



Producing high quality corn silage

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Corn silage is two crops

Corn silage consist of:

1. A high quality grain.
2. A fair quality tropical grass.

Corn silage quality depends to a large extent on the relative proportion of these two.

In general, more grain = higher silage quality.

A good ear is crop insurance

- Weather has a great influence on stover quality (stalks and leaves).
- Weather influences the amount of grain on a corn plant, but grain only has about 5% fiber.
- Therefore, weather has much less effect on grain quality than it does on stover.
- High quality corn silage starts with a good ear.

Dual-purpose hybrids

Dual-purpose hybrids

- Dual-purpose hybrids are bred for grain harvest but can be harvested for silage.
- There's usually only ~ 5 % points difference in NDF-d between top and bottom dual-purpose hybrids in silage hybrid trials.
- Differences in corn silage quality among dual purpose hybrids is primarily related to grain: stalk ratio.
- Rely on company and university silage trial data to identify the best dual-purpose hybrids...but don't expect miracles.

Cornell University corn silage hybrid trials, Aurora, NY 2008

	101-105	106-110	111-115
	30-hr dNDF, %		
Top	58.3	58.1	58.5
Bottom	53.6	52.2	53.6
Mycogen BMR	71.3	71.3	69.9

High digestibility non-BMR hybrids? 2008 Cornell trials

Location/ RM	High	Low	“Hi-d” entry
1/106	58.0	53.2	56.6
1/111	58.1	54.8	57.2
2/106	58.1	52.2	57.1
2/111	58.7	53.6	56.6

Leafy corn hybrids

Leafy corn silage in the field and in the cow

- Field and lactation trials have not found a consistent advantage to leafy corn hybrids: Similar yield, similar milk production.
- Some leafy hybrids have a slightly longer “harvest window”—a plus in some situations.
- Farmers should make purchase decision on leafy hybrids based on how they perform in hybrid trials, not because of the leafy trait. However, leafies are “hot”.

Brown Midrib (BMR) Hybrids

- Silage-only. Almost all BMR corn is currently sold by Mycogen Seeds. A small but growing portion of the market. More seed companies will be selling BMR corn in 2010.
- A naturally-occurring mutation discovered in 1924. The mutation causes incomplete lignin formation, resulting in lower lignin content and higher digestibility.
- Part of the BMR benefit is from *increased dry matter intake*; especially good with high corn silage diets and high-producing cows.

