**Corn Stover Harvest: Economic Considerations -- Pricing and Contracts**

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**Points to Consider: Economics of Corn Stover Harvest**
- Worth based on feed or bedding value?
- Costs of harvesting, storing, transporting?
- Cost of replacing lost crop/soil nutrients?
- Market price for corn stover?

**Feed (or Bedding) Value**
- Corn stover can substitute for medium quality mixed hay in a ration for wintering beef cows if a protein supplement such as dried distillers grains (DDGS) is added.
- Also can be treated with hydrated lime or ammonia to increase nutritive value of the stover.
- Compare costs of the stover + DDGS or lime/ammonia treatment costs.
Bedding Value

Weigh against the cost of purchasing bedding elsewhere.

Or, the value of renting stalk fields for grazing . . .

Consider the value of stalks – stover in the field, yet to be baled . . .

Or, the cost of replacing lost nutrients?
Cost of baling...

Storage costs

Cost (and risk) of transporting...

Estimating a Value for Corn Stover

File A1-70

Contains 8 examples related to pricing stover
Pricing corn stover based on feed value: Each ton corn stalks substitutes for about 1.16 T legume-grass hay + 0.22 T of DDGS

Example 1.
Assume the following:
Mixed hay price of $100 per ton
DDGS price of $220 per ton

$100 hay price x 1.16 = $116.00
Minus $220 DDGS price x 0.22 tons = $48.40
Value of feed replaced = $67.60 per ton of stalks

Not so convenient to weigh large round bales – so price by bale rather than ton. **Assume** typical large round bale of corn stover weighs 1,200 lbs. (0.6 tons) -- so value per ton can be multiplied by 0.6 to arrive at a price per bale.
Discount by cost to producer of transporting bales to the cattle.

Example 2.
Assume the feed value of corn stover is $67.60 per ton.

$67.60 x 0.6 tons per bale = $40.56 per bale

How to estimate the weight of round bales to help with pricing decisions?

Round Bale Weights vary considerably – typically containing 8-9 pounds dry matter per cubic foot.

**Formula for Weight (in pounds) =**

\[
\text{diameter (inches)} \times \text{diameter (inches)} \times \text{width (inches)} \times 0.005
\]
Measuring Width & Diameter of Round Bales

Width

Diameter

Example (using formula) for weight of round bale

- Weight (pounds) = \( \text{diameter (inches)} \times \text{diameter (inches)} \times \text{width (inches)} \times .005 \)

Example 3.
Assume a large round bale measures 65 inches in diameter and 60 inches wide:

\[
65 \times 65 \times 60 \times .005 = 1,268 \text{ lbs. per bale}
\]

1,268 pounds per bale / 2,000 pounds per ton = .63 tons per bale

Large Square Bale weight formula (based on 14 pounds stover per cubic foot):

Weight (pounds) = width (inches) \( \times \) height (inches) \( \times \) length (inches) \( \times \) .01

Example 4.
Assume a large square bale measures 3 feet wide by 3 feet high by 8 feet long (36 inches by 36 inches by 96 inches).

\[
36 \times 36 \times 96 \times .01 = 1,244 \text{ pounds per bale}
\]

1,244 lbs. per bale / 2,000 lbs. per ton = .62 tons per bale

Cost value: Bales of Corn Stover

Cost value:
- Equipment
- Fuel
- Labor

Chopping
Raking
Baling
Transporting
Costs can vary greatly – and are unique to each farm.

- Iowacorn.org estimates:
- $26 to $79 per ton to harvest, transport & store corn stover – most estimates in $40-$60 range.
- Variances due to methods used, number of tons/acre
- Either use your own established rates or ISU Custom rates.

The annual Iowa Farm Custom Rate Survey is packed with info to help you figure costs.

