

The Future of the Round Baler in Harvesting Crop Residue

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Let's look at a brief history of harvesting corn stalks and what factors drove the demand for this practice.

First uses

- Corn stalks were grazed to reclaim fallen ears and loose kernels.
- Extend fall pastures
- Tilled back into the soil to decay and supplement soil quality

Explore new uses

- Bedding for livestock (sleeping and birthing)
- Supplement hay and other feed in drought times
- Available, economical and high in fiber, Corn Stover is determined to be a valuable feed supplement for livestock.
- Can be mixed with protein, minerals, and urea to make valuable feed

Initial harvesting attempts came with many issues

- Small square balers (difficult to bale, labor intensive, high percent of dirt in bale, where to store to maintain bale quality but not use all barn space, hard to handle, bale quality deteriorates, extremely hard on baler, and hard to transport).
- Stalker head 483 for SPFH (where to put the product, how to feed or distribute for use, high cost of harvest equipment, spoilage in storage)
- Stack wagon (how to manage building the stack during harvesting, how to store and transport, how to manage stack utilization).

Look for better harvesting methods

- Outer layer thatching produced by haystacks, stacker wagons, and round balers proves to shed water with hay crops and should work for corn stalks also.
- 1972 legitimate large round bale hit the market place. It is agreed the round bale and its benefits would be the preferred final package for this practice if baler was up to the task.
- It could offer:
 - higher harvesting speeds
 - good dense package that would store outside
 - transport easily
 - utilized in a barn feed bunk, open pasture, or stalls
 - mixing wagon for feed rations, not too common early years

Why the limitations and challenges with round baling corn stalks; held the annual number of corn stalk bales constant, isolated the practice to certain geographic areas, and yielded a small total market.

- Limited demand (extend fall pasture, bedding, supplement drought pasture, no reliable efficient way to harvest)
- Final package quality was very inconsistent (poor shape, density, and wrap caused handling and storage issues.
- Crop residues, especially corn stalks, were very hard to manage at the pick up and in the bale chamber.
 - Very stiff and inflexible (Plugs and hairpins at corners, bulldozes and won't feed)
 - When dry, very light and hard to move (bridges feed opening or kicks out in front of pickup)
 - Required feeding ends of the bale to get good square corners, good density, and good shape in final the package. This aggravates plugging and feeding issues
 - Final package had to be wrapped tight to maintain shape and density.
 - hard to wrap and transport (strings come off bale and bale falls apart)
 - Stalk preparation becomes a critical factor (proper size, proper windrow, minimize dirt)
- Corn stalk baling is extremely hard on equipment (\$\$\$\$)
 - Root base still in ground and plant stalk still attached to root base is extremely hard on pickup components. Even stalks prepared with cutters can leave some stalks attached to root base. Clean cut stubble is still very hard on pickup teeth and rakes.
 - Outer stalk surface is extremely hard and tough is also hard on pickup teeth, cams, bearing, and slip clutches.
 - Very hard on forming belts and belt splices
 - Very dirty and abrasive, short life for drive belts, chains, and bearings
- Wrapping issues make it hard to complete the final package
 - Requires close twine spacing
 - Slow twine arm speeds and many rotation of the bale loose the integrity of the bale ends (poor storage and transport)
 - Loose twine on ends (poor storage and transport)
 - Early net wrap balers had problems with net damage due to crop build up (poor storage and transport).
 - Net would not cover full width (poor storage and transport)

New technologies, with renewable fuel and biomass industry, drive new levels of excitement and opportunity in baling corn stalks and other crops residues.

Fact: U.S. Dept. of Energy says that ethanol delivers 35% more energy than is used to produce it. And Biodiesel yields nearly twice as much energy required to produce. Gasoline, in contrast, yields 19% less energy than is needed to make it. As a result, biofuel use will climb steadily, Globally, 7% to 9% more each year until 2030, depending on how aggressive various countries are in advancing renewable energy

policies. In the U.S., ethanol output will double by 2010, with 40 new plants already under construction and up to 60 more in various stages of planning.

Fact: Distiller's grain, a by product of the Ethanol and Biofuel process, is a valuable source of high protein (in some cases protein is 10 points higher than corn gluten), high energy content, fat, and phosphorous. Corn stalks are high in fiber and low in phosphorous, crude protein, and phosphorous. Combined 70 percent corn stalks and 30 percent distillers grain (on a dry matter basis) results in an acceptable base ration.

Fact: Distiller's grains are an effective addition to feedlot diets. Nebraska and Iowa research suggests that distiller's grains (wet or dry) at up to 40% of the diet dry matter can replace corn for growing and finishing cattle. In many studies, feeding distiller's grains at 15-20% of the diet dry matter has improved average daily gain and efficiency of gain. Including distiller's grains up to 20% of the diet dry matter can usually be accomplished with corn based diets that contain forages low in protein without creating excess nitrogen excretion.