BMR hybrids in the field: Standability

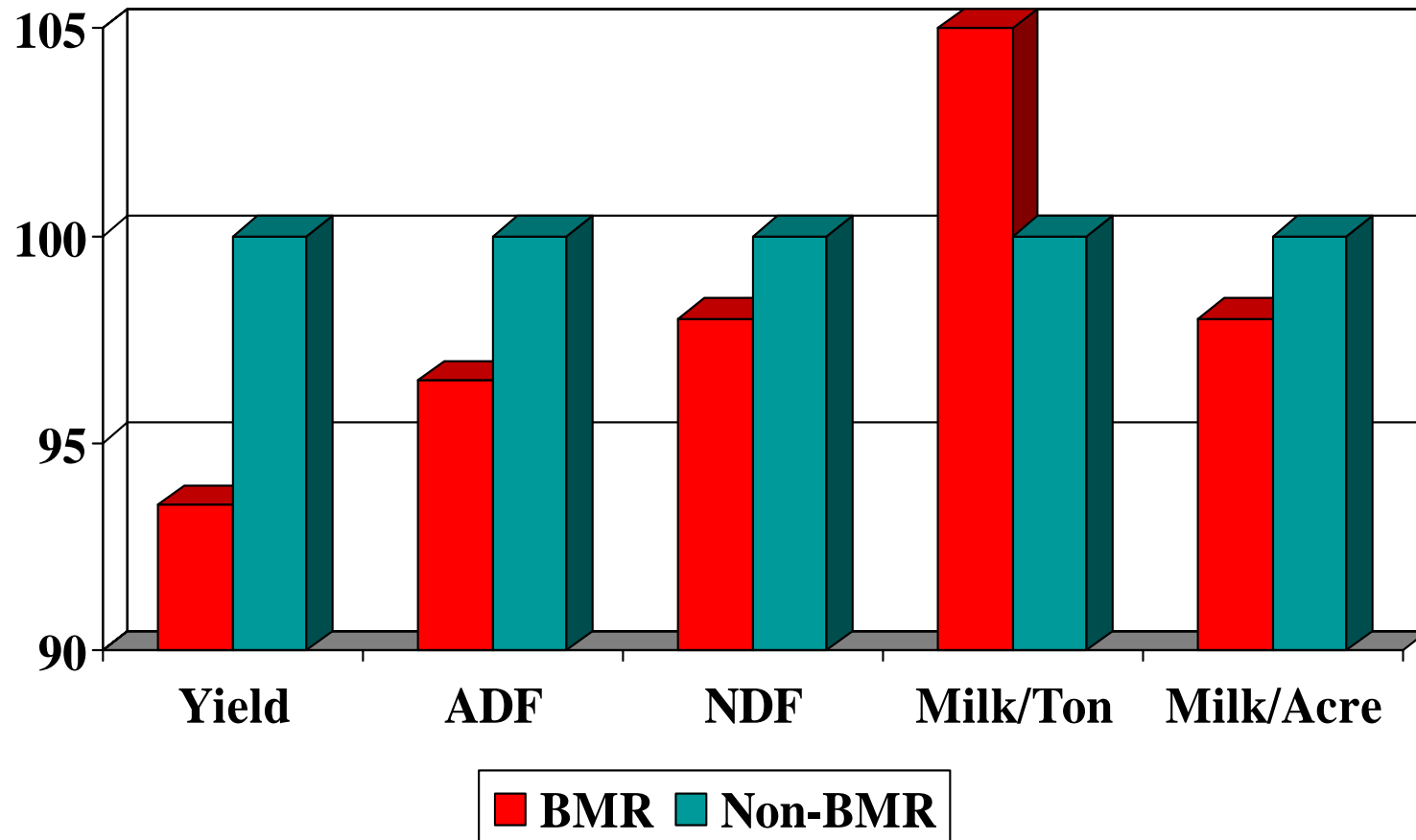
- Lower lignin = *Potential* standability problems. This hasn't been a problem in the 5 years we've grown BMR corn at Miner Institute. "Functional standability".
- Wind problems: Early season--Stalks bend but seldom break. Late-season--Lodging can be a problem. Don't let BMR get over about 35% DM.
- Farmers growing BMR corn in the Northeast seldom complain about standability problems.
- Almost impossible to find lodging data on corn silage hybrid trials. Cornell, UWisc, UMinn, MSU, OSU don't report any lodging data.

BMR hybrids in the field

- Avoid droughty, low fertility soils.
- Lower yield than most dual-purpose hybrids, but newer BMR hybrids appear to be more competitive.
- 2008 Cornell University, 10 trials: 13% lower yield but #1 in milk per ton in all 10 trials.
- About 35% higher seed price than many non-BMR hybrids. Stacking genetic traits onto a BMR hybrid can reduce the price premium (vs. non-BMR stacked hybrids) to 20-25%.

BMR vs. non-BMR corn silage

Average of 18 field and lactation trials



Mixing BMR and non-BMR corn silage

- BMR and non-BMR hybrids shouldn't be planted within the same field. Hard to manage the maturity differences that often occur.
- BMR and non-BMR shouldn't be mixed in the silo because of the considerable differences in intake and digestibility. OK to blend BMR and non-BMR corn silage in the ration.
- Miner Institute has been using about 50-50 BMR/non-BMR in the ration, but in the coming year will considerably increase the BMR feeding rate.

