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Cattle CODE: An Economic Model for Determining Byproduct Returns for Feedlot Cattle

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Summary

Cattle CODE — Coproduct Optimizer Decision Evaluator — is a model developed to predict performance and economic returns when byproducts are fed to finishing cattle. Four scenarios were evaluated to illustrate how the model works and to show sensitivity to corn price and distance from the ethanol plant, which resulted in positive returns for feeding WDGS, Sweet Bran, or DDGS up to 50% of diet DM and under 100 miles distance from the ethanol plant to the feedlot. The model can be found at http://beef.unl.edu under the byproduct feeds tab.

Introduction

Type of byproduct, dietary inclusion level, moisture content, trucking costs, feeding costs, and price relationship between byproducts and corn price affect cattle feeding profit or loss when using byproducts. Our objective was to use Coproduct Optimizer Decision Evaluator (Cattle CODE, at *http://beef.unl.edu*), a model designed to estimate profit or loss from feeding byproducts in feedlot diets, to evaluate these factors.

Procedure

Cattle CODE required cattle inputs of feeder and finished BW and their respective prices. Dry matter intake and F:G for cattle fed a corn-based diet with no byproducts were required inputs. Cattle processing and medical costs, death loss, yardage costs, and loan interest were also required. Feed ingredient prices, ingredient DM (%), and dietary inclusion level on a DM basis were needed for corn, byproducts, roughages, and a supplement. Inputs of semi-truck load size, cost/loaded mile, and miles hauled to the feedlot were needed for trucking costs (Table 1).

With these inputs, the model predicts DMI and F:G for each byproduct type and inclusion levels based on equations from research trials. The trials used include: wet distillers grains plus solubles (WDGS; Vander Pol et al., *2006 Nebraska Beef Report*, pp. 51-53), dry distillers grains plus solubles (DDGS; Buckner et al., *2007 Nebraska Beef Report*, pp. 36-38), modified distillers grains plus solubles (MDGS; Huls et al., *2008 Nebraska Beef Report*, pp. 50-51), Sweet Bran® and traditional wet corn gluten feed (Bremer et al., *2008 Nebraska Beef Report*, pp. 37-38), and wet Dakota Bran cake (Dbran; Bremer et al., *2006 Nebraska Beef Report*, pp. 57-58). With predicted DMI and F:G, the model calculated ADG. Feeder and fat cattle BW do not change in the model with inclusion of byproducts. Therefore, days on feed (DOF) were calculated based on ADG.

Yardage costs were divided into two parts. The model assumed 1/3 of yardage cost was for feeding costs, while the other 2/3 was for nonfeeding yardage costs. The feeding yardage cost component would account for any added costs associated with feeding wetter diets due to wet byproduct inclusions. Processing and medical expenses, death loss, and cattle loan interest remained the same in the model regardless of byproduct inclusion.

The model added urea (and associated cost) to diets when supplemental protein was needed to obtain at least 13.5% dietary CP. The model calculated dietary DM content with the inputs of feed ingredient DM and % inclusion, which was important for calculating feeding yardage costs. Byproduct hauling costs were calculated with load size, cost/loaded mile, and miles delivered to the feedlot.

A few byproduct feeding scenarios were evaluated to illustrate how this model can calculate profit/loss with any given inputs. Assumptions for inputs included: 740 lb feeder steer at breakeven price to cause the corn diet to have $0 profit, 1,300 lb finished steer at $90/cwt, 24 lb DMI and 6.5 F:G for cattle consuming a corn-based

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Table 1. Inputs required and outputs derived for Cattle CODE.

Inputs Required	Outputs Generated
Cattle	*Predicted/ Calculated Parameters*
Feeder weight	DMI for byproduct scenario
Feeder price/cwt	F:G for byproduct scenario
Finished weight	ADG
Finished price/cwt	DOF
DMI on corn diet	*Costs/ head*
F:G on corn diet	Nonfeeding yardage
Yardage cost/head/day	Feeding yardage
Processing and medical costs/ head	Byproduct transportation to the feedlot
Death loss %	*Diets*
Cattle loan interest %	DM%
Feed	CP%
Byproduct costs/ ton and %DM	Diet cost/ ton DM
Corn costs/ bushel, %DM, % of diet	Total feeding cost/ head
Roughage cost/ ton, %DM, % of diet	*Overall*
Supplement and urea costs/ ton, %DM, % of diet	Cost of gain/ lb
Transportation	Profit or Loss/ head
Truck load size (lbs as-is)	Byproduct returns/ head
Hauling cost/ loaded mile	
Miles from ethanol plant	

