Managing Corn for Silage
from Seed to Silo

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Start with quality

- Stover digestibility is important, but you need to start with a good ear.

- Corn grain is only ~ 5% NDF, so a wet, hot year (bad for fiber digestibility) has little effect on grain digestibility.

- A good ear is your insurance policy against a bad year for fiber digestibility.

- Average stover digestibility for dual purpose hybrids hasn’t changed in 50 years. Most silage quality improvement has come from more grain per plant and per acre.
Focus of most seed companies: Grain!
Relationship between corn forage *in vitro* true digestibility and era of release for whole-plant and stover.

\[ y = 0.83x + 73 \]

\[ R^2 = 0.88 \]
## What is corn silage quality worth?

<table>
<thead>
<tr>
<th>NDF-d</th>
<th>NEL</th>
<th>Milk, Lbs/T DM</th>
<th>Milk, $/T DM</th>
<th>Milk, Lbs/A</th>
<th>Milk, $/A</th>
</tr>
</thead>
<tbody>
<tr>
<td>Low</td>
<td>0.75</td>
<td>3572</td>
<td>$643</td>
<td>25004</td>
<td>$4500</td>
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<tr>
<td>Ave.</td>
<td>0.77</td>
<td>3682</td>
<td>$663</td>
<td>25777</td>
<td>$4640</td>
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<tr>
<td>High</td>
<td>0.79</td>
<td>3864</td>
<td>$696</td>
<td>27046</td>
<td>$4869</td>
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</table>

Milk @ $18.00/cwt.
From the previous slide, the difference between average and high NDF digestibility = $33 per ton of DM.

Assuming yield of 5 tons DM/acre, that’s $165 per acre. Average corn silage yields in the Northeast are closer to 15 tons/acre than 20.)

2.4 acres per unit of seed = ~$400 per bag of seed corn.

Therefore, buy seed corn that combines high yield and quality—regardless of price!
How many hybrids to plant for silage?

- Depends on acreage. 100 acres of corn—at least 2 hybrids, 4 or 5 isn’t too many. 1000 acres for silage doesn’t mean 20 or 30 hybrids!

- If planting and harvest can each be completed in a week or so, fewer hybrids are needed, of similar relative maturity—i.e. all 90 to 95 RM.

- If planting takes several weeks and a custom operator harvests the entire crop in several days, use hybrids with a greater range of relative maturity—i.e. 85-95 RM.
Plant population

- Today’s corn hybrids have the genetic potential to produce high yields and a good ear at final stands of at least 30,000 on most soils.

- Exceptions: Droughty soils—but these are rare in most of Vermont.

- Aim for a seed population of 32,000-34,000. Don’t pay attention to seed catalog recommendations suggesting under 30,000.
Leafy hybrids

- Up to twice as many leaves per plant.
- Modest silage quality differences. Univ. of Wisconsin study: +2 lbs milk/cow.
- Some leafy hybrids have a longer harvest window, especially useful if you use custom harvest.
- About 15% of the corn silage seed market. A hot seller.
Why are leafy hybrids hot?

- Seed price and yield similar to non-leafy hybrids.
- The extra leaves are at eye level, *where farmers can see them*.
- Leafy hybrids simply look great in the field.
- Leafies got sex appeal!
Brown midrib hybrids: In the field

- A natural mutation discovered in 1924 resulting in incomplete lignin formation. Lower lignin = potential standability problems.

- Poor drought and disease resistance, 5-20% lower yield than non-BMR hybrids. Newer hybrids should be are better.

- “Your grandfather’s corn”, about 10 years of genetic improvement compared to 50+ years for non-BMR hybrids.

- Very high seed price: At least twice that of most other hybrids.
Brown midrib hybrids: In the feedbunk

Higher digestibility than any other hybrid type; reliably higher DMI.

Especially good in high corn silage diets and diets that are over 50% forage.

Positive milk responses even with cows milking over 100#.

Not much benefit when fed to heifers and cows milking less than ~65 lbs.
BMR isn’t for most dairy farms

- Lower yield and very high seed cost makes BMR very expensive per ton of silage.
- Less than about a 24,000# herd average—BMR probably not a good fit.
- Not economical for heifers and low-producing cows, so BMR silage must be segregated = better fit for larger farms.
- Lower yield x higher DMI = Up to 25% more corn acres needed, therefore not good where acreage is limited.
BMR vs. non-BMR corn silage
Average of 18 field and lactation trials

- **Yield**
  - BMR
  - Non-BMR

- **ADF**
  - BMR
  - Non-BMR

- **NDF**
  - BMR
  - Non-BMR

- **Milk/ton**
  - BMR
  - Non-BMR

- **Milk/acre**
  - BMR
  - Non-BMR
“Best vs. worst” hybrids for NDF-d
Cornell University corn silage trials, 2005
Brown Midrib corn
Note brownish midribs
Corn Specialty Hybrid Silage Yield and Quality
Wisconsin, 1990-1999

Milk per Acre (lb/A)

Milk per Ton (lb/T)

- BMR
- Bt
- HOC
- Leafy
- Waxy

High yield
High quality
Fertilizers for corn silage

- 2008 is the year to rely on the high soil fertility levels you may have built up from many years of manure application.

