

New Version of SESAME

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Abstract

We released a new version of the software SESAME in November 2004. SESAME calculates break-even prices of feedstuffs based on their nutritional composition and market prices using a maximum likelihood method. Four major changes were implemented in this third major release. First, the net energy for lactation (NE_L) content of feedstuffs is dynamically calculated. In prior versions, NE_L had to be calculated and manually entered by the user. In Version 3, NE_L is calculated using the system implemented by the National Research Council (NRC) in its 2001 publication. Second, the quality adjustment factors for forage first proposed by Weiss (2002) have been fully incorporated. There are quality attributes in forages that are not entirely captured by their nutritional densities. The economic value of these quality attributes are captured by the adjustment factors. Third, we added graphical options to make the visual output more useful. Lastly, the software distribution has been entirely moved to an on-line system with direct payment by credit card. The database platform used is robust, allowing users to analyze purchasing decisions as well as estimating break-even prices of new feed ingredients.

Introduction

There is a constant need to estimate what feed ingredients are worth compared with what they are priced at. Producers need this information to

make informed decisions regarding their feed procurement. Feed manufacturers need this information to decide what commodities should be inventoried in their limited number of storage bins. Feed processors need this information to estimate the returns to new equipment and processes that generate new feed ingredients with altered nutritional characteristics. Although mathematical programming (i.e., least-cost programs) can be used to generate such information, the method has severe limitations that restrict its inference range. We have proposed a market-based method that estimates break-even prices of feedstuffs from the value of the nutrients contained in feeds and the trading prices of all commodities in a given market (St-Pierre and Glamocic, 2000). A stand-alone software, SESAMETM, was written to allow nutritionists and their clients a relatively easy access to the method. Details regarding SESAME and its application have been presented at this Conference (St-Pierre, 2000).

In November 2004, we released a new version of SESAME that incorporates recent work done in the area of feed evaluation, as well as new features to enhance the program usability. The objective of this paper is to describe the changes that have been incorporated in this new release.

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Changes to the Program

Dynamic calculation of dietary energy

In prior versions, the energy content of feedstuffs had to be calculated by the user before being manually entered in the program. This resulted in much confusion. For example, some users modified the nutritional profile of distillers dried grains without realizing that these changes did not modify the estimated energy content, and hence, had little impact on the calculated break-even prices. Version 3 incorporates the calculation scheme used by NRC (2001) in a dynamic fashion. A new NRC-Group attribute was added to each feedstuff (e.g., concentrate, forage, fat, animal, etc.) so that the proper NRC equation could be used in each instance. As in Table 15-1 of NRC (2001), NE_L is calculated at 3X maintenance, assuming that the diet has 74% total digestible nutrients (TDN).

Adjustment factors for forages

In a review of literature data, Weiss (2002) showed that the economic value of forages is not completely accounted for by nutrient density. At least for alfalfa, forages are not entirely substitutable. Cows respond to forage quality more than what nutritional content would indicate. Literature data adjusted for the trial effect indicate a reduction of 0.34 lb/day in fat-corrected milk (FCM) yield from a 1% increase in alfalfa NDF content (Figure 1). Additional work by Weiss on grass forage and St-Pierre on corn silage generalized the initial work of Weiss (2002). These adjustments are now fully implemented in SESAME V3.

Forage quality adjustments are based on expected change in FCM production. For alfalfa, a value of 44% NDF is set as the base. Thus, if a given lot of alfalfa contains 44% NDF, no adjustment is made. If NDF content is less than 44%, the economic value increases; if NDF content is greater than 44%, the value decreases. Adjustments are

calculated based on a change in FCM yield of 0.34 lb per unit change in alfalfa NDF. Thus, adjustments are a function of milk price. Other minor assumptions are also accounted for as described by Weiss (2002).

Table 1 illustrates the effect of the quality adjustments on three lots of alfalfa hay differing in NDF content. At a milk price of \$14.00/cwt of FCM, the adjustment amounts to approximately \$4.00 per ton of hay for each one percentage unit change in NDF content. The adjusted break-even prices are more in line with historical market price differences for quality of alfalfa hay.

The adjustment factors for grasses are based on much more limited data than those used for alfalfa. For grasses, a value of 53% NDF was used as a base. Adjustments to break-even prices are calculated using the same method as the ones used for alfalfa. Because of the limited data on which the adjustment factors are calculated for grasses, we have less confidence in these factors than those used for alfalfa. Adjustments for mixtures of grasses and legumes are based on the weighed adjustments using the proportion of grass and legume in the forage.