BMR hybrids in the feedbunk

- Higher NDF digestibility & DMI than any other hybrid type.
- Positive milk responses even with cows milking over 100 lbs. Higher producing cows = greater milk response.
- Great feed for transition and fresh cows.
- Relatively little benefit when fed to non-milking heifers and cows making less than 60-70 lbs.

BMR isn't for all dairy farms

- Even though the cost difference is narrowing, lower yield + higher seed cost = BMR more expensive per ton of silage.
- A good fit with herds large enough to have one or more silos just for BMR corn silage. Silage bags are OK if farmers can keep the predators away.
- Lower yield x higher DMI = More corn silage acres needed, so BMR may not be as good a fit where cropland acreage is limited.

However...

- As BMR yield continues to become more competitive, and as the price difference between BMR and non-BMR hybrids narrows....
- ...we may modify current BMR guidelines.
- Should the cutoff be 70 lbs? 60? 50? How about bred heifers?
- In the end, economics will rule.

Miner Institute's 2009 corn silage hybrids

- 210 acres of two BMR hybrids. We get about a 5 lb. milk response from feeding BMR.
- 60 acres of a leafy hybrid—Not because it's leafy, but because it performed well for both yield and quality in Cornell University silage trials.
- 50 acres of a triple stack, dual-purpose hybrid.
(Rootworm + corn borer + Liberty Link)

Corn hybrid summary

- Most improvements in dual-purpose (grain) hybrids have been in the ear, not the stalk.
- Don't assume that the newest dual-purpose hybrids have better NDF digestibility: Rely on silage trial data.
- Leafies are a good option if they have high digestibility. Some do, most don't.
- BMR: Not for all farms, not for all cows on a farm. Should be stored in a separate silo. Topnotch field and herd management are a must. But BMR makes cows milk.

Silage inoculants

- Silage inoculants increase milk production in 50% of lactation trials.
- Average increase 2 lbs/cow, = 1 lb/cow for all trials.
- 65-70# silage/c/d = 30 “cow days”/ton of silage.
- 30 lbs milk = \$3.60 @ \$12.00/cwt. Therefore, a 3:1 return assuming \$1.20/treated ton. This doesn't take reduced fermentation losses into account.

Corn silage maturity

- The minimum corn maturity for silage is at least 30% DM, especially for processed corn.
- Immature corn silage will negate the difference between high and average digestibility hybrids, and between high and low chop height.
- Corn harvested at 25-28% DM leaves milk potential in the field—both per ton and per acre.

Corn silage yield and % DM

Stage	% of full yield	% DM
Silk/blister	50	15-20
Late milk	70	20-25
Early dent	80	25-30
1/3 milk	100	30-35

Corn maturity vs. milk production

DM %	Milk, lb/ton DM	Milk, \$/ton DM	Milk, lb/acre	Milk, \$/acre
25	3309	662	21510	4301
30	3435	687	24050	4809
35	3530	707	26472	5294
40	3122	625	23412	4681
45	2970	593	20791	4158

Milk price \$20.00/cwt.

Effect of maturity on silage quality

Pioneer 34B23 & Mycogen TMF108, 6" chop height

	29% DM	34% DM
Yield, tons/A	18.9	18.6
Grain, %	35.9	42.2
Starch, %	25.2	33.5
NDF, %	44.8	42.3
Stover NDF-d, %	61.7	62.6

Corn silage DM %

- In spite of some recommendations, 30% DM corn silage is not what you should aim for.
- If you miss by 2 points on the wet side—28% DM—you lose yield and quality, increased effluent (silage juice).
- Aim for 33-34% —maybe 35% if you process. That way you'll be OK if you miss by 2% on either side.

