Photo by Fredric Ridenour.

The political side of silage

John Goeser for *Progressive Dairyman*

AT A GLANCE

Post-harvest season is the ideal time to formulate the next silage campaign. John Goeser walks you through the elements of planning that campaign for success (and you may need to take exit polls on your current bunker or pile …).

The political season has come and gone. Candidates often campaign on promises of change and improvements, but sometimes carry-through of these assurances doesn't come to fruition. But what does silage have to do with politics? The answer is rooted in change.

Ensiling is like a political campaign in that we have come to expect change. The change can be both for the better (storing the feed for months or years and improving feed value) or worse (clostridium bacteria growth, spoilage and dry matter losses).

Prior to understanding change, we need to better recognize what drives fermentation toward successful change and away from change toward failure.

The primaries

There are a number of forthright requirements for positive silage change. These necessities require planning in advance, much like a strong political campaign:

1 The optimal crop maturity within the correct moisture window avoids catastrophic losses.

2 Beneficial fermenting bacteria present are needed in adequate population numbers to carry out the fermentation.

3 The silo, bag, pit, bunker or pile needs to be packed and sealed to exclude air (oxygen), allowing anaerobic fermenting bacteria to grow efficiently and keep yeast and mold at bay.

4 There needs to be enough fuel, in sugar and soluble carbohydrates, within the ensiled feed to feed these fermenting bacteria.

Missing any one of these prerequisites will lead to negative change.

Nomination

After the prerequisites are met, the ensiling process changes transpire, and the change is multi-staged. In early fermentation, carbohydrates are converted to acids. The anaerobic bacteria metabolize sugar into fermentation acids (e.g., lactic acid), which then increase in concentration to a point that the pH is depressed below 4 to 4.5 for ideal preservation. (This final stable pH depends on moisture content.) When the pH decreases below 4.5 to 5.0, microbial growth is slowed and largely stopped.

Typically, 4 to 8 percent of soluble carbohydrate is converted into acids. This is a positive change, trading sugar for acidic forage that is stable for months or even years. Ideally, there is a 1-to-1 conversion of fuel to acid, but just like your truck doesn't always burn fuel efficiently, some energy can be lost in gases. This is a negative change and results in dry matter losses. Some farms lose 5 or more tons out of every 100 tons ensiled to gas losses.

If the moisture content is not ideal (e.g., too wet), or there is not enough sugar to feed the fermenting bacteria, the fermentation process may not achieve the ideal pH and stability, or it may linger on far too long. In some cases, enterobacteria, such as clostridium species, can grow and kick-start a secondary fermentation path where protein and other carbohydrates are broken down. One of the end results is butyric acid, which stinks and stains our hands with a wretched smell when sampling. But more importantly, there are other anti-nutrition factors associated with this very negative change, such as substantial protein and dry matter losses, toxins and odorous compounds that lead to feed refusal.

The debates

After the primary fermentation, the subsequent changes occur, for better or worse. The bacteria that fermented the feed eventually die off or go dormant, some leaving behind proteolytic enzymes that continue to cut up proteins. Further, some proteins are solubilized in the fermentation acids now present. In the case of high-moisture corn, corn silage, sorghum or small-grain silages, this protein breakdown leads to greater starch digestion within the rumen and is the main reason forages "feed better" after fermenting for three months or more. The question is often asked: "What is the ideal length of time to allow forage or high-moisture grain to ferment prior to feeding?" The answer is (like many political debates): It depends.

Campaigning

The fermentation process can proceed fairly rapidly in some years, with ideal or moderate harvest temperatures or with aggressive and research-proven bacterial inoculants. This leads to forage that feeds better within three months. Interestingly though, extremely large silage masses (e.g., thousands of tons) will maintain the harvest-time ambient temperature for months. If forage is harvested during cool or sub-freezing temperatures, the fermentation process might take six months (or never) to ferment. If harvested in 100+°F temperatures, the fermentation process may proceed imperfectly due to high temperatures affecting the bacteria's ability to grow. This could lead to greater acetic acid concentrations and greater dry matter losses, which qualify as negative changes.

Ultimately, missing the ideal moisture window is one of the biggest factors leading to catastrophic negative change. For example, researchers have built models relating forage losses purely to dry matter content. Too little or too much moisture leads to inefficient or extended fermentation that may never stabilize. Oxygen exposure is then the next largest factor to manage.

Election day

Planning and working the plan before the actual date of harvest, or the election, holds true as the best means to optimize the outcome – whether it's fermentation or a political race. Work with your consulting team to determine the appropriate moisture content for your silo and management system, and work diligently to squeeze and keep out oxygen at the surface, sides or edges and within the silage mass. Pack well beyond 50 pounds as-fed density per cubic foot and seal your storage well. Be sure to fix rodent holes or tears quickly (less than one day).

Consulting with your advisory team and considering off-season meetings can help you put together a management plan for positive fermentation changes.

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