

# Storage and Handling of High Moisture Co-Products from Ethanol Production in Beef Operations

## Feed Specialist and Veterinarian Study

### A.S. Leaflet R2417

Joel Baskett, Ashley Nelson, and Kelsey Vincent, undergraduates in agricultural systems technology; Daryl Strohhahn and Dan Loy, professors of animal science; Carl Bern and Thomas Brumm, professors of agricultural and biosystems engineering

#### Summary

The use of corn co-products in beef feeding operations has greatly increased over recent years because of the booming ethanol industry; however, little is known about efficient transportation, storage, and handling of the product. Problems associated with these areas cost beef producer's time and money. In an effort to find out more information, 164 surveys were sent out to veterinarians and feed specialists throughout the state of Iowa to identify the transportation, storage, and handling procedures, trends, and problems associated with the use of co-products as a feed ingredient. The results of the surveys conclude that various types of co-products are used throughout the beef industry, and the methods of transporting, storing, and handling them varies greatly. Additionally, the quality and physical characteristics of the co-products challenge the mixing and storability of the co-product. With this, standards for co-products grading and spoilage determination are two major recommendations resulting from this study.

#### Introduction

Over the past few years, the corn ethanol industry has experienced exponential growth resulting in large amounts of feed co-products. The beef industry has found these co-products are a good alternative feed source. Because of the increased availability of the ethanol co-products and due to part of them being high moisture, storage and handling have become important aspects of operation management.

Distillers grains are acknowledged as an ethanol by-product that is produced after the fermentation process is completed and the alcohol and carbon dioxide are removed. There are three main types of distillers grains: wet distillers grains (WDG), dry distillers grains (DDG), and wet and dry distillers grains with solubles (DDGS/WDGS). The main difference between DDG and WDG is that DDG are dried to decrease the moisture content from 60-70% to 10%. This drying process increases the cost, but also helps preserve the product for storage and shipment. DDGS/WDGS is distillers grains

with the condensed distiller's soluble (CDS or syrup) co-product added. High Moisture Co-Products are defined as any product containing more than 50% moisture.

Ethanol plants in North America are producing about 12.5 million metric tons (13.8 million standard tons) of distiller's grains each year. With the increase in ethanol production, this number is predicted to reach 38 million metric tons (41.8 million standard tons) per year. Because of this, the livestock industry has acknowledged the feeding potential of these ethanol co-products.

#### Materials and Methods

Recognizing the limited information available on the storage, handling, and transportation of high moisture co-products to beef producers, and with marginal knowledge that veterinarians and feed specialists have on the subject, a joint effort by the Iowa Beef Center (IBC) and three senior undergraduate students from the Agricultural & Biosystems Engineering Department at Iowa State University was established. Through these effort, a survey study to determine common practices and procedures of how high moisture co-products are stored and handled, determine problems users have with them, and to discover areas for equipment and practice improvement.

Two surveys were developed and sent out to two main groups of people in the beef industry- Producers, and Veterinarians/ Feed Specialists. Producers were defined as those people who own/operate a beef production operation. Veterinarians were defined as the certified professionals on the expertise of the health and management suggestions to such producers. Feed Specialists were defined as suppliers of additives and supplements to producers.

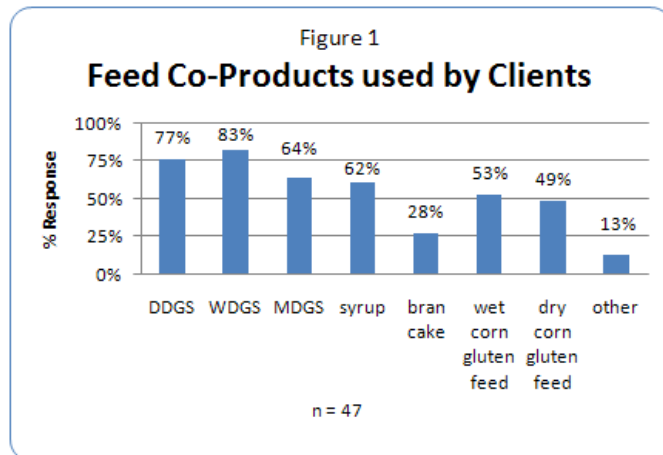
Through the work of the IBC and the students, topics of interest were generated under the general categories of handling, storage, and transportation of high moisture co-products. These were noted as important issues to the beef industry. Determining factors for key issues were: common practices used by producers, known problems associated with high moisture co-products, research advancements in this area, and the collective knowledge of the IBC and the undergraduate students. After narrowing these topics down to the most pertinent issues currently needing attention, questions were generated regarding high moisture co-products storage practices, transportation, handling, and general management practices by Producers and Veterinarians/Feed Specialists.

The surveys were mailed to beef producers from a list which the IBC had used from previous mailings. The IBC extension field livestock specialist formed a new list of veterinarians and feed specialists which they consented to the use of the study. In total, 2,309 surveys were mailed to the different groups; 2,145 of these went to the Producers, and 164 went to the Veterinarians and Feed Specialists. Of the total Beef Producer surveys that were sent out, 337 were returned; resulting in a 16% return rate however; only 228 surveys contained usable data to evaluate due to incomplete surveys returned. The completed surveys were returned to the IBC for analysis to determine trends associated with common practices and problems with the use of high moisture co-products as a feedstuff. Respondents were allowed to choose or select more than one answer for many of the questions; therefore, percentages do not add up to 100% for each question.