Estimating % dry matter of corn in the field

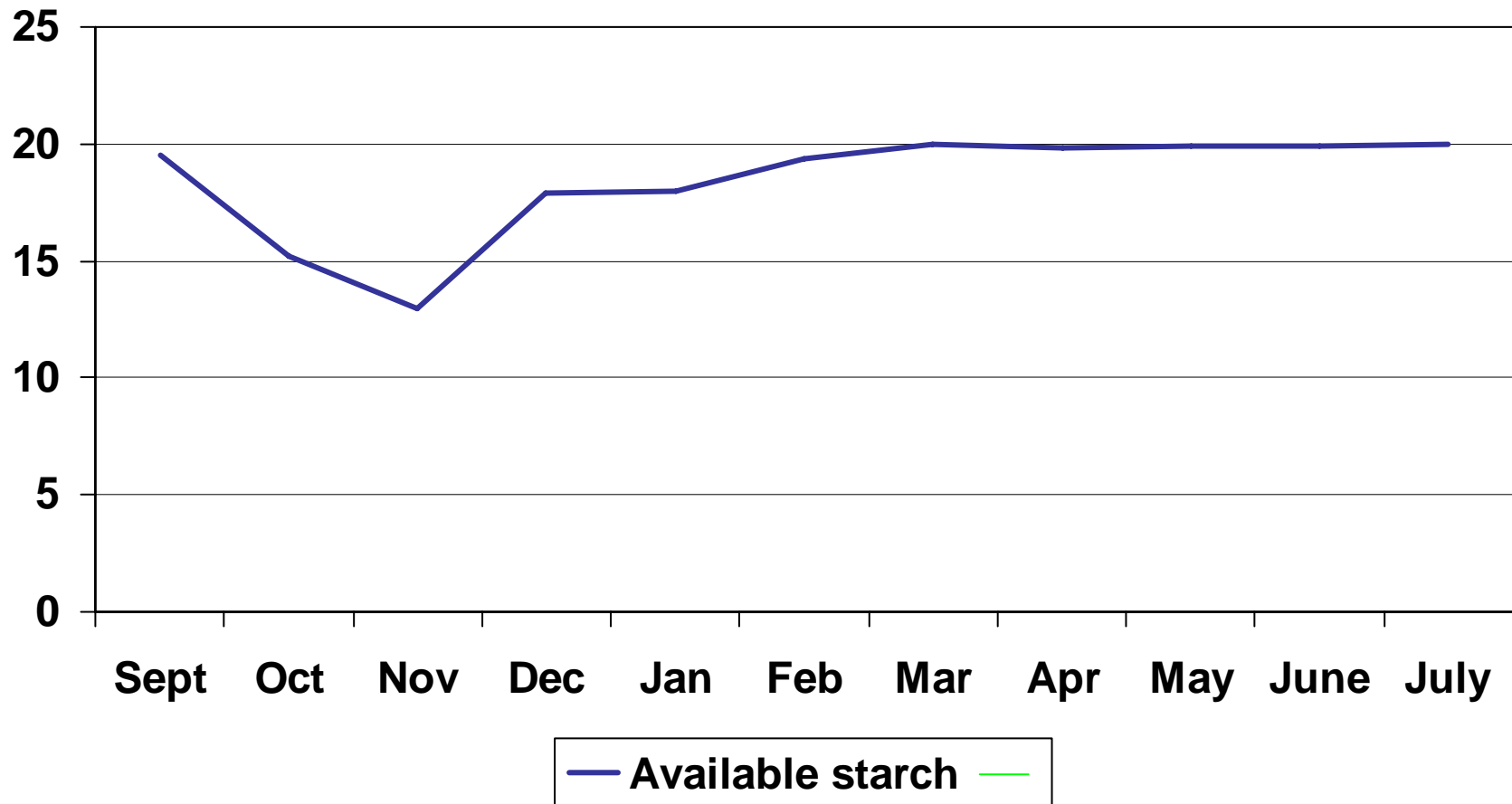
- Harvest 10-20 representative plants by hand and run them through the chopper, or chop 50-100 feet of row (not the outside few rows).
- Dry a quart sample using a Koster Tester or microwave oven.
- Then, subtract two percentage points.
- Example: Measured DM = 34%. Actual field DM ~ 32%.

