

Hay Storage Systems

2018 Hay Shortcourse

John W. Worley



extension.uga.edu

1-800-ASK-UGA1

HAY LOSS ACCUMULATES WITH EACH STEP

**It's not unusual to see total
losses of 70% or greater**

**We will concentrate on the
Storage portion**

Slide courtesy of
Dennis Hancock

A photograph showing a field of green hay being cured. The hay is laid out in rows, and some areas appear slightly yellowed from the sun.


**Field curing
10-25% loss**

A photograph showing a red tractor with a hay baler attachment in a field, creating large round hay bales.

**Harvesting
7-15% loss**

A photograph showing several large, round hay bales stacked in a field. The bales are covered in a layer of green grass or weeds, suggesting they are being stored outdoors.

**Storage
5-45% loss**

A photograph showing a large pile of hay on the ground, with a person's legs visible in the foreground, suggesting the hay is being prepared for feeding.

**Feeding
10-30% loss**

Storage Alternatives

■ Curing

- Field Dry (15% moisture)
- Baleage (50-60% moisture)

■ Packaging

- Round Bales
 - Twine
 - Bale (net) Wrap
- Square Bales
 - Small
 - Large

Alternatives

■ Storage

- Square Bales - Barn

- Round Bales

 - Field

 - Tarp

 - Barn

Twine vs. Hay Wrap



Permeable Wrap



- Aka “B-Wrap”
- Compare to Gore-tex
- Preserves hay very similar to a barn
- Cost similar to a barn (\$7/bale)

Baleage



- Greater control over harvesting time
- Excellent quality if moisture level right and no leaks
- Reduces Nitrate Levels

Baleage



- Costs more
- Can cause problems if ensiling isn't successful
- Disposal of Plastic

Baleage



- Get the moisture level right (50-60%)
- Get tension right and put enough plastic
- Control vegetation (mice and predators)

Hay Storage – Preserving Quality

- Why build it?
- How to build it
- How to use it



Hay Barn



- Best choice for long-term storage

Small Square Bales



Hay Barn

- Enclosed sides –
 - Better Protection (sun and rain)
 - Costs about twice as much
 - Ventilation
 - High-end hay storage
 - Small square bales



Tarp

- Low-cost alternative
- More Labor
- Decreased losses in case of fire



Uncovered



- Lowest Cost - Greatest Losses - Poorest Quality

Storage Options

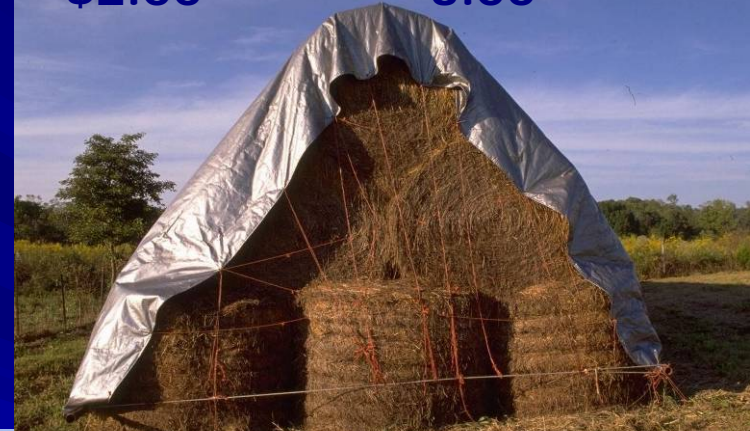
Tarped Stacks

Hay Sheds

Hoop Structures



\$2.00 – 3.00



\$5.50+



\$3.00 – 5.00

Slide courtesy of
Dennis Hancock

Cost of Owning a Building

- 50 by 100 ft building at \$6.00/ square foot (\$30,000) (Roof only)
 - Depreciation (20 years) \$1500
 - Interest (8%) \$1200
 - Tax & Ins. \$900
 - Annual Repairs \$150
- Total Annual Cost \$3750

Benefits of Covered Storage

- Reduced Dry Matter Loss
- Improved Nutritional Value
- Reduced animal refusal
- Barn can be used for other things when not used for hay (equipment storage)

Dry Matter Losses (%)

| Study | Ground Stored | Elevated on Pallets | Elevated & Tarped | Tarped Only | Barn Stored |
|-------|---------------|---------------------|-------------------|-------------|-------------|
| 1 | 65 | 38 | 14 | na | 4 |
| 2 | 50 | 32 | 14 | na | 4 |
| 3 | 30 | na | na | 10 | 0 |

Size of Bale Affects Losses



- Outer 4 to 6 inches is lost
- Higher percentage of a small bale

Dry Matter Losses (%) As Affected by Bale Size

| Bale Diam. (ft.) | Ground Stored | Elevated on Pallets | Elevated & Wrapped | Barn Stored |
|------------------|---------------|---------------------|--------------------|-------------|
| 4 | 32.4 | 26.2 | 14.6 | 4 |
| 5 | 23.8 | 17.4 | 11.4 | 4 |
| 6 | 19.6 | 13.4 | 10.0 | 4 |

Digestibility and Palatability Also Affected

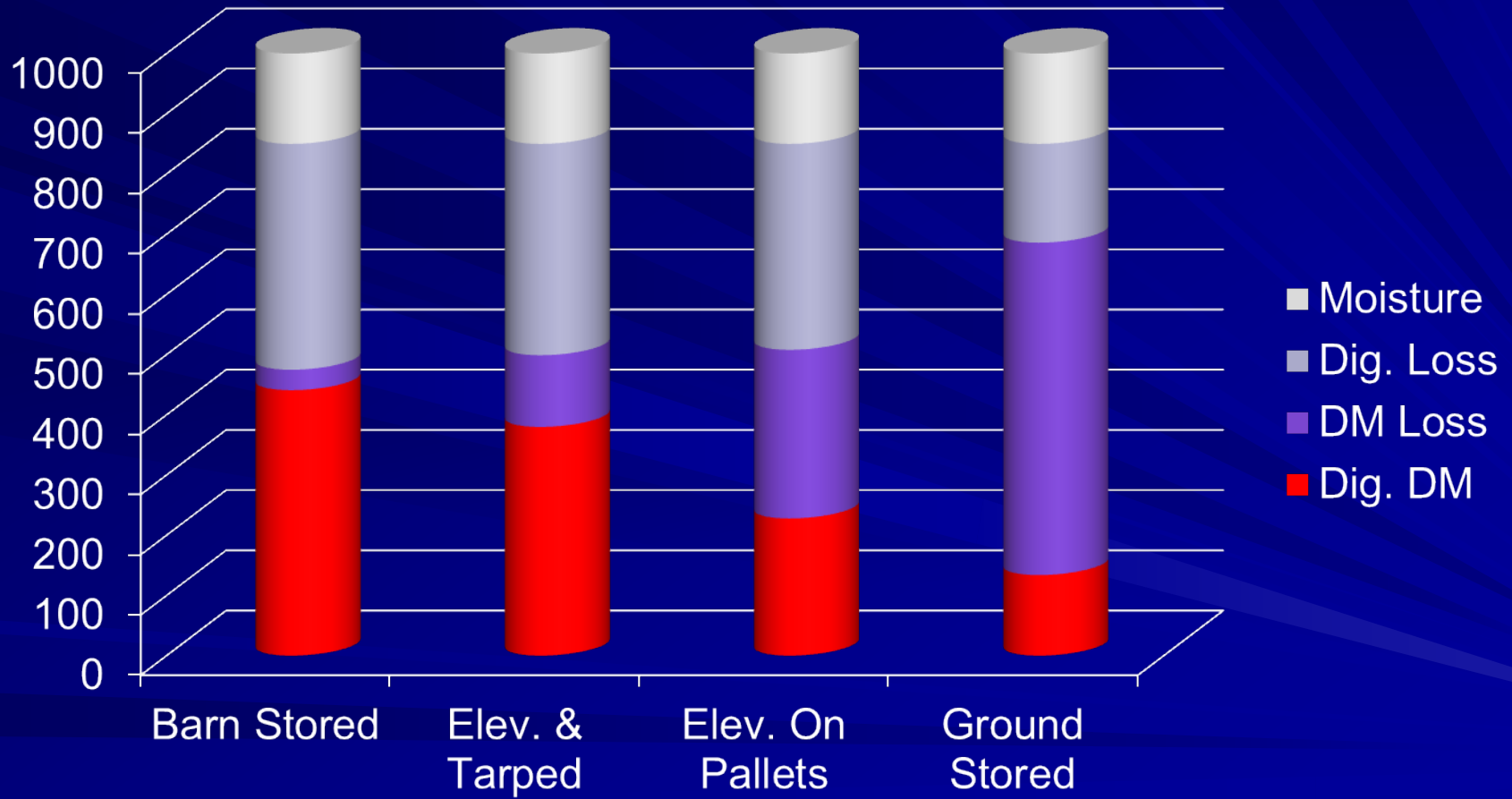


Nutritional Losses

Start with 1,000-lb bale at 15% moisture

| 850 lb DM before storage | Ground Stored | Elev. on Pallets | Elev. & Tarped | Barn Stored |
|---------------------------------------|------------------|---------------------|-------------------|----------------|
| DM Loss | 65 | 38 | 14 | 4 |
| Digestibility (%) | 45 | 49 | 52 | 54 |
| Digestible Matter After Storage | 172 | 258 | 380 | 441 |

Digestible Matter After Storage (1,000-lb Bale)