The targeted geographic area was based in Iowa, with a few exceptions located in neighboring states, allowing for members of the three focus groups who had their operations located outside of Iowa.

**Results and Discussion**

The majority of feed specialists and veterinarians surveyed service cow/calf and feedlot operations, with an average client base of over 1,000 head cattle. As seen in Figure 1, WDGS have the highest usage among these types of operations. High moisture co-products are currently used by 94% of their clients. The remaining clients not using the co-products have discontinued use because of storage problems and inconsistency in product quality.

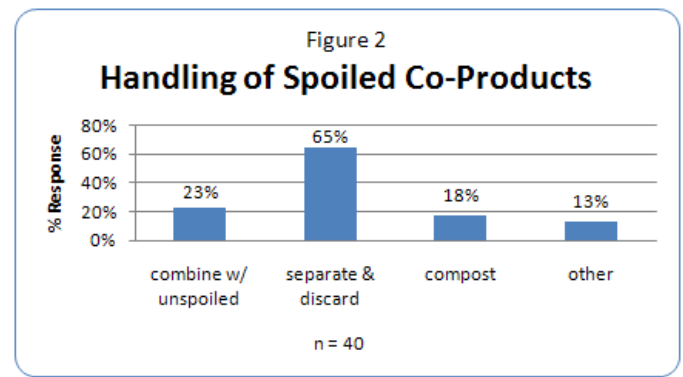


*Wet Co-Product Storage*

Piling wet co-products is the most common storage practice, with the majority of clients using fresh piles. Covering the piles with plastic or mixing in storage additives (such as forage) in a silage bag are also typical methods.

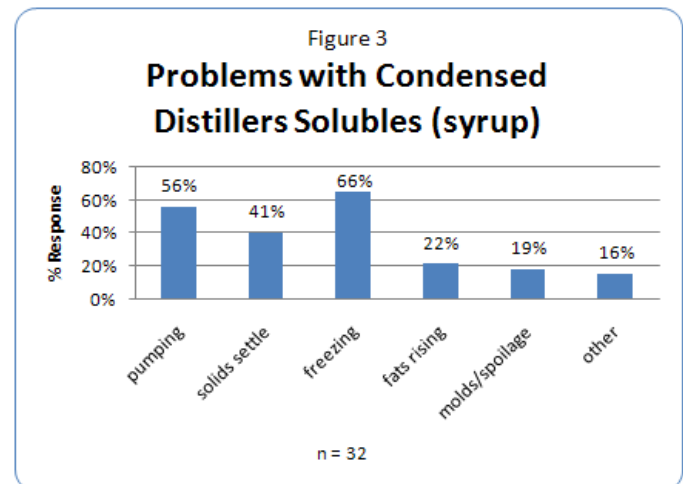
Feed specialists and veterinarians recommend temporary storage (silage bag/plastic cover) and permanent storage surface (concrete slab) to clients in order to extend the life of the co-product.

Spoilage is another key issue when storing wet co-products. When determining when a wet co-product has spoiled such that it is unacceptable for use, 68% of veterinarians and feed specialists agree upon the use of a visual check as opposed to smell or feel. Unfortunately, there are no standards currently in place to determine what “unacceptable spoilage” is. Acceptable amount of discard due to spoilage ranges from 1-10% spoilage. Figure 2 shows how spoiled co-product is handled by clients.



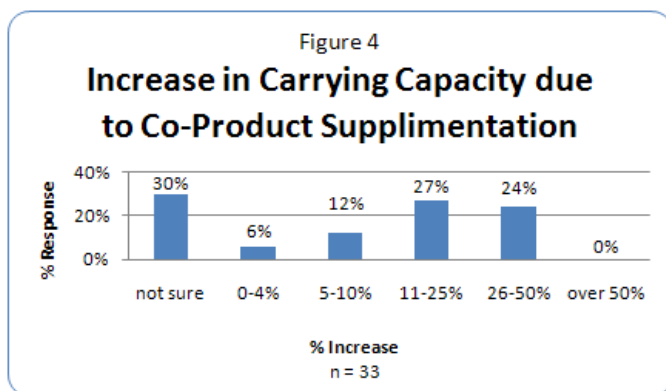
*Condensed Distillers Solubles (Syrup)*

The top three challenges clients face with the storage of syrup are (in order): storage structure, equipment, and cost. Remaining challenges listed include: spoilage, labor, space, and birds. Tanks, with the overwhelming majority being underground or above ground heated, are most commonly used to store syrup. Another alternative used is agitation by 25% of clients. Problems associated with the overall storage of syrup, according to the veterinarian and feed specialists can be seen in Figure 3.