Silage processing

- Silage processors are now “old news” since most large dairy farms process corn silage.
- However, many are not being adjusted properly, including those run by custom operators.
- Also, as processor rolls get worn, many aren't replaced until after at least one crop of badly processed corn. An increasing problem.

Corn silage starch availability

As % of total starch



Cumberland Valley Analytical
Laboratory

European research on corn silage starch degradability

- 15 bunker silos, each containing silage from a single corn hybrid.
- Measured starch degradability from 2 to 10 months after ensiling.
- Starch degradability didn't change much until 4 months after ensiling.
- Then steady increases up to 10 months post-ensiling—when the study ended.

What does this mean to your clientele?

- Farmers won't wait 10 months before feeding "new crop" corn silage.
- But don't assume that the digestibility of the corn silage fed today is the same as it was in December...even if it's the same hybrid from the same silo.
- Connection between increased corn silage starch availability and "spring acidosis"?
- Do *in vitro* analysis on corn silage on a regular basis.

Silage additives

- Silage inoculants should be part of a farm's risk management strategy.
- Cost: benefit favors applying an inoculant to every crop, every year.
- You can put up good quality silage without using an inoculant. But you'll make better silage more often by using one.

Inoculating immature corn silage

- Immature corn silage should be inoculated with a research-proven bacterial inoculant.
- If dry matter is less than 30%, don't use an inoculant containing *Lactobacillus buchneri*.
- Immature corn silage will produce a lot of acetic acid via “wild” acetic acid bacteria, and using *L. buchneri* might further increase acetic acid production.

Match harvest rate to packing ability

- Old rule of thumb: Tractor weight divided by 800 = fill rate in tons per hour.
- 32,000 lb. tractor = 40 tons/hour. Research done with hay silage, probably conservative. For corn silage, 50 tons/hour?
- Even so, many bunker silo filling/packing operations need two big tractors on the pile.

Progressive wedge and small bunker silos

- The progressive wedge may not be the best method to fill small bunker silos.
- Not enough space on the ramp to spread a truckload of silage in the recommended 6" or less layer.
- If the silo will be filled in a few days, fill it horizontally—only enough ramp to drive up onto the pile.

Drive-over piles (stack
silos)

Why drive-over piles instead of bunker silos?

- ❑ Cheaper than bunker silos—no walls.
- ❑ Flexible capacity.
- ❑ Can remove silage from across the face rather than from the front. Smoother face, less aerobic loss.

Drive-over piles: Potential problems and pitfalls

- ❑ Putting the pile on bare soil instead of asphalt or concrete. Piles take up a lot of space!
- ❑ Sides too steep to pack. Must be packed front and back and side to side. This is the biggest mistake made with silage piles.
- ❑ Feeding face too large to feed off enough each day to prevent spoilage.
- ❑ High losses from “tails” around the perimeter of the stack.

