In the past two years, production of animal bedding from shredded old newspapers has received considerable attention as a recycling market opportunity. The idea is not new: Research on the feasibility of shredded paper animal bedding was conducted at a number of universities more than 15 years ago. At that time, toxics in inks discouraged the use of paper bedding.

It wasn't until the early 1980s, after many toxic contaminants had been banned from newspaper printing inks, that a number of processors in small rural communities in Minnesota and Wisconsin pursued animal bedding as a reliable use for old newspapers (ONP). Local farmers could absorb the small ONP volumes generated by rural communities. The paper bedding could be sold for prices comparable to, or more than, those offered by paper mills for ONP, and recycling program operators experienced less volatility in price fluctuations with animal bedding than with traditional paper recycling markets.

However, demand for paper bedding took off only in the Midwest during recurring poor weather conditions in the late 1980s. With straw prices hitting $150 per ton, when available, the attractiveness of paper bedding at $60 per ton was persuasive.

When ONP prices paid by mills plummeted in 1989 as a result of increased supply from new curbside collection efforts, collectors in the East had to pay packers to take ONP. Paper bedding received attention from the recycling industry, especially in those states with high tipping fees and strong farming operations, dairy herds in particular.

Carl Hursh, chief of waste reduction and recycling for Pennsylvania's Department of Environmental Resources, estimates that paper bedding was used by 673 dairy herds with 45,310 cows in the state at the beginning of 1990. At an average of one-half ton of paper to bed one cow for a year, this represents use of more than 22,000 tons of ONP just to bed cows.

Interviews with state officials and local animal bedding programs indicate that, as of the beginning of the year, at least 100 U.S. operations make paper animal bedding. These programs sell approximately 50,000 to 100,000 tons per year of bedding. Additional quantities of paper animal bedding are produced by individual farmers for whom statistics are not available.

One equipment manufacturer has sold 50 paper bedding systems in 14 months, with sales even to Hawaii.

The most telling indication of success may be the $500,000 capitalization of Agri-Paper Recycling, a limited Wisconsin partnership involving a farmers' cooperative, a local utility and private investors. The cooperative's 500 dairy farmers took this initiative to obtain a consistent and stable source of bedding. While the farmers can't control the weather to guarantee straw production, Agri-Paper can obtain contracts with local communities to lock up the ONP supply. There should be plenty of opportunity to get this material since Wisconsin's new state law bans ONP from landfills beginning in 1995.

Agri-Paper, which began its equipment shakedown in May, is projected to produce over 15,000 tons annually of paper bedding for its members, making it the largest operation in the U.S.

Concerns answered
Questions have been raised about the feasibility and safety of using paper for bedding of various types of animals. Some of the concerns are:

- toxicity of heavy metals and organic dyes in inks
- dust from grinding the paper
- safety issues of staples in inserts, and glass or metal containers not separated from the paper
- litter problems during transportation and unloading at the farms.

Researchers at several universities...
### Table 1 — Survey of producers of shredded paper animal bedding