diet, $12.00/ head for processing and medical costs, 1.5% death loss, 8.1% cattle loan interest, and $0.35/ hd*day for yardage costs. Feed inputs included blending dry-rolled corn ($3.70/bu) with high-moisture corn ($3.35/bu) on an equal DM basis, 7% alfalfa hay ($130/ton), 4% dry supplement ($190/ton), and urea priced at $320/ton. Only three byproducts were evaluated for this report, including: WDGS (33% DM) and Sweet Bran (60% DM) priced at 95% and DDGS priced at 100% the price of corn (DM basis). Transportation inputs included $3.00/ loaded mile and 50,000 lb (as-is) byproduct capacity per load. A sensitivity analysis was conducted for mileage at 0, 30, 60, and 100 miles with hauling WDGS or Sweet Bran to a feedlot from the supplier. As the ethanol industry continues to expand with changing byproduct prices, we wanted to examine the price relationship of WDGS to corn at 95%, 85%, and 75% (DM basis). We also evaluated the sensitivity of changing corn prices at $2.70, $3.70, and $4.70/ bu with a changing corn market on DDGS returns.

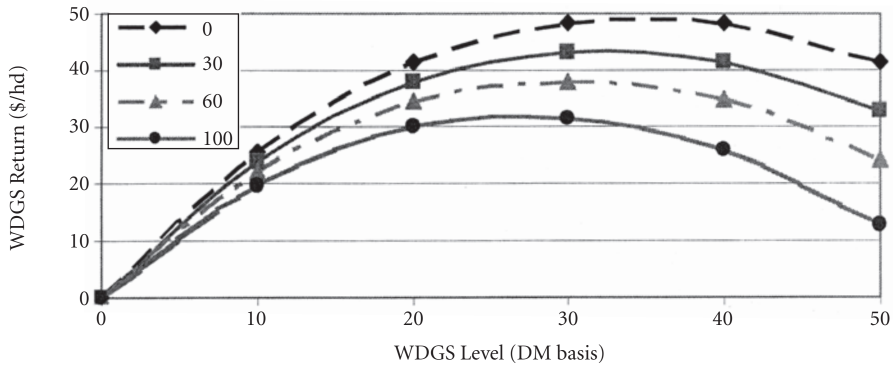

Figure 1. **Economic return for feeding WDGS at 95% the price of corn ($3.70/bu corn) at 0, 30, 60, and 100 miles.**

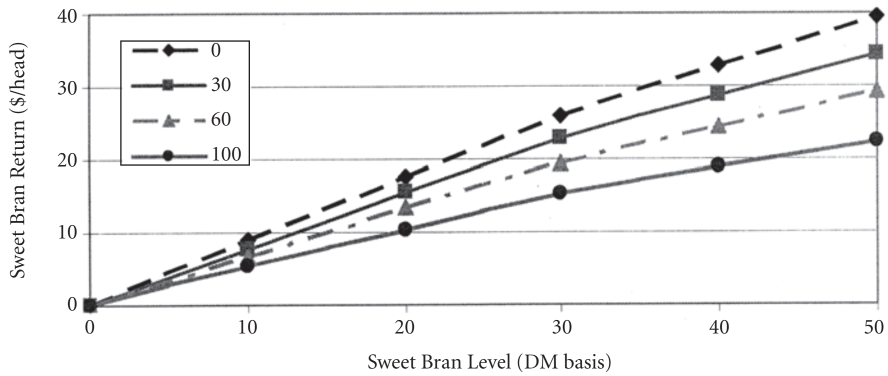

Figure 2. **Economic return for feeding Sweet Bran at 95% the price of corn ($3.70/bu corn) at 0, 30, 60, and 100 miles.**

Results

Distance between the ethanol plant and the feedlot impacted cattle returns when WDGS was fed. Feeding WDGS (priced at 95% of corn price) increased returns quadratically as WDGS inclusion levels increased up to 50% diet DM compared to feeding corn alone (Figure 1). If the feedlot was at the ethanol plant, the optimum inclusion level was 35% to 40% of diet DM and returns were $40-50 more/head compared to feeding corn. As the distance from the ethanol plant to the feedlot increased from 0 to 100 miles, the returns decreased for feeding WDGS when compared to corn alone. The optimum inclusion of WDGS also decreased as distance increased from the ethanol plant to the feedlot. These examples suggest that the optimum DM inclusion of WDGS was 35% to 40% if the feedlot was at the ethanol plant compared to an optimum inclusion of 20% to 25% if the feedlot was 100 miles away from the plant. Distance from the ethanol plant to the feedlot has a larger impact on economic returns as dietary inclusion level increased.