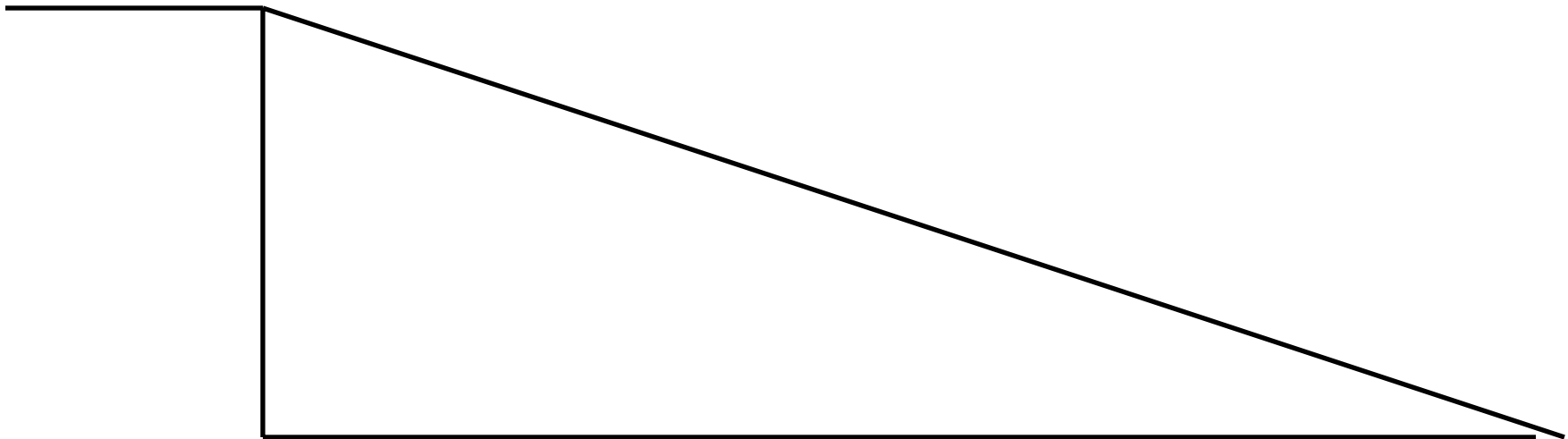
Dry matter losses, %

	Filling	Gaseous	Spoilage	Unloading	Total
Bag	1	7	2	3	13
Bunker	2	8	5	3	18
Stack	2.5	8	10	3	23.5

If you're going to do a drive-over pile, do it right.

- Maximum height 18 feet, but no higher than you can reach with the loader for proper face management.
- Side slopes no less than 3:1. (3 feet of width for each 1 foot of height.)
- 10 foot wide crown and 15 foot maximum height = **100 foot width**. A 10 foot wide crown and 10 foot maximum height = **70 foot width**.

This is a 3:1 slope.



Miner Institute Farm Report

- 12 pages monthly.
Free on request:
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- Or, via Miner Institute website:
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FARM REPORT



WHAT'S HAPPENING ON THE FARM

December 2nd had a little more excitement than a normal Tuesday on the farm usually holds. After a brief morning meeting between farm manager, feeder, herdsman intern and herdsman, we split to work on the few tasks left before moving cows into the new dry cow barn. Grooving the concrete floors had left the waterers covered in dust, the feed alley needed to be swept and gates moved around. December 1st had been the last day the far dry and close-up animals would be fed in the "old barn"; it was moving day!

Using our gooseneck trailer and small cattle trailer, we made several trips between barns. First we moved close-up cows onto the bedded pack – a two thirds, one third mixture of sawdust and chopped straw. This is the first time (at least for quite a while) that we have managed dry cows at Miner on a pack. We are planning on letting the cows freshen right on the bedded pack, although there are several conveniently located maternity pens in case we need to assist with a calving. Right off the close-up pen is the vet room with a cattle chute, a calf pen for newborn calves and storage for vaccines, calving supplies and colostrum.

The far dry cows were moved into the side of the barn with sand-bedded freestalls. Both dry cow groups did a lot of running, smelling, and general curious cow behavior. However, the close-up cows were all lying down within a few hours; not so with the far dry cows! This was the first time they had ever seen a sand bedded freestall and they were a little hesitant to give it a try - especially because some of them sank up to their knees when they stepped up into the stalls! We had done our best to pack the sand, but couldn't apply quite as much pressure as an 1800 lbs cow! By the evening 11 animals were lying down, some were perching, and others were still milling around or eating.

Cows were all moved by lunchtime and it went very smoothly. The barn is far from full – extra pens will be used for control and treatment groups during research studies and to accommodate a larger herd size should we decide to expand. We are excited to be finally in the new barn and actually work in the facility that we spent so much time designing; from now until February we have 100 animals due to calve so we should soon see how things work. If you are interested in seeing the new barn, visitors are welcome.

From all of us at the dairy barn – Merry Christmas and Happy New Year!

—Anna Pape, pape@whminer.com



Dry cows walk down the grooved concrete feed alley to get to the bedded pack. Everything looks so clean and bright in the new barn!