<table>
<thead>
<tr>
<th>Programs</th>
<th>Year started (1)</th>
<th>Waste paper (2)</th>
<th>Equipment description</th>
<th>Operating cost ($/ton) (3)</th>
<th>Market price ($/ton) (4)</th>
<th>System throughput (tons/hour) (5)</th>
<th>Bedding volume (tons/year) (6)</th>
<th>Labor (FTE) (7)</th>
<th>Chopper/shredder output (8)</th>
<th>Date weight (lbs) (9)</th>
<th>End user</th>
</tr>
</thead>
<tbody>
<tr>
<td>Agri-Paper Recycling</td>
<td>1990</td>
<td>ONP</td>
<td>Shredder (50HP), hay bale, conveyor feed, blower and cyclone</td>
<td>$270,000 total</td>
<td>20-30</td>
<td>60</td>
<td>7.0 N.A.</td>
<td>850</td>
<td>2-3 Strips</td>
<td>60-65</td>
<td>Dairy</td>
</tr>
<tr>
<td>Mt. Horab, WI</td>
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<tr>
<td>Columbia County</td>
<td>1981</td>
<td>ONP</td>
<td>Shredder (15 HP), hay bale, blower and cyclone</td>
<td>24,000 N.A.</td>
<td>40</td>
<td>1.0-3.0</td>
<td>850 N.A.</td>
<td>70</td>
<td>2-3 Strips</td>
<td>60-65</td>
<td>Dairy, hogs, peacocks, worms, horses</td>
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<tr>
<td>Portage, WI</td>
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<tr>
<td>Crown Y Recycling</td>
<td>1989</td>
<td>ONP</td>
<td>Shredder, horizontal paper bale/manual tie</td>
<td>12,000 18-22</td>
<td>28-29</td>
<td>1.1-1.6</td>
<td>575 N.A.</td>
<td>1-2</td>
<td>1,100-1,000 Strips</td>
<td></td>
<td>Dairy</td>
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<tr>
<td>Cutchi, NY</td>
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<tr>
<td>Fillmore County</td>
<td>1985</td>
<td>ONP</td>
<td>Shredder (10 HP), hay bale</td>
<td>9,000 25</td>
<td>63</td>
<td>0.8</td>
<td>360 N.A.</td>
<td>2-3</td>
<td>Strips</td>
<td></td>
<td>Dairy</td>
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<tr>
<td>Preston, MN</td>
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<tr>
<td>Houston County</td>
<td>1989</td>
<td>ONP</td>
<td>Modified wood chopper, hay bale</td>
<td>7,700 32-34</td>
<td>41</td>
<td>2.0</td>
<td>375 N.A.</td>
<td>2-3</td>
<td>Squares 60-65</td>
<td></td>
<td>Dairy</td>
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<tr>
<td>Houston, MN</td>
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<tr>
<td>Infinity Recycling</td>
<td>1990</td>
<td>ONP</td>
<td>Modified wood chopper, hay bale</td>
<td>7,500 10-15</td>
<td>20</td>
<td>0.7-1.0</td>
<td>N.A.</td>
<td>2</td>
<td>Squares 70</td>
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<td>Dairy</td>
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<tr>
<td>Chestertown, MD</td>
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<tr>
<td>Intra-State Recycling</td>
<td>1987</td>
<td>ONP</td>
<td>Shredder (used), wood chip draper/ auto tie (used)</td>
<td>23,000 37-38</td>
<td>50</td>
<td>0.8-1.0</td>
<td>235 N.A.</td>
<td>1-2</td>
<td>Strips 55-65</td>
<td></td>
<td>Dairy, pigs, chickens, dogs</td>
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<tr>
<td>Stevens Point, WI</td>
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<tr>
<td>Manitowoc County</td>
<td>1989</td>
<td>ONP</td>
<td>Modified wood chopper, hay bale</td>
<td>6,200 30</td>
<td>25</td>
<td>2.5-3.0</td>
<td>720 N.A.</td>
<td>2-3</td>
<td>Squares 60</td>
<td></td>
<td>Dairy, hogs, chickens</td>
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<tr>
<td>Manitowoc, WI</td>
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<tr>
<td>Olmstead County</td>
<td>1989</td>
<td>ONP</td>
<td>Modified wood chopper, hay bale</td>
<td>6,000 27</td>
<td>42</td>
<td>1.7</td>
<td>900 N.A.</td>
<td>3-4</td>
<td>Squares 60</td>
<td></td>
<td>Dairy, hogs, sheep</td>
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<tr>
<td>Rochester, MN</td>
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<tr>
<td>Portage Recycling Organization</td>
<td>1989</td>
<td>ONP</td>
<td>Shredder (used), used chopper, hay bale, two electric motors</td>
<td>donated 10-15 20-40 0.3</td>
<td>150</td>
<td>1 Squares 40</td>
<td>Dairy, hogs, sheep</td>
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<td>Kent, OH</td>
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<tr>
<td>Potter County</td>
<td>1989</td>
<td>ONP</td>
<td>Shredder, hay bale, two electric motors</td>
<td>8,600 18-19</td>
<td>23</td>
<td>1.5-2.0</td>
<td>360 N.A.</td>
<td>3-4</td>
<td>Strips 40</td>
<td></td>
<td>Dairy, beef, hogs, sheep, sheep</td>
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<td>Ullyssea, PA</td>
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<tr>
<td>Smith Livestock</td>
<td>1990</td>
<td>ONP</td>
<td>Modified wood chopper, hay bale</td>
<td>16,000 18</td>
<td>40</td>
<td>3.0</td>
<td>480 N.A.</td>
<td>3-4</td>
<td>Squares 50</td>
<td></td>
<td>Dairy, pigs, chickens</td>
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<td>Defwrlng, PA</td>
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<td>Sugar Grove, PA</td>
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<td>Dairy, horses, sheep</td>
</tr>
<tr>
<td>Vermont Rural Recyclers</td>
<td>1989</td>
<td>ONP</td>
<td>Modified wood chopper, hay bale</td>
<td>6,600 N.A.</td>
<td>60</td>
<td>1.0-2.5</td>
<td>240 N.A.</td>
<td>1-3</td>
<td>Squares 60</td>
<td></td>
<td>Dairy, hogs, chickens</td>
</tr>
<tr>
<td>Recyclers, Marshfield, VT</td>
<td>1989</td>
<td>ONP</td>
<td>Shredder, hay bale, two electric motors</td>
<td>10,000 18-19</td>
<td>23</td>
<td>1.5-2.0</td>
<td>360 N.A.</td>
<td>3-4</td>
<td>Squares 60</td>
<td></td>
<td>Dairy, hogs, sheep</td>
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<tr>
<td>Marshfield, VT</td>
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<tr>
<td>Waste-Stream Management</td>
<td>1988</td>
<td>Mixed paper</td>
<td>Shredder (50 HP), hay bale</td>
<td>60,000 28-40</td>
<td>40</td>
<td>1.0-1.5</td>
<td>800 N.A.</td>
<td>2-3</td>
<td>Strips 50-60</td>
<td></td>
<td>Dairy, sheep, horsee</td>
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<td>Management</td>
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<td>Potsdam, NY</td>
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<tr>
<td>Wauushara Recycling</td>
<td>1989</td>
<td>ONP</td>
<td>Shredder, hay bale (used)</td>
<td>12,000 40-42</td>
<td>46</td>
<td>0.3</td>
<td>120 N.A.</td>
<td>1</td>
<td>Strips 85</td>
<td></td>
<td>Dairy</td>
</tr>
<tr>
<td>Wausau, WI</td>
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</tbody>
</table>

N.A. — Not available.

(1) Year that operation began producing animal bedding.
(2) ONP — old newspapers with advertising inserts.
(3) Operating cost does not include capital cost unless noted as a "total" cost.
(4) Market prices are rounded to nearest dollar and F.O.B. the processing center.
(5) Animal bedding volumes have been annualized for programs that are less than one year old.
(6) FTE — full-time equivalent positions.
(7) "Squares" refers to pieces that range from 1" square up to 3" square.
(8) Telephone directories and computer paper are also used to supplement the ONP.

have performed field and laboratory tests addressing these concerns as well as the economics of replacing straw and wood bedding with paper.

Most studies have focused on the effect of paper bedding on cows because the animals' digestive process can extract compounds and concentrate them in milk. The concern about heavy metals appears minimal at this time. As far as a bedding application, Dr. Stephen Spencer, professor of dairy science at Pennsylvania State University, says research shows higher levels of heavy metals in straw-bedded manure than in newspaper-bedded manure.

Tom Richard, biological engineer at Cornell University, feels that while the heavy metal issue has been fairly well studied, there is more concern with the new organic dyes being used by the printing industry, including possible newspaper applications. Some of these dyes are carcinogenic.

As far as paper animal bedding, Richard states, "Cornell neither discourages nor encourages the use of shredded paper for animal bedding. We urge processors to be cautious and minimize the amount of glossy inserts in the bedding. Brightly colored inks used with types of paper other than newspapers are also a concern until more toxicological studies have been done."

Studies have shown no problem with dust as long as the paper is not ground into small particles, such as is done for cellulose insulation. Joe Heimlich's re-

### NEWSPAPER BEDDING SELLS

Get $60 per ton and more for your recycled newspaper by selling chopped, baled bedding to dairy, hog and poultry farms, pet shops, horse breeders and kennels. Fast becoming the preferred form of animal bedding with a huge market potential.

The PCR Paper System is designed specifically to produce high volumes of the right product to tap this market. Easy to set-up and use. A complete, proven turn-key system to chop and bale 2 to 3 tons per hour. Power with electric motors, diesel, or PTO. Entire system can be mobile or stationary.

