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**Corn Silage to Beef Calculator**

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Introduction
The value of corn silage as a feedstuff for beef cattle generally is viewed in terms of grain yield with the accompanying forage yield being ignored or valued to a slight degree as a source of physically effective fiber. The development of more digestible fiber in the forage fraction of the silage and the variability of this digestibility between varieties should cause the user of silage to re-evaluate this criteria in selecting and ranking varieties in terms of value as a feedstuff. The dairy industry has already taken this step in ranking silage in terms of milk producing potential per acre with the University of Wisconsin’s “Milk 2006” index which looks at the energy yield of the silage per acre thus the starch in the grain, the digestibility of the forage component and the total silage yield per acre enter into the equation. With this in mind, this same concept should be applicable to growing cattle.

Materials & Methods
The National Academy of Science Engineering and Medicine (NASEM) has recently published an updated version of their guidelines for the nutrient requirements for beef cattle. This document outlines in some detail the conversion of feed energy to growth in cattle. The total digestible nutrients (TDN) and net energy content (NEm & NEg) of the feed can be obtained quite conveniently with the use of a commercial feed testing laboratory. The use of a 48 hour NDF digestibility greatly adds to the existing approximate analysis testing of the feedstuff when estimating energy content since this digestibility of feed fiber is of sizable variation between varieties of corn silage. This nutrient data is then applied to a standardized 900 pound steer to allow for an illustration of how much potential growth is allowed per unit of silage. Finally, the actual production data must be incorporated into the model. This involves yield data for the varieties involved along with production and harvest costs. The equations used to generate the results are listed as follows:

Calculation from Corn Silage to Beef Worksheet
Dry Matter intake (DMI) - take the lower of these two equations
1. NASEM DMI=((408*0.75 x (0.2435 x NEm x 2.2045- 0.0466 x (NEm x 2.2045)^2-0.0869))/(NEm x 2.2045)) x 2.2045
2. NDF DMI =((900 x 0.012)/(NDF% x 0.01))

**DMI in pounds**

Weight Gain from Energy and Protein - take the lower of these two equations
Allowable gain from energy intake = ADG-e = ((13.91 x 358.71^-0.6837 x km^-0.9116)) x 2.2045

**ADG-e in pounds / day**

km=((DMI x NE m-6.33)/NE m x NE g)
NE m and NE g in Mcals per pound
If NEm and NEg are not provided directly to the program, but the nutrient profile is provided then
NE m = (4 x DMd% x 0.01 x CP% x 0.01 + NDF% x 0.01 x NDFd% x 0.01 x 2 + Fat% x 0.01 x 9 x DMd% x 0.01 + 4 x DMd% x 0.01 x 0.01 x NFC%) x 0.275)
Then TDN is calculated
TDN =((NEm + 0.132) / 0.01318)
NEg =TDN x 0.01318 - 0.459
NFC = nonfiber carbohydrate
DMd = dry matter digestibility

Allowable gain from protein intake = ADG-p =((29.4 x 5.673 + NetMP) / 268) x 2.2045

**ADG-p in pounds / day**

NetMP =((((FeedMP + MicrobialMP) - 301) x (0.834 - (298.8 x 0.00114)))
Feed MP =((CP% x 0.01 x DMI x 0.32) x 453.6 x 0.8

**FeedMP in grams**

Select lower of the two:
MicrobialMP1 =0.13 x (NFC x 0.01 x DMI+DNI x NDFD x 0.01 x NDF% x 0.01 x 0.85) x 453.6 x .64
MicrobialMP2 =0.68 x CP% x 0.01 x DMI x 453.6

**MicrobialMP in grams**

To calculate the amount of urea needed
Urea required = (MicrobialMP1 – MicrobialMP2) / (250 x 0.01 x 453.6)

**Grams of urea**

Cost of Urea = user defined per ton
Beef Per Acre = (DM/acre)/DMI x ADG

Pounds

$/lb Beef = Cost per Acre / Beef per Acre

Results & Discussion

With corn silage, MicrobialMP1 will always be higher and not used due to the urea fermentation potential of corn silage (not enough nitrogen to utilize the energy). Therefore, MicrobialMP2 is always selected unless we add urea. Different varieties have differing amounts of urea fermentation potential required to balance, thus if the “Urea Balance” selection is marked “yes” in the program, then urea is added to balance and crude protein (N) is no longer limiting to ADG, thus varieties can be compared on energy produced per acre when this is done rather than limiting their potential by plant protein. The urea is given a cost on the worksheet by the user which is factored into the cost of gain based on how much urea is needed.

Another adjustment that is allowed is that for cattle consuming high levels of starch and the probable depression in fiber digestion in their diet. Cattle may be on all forage diets or they may be on a feedyard fattening protocol. With the cattle on the high starch rations used for fattening the value of the digestible NDF is reduced to 50% of the 48 hour laboratory value. This reduces the value of fiber digestibility, but still credits it to some degree in the ration.

The input / output appears as such: