Forage Sampling Options

Forage Sampling: Baleage's Management Challenge

Why the Challenge?

Schemes for reliably sampling dry baled hay and chopped haylage are well entrenched. Dry hay requires blocking and mapping like quality material, scheduling, muscle, cataloguing and applying the information. Haylage requires blocking like fields, load by load sampling, composite lab samples tied to silo maps, fermentation correction and applying the information. Baleage combines the hassles of both hay and haylage and then adds one more; you do not want to compromise the plastic too long in advance of feedout.

Three Options, Only One is Practical

Since baleage is a technology that fits more moderate sized herds usually without an abundance of labor at harvest, extra work during the mowing, raking, baling and wrapping timeframe is generally not welcomed. Windrow sampling and sampling at the wrapper are only briefly mentioned because of the timing relative to harvest bottlenecks.

Windrow sampling (random cut-outs with hedge shear, mixing and taking a composite) is effective, but not without some obvious drawbacks:

- ✓Takes a lot of labor
- ✓Labor during critical need time
- ✓Requires accurate mapping
- ✓Fermentation adjustment

Pre-wrap sampling (with hay probe either in fields or when bales are assembled at wrapper) is also effective, but suffers from the same labor crunch that limits windrow sampling. May be your best bet with in-line wrappers. Limitations:

- ✓Labor during critical need time
- ✓Requires accurate mapping
- ✓Fermentation adjustment
- ✓Precludes feed rep sampling

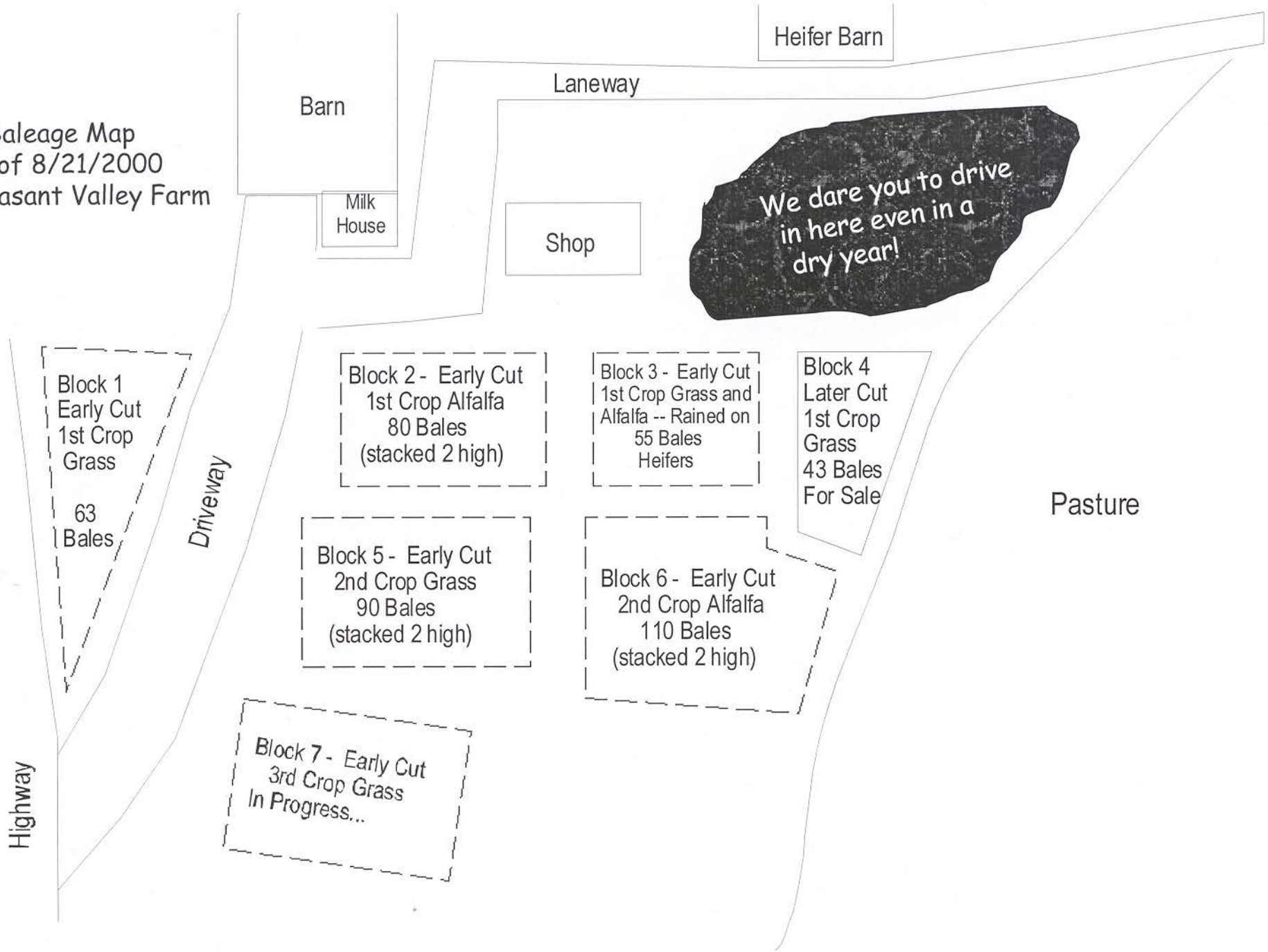
Wrapped/fully fermented bales reasonably blocked by quality and/or composition offer the most reasonable possibility for sampling relative to ration balancing and use. Still not perfect, but fewer critical limitations:

- ✓Requires accurate mapping
- ✓Timing of sampling critical
- ✓Need for rigorous communication with feed rep to get rewards

Recommended Procedure

- ☑ Take time at harvest to judge which fields will be similar enough from a maturity, composition and/or rain effect standpoint, block the like bales and map where and what they are.
- ☑ Review with your feed rep what is where and develop a block feedout strategy.
- ☑ Sample 6 - 8 bales in the next block or blocks to be fed about a week prior to feedout (presuming a week or less lab turnaround time). Use a serious hayprobe with at least 24" of probe length. Select random bales that are accessible for earliest feedout. Tape up plastic and feed these bales first.
- ☑ Develop system with feed rep so concentrate mix or amount changes are ready before new block.
- ☑ Be diligent, stick with strategy even when winter doldrums begin to affect attitudes!
- ☑ Jot down surprises in analyses. Use new-found knowledge of field notes vs. analysis to enhance your ability to block bales next season!

Baleage Map
as of 8/21/2000
Pleasant Valley Farm



Storage Costs --

Cost per Ton of Dry Matter Stored

Comparisons with other storage systems

How does Baleage Compare with other Storage Systems?

Below is a shrunken down version of a spreadsheet comparing different modes of silage storage. The readable version is on the next page. Here we will annotate sections having the most relevance and briefly discuss how to best interpret and use this information.

The values in gray (lighter shade) are change-able, while those in black are calculated from the gray. The prices used were non-bargained market prices for new equipment. Bargaining on new equipment or getting fire-sale prices on good used equipment may change the results somewhat.

Costs such as plastic that are tethered to the price of petroleum will rise and fall. Likewise, the cost of plastic disposal may be an issue in some locales and ignored in others. Should you feel safer in the decision making process to plug in up to the moment values, this spreadsheet is available from the University of Wisconsin at this URL: http://www.uwex.edu/ces/crops/uwforage/dec_soft.htm

Cornell Cooperative Extension Ag Staff can also assist you if you do not have access to the World Wide Web. Please note that the bottom 5 modes of storage are reasonably close in annual cost per ton of DM stored. How the storage system fits the harvest and feeding systems shapes the final decision!

INPUT SECTION

Silo Type	Structure Cost ($)	Unloader/ Tractor Cost ($)	Bagger/ Blower/ Wrapper Cost ($)	Proportion of Time <-- Used (decimal)	Loading Tractor Cost ($)	Proportion of Dry Matter Loss (decimal)	TOTAL CAPITAL COST ($)	Capital Cost per Ton DM ($/T DM)
Steel/Glass Tower (OL)	104200	50000	4000	1	56250	0.06	163825	427
Cast in Place Tower (OL)	68000	32000	4000	1	56250	0.06	109625	285
Stave Tower	49200	15000	4000	1	56250	0.1	73825	192
Above Ground Bunker	46600	31500	0	0	56250	0.13	58525	152
Packed Pile	12240	31500	0	0	56250	0.18	24165	63
Bagger	6820	31500	17400	1	33750	0.1	33895	88
Silage Bale Wrap	6728	31500	10000	1	31500	0.13	24603	64

Capital Costs of "structure" section, including equipment such as baggers & wrappers.

Tractor Use	Tractor HP	Cost/HP ($/HP)	Tractor Cost($)	Proportion of Time Used	Proportion of Capacity
Blower	125	450	56250	0.1	0.7
Bagger	75	450	33750	0.1	0.7
Pack Bunker/Pile	125	450	56250	0.1	0.5
Unload Bag/Bunker/Pile	70	450	31500	0.2	0.5
Wrap & Unload Bales	70	450	31500	0.25	0.5

Tractor charges to the cost of the storage system based upon its proportional use.