Our shredder can be disconnected from the baler (in minutes) and be used to shred plastic, and chip brush or solid wood up to 9" in diameter. Our customers tell us it is one of the most cost effective recycling machines on the market. Call or write for complete information:

**PCR, Inc.**

Route 1  Coon Valley, Wisconsin 54623
Ph. (608) 452-3651  FAX (608) 452-3031
Research at Ohio State University showed chopped paper was acceptable in sizes from one-inch square up to three inches by five inches. Shredded paper should be in strips that are 1/4-inch to 3/4-inch wide and about 8 to 10 inches long. Longer strips tend to wrap around an animal’s legs and get tracked around. Shorter strips often create a litter problem in the bedding area and in the fields during manure disposal.

Interviews with animal bedding producers revealed only one complaint, from a farmer who had found a tin can in his bedding. Six of the producers interviewed pull newspaper inserts, magazines and glossy sections to minimize exposure to colored inks and staples. In addition, colored inserts do not have the absorbency of the newsprint and reduce the quality of the product, according to these operators. Other programs educate local residents to pull this material from ONP, but do not themselves remove inserts.

Two of the producers interviewed go beyond using ONP as a sole feedstock. Smith Livestock Bedding of Sugar Grove, Pennsylvania supplements ONP with telephone directories and computer paper to cope with the high demand for animal bedding. Waste-Stream Management (WSM) of Potsdam, New York is part of an experiment looking at the feasibility of animal bedding production on behalf of the New York State Energy Research and Development Authority. Clarkson University is conducting chemical and econom-
ical analyses of the bedding. WSM, a waste hauler, is using residential mixed paper from its curbside collection program to produce the animal bedding.

WSM initially offered three types of bedding to farmers as part of a five-month pilot project: a premium grade made from ONP with some corrugated container material added for loft at $60 per ton, a standard grade made from ONP at $45 per ton, and an economy grade made from mixed paper for $30 per ton.

The response to the economy grade was so strong that the other products were discontinued. The economy grade's popularity is due to its low cost coupled with the loft and texture from the corrugated and paperboard material that is part of mixed waste paper. These fibers impart springiness to bedding, making it more comfortable for animals. The bedding when wet does not pack together as much as an ONP-only product, making handling for disposal easier.

The major disadvantage with paper-based animal bedding remains the littering problem that occurs during transportation and use. Almost all producers experience this problem with paper bedding. Animal bedding producers and users report a number of other advantages of paper animal bedding (see sidebar).

**Benefits of paper bedding**

In addition to the obvious benefit of keeping ONP out of landfills, paper bedding provides advantages to farmers over traditional bedding.

Farmers must devote valuable land to grow oats, wheat and barley as straw for bedding their animals. The straw must be harvested at a specific time in the fall before the rain sets in and makes the straw useless for bedding. Sawdust, an alternative to straw, is less effective and sometimes more expensive.

With paper bedding, the timing of collection isn't critical. Farmers also gain more flexibility, since crops can be harvested entirely for animal feed, left on the ground as cover, or replaced by a more valuable cash crop.

NEWSPRINT FOR ANIMAL BEDDING!

GET RID OF OLD NEWS! KEEP UP WITH INCREASING DEMANDS FOR DRIER, CHEAPER, CLEANER SHREDDED NEWSPAPER ANIMAL BEDDING WITH OUR MODEL 20 SHREDDER.

MODEL 20 is a high-volume reel type conveyor shredder that takes books, magazines, corrugated and news. Minimal dust, low power, ruggedly American made, economical. Built for continuous service, high volume. Adjustable shreds.

Equipment readily available

The paper shredder has moved from the city to the farm. Two-thirds of the programs surveyed use a paper shredder, which produces strips of paper approximately ½-inch wide and as long as the piece of paper that is fed into the shredder. A popular alternative to the paper shredder is a modified wood chipper that produces pieces of paper ranging from one to nine square inches in size. This animal bedding product does not cause dust problems for the farmer; however, it does require more care in baling than the shredded paper. On the other hand, it poses fewer problems with animals tracking bedding out of stalls.

Some farmers obtain ONP and use forage choppers to generate animal bedding, and other producers use tub grinders.