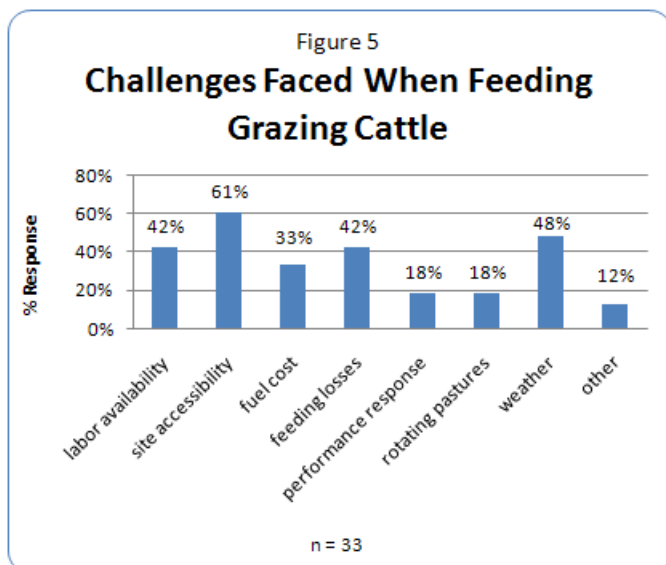


*Ration Delivery to Pasture or Grazing Cattle*

Co-products are fed to grazing cattle by 76% of surveyed feed specialists and veterinarians' clients. The primary response for supplementation of grass with a co-product is to enhance nutrition and increase carrying capacity of pasture while others do it for average daily gain, reduced cost, and conception rate, ease of checking and gathering, and improved health. Figure 4 shows how carrying capacity of the pasture increased with the supplementation program.



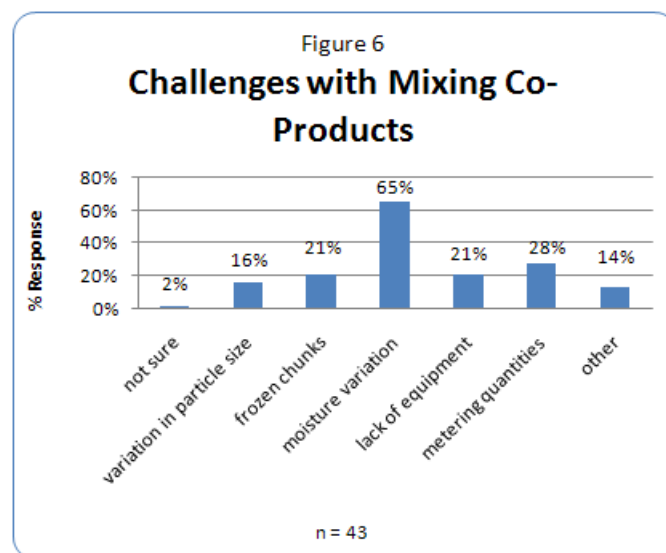
The top three feeding methods for supplementing grazing cattle are in a bunk, tires, or on the ground in various locations. Hay rings and feeding on the ground along fence rows are other methods used. Frequently used equipment for feed delivery is a mixer wagon and tractor; however it was found that trucks with mixer, pickup with mechanism, and storage wagons are also used. Figure 5 shows how these respondents rated the challenges faced when feeding grazing cattle.



*Wet Co-Product Mixing and Delivery*

Seventy eight percent of respondents used either a reel or auger type mixing apparatuses to blend co-products with additives and other feedstuffs. The other 22% responded using paddle, apron/chain, bale processors apparatuses or already mixed to process the co-product with the feedstuffs.

The biggest challenge with mixing co-products is variation in moisture throughout the co-product; other challenges are indicated in Figure 6. When going from loading to mixing co-products, 56% of those who responded say their clients have difficulties with appropriate metering of distillers grains into a mixing system. Twenty-eight percent say getting the product out of storage is an issue. Delivering the feed to bunk/site is difficult for 8% of clients.



With corroboration from results of the **Storage and Handling of High Moisture Co-Products from Ethanol Production in Beef Operations-Beef Producer Study**, some distinct conclusions can be drawn. The information from the Veterinarian and Feed Specialist survey shows that they do not prefer the use of chemical or biological preservatives for extended storage of co-products. In the Beef Producer study, it was found that this means of storage is one of the top methods which producers prefer. Additionally, beef producers tend to combine and mix spoiled co-product with fresh in order to reduce loss due to spoilage, whereas feed specialists and veterinarians prefer separation and discard of spoiled co-product.

All surveyed groups concur that an acceptable amount of spoilage loss should be 1-10% per load. Moisture variation and appropriate metering of co-product are also two challenges that all parties agreed upon in the use of co-products for beef operations.

### **Implications**

Implementing a grading system, with specifications for sulfur, particle size, moisture content, fat & protein levels, would result in uniform classes of co-products, making them more marketable and less variable between truckloads for clients. Additionally, a standard for spoilage is necessary to determine the acceptable amount of spoiled co-product, if any, can be feed to livestock.

Suggested areas of design for easier delivery include:

- Systems for smaller feeders in cow/calf operations to utilize both WDGS and Syrup more effectively
- Better flowability of co-product
- Equipment with justifiable costs
- Liquid tank which unloads with air pressure

### **Acknowledgments**

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