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Harvesting & Transport costs:

<table>
<thead>
<tr>
<th>Example 5.</th>
<th></th>
</tr>
</thead>
<tbody>
<tr>
<td>Assume the following:</td>
<td></td>
</tr>
<tr>
<td>Custom stalk chopping</td>
<td>$10.35 per acre</td>
</tr>
<tr>
<td>Custom raking</td>
<td>$5.75 per acre</td>
</tr>
<tr>
<td>Subtotal</td>
<td>$16.10 per acre</td>
</tr>
<tr>
<td>Assuming 4 bales/acre</td>
<td>$4.02 per bale</td>
</tr>
<tr>
<td>Custom baling</td>
<td>$12.45 per bale</td>
</tr>
<tr>
<td>Total harvesting cost</td>
<td>$16.47 per bale</td>
</tr>
<tr>
<td>Transport (20 miles @ $.25/mile/bale)</td>
<td>$5.00 per bale</td>
</tr>
<tr>
<td>Harvesting + Transport</td>
<td>$21.47 per bale</td>
</tr>
</tbody>
</table>

Nutrient Replacement Costs?

- Replacement cost of phosphorous and potassium is in the range of $15 to $20 per dry ton of stover removed. Iowacorn.org

- At 80% dry matter, removal rates are:
  - 16 pounds nitrogen
  - 4.7 pounds phosphate
  - 20 pounds potash per ton of wet stover harvested.
Nutrient Replacement + Harvest costs:

**Example 6.**
Assume the following:
- Weight of round bale is 1,200 lbs (.6 tons)
- Nitrogen removal value
  
  \[ = 16 \text{ lb} \cdot \$6.7 \cdot .6 \text{T.} = \$6.43 \text{ per bale} \]
- Phosphate removal value
  
  \[ = 4.7 \text{ lb} \cdot \$6.5 \cdot .6 \text{T.} = \$1.83 \text{ per bale} \]
- Potash removal value
  
  \[ = 20 \text{ lb} \cdot \$6.1 \cdot .6 \text{T.} = \$7.32 \text{ per bale} \]
- Total value of nutrient removal = $15.58 per bale
- Total harvesting cost = $21.47 per bale
- Total cost per bale = $37.05 per bale

Other intangible costs?
- Managing stover harvest is an additional fall chore.
- Requires additional time, labor, coordination with other post-harvest tasks.
- May delay fall fieldwork, especially with a wet fall.
- Extra trips across field = more soil compaction?
- Lost nutrients or organic matter may impact long-term productivity.

Minimum $ amount?
- Livestock producer?
- Feed value
- Crop producer?
- Total cost per bale

Market value? Keep tabs on local market results—for example:

**Rock Valley Hay Auction**

- BEDDING -14
  - SIZE KIND LBS $/T
  - 3x4 oatstr 39180 100.00
  - lgrd whtstr 35560 90.00
  - lgrd oatstr 38400 85.00
  - lgrd cmnstk 41340 60.00
  - lgrd cmnstk 33440 57.50
  - lgrd cmnstk 44080 57.50
  - lgrd cmnstk 34500 55.00
  - lgrd cmnstk 38360 52.50
  - lgrd cmnstk 44680 47.50
  - lgrd cmnstk 15440 40.00
  - lgrd cmnstk 19200 40.00
  - lgrd cmnstk 34220 40.00
  - lgrd cmnstk 27540 37.50
- Sold by bale: smsq straw 63 @ 2.25 ea.
Price where buyer harvests?
Cost to seller = value of nutrients removed
Value to buyer -> feed value minus cost of harvest + transport

Example 7.
Assume the following:
Feed value of stover = $40.56 per bale (Example 1)
Harvesting cost per bale = $21.47 per bale (Example 5)
Feed value of standing stover to be harvested = $19.09 per bale

Grazing stalks?
► 2 acres/cow/month
► Water, fences?

Example 8.
Assume 2 acres of corn stover replace 25 pounds of hay per day.
25 lbs. of hay / day x 30 days / month = 750 lbs. of hay / month, or .375 tons / month
.375 tons x $100 per ton / 2 acres = $18.75 per acre
This blank interactive spreadsheet is a free tool on Ag Decision Maker.

