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Forage shrink costs more when inputs are high

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As the 2022 growing season approaches there is no shortage of discussion on the high and volatile prices of inputs for crop production. Several good resources were presented this winter about finding efficiencies with crop inputs, including recent articles in the March 2022 "The Manager" issue in *Progressive Dairy* by PRO-DAIRY on manure and fertilizer use.

While the industry is continually looking to advance practices and become more efficient, these are long-term goals that are not likely to yield meaningful results in addressing rapid changes to inputs from 2021 to 2022. A common theme in the resources shared this winter is there is no magic solution and if something new is suggested that seems too good to be true, it probably is. As always, the potential to mitigate these challenges comes from the use/adoption of current sound management practices.

This same concept applies to our management of forages in the harvest and storage phases. There is little in terms of drastic changes from 2021 to address forage harvest; however, many opportunities remain to evaluate management practices and look for opportunities to combat increased cost. More broadly this ties into evaluating your forage system to develop strategies to ensure quality forage for the entire dairy herd. Furthermore, as supplemental feeds are also experiencing price uncertainty, high quality forages offer an opportunity to combat high commodity prices.

The forage acreage needs calculator is designed to help determine the acres of each crop needed to meet the needs of a given number of animals but it can also serve as a way to determine the impact of shrink on the acreage needed at a time when each acre needed has an increased cost to manage productively.

Some level of silage shrink is unavoidable, which is attributed to dry matter (DM) losses through the fermentation process itself. In the best scenarios this is near 10 percent. The real opportunity exists in all the other areas of the ensiling process where both yield and quality are lost. Many of those practices outlined below also help to assure the best possible fermentation which helps reduce the fermentation losses to the lowest practical levels.

Before we consider managing forage quantity and quality, all spring plans should start with making safety a priority this harvest season.

HARVEST

Harvesting forage at the optimum quality and working to manage for the weather, rather than letting the weather disrupt plans, is critical. Considerations for upfront planning that can increase the chances of success when harvest time does arrive can be found at dynamic harvest

scheduling and corn silage hybrid considerations: relative maturity and traits. The threat for losses in the hay harvest process are greater than in corn silage though both systems are susceptible to avoidable losses.

Respiration losses in the windrow

When a plant is cut, it continues to respire. This aids the drying process but also burns plant sugars and reduces overall DM yield. Studies report respiration losses of one to seven percent of DM yield. Plant sugars provide an important food source to the microbes responsible for proper fermentation, therefore excessive losses of sugars during the drying process increases the risk of improper fermentation.

Respiration losses can be minimized by shortening the time mowed hay remains in the windrow prior to harvest. One of the most significant management factors to control this is maximizing windrow width to allow as much exposure to sunlight as possible. Windrows should be a minimum of 80 percent of cutter bar width and preferably more.

Other factor to consider include:

- *No conditioning.* Some studies show no conditioning speeds the drying process for silage, but it is not recommended for dry hay production. It also tends to be more beneficial in alfalfa than high yield grass.
- *Increase cutting height.* Increasing cutting height comes with the tradeoff of leaving more material in the field but can result in higher quality and less overall harvest losses. This outweighs the extra stubble left in the field, particularly in spring when the ground is still wet, which slows drying.

Speeding the drying process has the additional benefit of reducing weather associated risk. Dry matter losses from hay that is rained on in the windrow is reported to range from three to 50 percent, with as little as 0.2 inches to 2.0 inches, respectively. The worst-case scenario is when hay is left in the windrow for several days but still must be ensiled at a lower than desired DM. At this point much of the sugar is gone but the forage is still too wet, which is a leading cause of poor fermentation and butyric acid production.

Leaf loss

Particularly with legumes, leaf loss through tedding, raking, and harvesting can be significant, reducing both quality and yield. Losses are generally most significant when the crop becomes too dry prior to the completion of these tasks. Practices to encourage uniform and rapid drying of the windrow mentioned prior, as well as proper setup of hay handling equipment, will minimize these losses. Finally, harvesting at the correct DM, will minimize losses. Particularly when chopping forages, losses in drier hay crop silage can add up though they can also exist when baling.

Transportation losses

Losses during the transportation process may seem insignificant; however, they too can add up, particularly in drier silages and when transported at higher speeds as is more common with the increasing use of dump trucks and tractor trailers. Additionally, they can create safety and public perception concerns when forages blow onto roadways. Evaluate the use of forage box covers to minimizes these losses.

STORAGE

After managing the hurdles to get the maximum yield and quality out of the field, storage represents the next challenge and opportunity. Managing these opportunities starts as soon as the forage is delivered to the storage and continue through feedout. Horizontal silos (bunk and drive over piles) continue to gain popularity given their logistical advantages for large quantities of forage but can also present the most challenges to maintain forage quantity and quality. Success with storage starts with pre-harvest planning of how and where forage will be stored with considerations for both preserving yield and quality as well as access to different feeds for different groups of animals. See strategic forage storage planning.

Forage Dry Matter

Ensiling at the proper DM is critical to achieve a proper fermentation. For most silages, a forage DM close to 35 percent is recommended to optimize yield, quality, and fermentation. Though this can differ by storage structure, with a slightly greater DM generally favored for upright silos and baleage.