Fact: A distillers grain-corn stalk ration with added minerals and urea was compared to a conventional alfalfa, corn silage, corn, and supplement ration fed to heifers weighing 450 and 850 pounds. The following ration was fed to the 850 pound heifers to achieve average daily gain of 1.8 pounds a day (all feeds are expressed on a 100% dry matter basis): 5.6 lb of distillers grain, 12.3 lb of corn stalks, 0.05 lb of limestone, 0.04 lb of trace mineral salt, 0.14 lb of urea, and 0.01 lb of vitamin ADE premix. Comparable weight gains and wither/hip height grow rates were achieved compared to the traditional heifer ration; but the cost per day for the conventional ration was \$1.26 per heifer per day compared to \$0.40 per heifer per day for the distillers-corn stalk ration. For smaller heifers (450 pound heifers), the cost for conventional ration was 70 cents per heifer per day compared to 27 cents per heifer per day. The distillers grain-corn stalk ration could also be fed to dry cows (similar to the high straw based diets).

Sources:

Using distillers grains in diets for growing and finishing beef cattle. G. Erickson*and T. Klopfenstein, *University of Nebraska-Lincoln*.

MODIFYING HEIFER GROWTH Michael F. Hutjens
Kiplinger Agriculture Letter Vol77 No.26)

So what do the following elements mean to US?

- **Ethanol industry demands more corn acres. (more stalks available for usage)**
- **Ethanol plants and corn acres are the same geographic locations**
- **Corn stalks become a valued resource of high energy fiber and roughage to mix with distiller's grain to complete feed rations.**

- Feedlots find good value in distiller's grain and large round bales of corn stalks to blend into their feed diets for growing and finishing beef cattle.
- Can also be use in Dairies, dry cows, and heifers
- Feed lots, Dairies, and Livestock populations are located in areas other than dedicated hay ground. (new market for balers)
- Maintain producer profits and hold consumer price with raising grain prices
- Bedding, free stall feed, and pasture feed bunks continue to use some portion of the corn stalks baled each year but the real demand is from the push for renewable fuel industries. Initially for feed purposes eventually for cellulose fuel production

It means:

- It means new market for round balers (row crop land)
- It means extended use season for custom operators
- It means new source of income for row crop farmers and smaller mixed crop farmers. (stalk bales today are selling from 15 to 30 dollars a bale in many areas.)
- It means lower feed costs for the livestock producers
- It means increased sales for the equipment dealers
- It means increased manufacturing schedules for the hay and forage companies.

It means the future of Round Balers in this industry is Bright and Exciting. Right??

Well not quite. Remember all the limitation and challenges we discussed earlier. Well they still exist.

So what this really means is With the Right Round Baler the Future is Bright and Exciting.

John Deere Meets the Challenges of Baling Corn Stalks



John Deere has spent a lot of time and research in making a baler that will work in most every crop presented to it. John Deere round balers are well known in the industry for reliability, the final package, and re-sale. One of our biggest challenges has been to make a baler to stand the tough conditions in baling cornstalks. With the MegaWide™Plus pickup, DiamondTough™ Triple Weave belts, adjustable bale density, variable core kit, #80 Drive Chains, Chromed pin starter roll chain, CoverEdge™ net wrap, and XL high flotation tires, John Deere is real close to the perfect baler for corn stalks.

Let's follow the flow of the crop to experience the enhancements of a John Deere Round Baler for Corn Stalk Baling. Corn stalk baling requires a few adjustments to your baler when switching from hay. We'll discuss those as well.

Pick-up function and reliability may be the most critical component to baling cornstalks.

ROLLER BAFFLE

The first component on the MegaWide™Plus pickup to make contact with the crop is the "roller baffle."



MegaWidePlus™ with Self-Adjusting Roller Baffle



The Self-Adjusting Roller Baffle is:

- Standard on all balers equipped with a MegaWide™Plus pickup
- Self-Adjusting
- Floats independently of the pickup
- Provides smoother crop flow across the pickup
- Patented design exclusive to John Deere

The roller baffle was developed to assist in light crop baling. Often, in light crop conditions, the pickup teeth will flip the crop ahead of the pickup. This causes the crop to pile up and clump feed. The roller baffle keeps crop from flipping forward, keeping it in contact with the pickup teeth. The result is better feeding in light crop conditions but also heavy crop conditions.

The John Deere roller baffle is self-adjusting to various windrow and crop conditions. Field tests have shown not only better crop flow in light conditions, but remarkably better crop control in heavy windrows. Increased crop handling capacity means greater productivity. You can handle faster ground speeds or larger windrows without plugging.

Corn Stalk baling would be a prime example of a crop that is difficult to handle and causes loss, plugging, or reduced ground speeds. The roller baffle has helped to eliminate these challenges in corn stalk baling.

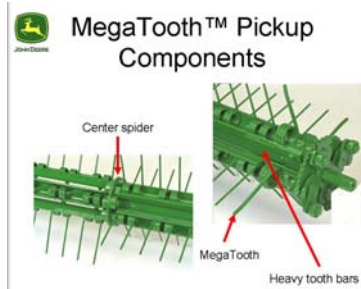
MEGATOOTH™PICKUP AND MEGAWIDE™PLUS COMPONENTS

"MegaTough™ Teeth"



MegaTough™ square tooth design possesses a higher deflection rate with reduced tooth uncoiling from spring back action. Corn stalk baling is hard on teeth. With the MegaTough™ square tooth design, tooth damaged has been reduced greatly.