Most animal bedding producers opt for a hay baler, generally a used one, that turns out a twelve-tied bale weighing 40 to 70

Fifteen reasons why paper bedding is preferred to other bedding materials

- More sterile, so less bacteria and mold grow
- No spores to cause field weeds
- No fly eggs to hatch in the barn
- Little or no dust
- Fewer heavy metals in newspaper than in straw
- More absorbent by 50 to 100 percent than straw or wood shavings
- Less expensive to purchase
- Sixteen percent less bedding is needed for a given job
- Better thermal insulating properties for young animals
- Lower building heating costs
- Fewer accidents for newborn animals, because it is less slippery
- Fewer odors, such as ammonia from manure
- Less mixing time and clogging in manure removal systems, especially slurry-type systems
- Faster decomposition in the fields
- Reduced storage space required on the farm.
70 pounds. Although chopped or shredded paper can go into a standard paper baler, producing bales weighing 1,000 pounds or more, this may limit the program operator to larger farmers who have equipment, such as a bucket tractor, to unload such bales.

Blowing the paper into the baler, rather than conveying or hand feeding it, is best because it distributes the paper better, contributing to solid bales. A cyclone and a venting system, to minimize dust, are used with this approach.

A number of equipment manufacturers make systems specifically for animal bedding production. These combine either a shredder or a chopper with a hay baler and may include an automatic conveyor feed system, automatic bale tie-off and other attractive features. A list of equipment suppliers is provided in a sidebar.

Safety considerations are important in operating bedding plants. Dust masks, eye glasses and ear protection are almost mandatory for workers at animal bedding operations.

Fires can be caused in several ways and are a major operational concern. Wet paper tends to combust. Shredded or chopped paper obviously is ideal for tinder. Poor maintenance of equipment can contribute to fire hazards. Bales stored near the working area can pose an additional threat if there is an equipment fire.

Economic analysis

Table 1 provides economic data, although analysis needs to be approached cautiously, since all relevant factors are not provided. Some producers use handicapped workers, so productivity may be low and labor requirements may be high, yet operating costs may remain low because of subsidized labor costs.

Also, many producers are less than a year old, so they do not have long-term financial records. In almost every case, producers are not making the bedding eight hours a day, five days a week; productivity suffers because start-up, cleanup and maintenance time is still required.

Some operations work on a narrow margin between operating cost and market price because additional revenues or cost savings are achieved. For example,

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**Equipment suppliers for animal bedding systems**

The following companies provide equipment used to prepare paper for the production of animal bedding. Information on hay balers can be obtained from local agricultural implement dealers. A more comprehensive list of paper shredders and related equipment manufacturers appears in the August Equipment Guide.

- Allegheny Paper Shredders Corp.
  Delmont, PA
- Besco Systems Inc.
  Camp Hill, PA
- Haybuster
  Jamestown, ND
- Industrial Paper Shredders
  Salem, OH
- PRC, Inc.
  Coon Valley, WI
- Shred Pax Corp.
  Wood Dale, IL
- Waste Technologies Inc.
  Papillion, NE

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**From MAGNATECH...**

A shredder system that meets your needs, not somebody else’s sales quota.

As independent consultants, Magnatech has only one standard to meet—your exact shredding needs.

We have no sales quotas, no blind allegiance to a specific supplier, no reason to use one brand of machine when another would perform better.

Your system is designed with components of any brand on the market, high-speed or slow-speed, new or used, based on the needs of your application. And nothing else.

At Magnatech, there’s only one standard—meeting your requirements at the lowest possible cost!

---

Bill Graveman: Route 2, Box 1-M
Tonganoxie, KS 66086
(913) 845-3553
FAX: (913) 845-3563

Don Graveman: P.O. Box 52
St. Charles, MO 63302
(314) 949-0096
FAX: (314) 723-7879
in the case of WSM, the company has seen landfill tipping fees soar from $30 per ton in 1988 to $70 per ton in 1990 — every ton of ONP that isn’t landfilled saves the waste hauling firm money.

Two pieces of equipment — a shredder or chopper and a baler — are needed to make paper bedding; few producers, however, run 40 hours per week. Thus the capital cost per ton of producing animal bedding is higher than preparing waste paper for shipment to a paper mill.