The analysis for transporting Sweet Bran (priced at 95% of corn price, DM basis) from 0 to 100 miles to a feedlot resulted in positive returns by feeding Sweet Bran up to 50% of diet DM (Figure 2). When the feedlot was located at the ethanol plant, the optimum inclusion level of Sweet Bran was 50% diet DM, with returns

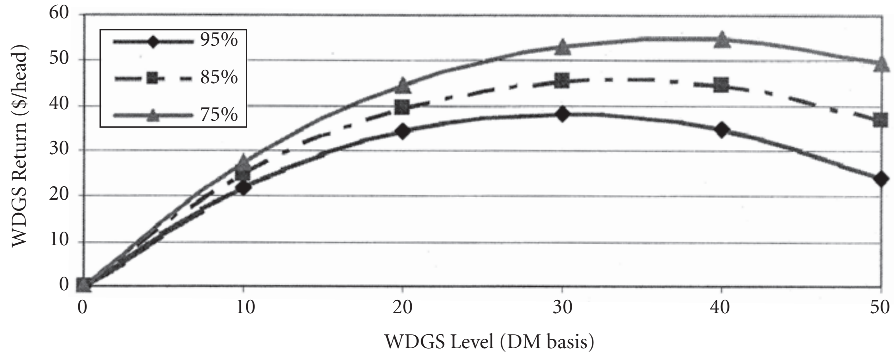

Figure 3. Economic return for feeding WDGS with $3.70/bu corn at 60 miles to the feedlot with 95%, 85%, and 75% WDGS price relative to corn (DM basis).

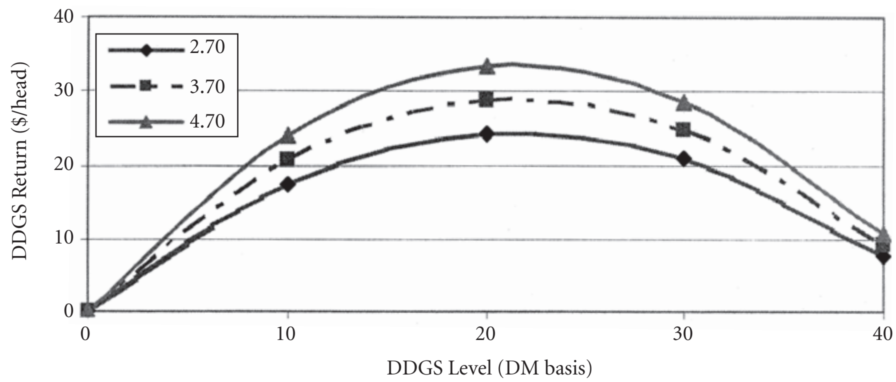

Figure 4. Economic return for feeding DDGS at 60 miles to the feedlot with 100% DDGS price relative to corn when corn is priced at $2.70, $3.70, or $4.70/bu.

up to $40/head compared to feeding corn. As distance from the ethanol plant to the feedlot increased from 0 to 100 miles, the optimum economic inclusion level for Sweet Bran remained the same at 50% diet DM, but the overall returns at 50% inclusion decreased to about $20/head at 100 miles. These results suggested that feeding Sweet Bran increased returns as dietary inclusion levels increased up to 50% of diet DM compared to corn, regardless of mileage. Inclusion level had a larger impact than distance from the ethanol plant for Sweet Bran based on economic returns.

With a constant corn price ($3.70/bu) and distance (60 miles), economic returns were sensitive to price of WDGS relative to corn. If WDGS was priced at 95% of corn price, then optimum inclusion of WDGS was 30% which returned $38/head (Figure 3). The optimum inclusion of WDGS was 35% diet DM when WDGS was priced at 85% of corn price and returns were $45/head. When pricing WDGS at 75% of corn price, the optimum inclusion level increased to 40% diet DM and returned $55/head. Pricing WDGS at a lower cost relative to corn had a larger impact on economic returns as inclusion levels of WDGS increased.

We determined the sensitivity of corn prices at $2.70, $3.70, and $4.70/bu with DDGS (priced at 100% of corn price), as 60 miles hauling distance for DDGS remained constant. This resulted in positive quadratic returns up to 40% diet DM (Figure 4) as optimum DDGS inclusion level remained the same at 20% to 25% diet DM for each of these corn prices with returns of $25 to $33/head. Increasing corn prices improved returns for feeding DDGS, but the most economic changes were observed at intermediate dietary inclusion levels of DDGS. Similar relationships were observed with feeding WDGS and increasing corn prices, as more profit resulted from increased corn prices with greater WDGS inclusion levels.

Based on these limited examples, feeding byproducts increased cattle economic returns compared to feeding corn. However, returns were impacted by type of byproduct used, inclusion level in the diet, distance from the ethanol plant, corn price, and byproduct price relative to corn. This model should allow for producers to use their own inputs and improve their decision making ability on using byproducts. The model can be downloaded at *http://beef.unl.edu*.

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