INPUT

Quantity(TDM)	384	Elect.($.07/KWH)	0.07	Bag Cost ($295/Bag)	295	Number Bales	1097
Value ($85/TDM)	85			Number Bags	8	Fuel Cost($/Gal)	1
BS Plastic	200	/sq ft * Area)->		Pile Plastic($)	469	Struct. Life(20 YRS)	20
BS Fill Labor(HR)	56	n./TDM)-------->		Pile Fill Labor(HR)	56	Equip. Life (10 YRS)	10
BS Cover Labor(Min HR)	20	Min HR/sq ft)-->		Pile Cover Labor(HR)	47	Interest Rate (12%)	10
BS Empty Labor(HR)	182	/Load)--------->		Pile Empty Labor(HR)	182	Repairs (2%)	2
TS Fill Labor (HR)	48			Wrap Plastic($3/Bale)	3	Taxes (1.5%)	1.5
TS Unload Rate(2TDM/HR)	2	(3 min./bale)-------->		Wrap Labor(HR)	55	Insurance (0.5%)	0.5
TS Attention at Unloading (50%)	50	(2 min./bale)-------->		Unload Bales Labor(HR)	37	Machinery ACF	0.19
Labor Cost($10/HR)	10	(5 min./bale)-------->		Unwrap Labor(HR)	91	Structures ACF	0.16

Input costs peculiar to each mode of storage

OUTPUT--------- ANNUAL COSTS

Silo Type	Silo/ Storage Pad ($/YR)	Unloader/ Tractor ($/YR)	Blower/ Bagger/ Wrapper ($/YR)	Loading Tractor ($/YR)	Labor ($/YR)	Fuel & Lubrication &Electricity ($/YR)	Plastic/ Bags ($/YR)	Dry Matter Loss ($/YR)	TOTAL ANNUAL COST ($/YR)	Annual Cost/Ton DM ($/TDM-YR)
Steel/Glass Tower (OL)	16407	9387	751	1056	1440	428	0	1958	31428	82
Cast in Place Tower(OL)	10707	6008	751	1056	1440	428	0	1958	22349	58
Stave Tower	7747	2816	751	1056	1440	428	0	3264	17502	46
Above Ground Bunker	7338	1183	0	1056	2580	690	200	4243	17290	45
Packed Pile	1927	1183	0	1056	2850	690	469	5875	14051	37
Bagger	1074	1183	3267	634	2300	622	2360	3264	14703	38
Wrapper	1059	595	1877	884	1830	225	3291	4243	14005	36

The "bottom line"; annual cost per ton of dry matter stored.

Costs not included are: Snow removal, Access road, Multiple silo fills/yr, Plastic disposal.
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Storage comparisons look good, but what about harvest costs?

To our knowledge, no Ag Engineer or Ag Economist has taken on the financial comparisons among the silage harvest options. Equipment, labor and time (as it affects forage quality as well as man-hours) all combine in a huge dynamic. Round balers vary in price and features way beyond the variability in wrappers. Likewise, choppers, self-unloading wagons, dump wagons, trucks, etc. are all over the map price-wise. Windrowers come in so many types, sizes, capacities, ground speeds and prices that it would take pages to list them all.

Intuitively, a heavy duty baler with a good operator will be competitive with the same operator pulling a chopper up to the point the baler speed becomes a bottleneck to tons of DM harvested per day. That point surely is influenced by herd size -- as it affects tons of DM needed per year.

We all drive by farms that combine all of the equipment (regardless of how well depreciated) needed to square bale, fill an upright silo, put up a bag or two (usually renting the bagger), dry round bales and also some balage bales. Unlike when you can't decide which breed of dog to get, you get a mutt that has them all; having all harvest and storage options going simultaneously is neither cost nor quality effective.

Harvest & Storage Costs --
Example Partial Budgets for Planning

The foldout page that follows shows a listing of assumptions on the left hand side and the expected added income, reduced costs, reduced income and added costs in quadrants on the right hand side. Equipment dealers/material suppliers are good sources of values for many items you would put into a budget. Experienced producers are excellent sources of items and values you might not think of on your own.

A couple of blank budget templates are provided for your use.

CASE 21 NEW GLASS/STEEL

No. Tower Silos = 2
Tower Silos = 20X70
No. Bunker Silos = 4
Bunker Silos = 20X100X8
No. Bag Silos = 8
Bag Silos = 135X8
No. Piles = 4
Pile Size:H=6,TW=9,BW=45,L=100
No. Bales = 1097
Bale Size = 4ft dia. 4ft long
Variable Changed = New Steel Silo

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Costs not included are: : Snow removal, Access road, Multiple silo fills/yr, Plastic disposal.
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Partial Budget

For: Baleage System vs. Repairing Silo Unloader & Replacing Harvest Equipmt.

