MAKING SILAGE IN CUSTOM OPERATIONS – CHALLENGES AND OPPORTUNITIES

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ABSTRACT

Silage is an important feed for California dairy and livestock farms. We estimate that roughly 800,000 acres of corn and small grains were harvested as silage in 2010. The harvest and successful ensiling of about 18 million tons of forage is an enormous task. Most of this work is provided by commercial, silage harvesting businesses located throughout the San Joaquin Valley. How do they do it, and what challenges do they encounter? What opportunities do they see for improving silage quality? We decided to ask. Our presentation summarizes interviews that we personally conducted with selected custom operators who agreed to share their information during and after the 2010 corn harvest season.

Key words: forage harvest, custom silage harvest

INTRODUCTION

Double cropping of small grain (winter) forages with corn for silage is a common practice in California where we are blessed with a climate to grow crops year round. The vast majority of the forage acres are located in the San Joaquin Valley where over 70% of the state's dairy cows reside. Together, corn and winter forage crops recycle manure nutrients and water from dairies, and provide important sources of economical, ensiled feed throughout the year. Because of their large size, many dairies purchase forage from local farmers to supplement what they grow on their own land. Nearly all dairies hire custom harvest operators to chop, haul and pack the silage pile. They also sometimes rely on the harvester to assist in locating purchased sources of forage and for advice on agronomic crop management.

CUSTOM SILAGE HARVESTERS

Finding, listening to, and describing them. What do custom forage harvest businesses look like? To discover this, first we had to find them. The Yellow Pages, on-line lists, and local Ag Source advertising booklets provided some help, but these were not comprehensive and they did not differentiate clearly forage from other crop harvest businesses. Since we were not aware of any common trade group or association to which they all belonged, we began our investigation by talking with businesses in Kings and Tulare Counties with which we were familiar. From the local businesses, we received names of others more distant, and we continued to build our contact list in that manner.

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A preliminary discussion with one harvester prior to corn harvest helped us to develop a two page standardized questionnaire that would be used for all interviews. Information gathered included business background, harvesting equipment, harvest scheduling, type of silage including delivery rate and packing, cut length, processing and cutting height, pricing structure, and problems or challenges they encounter in these areas. Their perspectives on opportunities to improve silage quality in California, and other concerns or input were encouraged. The interviews were scheduled during October and November. Local interviews were conducted in person either in the field or at the company business. More distant businesses were interviewed by telephone. We recorded all responses, and the entire process took about one hour. The manuscript for this proceedings booklet was submitted before all of our interviews were completed. A general description that follows will be developed further for presentation at the Corn/Cereal Silage Conference on December 1, 2010 in Visalia.

HARVESTER CHARACTERISTICS

We estimate that there are approximately 25 to 30 established custom harvest operators in the San Joaquin Valley. They range in size, location, equipment and services offered, but one thing in common among businesses that we interviewed is that they are all family operations. Their business experience ranges from 15 to over 40 years. The number of crews operating during a harvest season is one to nine, and they employ from 10 to 130 people. A crew is composed of a foreman overseeing one or more choppers, trucks (owned and/or subcontracted), one or more packing tractors and sometimes a water truck. The longest distance traveled for providing services is generally about 50 to 70 miles from their base of operations. Tons harvested ranges from 100,000 tons to over 2 million tons in a calendar year.

Various brands, models and sizes of choppers and packing choppers are utilized. Sharpening and changing of knives occurs at various intervals, but always more frequently for small grains than for corn. Back up equipment is usually available, but sometimes this is through arrangements with other chopping businesses.

Scheduling of harvest is a shared responsibility with both the grower/dairyman and the harvester involved in the decision to varying degrees. The harvester typically visits a field numerous times. This can amount to hundreds of miles traveled each day depending on the number of clients. It begins early in the growing season and increases in frequency around the time of the last irrigation. Harvest timing is determined always by moisture (chopping people refer to moisture and not dry matter, so for the purposes of this paper, we will refer to moisture). Moisture of the plant (stalk and kernel or grain), and also soil and field conditions are considered when deciding harvest time. In some cases, harvesters are able to draw on years of experience with the same farmers and fields which helps the decision making process.