Another pricing example

Acreage Shift by Crop since 2011:

Acreage change from 2011
Units: 1,000 acres

Source: USDA-NASS
Research Conducted in 2011: *Essential Elements for Producer Participation in Biomass Markets*

Jarboe, Martens, Hoque & Artz  
*Iowa State University*

- Sent to 2,250 Iowa crop producers farming 50 acres or more

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*Interest in Supplying Biomass*

Source: Jarboe, et al. 2011

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*Biofuels Knowledge*

Source: Jarboe, et al. 2011

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*Soil and Residue Management*

Source: Jarboe, et al. 2011
Producer Challenges: Supplying Biomass

<table>
<thead>
<tr>
<th>Challenge</th>
<th>Average Rating</th>
</tr>
</thead>
<tbody>
<tr>
<td>Nutrient loss</td>
<td>5.55</td>
</tr>
<tr>
<td>Distance to markets</td>
<td>5.52</td>
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<tr>
<td>Long-term biomass market viability</td>
<td>5.44</td>
</tr>
<tr>
<td>Biomass price volatility</td>
<td>5.26</td>
</tr>
<tr>
<td>Soil erosion issues</td>
<td>5.19</td>
</tr>
<tr>
<td>Percent of biomass removed</td>
<td>5.13</td>
</tr>
<tr>
<td>In-field transport and compaction</td>
<td>5.00</td>
</tr>
<tr>
<td>Contract opt-out clauses</td>
<td>4.99</td>
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<tr>
<td>Contract terms of storage</td>
<td>4.93</td>
</tr>
<tr>
<td>Residue management</td>
<td>4.92</td>
</tr>
</tbody>
</table>

Source: Jarboe, et al. 2011

Leased Land: Who owns above-ground residue – Landowner or Tenant?

- **Above-Ground Residue**: Iowa Code 562.5A
  - Tenant has right to take part of a harvested crop’s above ground plant, such as corn stover and other crop residue – at harvest, after harvest, until termination of tenancy.
  - **Written lease** may have language to alter rule.

Questions to ask before entering into a contract

- Do you want to get into the corn stover harvesting business yourself?
- Would you rather **custom contract** with someone else to do the harvest?
- Think about all the costs, benefits, risks

Read, review, question any written contract presented to you:

- What are you committing to provide/deliver?
- When? — Delivery dates?
- Price? — set, or determined by a formula?
- When will you be paid? — and is there a penalty for late payment by the buyer?
- What if you can’t deliver, e.g., due to wet fall weather?
- Other provisions?
Example: Quality requirements in the contracts?

**Bale Quality Metrics: Standards maintaining quality of inbound feedstock**
- Moisture: Just as corn is corrected to 15% moisture to create a level comparison, we will purchase biomass on a Bone Dry Ton (BDT) basis to compare all bales equally. Shrink to 0% = BDT
- 0 - 15% = No dock
- 15 - 25% = $10/BDT dock
- 25%+ = Rejected

Under what circumstances can your delivery be docked or rejected?

http://poet-dsm.com/biomass

Before you sign a legally binding contract . . .

- Have the contract reviewed by your attorney who is familiar with agricultural operations.
- Be sure you understand what you are committing to . . . What are your obligations as seller . . . and what are the obligations of the buyer?

Example: Financial penalties in the contracts

**Financial Penalties**
- Trailer Cleaning Fee
  All trailers need to be cleaned off prior to loading. A $35 reduction fee will be added to the scale ticket if trailer is not cleaned.
- Broken Bales
  Broken bales will not be tolerated on inbound deliveries. If a bale is determined to be inadequate for handling off the trailer or breaks when being unloaded from a self-unloading trailer, a $40 fee will be added per bale to the scale ticket. Excessive broken bales may result in loads being rejected or future deliveries stopped.
- Late Deliveries
  Deliveries are scheduled on a day-to-day basis. If the tonnage scheduled for delivery is not delivered in the proper week, a $10/BDT reduction of the contract price will be assessed. If issues arise where deliveries cannot be made by the producer, the producer is responsible for contacting POET to work through the situation.

http://poet-dsm.com/biomass

In addition to ISU’s Ag Decision Maker – other resources:
Iowacorn.org
“Sustainable Corn Stover Harvest” – 8-page booklet

Corn Stover – Cost Estimates and Farmer Supply Response
www.extension.purdue.edu/renewable-energy
Click on PUBLICATIONS

Thank-you!
Questions ??

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Purdue University Extension – Renewable Energy Publications