99%. What is the frequency of positive test results, if the underlying prevalence of Johne's is 5%.

PosFreq = (.45,.99,.05) = 3%

PowerDETECT **(population, prevalence, significance, test sensitivity)**

This function calculated the sample sized needed to detect at least one infected animal at the significance level entered with a test having a sensitivity value.

Reference: Noordhuizen et al, Application of Quantitative Methods in Veterinary Epidemiology. 1997 Wageningen. Page 50

Example application: If a herd of 100 cows is suspected of having Johne's at about 5%, how many animals should you test to be 95% confident that the herd is free of Johnes. (Elisa test sensitivity = 45%)

Powerdetect (100,.05,.95, .45) = 73 cows

PowerMAXD **(population, # sampled negative, significance, test sensitivity)**

This function calculates that maximum disease level if all sampled are negative to a test having the entered sensitivity value.

Reference: Noordhuizen et al, Application of Quantitative Methods in Veterinary Epidemiology. 1997 Wageningen. Page 50

Example application: If a herd of 1000 cows is suspected of having Johne's. What is the maximum prevalence in the herd (of 1000) (with a significance level of 95%) if 100 cows test negative (Elisa test sensitivity = 45%)

PowerMaxD (1000,.100,.95, .45) = 6.2%

Powermean **(Standard Deviation, within X units, significance - .95 or .99)**

This function determines the sample size needed to estimate a population mean. The variation around the population mean to be estimated is needed (Standard Deviation) as well has how close to the population mean should the mean of the sample 95 or 99 percent of the time..

Reference: Veterinary Epidemiology Principles and Methods, Wayne Martin, A Meek, P Willeberg. Iowa State University Press/ Ames. Page 33.

Example: The standard deviation around daysopen is about 20 days. An investigator wants to sample a group of cows and be sure that the mean of their days open is within 5 days of the true population 95% of the time. How many cows should he sample.

Powermean (20,5,.95) = 61 cows

Powerport **(proportion, within X units, significance - .95 or .99)**

This function determines the sample size needed to estimate a population proportion. The production consultant must provide an estimate of the proportion a priori as well has how close the the true population proportion should the sample be, 95 or 99% of the time.

Reference: Veterinary Epidemiology Principles and Methods, Wayne Martin, A Meek, P Willeberg. Iowa State University Press/ Ames. Page 32.

Example: It is expected that 30% of the cow population has disease X. The production consultant wants an estimate of this disease from a survey, to be within 6% of the true value 95% of the time. How many cows should be in the survey

Powerport (.,.06,.95) = 224 cows

PRagg **(Percent Open, Time of observation)**

This function calculates a PR for a 21 day interval, based on estimating an almost instantaneous rate for the observed period and using this rate over 21 days. (It will approximate an exact level).

Example: Ov-synch is used on 100 cows at day 50 in milk. No heat detection occurs 21 days post breeding and 70 of the 100 cows are open at the 42 day preg check. What is the PR for the 2 intervals.

PRagg (.70, 42) =16.39

Reference: Survival Analysis. Allision SAS book

PRCI **(PR, Voluntary Wait)**

This function calculates the calving interval that corresponds to a given pregnancy rate for a given voluntary wait period. The formula assumes that the PR is constant over all time intervals.

Example: The pregnancy rate for a herd is estimated at 20%. The herd has a voluntary wait period of 50 days. What is the corresponding CI for the average cow in the herd?

PRCI (.20, 50) =13.89 months

Reference: Survival Analysis. Allision SAS book

PredNEG **(Sensitivity, Specificity, prevalence)**

This function calculates the predictive value negative for a negative test results given the entered sensitivity, specificity, and prevalence of the condition of interest.

Reference: Noordhuizen et al, Application of Quantitative Methods in Veterinary Epidemiology. 1997 Wageningen. Page 76

Assumptions: Baysian Calculations

Example: An Elisa test for Johne's disease has a sensitivity and specificity of 45% and 99%. The underlying prevalence of Johne's disease is 5%. What is the Probability that a cow is free of Johne's disease given that she is test negative?

Predneg(.45,.99,.05) = 97%

PredPos **(Sensitivity, Specificity, prevalence)**

This function calculates the predictive value postive for postivit test results given the entered specificity, sensitivity and prevalence of the condition of interest.

Reference: Noordhuizen et al, Application of Quantitative Methods in Veterinary Epidemiology. 1997 Wageningen. Page 76

Assumptions: Baysian Calculations

Example: An Elisa test for Johne's disease has a sensitivity and specificity of 45% and 99%. The underlying prevalence of Johne's disease is 5%. What is the Probability that a cow has Johne's disease given that she is test positive?

Predpos(.45,.99,.05) = 70%

Probabove (observation value, mean, standard deviation)

Category: Statistics

This command calculates the probability of observing a value greater than and equal to the entered observation value from a population with the entered mean and standard deviation.

Example: A population of cows has an average milk production of 80 lbs with a standard deviation of 20 lbs. What is the probability of observing cows with milk production equal to and greater then 60 lbs.

Probabove (60, 80, 20) = 84.1%

Probbelow (observation value, mean, standard deviation)

Category: Statistics

This command calculates the probability of observing a value less than and equal to the entered observation value from a population with the entered mean and standard deviation.

Example: A population of cows has an average milk production of 80 lbs with a standard deviation of 20 lbs. What is the probability of observing cows with milk production equal to and less then 60 lbs.

Probbelow (60, 80, 20) = 15.9%

Quadratic1 **(A_Coeff, B_Coeff, C_Coeff)**

This function solves for the value of x for the following function: $\mathbf{A}\, x^2 + \mathbf{B}x + \mathbf{C} = 0$, where
A = the A_Coeff value, B = B_Coeff value and C_Coeff value.
The following formulat is used:

$$X = (-b +/- (b^2 - 4\, ac)^{.5})/ 2*a$$

Each root is found by using either a + or – sign.

Reference: Basic High School Algebra Bood

Assumptions: That math works

Example: An equation has the following form: : $\mathbf{1}\, x^2 - 2x + \mathbf{.3} = 0$,

Quadratic1(1,-2,.3) = .1633
Quadratic2 (1,-2,.3) = 1.837

Quadratic2 **(A_Coeff, B_Coeff, C_Coeff)**

This function solves for the value of x for the following function: $\mathbf{A}\, x^2 + \mathbf{B}x + \mathbf{C} = 0$, where
A = the A_Coeff value, B = B_Coeff value and C_Coeff value.
The following formulat is used:

$$X = (-b +/- (b^2 - 4\, ac)^{.5})/ 2*a$$

Each root is found by using either a + or – sign.

Reference: Basic High School Algebra Bood

Assumptions: That math works

Example: An equation has the following form: : $\mathbf{1}\, x^2 - 2x + \mathbf{.3} = 0$,

Quadratic1(1,-2,.3) = .1633
Quadratic2 (1,-2,.3) = 1.837

Rogers **(DayInMilk, Lactation)**

Category CULLING

This function is based on the culling model developed by Dr. Gary Rogers.at Penn State. The model requires that the day in milk for the cow of interest be entered as well as her lactation number. The critical percent of herd ME required for the producer to what to continue breeding this cow is calculated. If the cow's ME as a percent of the herd ME is below this level – she might be considered to be a cull animal. Assumptions: Shape of net economic returns are similar to PA cow as well as survival characteristics.
Reference: JDS

Example application: A 3'rd lactation cow is 200 days in milk. What should her ME milk production be, as a percent of the herd ME to warrant continued breeding?

= Rogers (200,3) = 95.3%