Adjustment factors for corn silage are entirely based on the DM content. A review of published literature (St-Pierre, unpublished) showed a curvilinear response in DM digestibility and intake to DM content of corn silage. The intake depression associated with DM content greater than 36% is based predominantly on older data with non-mechanically processed silage. It is possible that mechanical processing considerably reduces considerably the intake and digestibility depressions of dryer silages, but published data are still too sketchy to allow a correct quantification of this effect. Table 2 reports the adjustments used for corn silage break-even price calculations in SESAME Version 3.0.

New graphic options

Many users favor graphical presentation of results over tabular ones. In prior versions of SESAME, the graphical output worked properly as long as the problem did not include feedstuffs with prices considerably greater than the average price of all feeds used in a problem. In instances where high priced ingredients were included, as when protected amino acid products were included, the graphical display of the results was nearly worthless due to the great distortion of the x-scale (Figure 2a). Version 3 includes an option to exclude feeds whose estimated price exceeds the average price of all feeds by a certain percentage (the default is 50%). The user can thus produce clear graphics in nearly all situations (Figure 2b).

New on-line distribution

Prior versions of SESAME were distributed on a CD-ROM. Literature (users manual, tutorials, etc.) was shipped in a traditional three-ring binder. Payments were accepted only in the form of checks in U.S. dollars. This system was labor intensive, untimely, and extremely unfriendly, particularly, to our international users. In Version 3, the product is delivered on-line, and payment is made using a credit card. SESAME V3.0 is available in English and Spanish and can be downloaded from www.sesamesoft.com. The software can be downloaded and used for free on a 7-day trial basis, after which a license purchase is required. The cost for the initial license is \$99/copy. Prior license holders who wish to upgrade can do it for \$29/copy. All documents are now available from this site in pdf format.

Conclusions

Version 3 of SESAME incorporates major changes to the energy calculation of feedstuffs, to the adjustments made in estimating forage prices, to the graphical display of results, and in the system used for its distribution.

References

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Table 1. Quality adjustments for alfalfa hay of three different NDF content.¹

	Hay #1	Hay #2	Hay #3
DM (%)	86	86	86
CP (% of DM)	20	20	20
Protein Degradability (% of CP)	81.1	81.1	81.1
NDF (% of DM)	40	44	48
NDF Effectiveness (% of NDF)	100	100	100
NE _L (Mcal/lb DM)	0.59	0.57	0.55
Break-even price (\$/ton) ²			
Unadjusted	104.74	105.19	104.32
Adjustment factor	+14.44	0	-14.44
Adjusted	119.18	105.19	89.88

¹NDF = neutral detergent fiber, DM = dry matter, CP = crude protein, NE_L = net energy for lactation; RDP = rumen degradable protein, RUP = rumen undegradable protein, and FCM = fat corrected milk.

²Based on the following prices: NE_L, \$0.08/Mcal; RDP, -\$0.045/lb; Digestible RUP, \$0.20/lb; non-effective NDF, -\$0.05/lb; effective NDF, \$0.05/lb; and FCM, \$0.14/lb.

Table 2. Multiplicative adjustment factors for corn silage used in SESAME V3.0.

DM (%)	Multiplicative Adjustments
24	0.78
26	0.85
28	0.93
30-39	1.00
40	0.91
42	0.85