A) Added Income			C) Reduced Income		
5% increase in milk sales (3 lbs/cow/day)	$	6,843		$	-
	$	-		$	-
	$	-		$	-
	$	-		$	-
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	$	-		$	-
	$	-		$	-
	$	-		$	-
	$	-		$	-
Subtotal	$	6,843	**Subtotal**	$	-

B) Reduced Costs			D) Added Costs		
Blower expense	$	200	Wrap	$	3,250
Electricity	$	200	Dumpster	$	600
Silo Unloader repair	$	500	Round Bale feeders (3)	$	862
	$	-	Bale hugger	$	143
	$	-	Wagon to move bales from field	$	345
	$	-		$	-
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Subtotal	$	900	**Subtotal**	$	5,200
E) Total Increase in Income (A+B)	$	7,743	**F) Total Reduction in Income (C+D)**	$	5,200

Grand Total - Change in Net Income (E-F) $ 2,543

Partial Budget Assumptions

1) Farmer has aging silo and worn out chopper and forage wagons
2) Currently fills a 20x60 with haylage
3) 50 cows @20,000 lbs per cow per year milk production
4) $12.50 per cwt milk price
5) Baleage allows for more timely harvest (improved forage quality) and segregation of forages
6) Cost of Round Baler and Wrapper is equal to cost of chopper and 2 wagons
7) 10 year depreciation on machinery
8) need to buy 3 round bale feeders at $1150 a piece
9) Bale feeders last 4 years - no salvage value
10) 1000 round bales made per year
11) Need dumpster for disposing of plastic
12) 5% milk response from baleage (~3 lbs/cow per day)
13) operating costs for either chopper and wagons or baler and wrapper is the same
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Partial Budget

A) Added Income		C) Reduced Income	
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Subtotal	$ -	Subtotal	$ -

B) Reduced Costs		D) Added Costs	
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Subtotal	$ -	Subtotal	$ -
E) Total Increase in Income (A+B)	$ -	F) Total Reduction in Income (C+D)	$ -

Grand Total - Change in Net Income (E-F) $ -

Partial Budget Assumptions

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Associated Equipment:

*Around-the-barn rail feeder, commercial
*Around-the-barn rail feeder, farm fabricated
*Bale Splitter, hydraulic
*Bale Splitter, "armstrong"
*Around-the-barn powercart, commercial
*Handlers; "huggers" & "cradlers"
*Hauling, on standard running gear & self-pickup

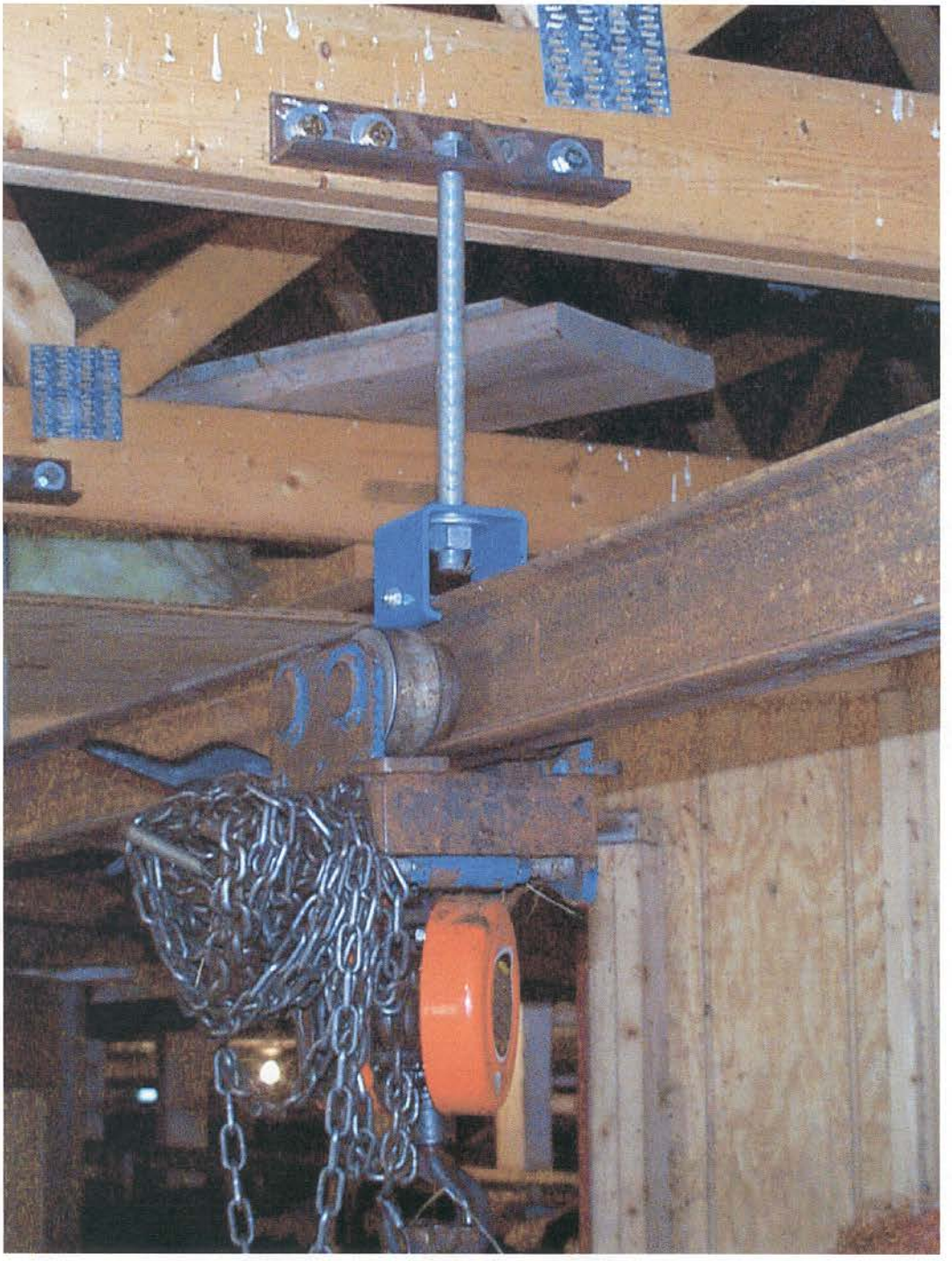
Feedout Equipment:

Farm Fabricated Around-the-Barn Rail, Manual Push, Swiveling Bale Unroller (1)

View of rail, spike, plate, chain hoist and roller

Feedout Equipment:

Farm Fabricated Around-the-Barn Rail, Manual Push, Swiveling Bale Unroller (2)



Close-up of rail, chain hoist and roller

Feedout Equipment:

Farm Fabricated Around-the-Barn Rail, Manual Push, Swiveling Bale Unroller (3)

Curved section of rail took some finding.
Patience during installation is needed!

Feedout Equipment:

Farm Fabricated Around-the-Barn Rail, Manual Push, Swiveling Bale Unroller (4)

Spike being worked through the center of the bale with the aid of a "convincer" Plate on top of bale to be attached to the spike when it comes through the other end.

Feedout Equipment:

Farm Fabricated Around-the-Barn Rail, Manual Push, Swiveling Bale Unroller (5)

Bale is winched into position and is "ready to roll".

Feedout Equipment:

Farm Fabricated Around-the-Barn Rail, Manual Push, Swiveling Bale Unroller (6)

Feedout is fast, easy and clearly appreciated by the "customer"!

Feedout Equipment:

Commercial Around-the-Barn, Manual Push, Swiveling Bale Unroller (1)

Bale recently powered into position on the rail and ready to leave the feedroom

Feedout Equipment:

Commercial Around-the-Barn Rail, Manual Push, Swiveling Bale Unroller (2)

Bale in feed manger; Feeder's View

Feedout Equipment:

Commercial Around-the-Barn Rail, Manual Push, Swiveling Bale Unroller (3)

Bale in feed manger; Cow's View

Feedout Equipment:

Commercial Around-the-Barn Rail, Manual Push, Swiveling Bale Unroller (4)

Got Rail? Home fabricated concentrate feeder with rail roller hardware

Feedout Equipment:

Bale Splitter for Drive-in Haymow - Hydraulic

The surprisingly sharp and massive knife cuts through rather quickly.

Feedout Equipment:

Bale Splitter for Drive-in Haymow - Hydraulic

Bale "butterflies" into two piles that handle easily with a large 4-tine fork .

Feedout Equipment:

Bale Splitter for Drive-in Haymow - Manual

Antique loose hay cutter gets a second life as an "Armstrong" Bale Splitter

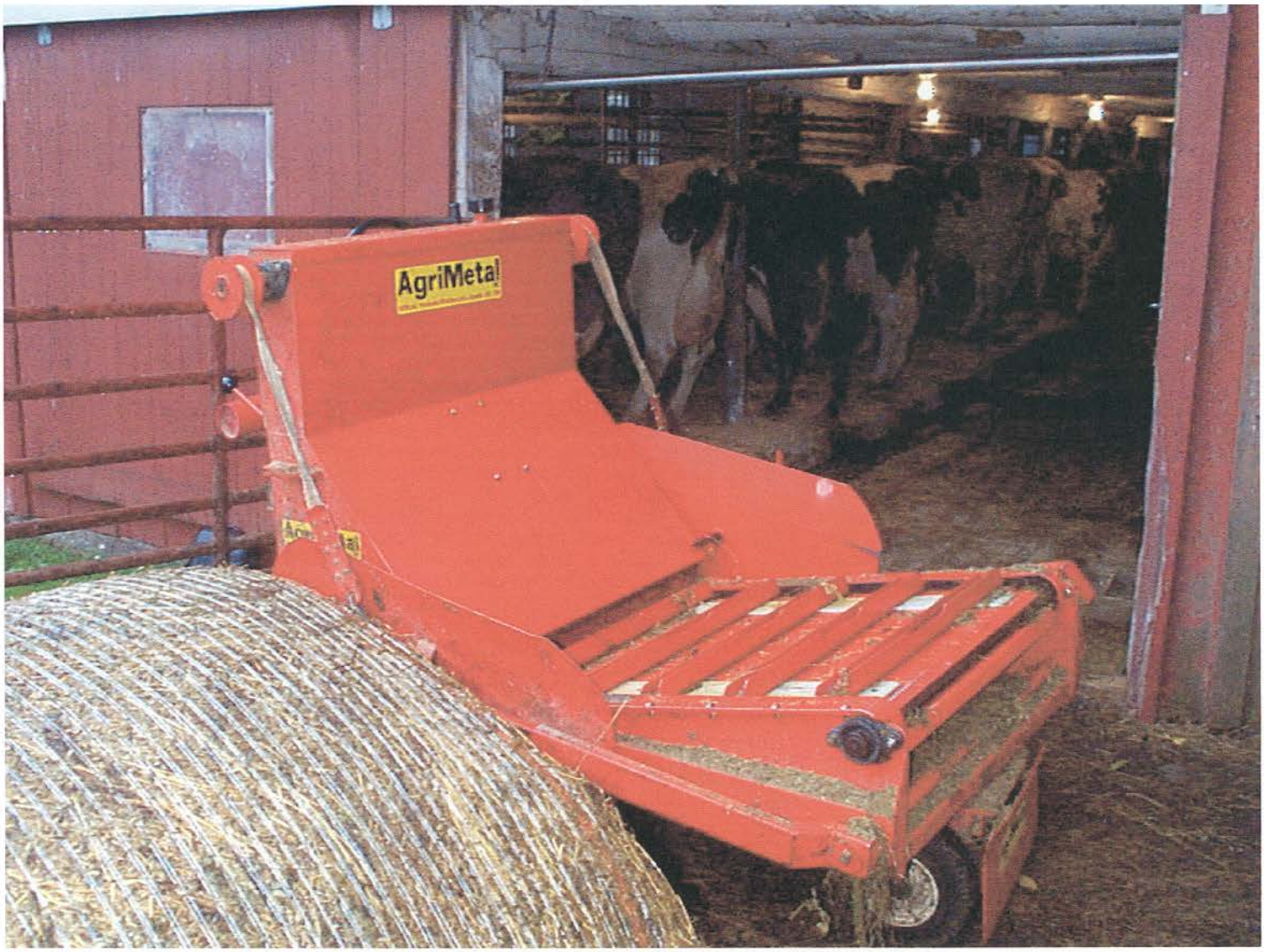
Feedout Equipment:

Bale Splitter for Drive-in Haymow - Manual

Before you chuckle, consider that it's fast and easy cutting and no engines need be started if the bale is already in the hay mow and it happens to be 30° below zero!

Feedout Equipment:

Around-the-Barn Powercart Bale unroller(1)