- Many more nutrients come onto a dairy farm each year as feed and fertilizer than leave it as milk and cull livestock.

- Don’t hesitate to apply just N to corn fields that have high P and K levels.

- Use PSNT especially on fields that receive spring-applied manure.
Harvest management: High chop corn silage

Considerable research on chopping at 12”, 18”, and 30” height (vs. normal 6-8”).

Advantages:
-- Chop height decisions delayed until harvest.
-- No additional cost.
-- Works with most hybrids—but not BMR.
-- Wisconsin research shows +2 lbs milk/cow.

Disadvantages:
-- Reduced yield.
-- Only small improvements in digestibility?
Corn silage maturity
“Chop corn silage at 28 to 35% DM”

- Even though it’s often found in silage management handbooks, this is a bad recommendation.

- 28-30% DM should *not* be the goal for corn silage…32 to 35% corn silage = more milk per ton and per acre.

- The corn plant changes greatly as it progresses from 30% to 35% DM—*and almost all the change is due to more grain*.

- Important with corn at $2.50/bu; critical with corn at $4.50.
Determining dry matter in the field

- Chop 15-20 stalks, avoiding outside rows and non-representative areas, chop and carefully take a one-quart sample.

- Dry in a microwave or Koster Tester. Then subtract 2% points: If the reading is 32% DM, actual field DM is closer to 30%.

- Why? Nobody is completely sure…but you can count on it!
## Corn maturity vs. milk production

<table>
<thead>
<tr>
<th>DM %</th>
<th>Milk, lb/ton</th>
<th>Milk, $/ton</th>
<th>Milk, lb/acre</th>
<th>Milk, $/acre</th>
</tr>
</thead>
<tbody>
<tr>
<td>25</td>
<td>3309</td>
<td>595</td>
<td>21510</td>
<td>3871</td>
</tr>
<tr>
<td>30</td>
<td>3435</td>
<td>618</td>
<td>24050</td>
<td>4329</td>
</tr>
<tr>
<td>35</td>
<td>3530</td>
<td>636</td>
<td>26472</td>
<td>4765</td>
</tr>
<tr>
<td>40</td>
<td>3122</td>
<td>562</td>
<td>23412</td>
<td>4213</td>
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<tr>
<td>45</td>
<td>2970</td>
<td>534</td>
<td>20791</td>
<td>3742</td>
</tr>
</tbody>
</table>

Milk price $18.00/cwt.
Effect of Maturity on Corn Silage Dry Matter Digestibility

Pioneer Hi-Bred Int'l, 2001
Chopping corn at the right maturity...a key to success

- Unprocessed corn at 32-35% DM will make more milk than processed corn at 25% DM.

- 32-35% DM corn chopped at 6” will make more milk than corn chopped at 25% DM corn chopped at any height.

- A run-of-the-mill corn hybrid chopped at 30-35% will make more milk than most high-digestibility hybrids chopped at 25% DM.

- Immature corn silage leaves yield potential in the field, produces more silage effluent, less milk per ton and per acre. It also makes a real mess when processed or bagged.
Filling and packing

- Don’t let filling get ahead of packing! This is happening more frequently with increased use of self-propelled choppers and custom harvest.

- In general, if you’re filling at a rate of 100+ tons per hour, it’s hard to get adequate packing with just one tractor.

- “Rule of 800”: Tractor weight ÷ 800 = Filling rate per hour.
  With corn silage (especially processed CS), maybe “Rule of 600”: 30,000 lbs ÷ 600 = 50 tons/hour.
Continuous packing is essential

- Inadequate packing during filling followed by hours of packing later does little except mush up the surface of the silage.

- “Culvert effect”—packing really only helps the top foot of silage—probably mostly the top 6”, which is why the recommendation is to spread and pack 6” at a time.

- You can make good silage with so-so packing, but to make GREAT silage you have to finish the job right.
Don’t be in a hurry to start feeding

- European research with 15 on-farm silos of corn silage:
  - Slight increase in digestibility during the first few months after ensiling.
  - Larger increases in digestibility after the first few months.
  - Significant increases in digestibility continued throughout the 10-month study. Perhaps part of the cause of “spring acidosis”?
Keys to high quality corn silage

- Hybrid selection: Choose hybrids with good yield and high fiber digestibility. Both dual purpose and silage-only hybrids can meet these criteria.

- Proper maturity (hybrid maturity + planting date + harvest date) is more important than genetics.

- High populations are important: 30,000-33,000 plants/acre. Overplant by about 10%.

- Delay feeding new-crop corn silage for at least 1 month, preferably at least 2-3 months.
Questions?