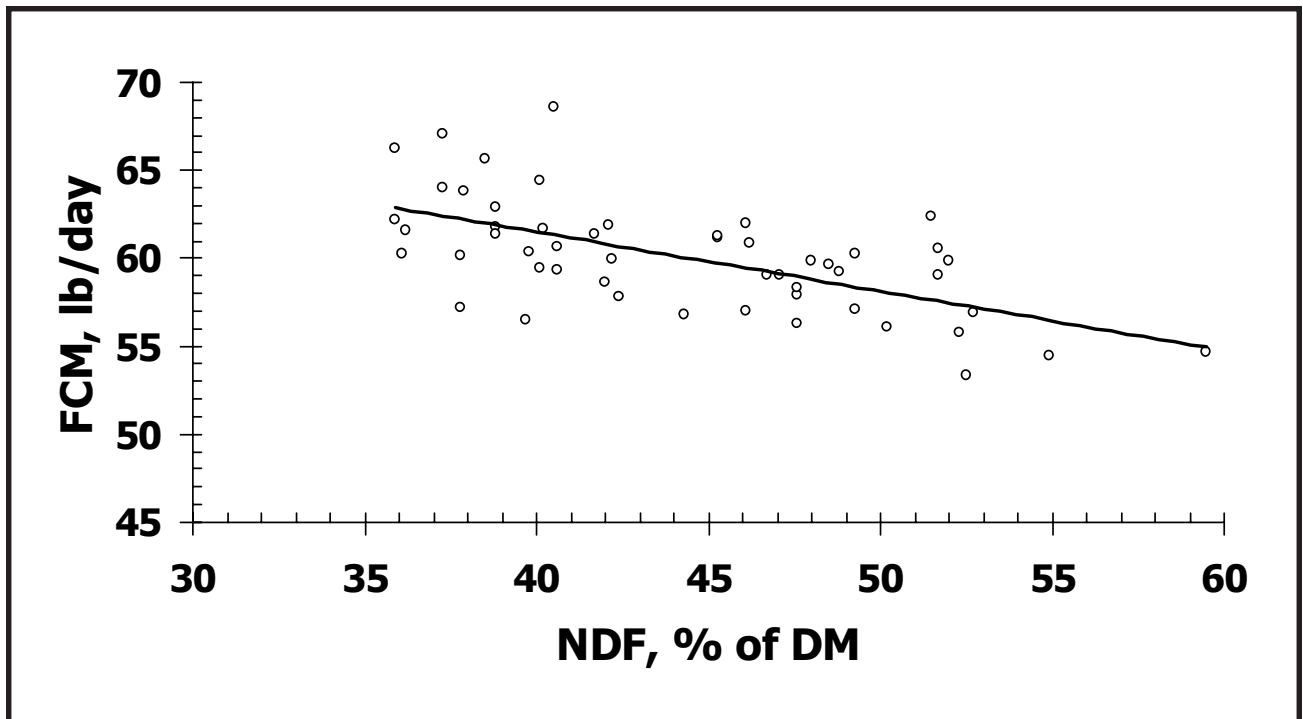


Figure 1. Effect of neutral detergent fiber (NDF) content of alfalfa on yield of 4% fat-corrected milk (FCM) when the alfalfa was fed in mixed diets to lactating dairy cows. Data were adjusted for trial effects. From Weiss (2002).

