Corn Silage to Beef Calculator

A.S. Leaflet R3136

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Summary and Implications

The Corn Silage to Beef calculator allows corn silage varieties to be summarized in terms of the beef they will yield as a feedstuff. This software has been made available t the general public through Iowa State Beef Center website as a free download at http://iowabeefcenter.org/calculators.html

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 his 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:

Calculations 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 NE g 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+DMI 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

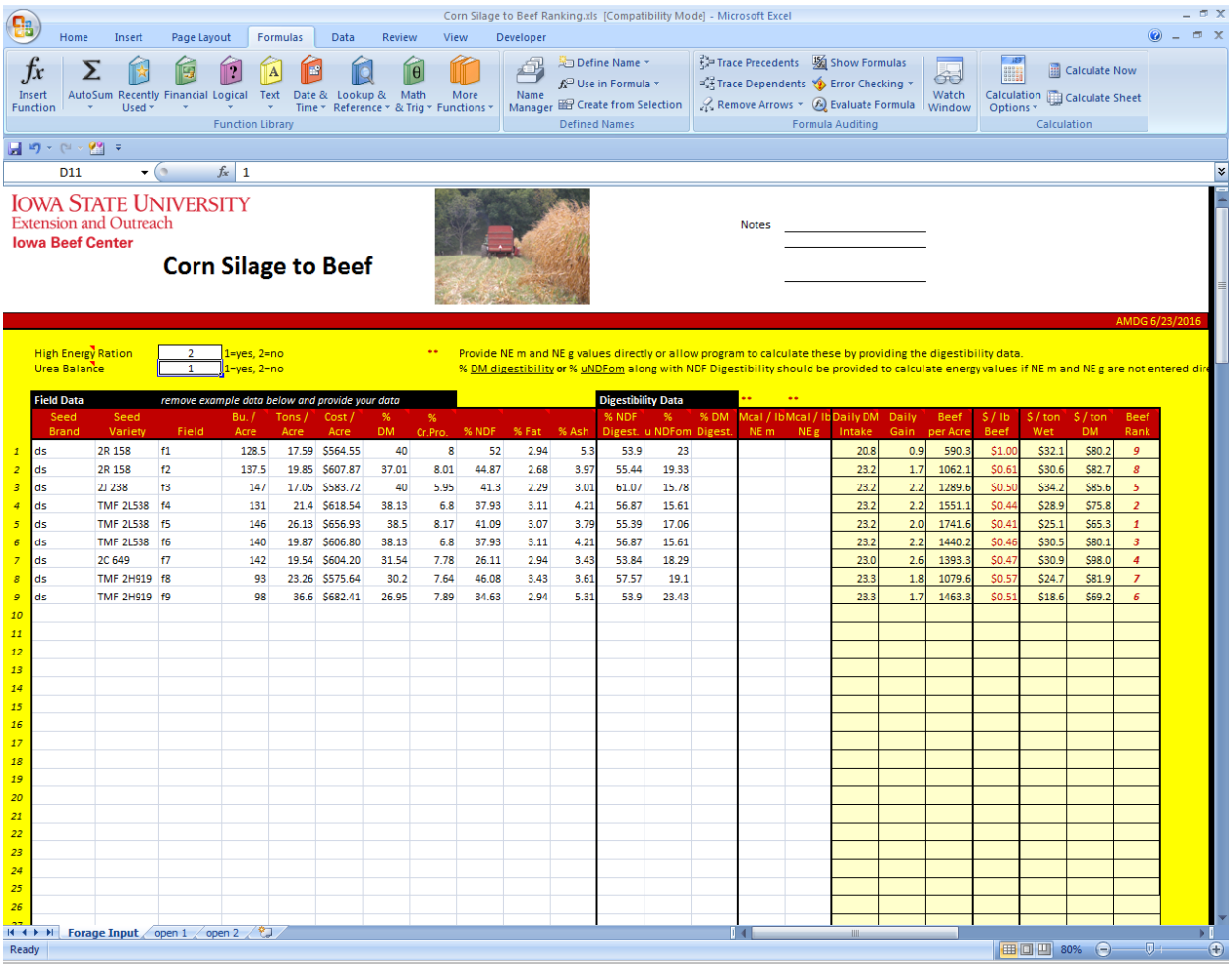
$/lb Beef = Cost per Acre / Beef per Acre

If urea balance is figured in then the cost of urea is added to the $/lb Beef
Cost of corn silage production = user defined per acre
Yield of corn silage = user defined per acre
Varieties are ranked on $/lb Beef

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:



Corn Silage to Beef Ranking.xls [Compatibility Mode] - Microsoft Excel

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Corn Silage to Beef

Notes

AMDG 6/23/2016

High Energy Ration: 2 (1=yes, 2=no)
Urea Balance: 1 (1=yes, 2=no)

** Provide NE m and NE g values directly or allow program to calculate these by providing the digestibility data.
% DM digestibility or % uNDFom along with NDF Digestibility should be provided to calculate energy values if NE m and NE g are not entered dir

	Field Data (remove example data below and provide your data)											Digestibility Data			**	**							
	Seed Brand	Seed Variety	Field	Bu. / Acre	Tons / Acre	Cost / Acre	% DM	% Cr.Pro.	% NDF	% Fat	% Ash	% NDF Digest.	% u NDFom	% DM Digest.	Mcal / lb NE m	Mcal / lb NE g	Daily DM Intake	Daily Gain	Beef per Acre	$ / lb Beef	$ / ton Wet	$ / ton DM	Beef Rank
1	ds	2R 158	f1	128.5	17.59	$564.55	40	8	52	2.94	5.3	53.9	23				20.8	0.9	590.3	$1.00	$32.1	$80.2	9
2	ds	2R 158	f2	137.5	19.85	$607.87	37.01	8.01	44.87	2.68	3.97	55.44	19.33				23.2	1.7	1062.1	$0.61	$30.6	$82.7	8
3	ds	2J 238	f3	147	17.05	$583.72	40	5.95	41.3	2.29	3.01	61.07	15.78				23.2	2.2	1289.6	$0.50	$34.2	$85.6	5
4	ds	TMF 2L538	f4	131	21.4	$618.54	38.13	6.8	37.93	3.11	4.21	56.87	15.61				23.2	2.2	1551.1	$0.44	$28.9	$75.8	2
5	ds	TMF 2L538	f5	146	26.13	$656.93	38.5	8.17	41.09	3.07	3.79	55.39	17.06				23.2	2.0	1741.6	$0.41	$25.1	$65.3	1
6	ds	TMF 2L538	f6	140	19.87	$606.80	38.13	6.8	37.93	3.11	4.21	56.87	15.61				23.2	2.2	1440.2	$0.46	$30.5	$80.1	3
7	ds	2C 649	f7	142	19.54	$604.20	31.54	7.78	26.11	2.94	3.43	53.84	18.29				23.0	2.6	1393.3	$0.47	$30.9	$98.0	4
8	ds	TMF 2H919	f8	93	23.26	$575.64	30.2	7.64	46.08	3.43	3.61	57.57	19.1				23.3	1.8	1079.6	$0.57	$24.7	$81.9	7
9	ds	TMF 2H919	f9	98	36.6	$682.41	26.95	7.89	34.63	2.94	5.31	53.9	23.43				23.3	1.7	1463.3	$0.51	$18.6	$69.2	6
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