Overview of Silage Management in California

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Stanislaus & San Joaquin Counties
30 Years of California Production

![Graph showing milk production over years from 1978 to 2008.](Image)

- Milk Production (million lbs):
  - 0 to 45,000

- Year:
  - 1978 to 2008
California #1 Dairy State

Milk Production (million lbs)

Year


CA
Wis.

0 5,000 10,000 15,000 20,000 25,000 30,000 35,000 40,000 45,000
Forages in CA

- California has the unique ability to grow and incorporate high quality forages into dairy rations.
  - Climate
  - Irrigation infrastructure
  - Fertilizer (recycled manure)

- **Alfalfa hay & corn silage** are the two most common ingredients in high string rations.

- Regulatory constraints (air and water) impact the way forages are grown, stored & fed in California.
Corn Silage & Milk Production

- Corn Silage Harvested Acres
- Milk Production (million lbs)

Year:
- 1978
- 1982
- 1986
- 1990
- 1994
- 1998
- 2002
- 2006

Legend:
- Corn Silage
- Milk Production
Objectives

1. Describe current silage management practices on California’s Central Valley dairies.

2. Identify regulatory considerations for silage in California.
In summer 2009, a feed management survey was mailed to dairy producers in Tulare, Stanislaus, and San Joaquin Counties; the first, third and seventh largest dairy counties in California.
Producers received an envelope containing:

1) an invitation letter to participate in the study,
2) a double sided one-page survey, and
3) a pre-paid return envelope.
Participating Dairies

Response rate was 16.9% (120/710).

Herd size range: 160 to 6,600 lactating cows (median=950).
Alfalfa hay and corn silage are the two most common forages fed to dairy cows on California dairies. Cereal hay and silage are also frequently fed.
How is silage stored?

Silage in California is more frequently stored in piles (85.0%) and on concrete (75.0%), than in bunkers or on dirt/gravel. Dairies utilizing silage bags often did so in conjunction with another type of storage.
Do you use bacterial inoculants?

Bacterial inoculants of various types were used by 54.0% of dairies.
How much spoiled forage is present on the top of the pile? Is it discarded?

Sixty percent of dairies discarded spoiled forage.

Twenty-five percent of dairies reported less than 3 inches of spoiled feed, 53.9% reported 3 to less than 6 inches, 15.7% reported 6 to less than 9 inches, and 4.9% reported at least 9 inches of spoiled feed.
What portion of the face width is removed daily?

Entire face removed by 40.2% of dairies; 19.6% removed half the face; 28.9% removed a third of the face; 11.3% removed a quarter or less of the face.
Other Results of Interest

**Mycotoxins**
- 25.0% of dairies suspected mycotoxins in 2008.
- Top surface spoiled forage was discarded by 70% of dairies suspecting mycotoxins.

**Dry Matter (DM) Determination**
- 52.3% of dairies determined DM at least once a month.
- Nutrition consultant responsible for determining DM (86.6%).

**Face Management**
- 73.4% considered that silage faces were maintained smooth.
Silage Management Summary

• Dairy owner and manager responses are subjective.

• Results indicate areas where silage management can be improved:
  – surface spoilage
  – removal rate
  – sizing of silage structures
Regulatory Considerations
Regional Water Quality Control Board

Waste Discharge Requirements for Existing Milk Cow Dairies adopted in 2007

- All dairies regulated, regardless of size.
- Restricts the amount of nitrogen (N) used on fields where manure is land applied.
- Goal: protect ground and surface waters.

TARGET = 1.4 x N removed in plant tissue (crop/field/year)
Waste Discharge Requirements

• Document total weight of nutrients removed from fields where manure is applied.
  – Dry matter (DM) content of harvested forage varies greatly.

• Detailed protocol for sampling silage not generally followed at dairies.
  – Nutrient removal may be under- or overestimated, thus compromising regulatory compliance.
Variability in dry matter content of corn for silage

• **Objective:**
  - To determine if differences exist in calculating DM removal based on various intensities of sub-sample and composite collection.

• **Procedures:**
  - Weights were obtained and samples collected for each truckload of forage harvested on a single corn field at three dairies.
  - DM was determined.
  - Actual field DM removal was determined by summing forage weight*DM for all samples from the field.
  - Field DM removal totals were calculated using two composite sampling methods.
Variability in dry matter content of corn for silage

Example of truckload samples taken to create Sequential (top) and Interval (bottom) composites.

Sample taken from a single truckload of forage
## Sampling Silage for Regulatory Purposes

Differences between estimated field DM removal and actual field DM removal based on method of sampling on one cooperator dairy.

<table>
<thead>
<tr>
<th></th>
<th>Individual</th>
<th>Sequential</th>
<th>Interval</th>
</tr>
</thead>
<tbody>
<tr>
<td>% difference</td>
<td>-21.5 to + 20.4</td>
<td>-5.14% to + 5.15</td>
<td>-2.71% to + 2.40</td>
</tr>
<tr>
<td>DM difference (lbs)</td>
<td>± 135,000</td>
<td>± 33,000</td>
<td>± 16,500</td>
</tr>
</tbody>
</table>

Through more intense sampling, under- and overestimations were reduced. Interval samples across all dairies were ± 3% of actual DM harvested.
San Joaquin Valley Air Pollution Control District

Rule 4570 for confined animal facilities adopted in 2006; Amended October, 2010

- 94% of dairies covered; 500 cows +
- Special emphasis on silage:
  - Most significant source of VOC emissions on dairies.
- Menu based approach; producers choose mitigation measures:
  - Harvest
  - Storage
  - Feed management

1,231 Dairies 87% Milk CDFA, 2009
Rule 4570 Mitigation Measures

• Cover silage surface within 72 hours of last forage delivery.

• Achieve minimum bulk density:
  – Corn = 44 lb/cu ft
  – Other = 40 lb/cu ft

• Parameters for harvest:
  – ≥ 65% moisture for corn
  – ≥ 60% other
  – Theoretical length of cut and roller opening considerations
Rule 4570 Mitigation Measures

- Exposed silage:
  - One pile = < 2,150 square feet
  - Multiple = < 4,300 square feet

- Face Management:
  - Shavers/facers
  - Maintain smooth vertical surface

- Silage additives

- Silage bags
Summary

1. Current silage management practices aid in identifying areas where improvements can be made.

2. Historically, silage management considerations focused on a quality end product. Central Valley dairy producers must consider implementation of management practices to achieve compliance with environmental regulations.

In the future, every member of the silage team will be responsible for carrying out best management practices/mitigation measures to ensure both quality feed and regulatory compliance.
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