



## Forage Growers Guide to Round Baling

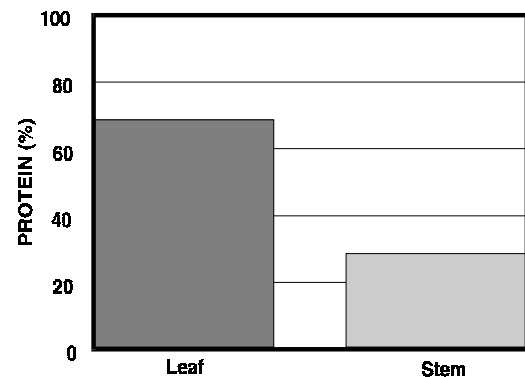
*PAMI has evaluated many round balers over the years. This Research Update summarizes our experience and gives useful tips on how you can round bale better!*

### Making a Better Round Bale

*About 70 percent of an alfalfa plant's protein is in the leaf, and only about 30 percent is in the stem. That's why your primary goal in making a round bale is keeping the leaves with the bale.*

*A good round bale is well-packed, has square corners and has a uniform size across its width. It captures and holds the feed, is easy to handle and will store well with little spoilage.*

*Several factors will have an affect on the quality of bale you produce. Understanding and managing each factor will pay off with better bales, quality hay and time savings. Here are some general tips that should help steer you in the right direction.*



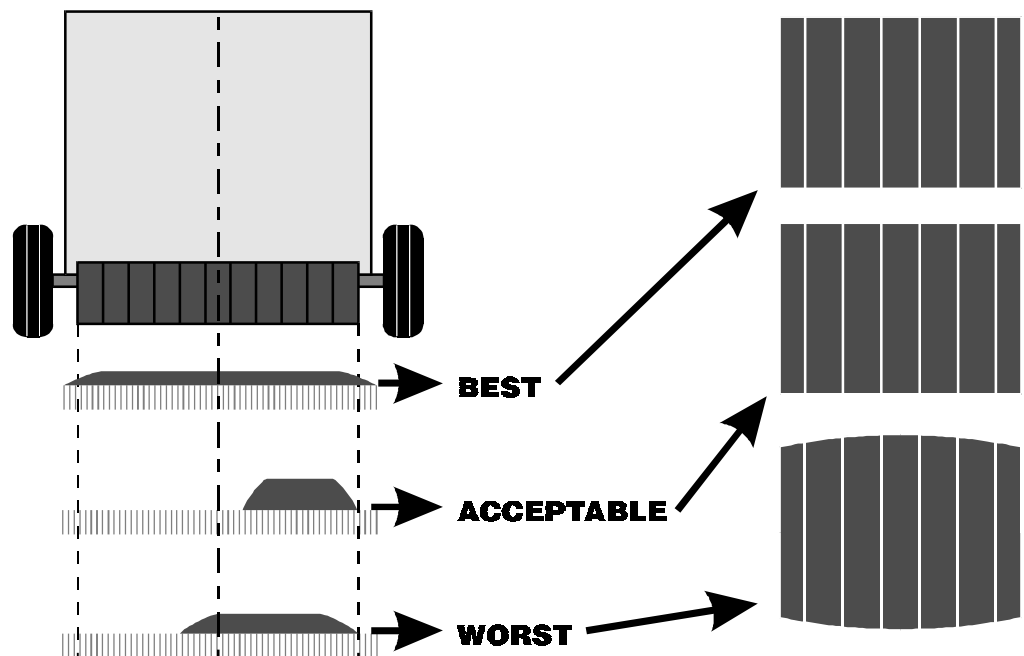
### It Begins With the Windrow

If possible, make the windrow as wide or slightly wider than the baler pick-up. This spreads the hay out for better drying, but more important, the baler can be fed evenly, building a bale that is even across its width.

If it's not possible to make the windrow the same width as the pick-up, make it less than half the pick-up width. A windrow more than half the pick-up width will always feed hay into the centre of the baler, regardless of the operator's efforts, and result in a bale that is barrel-shaped, thicker in the middle than the ends. Barrel-shaped bales are difficult to handle and shed their twine easily.

A windrow that is narrower than half of the width of the pick-up allows the operator to control the feed by weaving back and forth across the win-

drow. This distributes the material evenly across the width of the bale.



## Moisture Content is Critical

Proper moisture content at baling time is important for forming a firm, well-shaped bale, minimizing spoilage in storage and for limiting leaf loss during baling and handling. (The graph below shows the relationship between moisture content and leaf loss). The correct level of moisture for baling will depend on the crop, weather conditions and storage method. Generally speaking, don't bale until the moisture content has dropped to about 18 per cent.

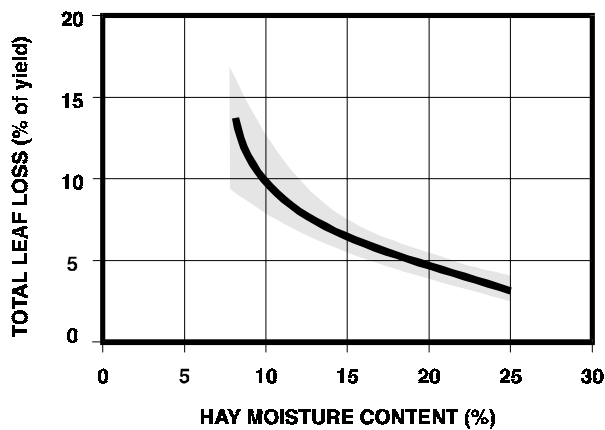
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***Baling in early morning and evening when the hay or straw is damp may help to overcome some of the problems associated with baling dry hay or straw.***

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Do not allow the windrow to dry too much before baling. Baling dry material results in excessive leaf loss and poorly packed bales. Baling in early morning and evening when the hay or straw is damp may help to overcome some of the problems associated with baling dry hay or straw.

If the crop is too wet, operating difficulties such as plugging could be a problem while trying to bale and spoilage could occur in storage.



## The Operation

### Before You Start

Make sure all maintenance has been performed according to the manufacturer's specifications. Examine all belts, chains and other moving parts (refer to the maintenance section of this report for a primer, but check the owner's manual for detail). Check the twine supply and, if necessary, replenish the stock and thread according to the owner's manual. The knots connecting one roll of twine to the next must be small enough to pass through the guides and twine arm.

Methods of loading rolls of surface wrap will vary between machines. Consult your owner's manual.

Set the pick-up as high as possible to minimize wear and damage, but low enough to ensure complete windrow cleanup. Always replace broken or missing teeth to maintain pick-up efficiency. For cleaner pick-up, travel in the same direction as the windrower, picking up the hay "head first".

Crowder wheels can be installed on the pick-up to help direct material into the pick-up if the windrow is slightly wider than the pick-up or when crowding the edge of the windrow.

## Adjust Bale Density and Size

Make necessary adjustments to the bale density settings. A dense bale will shed water better, reducing spoilage during storage. It will also be easier to handle without falling apart. A well-packed bale is also more efficient, enabling the producer to store more hay in fewer bales. Your owner's manual should explain how to adjust bale density.

Bale densities will range from 8 to 14 lb/ft<sup>3</sup> (128 to 224 kg/m<sup>3</sup>) for hay and 6 to 9 lb/ft<sup>3</sup> (96 to 144 kg/m<sup>3</sup>) for straw, depending on the baler. Bale weight is related to density and size.

A properly adjusted baler has a higher productivity and fewer breakdowns. Adjustments to accommodate changing field conditions may be necessary during the day.

## Starting the bale

Get off to a good start by making the core of the bale carefully.

For expanding chamber balers, it is especially important to distribute the hay evenly within the chamber at the beginning. If the windrow is narrower than the pick-up, begin weaving continually across the windrow immediately to feed the material from one side to the other. Crowding the edges of the windrow will pack the edges of the bale.

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***Proper weaving techniques are important when starting and forming a bale.***

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With some older, belt-type machines, feeding the edges quickly and early is important to prevent belts from slipping off the edges of the bale core.

Weaving is not as critical when forming the core in fixed-chamber balers because the material tumbles in the bale chamber, distributing itself more evenly than in expanding chamber balers.

Once the bale is about 2 ft (0.6 m) in diameter, do not weave as often. Crossing the windrow too often will create a barrel-shaped bale. Weave to one side for at least a count of ten, then quickly back to the other side for a count of 10, and so on.

Many modern round balers have an automatic control box and monitor that tells the operator when and which way to steer.

Weaving is very important again during the latter stages of bale formation to produce a bale with square corners. The baler's automatic control device will signal that the bale is nearing completion, usually allowing enough time to finish off the bale properly by weaving.

Crowding the edge of the windrow with the pick-up will help develop a square-cornered bale. Bales with square, well-packed corners are easier to store and handle and hold the twine better.

## Speed

Match ground speed and power take-off speed so the chamber is filled as quickly as the pick-up allows. Keep the machine as full as possible at all times. The fewer times the bale rolls in the baler, the lower the amount of leaf loss. It is more convenient to select and maintain a consistent RPM speed throughout bale formation.

If windrows are uniform, full-width and good-sized, you should be able to travel at about 4 to 6 mph (6 to 9 kph). Choose a pick-up speed that minimizes the agitation of the hay to reduce leaf loss.

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*To reduce leaf loss, choose a pick-up speed that minimizes the agitation of hay feeding into the chamber.*

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If the windrows are small and light, reduce the RPM's to prevent an overly dense bale, but keep the ground speed up.

Generally speaking, expanding chamber balers experience lower leaf loss than fixed chamber balers. However, there are ways to reduce leaf loss regardless of what baler you use. Bale

at the proper moisture content, at the right travel and PTO speeds and don't be scrimp on twine.

## Wrapping

Round bales may be wrapped either with twine or a surface wrap.

On some models, twine wrapping is fully automatic. If not on your machine, study the owners manual for the proper procedure.

Use enough twine to wrap the bale securely. If the bale is too loose, losses will occur during handling and storage. Short, dry material such as straw will require a closer twine spacing than longer grasses. Adjust the speed of movement of the twine tube across the bale chamber so spacing is appropriate for the material being baled— anywhere from 4 to 10 inches (10 to 25 cm).

If your baler has a twine tension control, adjust to wrap tightly, but not so tight as to break the twine.

Surface wrapped bales are wrapped automatically. Forward movement must stop as soon as the monitor indicates wrapping has started.

## Packaging

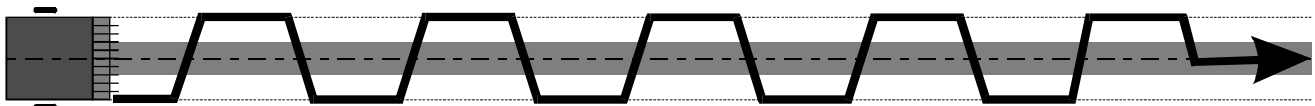
### Twine

Always use a quality twine that is strong enough to hold the bale together.

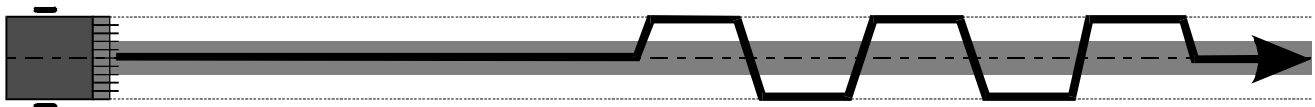
Twine for round balers is available in sisal or plastic. Sisal is less durable than plastic. Plastic does not deteriorate, and it cannot be digested by livestock. If you intend to store the bales for a long time, use plastic.

## WEAVING PATTERNS

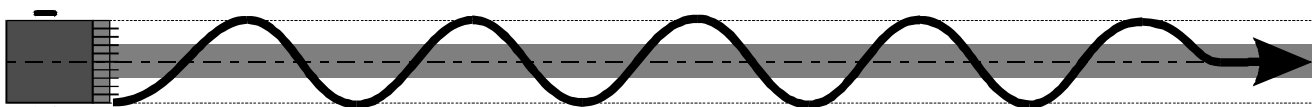
### Expanding Chamber (Hard Core) Baler- Right



### Fixed Chamber (Soft Core) Baler- Right



### Wrong



Twine wrapped bales:

- tend to settle and flatten on the bottom in storage
- are less expensive to wrap
- take a little longer in the field to wrap

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**Tip: You may need a wire to help thread the twine through the twine tubes, so keep a piece of wire handy on the tractor in case you have to perform this operation in the field.**

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## Surface Wrap

Surface wrap for bales is available in two types— net wrap and solid plastic wrap. Results of PAMI studies indicate that solid plastic wrap can trap water inside the bale resulting in an unacceptable amount of spoilage. Net wrap allows the bale to “breathe” while providing many other benefits.

Surface wrapped bales:

- Retain their shape better so are easier to transport and handle
- Minimize handling losses
- Have lower storage spoilage losses when using net wrap
- Are quicker than twine wrapping, resulting in less time spent waiting for the wrapping to be completed and lower leaf losses



A net wrapped bale (versus plastic wrapped) allows the hay to “breathe”.

- Are a little more expensive than twine

## Less than perfect conditions

Baling short, dry and slick material such as straw from a rotary combine can be a challenge. The baler may continually plug or starting the bale may be difficult.

- If necessary, use a rake to make decent-sized windrows
- Bale in late evening or early morning to take advantage of moisture
- Reduce bale density settings
- Make smaller bales
- Decrease the PTO speed while maintaining normal ground speeds
- Keep the pick-up in good repair
- If possible, adjust the distance from the twine to the end of the bales as wide as possible so the twine doesn't slip off the end of the bale
- Use a close twine spacing across the bale

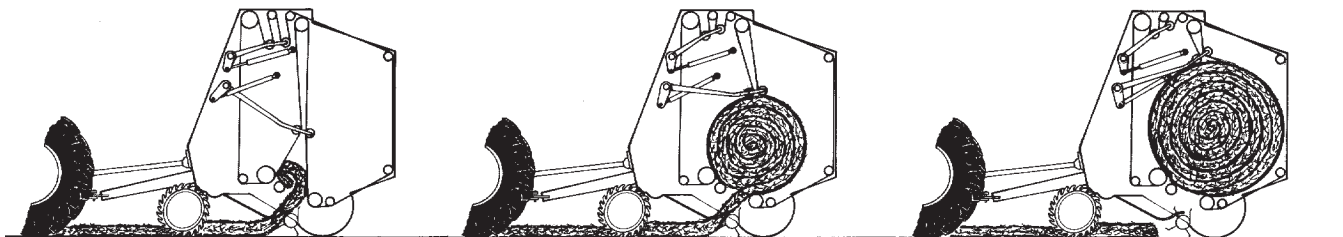
Wind guards may be installed to provide protection to the pick-up during windy conditions.

## Soft Core or Hard Core?

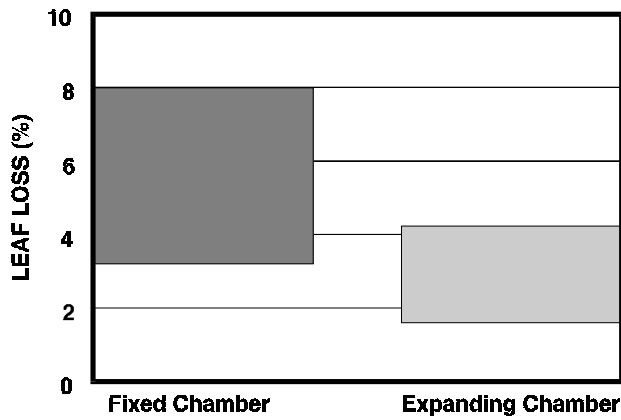
### It's your choice

The soft core (fixed chamber) versus hard core (expanding chamber) debate continues. Soft core supporters claim that soft core bales dry better in storage. Hard core proponents insist that their bales settle less over the winter and are easier to handle in late winter and spring.

PAMI comparisons show that expanding chamber balers generally experience lower leaf losses than fixed chamber balers (see graph). But there are ways to reduce leaf loss no matter what baler you use. Bale at the proper moisture content, at the right travel and PTO speeds, and don't be scrimp on twine.



Stages of Bale Formation— Expanding Chamber Baler (Hard Core Bales)



PAMI research has detected no significant difference in bale sagging between the two types over a 100 day period. Nor has an extensive literature search been able to discover any support to the claim that soft core bales dry better.

There are several other factors to consider when making the choice between fixed and expanding chamber balers.

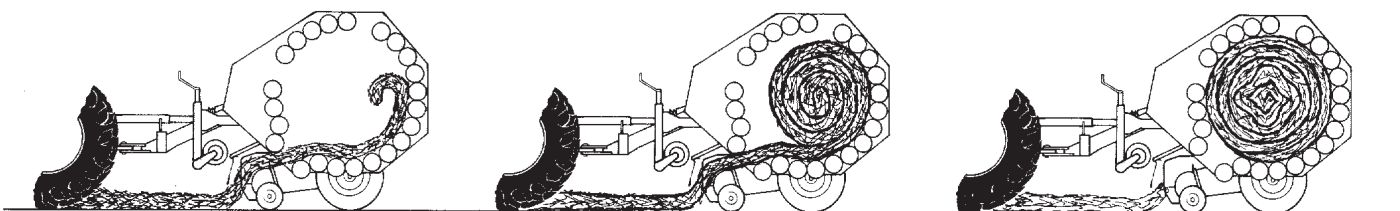
		Hard Core	Soft Core
Power Requirements	hp	22 - 31	41-74
	kW	16 - 23	31-55
Bale size adjustable		yes	no
Bale density adjustable		yes	some
Leaf losses in baling		2% - 4%	3% - 8%

Being less dense, soft core bales generally contain less hay than hard core bales. Fixed chamber balers are, on average, less costly than variable chamber balers.