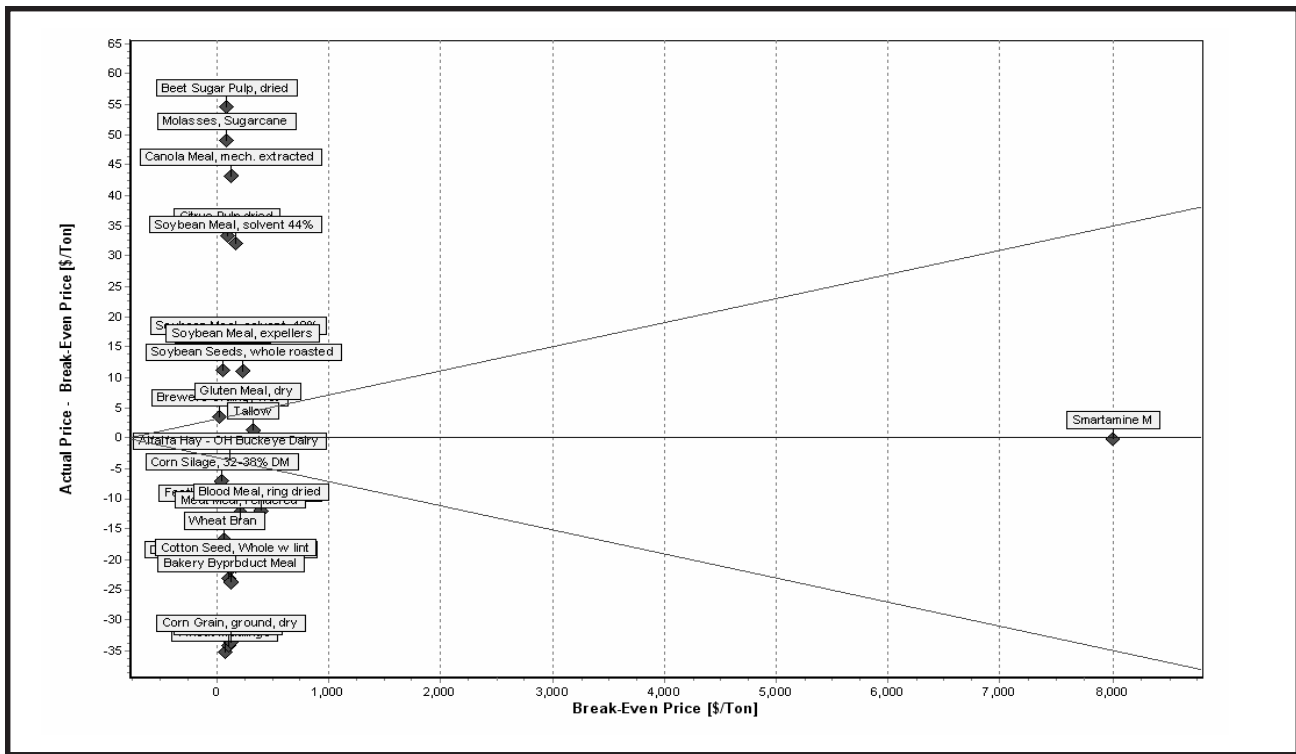


Figure 2a. Graphical display of results in SESAME V2.0. Distortion in the X-scale from a highly priced feedstuff reduced the clarity of the graphic.

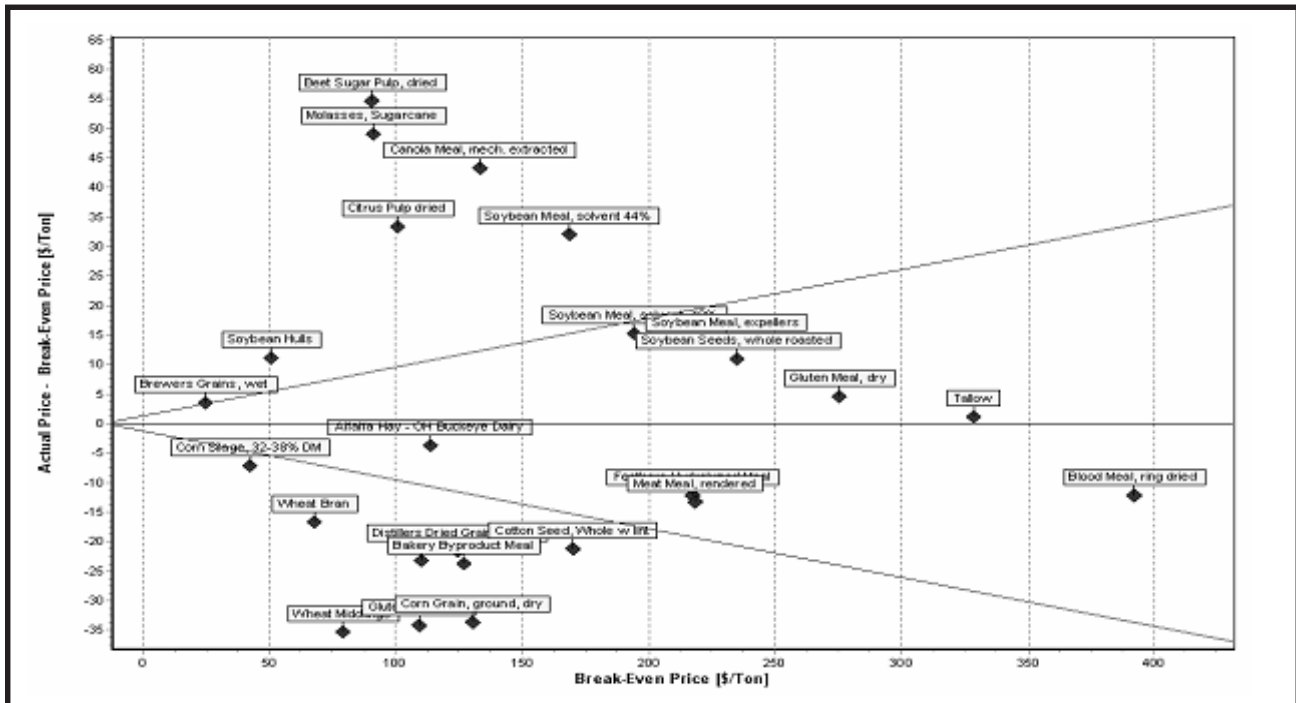


Figure 2b. Graphical display of results in SESAME V3.0. Highly priced feedstuffs can be removed from the graphic. This eliminates the distortion in the x-scale and restores clarity of the graphic.