Project Title: Carcass Value Optimization Web Application

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Background

A web application was created to report on optimum and minimum values obtainable for various carcass types along with the live value associated with the optimum obtainable value. Fabrication data came from prior carcass performance studies. Regressions were performed to validate average weights by subprimal for various carcass types and regression weights were used where limited subprimal weight data existed for specific carcass types. Pricing used in the calculation of values is derived from USDA weekly boxed and drop value reports. A carcass value optimizer is applied to this data to calculate the optimum and minimum potential values and a live value model is applied to the maximum potential value to determine an optimum live value.

Methodology

A web application was created for this project composed of a data loader, price manager, data modeling, value optimization processing and a data display.

A weekly data loader was designed to use the following USDA reports: Weekly Boxed Beef Cutout and Boxed Beef Cuts report, the National Weekly Boxed Beef Cuts for Branded Product report, National Weekly Boxed Beef Cuts for Ungraded Product report, and the Daily By-Product Drop Value report (Figure 1). The utility Widget from GnuWin32 was used as the method of file transfer.

Some subprimals included in the value optimization structure are either omitted from the USDA price reporting or, even though the subprimal may appear in the report, the volume of sales for these subprimals is regularly below the threshold that would result in their being reported.

A model was created for those subprimals regularly omitted from these reports. The model uses the values of related subprimals and a factor to determine the appropriate current value. Other subprimals have sporadic pricing updates in these reports. Pricing for the prior week is carried forward to the current week for these subprimals. A manual price override is also incorporated in the system which allows an administrator to directly update a price. Reasons for making direct price updates include the age of an existing price that had been carried forward for several weeks or an erroneous price being loaded from the reports. Pricing for a significant number of branded subprimals was not available. Choice pricing was used where branded pricing was unavailable.

A map was created to allow the prices coming from the report subprimal structure to be passed to the subprimal structure used in the optimization processing. All price processing after the initial report data load is performed within the report subprimal structure for the current week. Once this price processing is complete, the values for the current week are passed to the carcass value optimization processing structure. It was determined, based on the date of publication of the price data reports, that the best time to run the file loader would be at 6:00 pm Mountain time on Mondays.

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The carcass value optimization processor uses carcass subprimal weights from prior carcass performance studies and prices from the USDA reports and price modeling to determine what the maximum and minimum values are for each potential carcass type. A carcass type is defined as a specific yield grade, quality grade, sex/breed (steer, heifer, Holstein) and hot carcass weight category (fifty-pound increments from 600-1100).

The carcass weight values for each subprimal, and other carcass items such as trim, fat and bone, are associated with each fabrication point for each carcass type. A regression was performed for each yield grade (1,2,3,4-5) and sex/breed value to validate the averages calculated with the carcass study data. Those carcass types with fewer than four carcass data points were found to have a greater variation relative to the regression than those with four or more data points, therefore the regression data was used in place of the average carcass data for those carcass types with fewer than four carcasses.

There are approximately $23x10^9$ potential fabrication combinations included in the optimization carcass structure. The fabrication optimization process identifies the optimum fabrication points throughout the carcass, for each carcass type, that will result in the greatest overall carcass value. This value is determined based only on the value of each subprimal. No attempt was made to account for the differences in fabrication costs for different fabrication points. Based on the results of the optimization analysis, it does not appear that adjusting values for this cost would have significantly affected the optimization outcomes as the incremental difference between exclusive fabrication points significantly exceeded the incremental fabrication costs between any of these points. A similar process is run that determines the fabrication points that result in the minimum value for each carcass type.

When this optimizer was originally completed and loaded with pricing for January 2009, approximately 40 unique optimum solutions were found for 400 different carcass types. The spread between maximum and minimum value ranged from approximately $150 to $300, with the smaller spread occurring in lighter carcasses with lower yield grades and the higher spread occurring with heavy carcasses with higher yield grades. The prices being used in this web site reflect domestic pricing. It is expected that the inclusion of export pricing would significantly increase the maximum/minimum spread.

The carcass subprimal weights are a reflection of the fabrication standards used by Colorado State University in their fabrication of the carcasses used in the study. Different fabrication standards may result in different optimum fabrication points. Also, the use of carcasses from cattle with significantly different conformations (e.g. Angus, significant *Bos Indicus* influence) compared to those used in the study would result in different subprimal weights and optimum fabrication points. It was noted that price changes resulting from normal market activity can result in significant changes in optimum fabrication points. When comparing the value of the optimum fabrication points for January 2009 pricing to March 2009 pricing for a yield grade 3, Choice, 850-pound steer carcass, approximately $60 per carcass would have been lost in March of 2009 by continuing to fabricate based on the January 2009 data.

A method for calculating the potential breakeven live value was created and applied to the maximum value for each carcass type. A yield percentage of 62 was used for a Holstein carcass and a yield percentage of 63.5 for steer and heifer carcasses. The drop value per CWT is taken from the Daily By-Product Drop Value report. A fixed value of $125 per carcass is used as an estimate of the harvest and fabrication cost.

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Once data for the current week is run through the optimization process, the optimized data is passed to a data view page for the web site. Users accessing the page select a live weight category, sex/breed, quality grade and yield grade. The system returns the maximum live value, maximum and minimum carcass value, and the value of each subprimal of the fabrication points that were selected as the maximum and minimum points along with the total fat, lean, bone, 50s trim and 70s trim associated with these fabrication points.

Figure 1. USDA Reports Data Source	
Report	**Web Address**
National Weekly Boxed Beef Cutout and Boxed Beef Cuts	http://www.ams.usda.gov/mnreports/lm_xb459.txt
National Weekly Boxed Beef Cuts for Branded Product	http://www.ams.usda.gov/mnreports/lm_xb452.txt
National Weekly Boxed Beef Cuts for Ungraded Product	http://www.ams.usda.gov/mnreports/lm_xb462.txt
Daily By-Product Drop Value	http://www.ams.usda.gov/mnreports/nw_ls441.txt

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