Nevertheless, the payoff is attractive. Several producers in the upper Midwest sell paper bedding for $40 to $60 per ton. By comparison, paper mills in the area are paying $5 to $25 per ton for ONP, if they will accept it all. In the East, animal bedding commands only $20 to $40 per ton; however, this is still attractive compared to paper mill prices.

An average operation has one or two people producing bedding at the rate of one ton per hour. However, the operation may run at only 15 to 35 percent of the processing capacity. One bottleneck is sorting the paper to remove the inserts or contaminants.

Operations can slow down when more ONP is needed. It does not take many farmers to absorb average production of 300 to 700 tons per year. A typical customer base consists of two or three dozen regular customers with good-size dairy herds, along with one or two dozen occasional customers. Most small producers

<table>
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<th>Table 2 — Costs of processing newsprint for livestock bedding</th>
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<td><strong>Variable costs</strong></td>
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<td>Purchase of waste paper</td>
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<td>Labor for shredding and baling (1)</td>
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<td>Electricity</td>
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<td>Maintenance and repairs</td>
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<td>Twine (2)</td>
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<td>Marketing cost</td>
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<td><strong>Total variable costs</strong></td>
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<td>Equipment amortization (3)</td>
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<td>Rent (5)</td>
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<tr>
<td><strong>Total fixed costs</strong></td>
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<td><strong>Total cost</strong></td>
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</table>

(1) One ton per person hour.
(2) One bale of twine for 500 tons of bedding.
(3) $16,000 investment in used baler, new wood chipper with dust control and motors, amortized over three years.
(4) 10 percent interest.
(5) 3,500 square feet.

Source: Tom Kriegl, County Agricultural Extension Agent, Sauk County, Wisconsin, 1988.
are turning all ONP collected in a geographic area into bedding. In some cases, they must go outside of the county or state to import ONP.

Tom Kriegl, agricultural extension agent for Sauk County, Wisconsin, has done an instructive economic analysis of an animal bedding program (see Table 2) that suggests a price of $60 per ton is needed to cover costs and generate a profit of nearly $12 per ton. Other factors that affect pricing decisions are delivery costs, quantity of material ordered and seasonal variations. Manitowoc County, Wisconsin pegs its bedding price at $15 per ton below the price of straw with a minimum of $25 per ton. “With more straw available this year, straw prices have ranged from $20 to $40 per ton, says Jeff Beyer, public works director for the county. “Normally, it will average $40 to $60 per ton.”

Mark Bauman, recycling manager for Olmstead County, Minnesota, dropped the bedding price from $53 per ton in 1989 to $42 per ton in early 1990. He expects to go down to $38 per ton through the summer months.

Promoting animal bedding

Many operators bemoan the fact that farmers are loathe to change their ways. However, all agree that once farmers try paper bedding, they are probably hooked.

The Pennsylvania Energy Office has a nine-minute video on animal bedding that allows farmers to hear experts address economic and health issues on the topic as well as to see a functioning processing operation. The video is a helpful supplement to the most effective technique — word of mouth.

Many producers cite success in attracting animal bedding users by going to the county fair and displaying bedding. It also helps to run a giveaway program in which prospective customers can get a few free bales of bedding.

Although dairy cattle might represent 50 to 90 percent of the end users of animal bedding, the material can also be used and promoted for other animals (hogs and pigs, beef cattle, horses, sheep, chickens and dogs), pheasants and worms. Garden mulch is also a viable use.

Bet on bedding

There are a few sticky items that may slow the expansion of animal bedding use. Several program operators point out that although animal bedding is a lifesaver now because of poor waste paper markets, they expect to sell ONP again to paper companies once mill prices move higher. There is also a concern about the availability of ONP in the future. Already major waste haulers and paper mills in Canada and the U.S. are tying up ONP supplies under long-term contracts. Some environmentalists have also questioned the wisdom of channeling ONP into one-use animal bedding when it could be recycled at least four or five times as a paper product.

Nevertheless, the superior features of paper bedding (subject to further toxicological review), the increased availability of dedicated processing equipment, and a local end use (especially for rural communities) with a stable price are strong attractions that will encourage ever-increasing numbers of communities, commercial producers and farmers’ groups to try paper bedding.