Annual Savings on Hay Storage

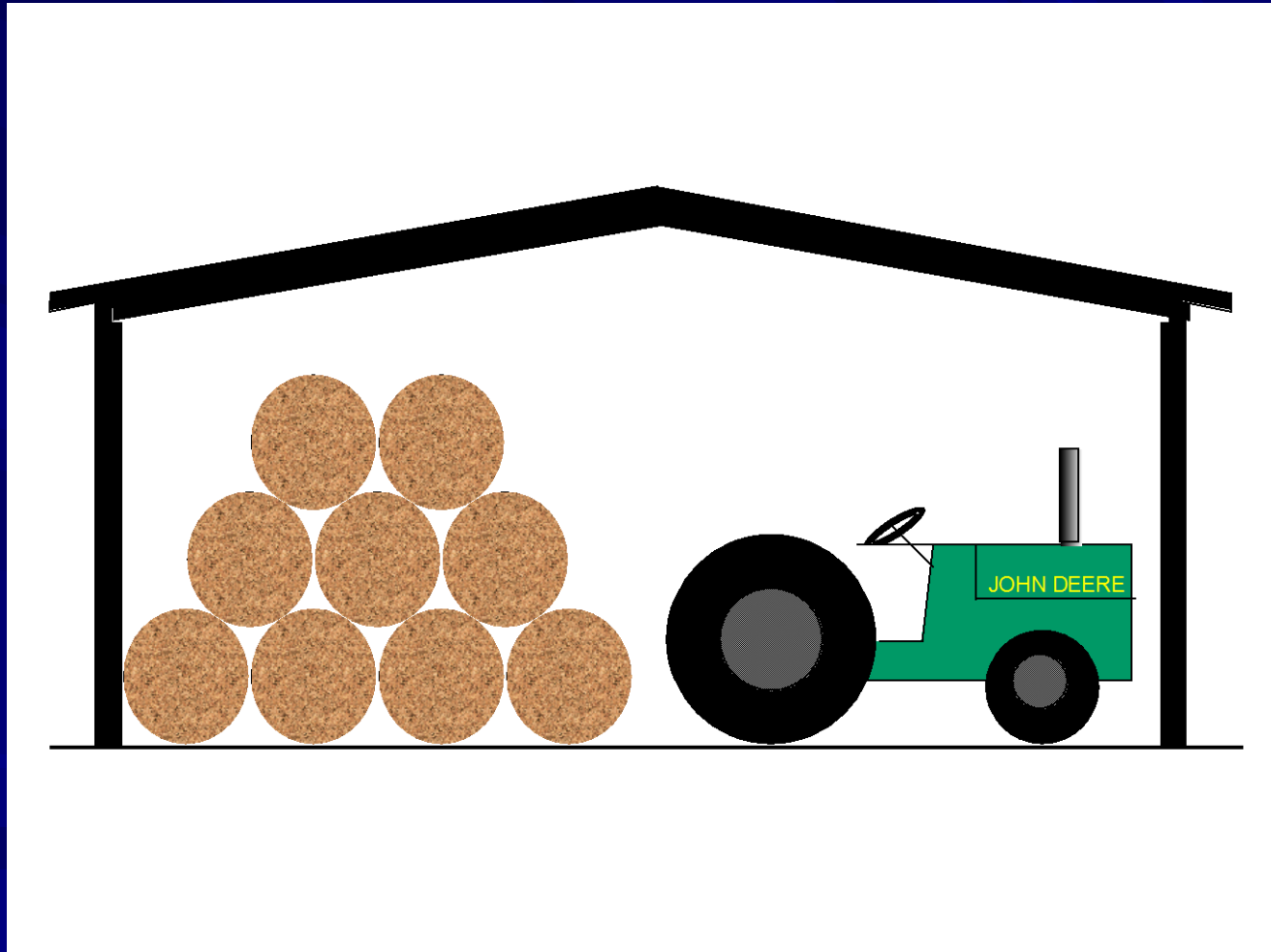
■ Assumptions

- Hay valued at \$80/ton (dry matter)
(\$34/1,000-lb roll)
- Hay losses reduced by 30%
- 50 x 100 building (annual cost - \$3750)
- Storage Capacity - 250 tons (wet basis)
- Hay stored at 15% moisture

Annual Savings on Hay Storage

- Dry matter saved - 61 tons - - \$4880
- Net Savings - - - \$1130
- What if?
 - If Digestibility Improved by 9% (Total of 42% Savings) Net Savings - - \$3100
 - If Hay worth \$90/ton, Net Savings - - \$4000

If You Build A Barn



Barn Recommendations

- Build to meet Southern Building code (80 mph wind)
- If possible, orient the long axis east and west on open-sided barns
- Round bale storage should be open, especially at the gable end for ventilation

Barn Recommendations



- Stack bales on end to increase capacity
- Make sure the eave height (vertical clearance) of barn is sufficient

Rot and Rust on Inside Roof?