Cart ready for bale on concrete runway

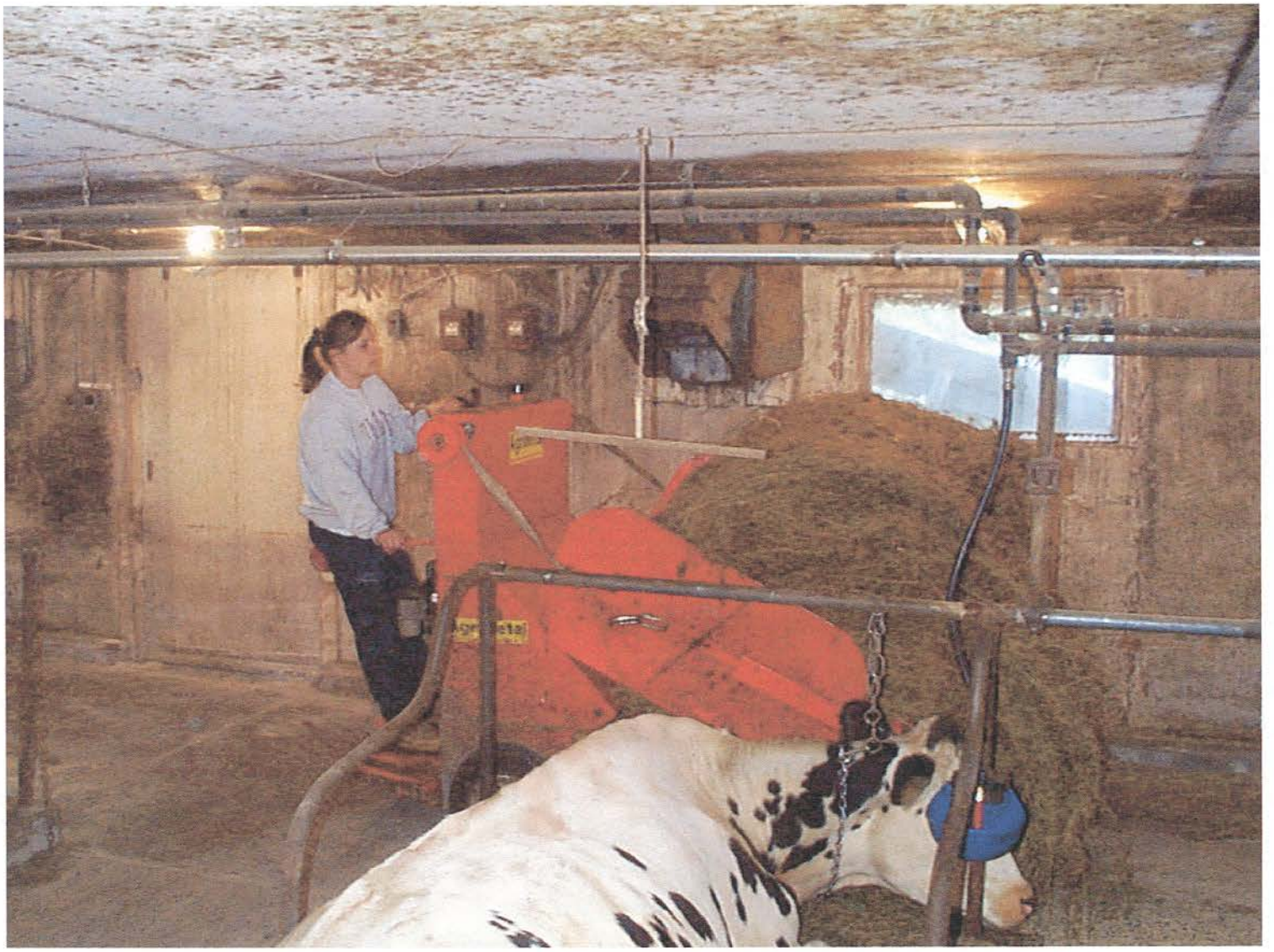
Feedout Equipment:

Around-the-Barn Powercart Bale Unroller(2)

Loader drops bale into position on cart

Feedout Equipment:

Around-the-Barn Powercart Bale Unroller(3)