The pickup reel on the MegaWide™Plus pickup consists of heavier components:



- Mega Teeth (9mm dia) – located on ends of pickup reel
 - Heavier center teeth (6mm diameter compared to 4.3mm on standard pickup_
 - U-shaped channel tooth bars – resists twisting from heavy loads
 - Twin-cams (located each end of reel) – minimizes tooth bar windup
- Center support spider on 5-ft wide models – adds strength to tooth bars

COMPRESSION RACK & RODS



The compression rack is attached to the floating roller baffle assembly. As the crop flow varies, the compression rods move with the roller baffle to control and deliver crop directly to the rotor feed system.

As the whole assembly raises with crop volume, the rear of the compression rods maintain the same relative position between the rotor and starter roll improving crop control.

Additional compression rods can be added for conditions such as corn stalks. The additional rods will give better crop control across the pickup.

SPIRAL ROTOR FEED SYSTEM

Crop is delivered from the pickup teeth to the Spiral Rotor Feed System.



The Spiral Rotor Feed System components include:

- A solid hex shaft drive
- Large diameter converging augers to move the crop into the bale chamber and tightly pack side sheets for hard, square shouldered bales
- Welded feeder fingers provide positive crop feeding to the bale chamber.

CHAIN DRIVEN & CUTOUT-CLUTCH PROTECTED



Chain Driven & Cutout-Clutch Protected



The John Deere pickup is chain driven for strength and dependability. The drive system is cut-out clutch protected with a low-torque re-engagement feature in the event of a plug or obstruction.

Low-torque re-engagement means an operator can idle the tractor down and re-engage the PTO to reset the clutch. This may clear the plug from the pickup. This may not work if the slug is too large for re-engagement to handle the material.

SEMI-PNEUMATIC GAUGE WHEELS & FLOAT SPRINGS



Semi-Pneumatic Gauge Wheels & Adjustable Float Springs



Semi-pneumatic gauge wheels and adjustable float springs provide protection in rough or uneven ground conditions on the MegaWide™Plus pickup. Semi-pneumatic gauge wheels run in contact with the ground and eliminate flat tires that are often encountered in a corn field. The float springs can be adjusted to varying terrain, crop conditions, and baling speed. Float springs should be set at the absolute minimum for corn stalk baling (30-50lbs down pressure). It is desired to reduce

pickup tooth and stripper damage in rough field conditions.

DIAMONDTOUGH™ TRIPLE WEAVE BELTS



Durability Improvements
DiamondTough™ Triple Weave Belts



DiamondTough™ Triple Weave Belts have:

- Greater tear and puncture resistance than any baler belt on the market.
- Diamond pattern gently grips the crop to reduce fine material loss
- Faster bale starting
- Self-cleaning

BALE DENSITY ADJUSTMENT

Bale Density Adjustment



Bale density can be controlled using this adjustable valve. We recommend that the operator back the valve out two-to-three turns from the maximum setting (all the way in). This is a starting adjustment point. The operator can increase or decrease density as desired.

VARIABLE CORE

Variable Core Valve (Option)



John Deere balers can also be equipped with an optional variable core valve. If equipped, the operator can activate and set the diameter of soft core using +/- keys. Primary usage in hard to start crops such as corn stalks.

80# CHAIN DRIVEN



#80 chain on upper and lower drive rolls and chrome pin chain on starter roll drive increases service life, strength, and dependability.

COVEREDGE™ NET WRAP



CoverEdge™ net wrap stretches over the edges of the bale to cover 15% more surface area on the bale. This added feature allows better weather-ability by shedding water off the ends of the bale and will increase marketability, due to less crop spoilage and a better-looking bale.

When baling corn stalks we recommend 4 wraps of surface wrap to make a nicer packaged bale. Corn stalks are a much springier crop than hay. If using twine, we recommend 4" twine spacing.

XL HIGH FLOTATION 21.5x16.1, 10PR tires



These larger tires absorb greater shock loads and improve ride in rough corn ground, decrease compaction in soft ground, and allow for increased ground speed for greater productivity.

The features I have mentioned are all just part of the whole John Deere package. When you operate a John Deere baler you're not just operating a reliable piece of equipment with green paint, you're operating a piece of equipment that is also backed by the best dealer network in the industry.

- Limited demand for corn stalk bales
- Corn stalks are hard to manage and harvest
- Low productivity when baling corn stalks
- Inconsistent final package
- Final package hard to store and transport

What is the future of the round baler harvesting crop residue?

We have just scratched the surface and most of the answer is yet to be known, but for TODAY it is very exciting, rewarding, and profitable for many different levels of the industry. Consumer, livestock producer, row crop producer, custom operator, small mixed crop operators, equipment dealers, and equipment manufactures.