Enclosed Gable



Water Loss from Curing Hay

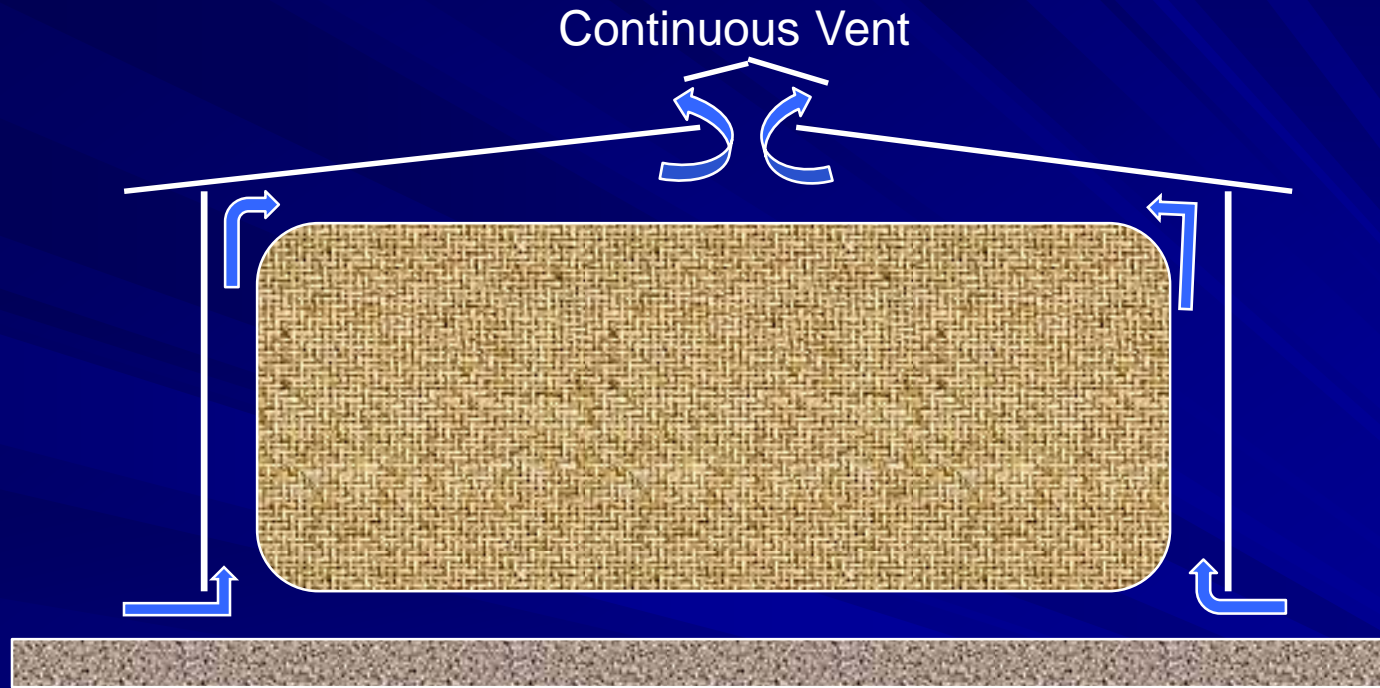
- 100 tons of hay stored at 16% moisture
- Dries to 13% moisture
- 3% of 100 tons = 3 tons of water
- = 722 gallons
- Must be removed by ventilation

Enclosed Hay Barn

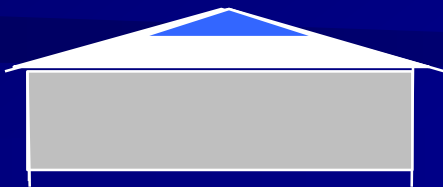
- Typical for small square bales



How much Ventilation? (Enclosed Barn)



Gable Vent



Ridge Vents



How much Ventilation? (Enclosed Barn)

- Larger of the following 2 options:
 - 6” continuous ridge vent
 - 2”/ 10 ft of width
- For a 50-ft wide building -10” Ridge vent (83 sq. ft of ridge/gable opening for 100-ft long building)
- Equal area of opening near bottom of walls (Door can serve as part of vent)

Flooring for Square Bales

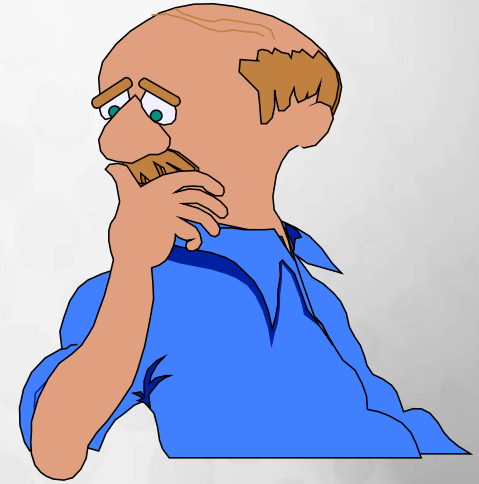
- Floor higher than surrounding soil
- Anything that promotes ventilation under the hay is good (Large rock, pallets, etc.)
- Ideal is a raised floor with air underneath (not always practical)
- Bottom layer on edge – primarily to keep twine from rotting, but also helps promote ventilation
- Concrete with vapor barrier underneath and well-drained

If You Store In the Field



Field Storage Recommendations

- Store on high, well-drained ground
- Store in open, sunny area
- Store in rows with flat edges touching and round edges separated (unless tarped)
- Orient rows North and South
- Orient rows down slope, not across slope



QUESTIONS ?

jworley@uga.edu