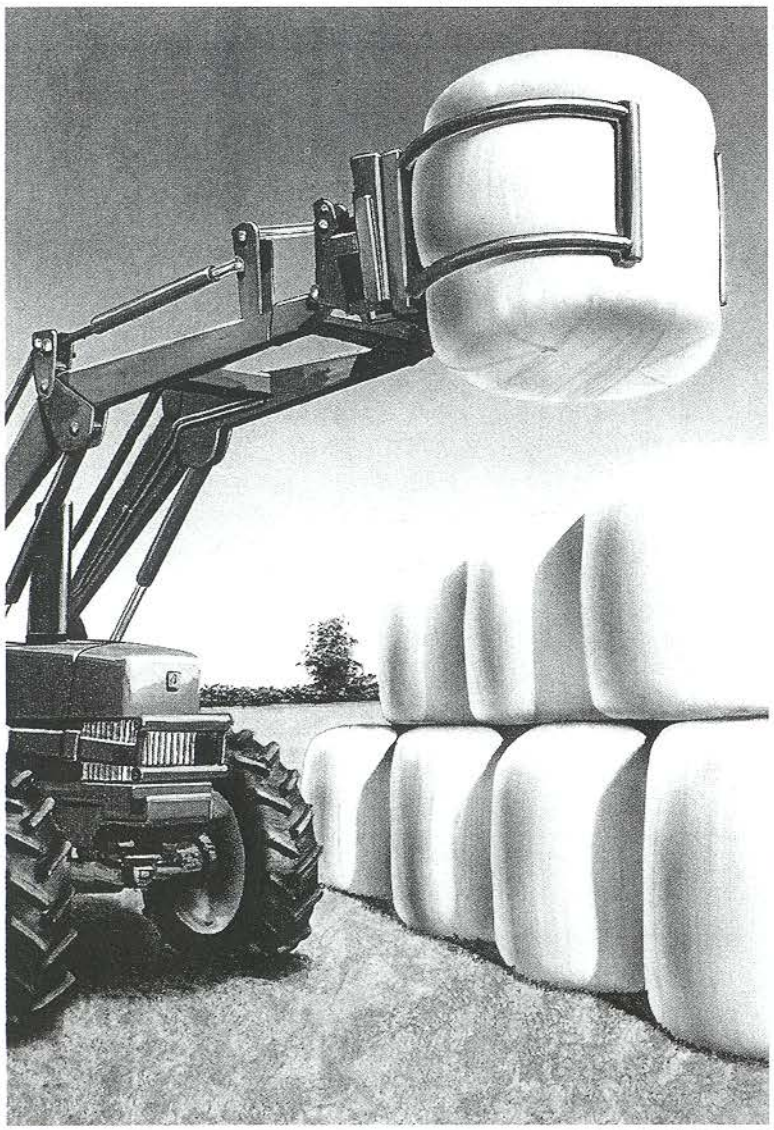
As seen by that white cow

Feedout Equipment:

Around-the-Barn Powercart Bale Unroller(4)

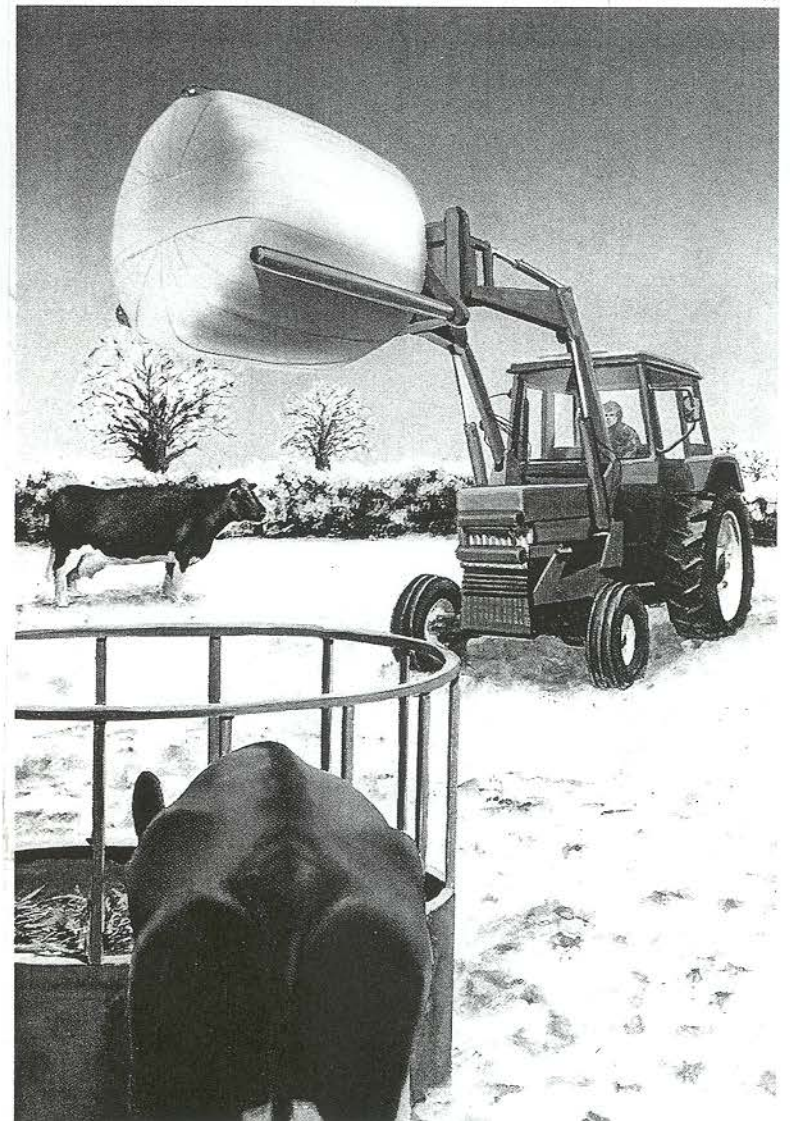
From the manger side with fork in hand

Bale Handlers



Bale "huggers" offer flexible handling. Care must be taken to avoid too much squeeze, resulting in breach of seal and spoilage.

Bale "cradlers" offer gentler handling. Depending on bale stacking technique, handling efficiency may be less.



Hauling Equipment:

Treated 6 x 6's on standard running gear

Hauling Equipment:

6th bale of 10 bale, self-pickup, hauling trailer being set onto trailer.

Hauling Equipment:

7th bale of 10 bale, self-pickup, hauling trailer grabbed by hydraulic pickup arm.

Hauling Equipment:

Full trailer and the "11th bale" headed to in-line wrapper.

Hauling Equipment:

Unload feature "from the tractor seat".

Hauling Equipment:

5 bale version of the self-pickup, hauling dump trailer.

Other Equipment:

In-line wrapper offers labor and/or plastic savings in some situations. Preservation quality can be equal to individually wrapped bales.