## Proper Maintenance Pays Off

Your round baler is an expensive machine. Every effort to maintain its operating efficiency and extend its life must be made. A well-maintained machine demands a premium price on the used market or as a trade-in.

Always carry out the daily and periodic servicing as outlined in your owner's manual.



Stages of Bale Formation— Fixed Chamber Baler (Soft Core Bales)

## Lubrication

Never lubricate any part of the machine while it is running!

- Lubricate as necessary and according to the manufacturer's directions
- Use lubricants recommended by the manufacturer
- Always clean grease fittings before lubricating

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**Tip:** Always keep a supply of spare parts on hand, as well as a belt lacing kit for belt-type balers.

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## General Inspection/Maintenance

### Driveline

- check belts, chains, sprockets and other moving parts for wear, alignment and proper operation
- ensure all lubricating devices are in working order or replace
- check for proper alignment/operation of the equal angle hitch (see PAMI Report #441 - What causes PTO Vibration?)

### Pick-up

- replace worn or broken teeth
- check wind guards, gauge wheels, crowder wheels, and lift/lock mechanism for proper operation

### Bale Chamber

- check all rollers, belts, chains, bearings, tension and pressure mechanisms

### Transport Equipment

- ensure all lights, reflectors, slow moving vehicle (SMV) symbols are in place and operating
- check wheels, tire condition and inflation
- inspect hitch, draw pin and safety chain

## Controls

- check all indicator lights, gauges, and alarms for proper operation
- check connections
- check and replace fuses as required

## Safety

- ensure all safety devices such as shields, extinguishers and first aid kits are in place
- check slip clutches for proper adjustment

## Hydraulics

- examine all hoses, connectors, cylinder for leaks (see owner's manual for technique)

- check fluid levels and top up if necessary
- check and replace filters as required (if equipped)

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***Never check for hydraulic leaks with your hand! Fluid under pressure can penetrate the skin and cause serious injury.***

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## Twine tying/cutting mechanism

- check for proper operation
- check and adjust twine tension (if equipped)

For fall storage and spring preparation procedures, check your owner's manual.

PAMI has evaluated many round balers. The following is a list of round balers and related equipment tested since 1986. Copies can be obtained by calling 1-800-567-PAMI and requesting the reports by name and number.

### ***Round Balers:***

488 New Holland 849 Round Baler  
489 Claas Rollant 62 Round Baler  
523 Gehl RB 1860 Round Baler  
530 Vicon RP 1510 Round Baler  
554 New Idea 486 Round Baler  
555 New Holland 855 Round Baler  
557 Gehl RB 1710 Round Baler  
586 Gehl RB 1865 Round Baler  
611 Deutz-Allis GP 2.50 Round Baler  
636 Case International 8460 Round Baler  
677 John Deere 535 Round Baler  
535 Hesston 560 Round Baler

### ***Mower Conditioners:***

497 Kuhn FC300 Mower-Conditioner  
498 Vicon KM 321 Mower-Conditioner  
524 New Holland 499 Mower-Conditioner  
535 Hesston 1150 Mower-Conditioner  
538 New Holland 116 Mower-Conditioner  
539 Gehl 2650 Mower-Conditioner  
594 Gehl 2270 Swing Frame Mower-Conditioner  
620 New Idea 5209 Disc Mower Conditioner  
646 Case IH 8380 Mower Conditioner  
647 New Idea 5114 Mower Conditioner  
648 Hesston 1170 Mower Conditioner  
685 Macdon 5000 Mower Conditioner

### ***Round Bale Movers:***

485 Massey Ferguson 505 Round Bale Mover  
493 Forster Model 40 Round Bale Mover  
516 Morris M-881 Hay Hiker Round Bale Mover  
522 Laurier H4250 Round Bale Mover  
536 Mumby Round Bale Mover  
593 Laurier H2125 Round Bale Mover  
674 Kingsman RBM - 217 Round Bale Mover

### ***Related reports include:***

441 What causes PTO vibration? This report gives a detailed look at what causes PTO shaft vibration and what can be done to solve the problem.

673 Round Bale Storage Techniques. An informative look at the different storage techniques for round bales, what works, and what doesn't.

700 Hay and Forage Moisture Meters. A look at four moisture meters, including one that attaches directly to a round bale. (Delmhorst HTM-1, Delmhorst RDM-H, DANI Haytester, Omni-Mark Preagro-25)

Interim Research Update #715 Hay in a Day? This *interim* report explores the PAMI research to date on hay maceration, explains what it is, how it works, and answers commonly asked questions. A full report will be available in 1996/97.

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