Excluding air and water

Oxygen and water, essential to life, are enemies of forage fermentation. It is critical to drive as much oxygen out of the fresh forage as possible to achieving a high density. Further, this is beneficial to maximize the quantity of forage stored in a given footprint and at feedout in preventing oxygen infiltration into the exposed feeding face of the silage. Exposure to outside water (rain) also leads to significant risk of spoilage and should be excluded from the time of ensiling to feedout.

When properly set up and maintained, storage options such as upright silos, silo bags, and baleage achieve the exclusion of air and water in a single process.

Silo bags – Be sure to follow manufacturers guidelines for proper filling and density of a silo bag, and monitor bagger pressure and bag stress throughout the filling process.

Baleage – Increasing bale density is positively correlated with the feedout life of the bale indicating that denser bales experience a better fermentation and result in a more stable feed. After making a quality bale, ensiling should happen as quickly as possible following the forage being baled.

- Studies show that impact is minimal to the resulting feed if wrapping of bales is delayed as much as 12 to 24 hours; however, this should not be standard practice as it introduces additional challenges for proper fermentation that are avoidable by ensiling more quickly.
- Follow manufacturers guidelines on the number of layers of plastic needed for proper preservation of forage. In general, additional layers are recommended for feed that will be stored more than nine months.

Horizontal Silos – forage preservation is much more dependent on management decisions in horizontal silos than silo bags and baleage where the harvesting and ensiling equipment play a larger role. Here again success starts with pre-season planning to ensure an adequately-sized and structurally-safe storage area, as well as adequate labor and packing weight to accommodate expected forage delivery rates with additional information available in achieving and measuring silage density. Staff should be properly trained on the importance of safe and

proper filling procedures with emphasis on layer thickness, safe slopes, and choreographing multiple pieces of equipment in a small area.

The use of high-quality plastic is critical to minimize spoilage around the edges of the bunk or pile.

- For bunks, the use of plastic to line the walls prior to filling is highly encouraged to reduce oxygen infiltration through the concrete walls and exclude rainwater that could otherwise seep between the wall and the silage.
- Oxygen barrier plastics, ideally a separate sheet layered under the standard black and white plastic, results in a substantial return on investment to reduce shrink losses.
- Minimizing spoilage under the plastic also presents a significant opportunity to minimize the safety risk associated with removing spoiled feed at feedout as there is little to no spoilage to deal with.
- Ensure adequate weight (tire sidewalls, sandbags, etc.) is used to cover the entire surface area with extra attention to edges and seems.

Fermentation of legumes

Legumes present additional challenges to achieve an optimum fermentation. Legumes tend to be lower in plant sugars than grass and also have a greater buffering capacity which makes it more difficult to drop the pH to desired levels. Additionally, hay crops and specifically legumes, can be more difficult to spread into thin layers and adequately pack into a horizontal silo. Understanding these added challenges can help to ensure steps are taken to mitigate them.

Silage inoculants

When used as directed, inoculants can enhance the fermentation process and stability of silage but should not be considered a solution for problems associated with improper harvest and storage management.

- Ask for data to support the efficacy of the product and make sure to compare products based on actual concentration of active ingredient.
- Determine where the risk and opportunities are.
    - "Front-end" products – associated with microbes beneficial to fermentation and can aid in achieving a proper fermentation.
    - "Back-end" products – aid in feed stability at feedout. While these produced are effective, they do have a "DM cost" as their activity in the silage results in a small loss of DM. This can be a positive tradeoff when concerns around feed stability at feedout are unavoidable (unstable feed, large face, slow feedout); however, other management strategies should be explored first to avoid these challenges from the start.

FEEDOUT

All steps taken to this point improve the chances for success at feedout as proper management of harvest and ensiling provide the best chances for a high quality and stable silage.

Feedout rate

Efforts should be made to minimize the amount of silage exposed to air during feedout and to size feedout faces appropriately to achieve an adequate rate of feedout.

- A minimum feedout rate of four to six inches per day is often referenced.

- This rate may be adequate in the winter months but should be considered a minimum and may not be adequate during the summer months.
- Avoid scenarios where piles are "split" and an exposed face is left for extended periods of time.

Silage face management

Defacers and rakes have become very prevalent on farms and do aid in maintaining a smooth face that will minimize surface area exposed to air; however, regardless of equipment used for removing silage, management and technique are critical.

- Silage should always be removed from top to bottom to minimize any excess movement of existing silage that would allow air infiltration.
- Equipment should be sized to reach the top of the silage face and the face should never be undermined as it significantly increases the risk of avalanches.

Safety

Large bunks and piles present additional risk at feedout.

- Only the silage removal equipment should be near the silage face.
- Avoid working near the top edge of the face by keeping tire and plastic removal ahead of feedout, and minimize any spoilage that would need to be removed.
- If work around the top of the face is necessary, utilize harnesses or portable railings attached to feedout equipment (tractor, loader, skidsteer, tele-handler).
- Never work in this area alone.

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