The silage structures created by the harvesters from most to least common are: pile (wedge type), bunker (a pile with sidewalls), drive-over pile and bag. Alfalfa is ensiled in bags more frequently than corn or small grains. Finished piles range in size from 500 to over 20,000 tons of silage. From start to completion, the time for building a pile varies with many factors. It could be as short as one or two days for a small pile, but extend to over a month depending on size, how many fields contribute forage to the pile, and how synchronous the harvest is for each of

those fields. With extended harvest, temporary covers are used on the piles, and these may be opened and resealed 3 or more times until the final harvest is complete. Good packing is assured by adjusting number of packing tractors and delivery rate of forage from the field to the pile. Delivery rate varies from 150 to 250 tons per hour, and this is adjusted by adding or removing choppers or trucks from the job site. The distance from the field to a pile is usually three to five miles, but in some cases can range up to 22 to 25 miles. The route taken from field to pile is not always the shortest. Considerations for safety, traffic and stop signals factor into the route chosen.

Chop length (also known as theoretical length of chop or TLC) averages from 10 to 21 mm (0.4 to 0.8 inches) and it may be adjusted depending on moisture of the crop. Shorter chop length may be used for drier material because it is harder to pack well. All corn is processed during harvest – the chopped corn is squeezed between rollers mounted on the chopper to break up cob discs and kernels. Roller openings range from 0.5 to 3.0 mm (0.02 to 0.12 inches).

The harvest operators that we interviewed play an important role in finding silage for dairies and dairies for silage. They essentially function as brokers, but there is no fee charged for matching up buyers and sellers. Purchase arrangements are settled between the grower and the dairyman. The buyer of the crop pays for the custom harvesting. Harvest operators provide chopping, hauling and packing in their service. They may subcontract some of their services. The most frequently subcontracted aspect is trucking and sometimes a packing tractor. The harvesters charge by the tons of forage harvested, and there is generally no correction for moisture content except in extreme cases. The price per ton varies from $8.05 to $9.25 per ton. There may be added fees for additional services such as application of inoculants or additional packing tractors. For distances to a pile from the field longer than established, (about two to three miles) additional costs per ton per mile are added. Silage covering is not provided – this is the responsibility of the dairyman, who often will hire a separate covering business for that service.

HARVESTER PERSPECTIVES

Challenges. Challenges most frequently expressed by the harvesters include crop moisture issues, a compressed harvest season for small grains in the spring, inadequate space for building silage piles, and difficulty with hired labor. Other notable challenges mentioned are working with consultants hired by the client (especially dairy nutritionists), new start up custom operators under cutting their price, and collecting payment. Perhaps surprisingly, these businesses that rely exclusively on expensive, specialized heavy equipment for their livelihood did not consider equipment break downs to be particularly challenging. They plan for and prepare for these inevitable events with preventative maintenance, well stocked shops and mechanics.

Careful attention to irrigation management throughout the growing season is essential for producing a healthy, high yielding crop to make good silage. Scheduling the last irrigation is especially important as it relates to plant moisture at harvest and this is a very big challenge for harvesters. They frequently consult with their clients about timing of the final irrigation, but there are sometimes differing opinions or unforeseen circumstances that lead to undesirable outcomes - a field that is too wet to enter with heavy equipment when the crop is ready, or a field

that dries out before the crop is mature. If insects (mites/aphids) become a problem, this complicates harvest timing enormously because they can damage and dry a field very quickly.

Plant moisture level at harvest is critical for making good silage, and yet determining the moisture level of a standing crop before sending in the choppers is quite difficult – as much an art as it is a science. Harvesters target 67% to 70% moisture as the range for harvest, depending on the customers desired level. Too dry or too wet is bad. Lower than 65% moisture does not pack, and "75% moisture splits a pile every time". Despite the consistent appearance of a field when you drive by at 60 mph, most fields lack uniformity for a variety of reasons. Varying soil types, time interval from start to end of irrigation, sporadic pest damage, and other factors all contribute to differences in moisture within the same field. Tools used by harvesters to assess moisture level include whole plant sampling (chopped, weighed and dried for actual measurements), kernel milk line or denting assessment, and visual field and soil evaluation. The introduction of "stay green" traits in some corn silage varieties further complicates visual assessments. Getting it wrong is costly for all parties. Pulling a crew from a field that is too wet only to come back another day takes hours and hundreds of dollars.

Spring harvest of small grains occurs over a short time period - 6 weeks or less. This compressed harvest season between late March and early May presents a challenge especially in the south San Joaquin Valley. Weather is a challenge in all regions - more unpredictable during spring than fall harvest. But in the south, wheat is by far the most common small grain planted for silage – and the few varieties that are commonly planted reach maturity within a narrow time frame. The capacity to harvest a lot of forage quickly is stretched to the limit. In some years, extra crews from operations out of the area may be brought in to get the crops harvested in a timely manner. As one travels north in the San Joaquin Valley, there is more diversity in small grain types used for silage – oats, wheat, barley and forage blends are more common and this diversity helps to spread the harvest season over a longer time period.

As dairies have grown larger in herd size, most have not increased their silage storage capacity. Harvesters are challenged with building piles on foot prints that do not allow adequate space for the incoming crop. Irregular shapes or very high piles that must be "shoe-horned" in between hay barns can present safety problems. The harvesters that we interviewed expressed strong opinions about roll over or drive over piles. The only thing consistent about these opinions was that there simply is not enough room on most dairies for conventional piles, let alone drive over piles that require much more space. As to the question of silage quality, some harvesters firmly believe the quality is superior in the drive over piles while others were not convinced.

Labor hired during harvest primarily for driving trucks is seasonal, and it is "difficult to find good people in seasonal work" was a comment we heard repeatedly. A core group that comes back each season may be available, but the need for additional workers can ramp up quickly and finding people all at once is not always easy.

Opportunities. For all the challenges, there are also opportunities to improve silage quality. The harvesters' perspectives focused on agronomic and logistical areas and also on the importance of better communication among all parties involved in the growing, harvesting and feeding of silage.

From an agronomic standpoint there is much improvement that could be made in field and water management that would benefit crop yield and quality. More attention to slope, leveling, and irrigation would help. Some expressed opinions that dairies have improved manure management in recent years, but they could still do better. Pest and weed control could improve. This year because of the poor economy, many short cuts were taken. Crop selection and planting schedules to lengthen the harvest season in the spring would help. Seed companies could focus more attention on plant genetics that are more suitable to irrigated Western US conditions.

Logistics of water – having the ability to move it where and when it is needed in adequate amounts, ditch water dates and other means of managing irrigation including field length are seen as areas that would improve quality. Logistics of silage pile construction – having a bigger footprint would be helpful. Taking a few acres of crop land out of production for this purpose is not a popular solution, but the harvesters need room to do a good job.

Finally- improved communication among harvesters, growers, dairymen (and their nutritionists), is seen as an important opportunity. Communication needs to start early. As one harvester said, "Don't wait until I'm finished and then tell me I screwed up". Visit the field before and during harvest.

SUMMARY

Making silage is complex, intense, high pressure work. All aspects of the operation require careful, detailed coordination. The harvester strives to understand what each customer is looking for and then deliver that to them every time. They want to put up good feed for their clients– but the challenges are great. Currently, severe economic considerations override many opportunities for agronomic or logistical improvements. In spite of that, there still is the prospect to open up dialogue among everyone with a vested interest in the process of growing, harvesting and feeding silage. A better understanding of the issues and constraints faced by each party could lead to more reasonable and creative approaches to solving problems and improving quality.