Generating a Profit from Oilseed Flax Straw

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Abstract

Most Prairie farmers who grow oilseed flax straw have problems dealing with the straw that is produced as a byproduct of producing flaxseed. The straw is either burnt, chopped with difficulty or sold for a very low price to the existing flax straw processors who are targeting the specialty paper and low end plastic reinforcement markets. This paper briefly examines some of the higher value and/or expanding markets for flax fiber based products. It will also outline new straw management techniques that are required to turn flax straw into a significant source of farmer profits.

Introduction

There are a wide range of uses and hence, a wide range of values for flax straw and flax fiber. The value proposition is significantly more for flax fiber than flax straw. The flax straw that is currently produced from oilseed flax has some significant quality deficiencies limiting its use to low value markets and limiting the development of new flax fiber processing facilities. To generate more profit from flax straw, producers need to understand the straw related quality factors that straw processors require and develop new flax straw management techniques that will increase the value of flax straw to processors and producers.

Flax Straw Uses

Flax straw has a heating value similar to soft coal and can be used as a carbon neutral heating fuel. Flax straw can be used for livestock feed or bedding, as a horticultural mix or used for waterfowl nesting sites. Bales of flax straw are also used to make cattle shelters, wind breaks and bale houses.

Flax Fiber Uses

Processed flax straw produces two saleable components; flax shive and flax fiber. The non fiber part of the flax straw stem (shives) tend to have low values and can be used in such items as particle board, fuel, livestock and pet bedding, and filler in plastic products.

Flax fibers are stronger and longer than wood fibers and are an alternative pulp sweetener to strengthen recycled paper pulp. Flax fibers are perfect for geotextiles to reduce dust and erosion at construction sites, or areas with steep slopes. Flax fibers can be used in a variety of absorbency products like disposable personal hygiene products or mats to clean up oil spills. Combinations of course and fine flax fibers present an economical and environmentally friendly alternative to fiberglass insulation. Flax fibers are a potential alternative to fiberglass for strengthening plastic composites. Garments made with flax fiber feel cooler and drier than garments made with cotton. Pure linen yarn can be knitted or woven and treated with chemicals to produce wrinkle resistant garments.

Generalized Flax Fiber Market Categories

Flax fiber is a natural biodegradable product. There is a growing trend towards the use of natural fibers for industrial and textile uses. The raw fiber market categories are listed according to profit potential for the secondary processor. Other market considerations are also discussed.

Cottonized Flax for blending in textiles- Raw fiber cost has a huge impact on the development of this market. Currently cottonized flax fiber is selling for US $1,500 to 3,100. If fiber quality and consistency improve the trade may increase substantially but prices may fall to US$ 900-1,500/tonne.

Scutching Tow-Generally used to make mats for plastic composites, insulation bats, filters and geotextiles. Market prices range from US $600-900/tonne depending upon the quality and year. Markets located throughout Europe, some areas of Asia and North America. Transportation cost are a constraint to market access. Better quality scutching tow is often combed and used for coarse spinning or for cottonizing.

Breaker Tow- Usually used in specialty pulps and papers. Industrial scale pulpers operate in the USA Europe, Asia, and Africa. Market prices range from US $240-330/tonne depending on quality and time of year.

Shives- The non fiber parts of stems. May be used for fuel, particle board, and bedding. Market Prices range from US $0 to 225/tonne. Transportation costs tend to be expensive relative to value.

Whole flax straw- May be used as geotextiles, specialty pulps, or oriented strand board. Flax straw value is low ranging from US $0 to 30/tonne.

Flax Straw Problems and Possible Solutions

There are several factors that affect the value of flax straw to processors including litter, weeds, plant height, transportation cost, fiber content, amount of retting, size and orientation of straw pieces. The factors that are of concern and possible management techniques for producers and

processors that can be used to alleviate the problems and improve the straw quality are given below.

1) Litter – Processors often consider flax fields beside highways and near urban centers as undesirable sources of flax straw for processing because of the presence of plastic, metal and paper litter that blows into the field and gets mixed with the straw. Producers should keep fields free from plastic twine and other litter.

2) Weeds - Weed stalks and weed seeds are very difficult to clean out of straw, and hence processors and even close neighbors will not consider weedy flax fields as a source of straw. Producers should practice good crop husbandry using cultural and chemical control for weeds.

3) Height - Oilseed flax in Western Canada is often very short and the amount of flax straw that can be salvaged after combining is consequently often very low. This, in turn, means that the cost of inspecting the field, organizing the purchase, baling and hauling of the straw is relatively costly per tonne of straw collected. Producers can select oilseed varieties with taller straw heights, and use harvesting techniques like straight cutting high or using a stripper header to increase salvageable flax straw height.

4) Distance - Some flax fields are a long distance from other flax fields. This again raises the cost of collection per tonne since there is a lot of "dead" time while travelling between widely separated fields. Processing plants could set up in areas with concentrated production and "cherry pick" fields with higher fiber content to reduce transportation cost per kg of fiber in the straw.

5) Fiber Content - The weather patterns in Western Canada are quite variable because of our location in the middle of a continent. When this is combined with a wide range of agronomic practices and varieties, the resultant flax straw has a wide range of fiber contents. Recent research has shown that the range of fiber contents in flax straw in Saskatchewan can vary from 2% to 30% in the same year depending on the weather, variety and agronomic practice. This is a huge range and it means that processors must be very careful as to what straw they purchase since most processor would need a fiber content of 10% to 15% just to break even.

Biolin Research has developed a NIR database and protocol that allows fiber contents to be measured in under 10 minutes when previously a week was required. The NIR technology can be used to determine if flax fiber contents are high enough to warrant further producer management efforts. Another strategy for processors is to stock pile high fiber content straw to maintain processing activities in years with low fiber production.

Several agronomic practices can be used to enhance fiber content. Producers should select a variety that is known to produce high fiber content. Increasing seeding rates and seedbed utilization tends to increase fiber contents. Fertilizer requirements for improving fiber contents under Prairie conditions are unknown at this time but high levels of nitrogen seem to reduce the percentage of fiber in the stems.

6) Dimensions of Straw Pieces - When straw is thrashed in a combine, it is bashed and smashed and pieces of straw come out in all shapes and sizes. They may be long or short, fat or thin, bare fibers or thick lower stems. Most of the pieces are relatively short, especially if they have been put through a chopper or rotary combine. In general, the shorter and more uneven the pieces of straw, the harder it is for mechanical systems to get clean fibers out of the straw. Thus putting flax straw through combines makes the job of getting fibers from the straw much more difficult than if the straw had remained intact. Straw can be kept intact (i.e., in one piece) by using a stripper-header or just cutting the seed bolls off with a straight cut header.

7) Amount of Retting - When flax straw begins retting (i.e., a technical term for rotting), microorganisms start to dissolve the pectins that hold the fibers to each other and to the non-fiber parts of the stem. Once most of these pectins are dissolved, it is quite easy to mechanically separate the fiber from the non-fiber parts of the stem and produce fibers that are free of any non-fibrous material.

To improve retting the straw must be spread out in thin layers and in contact with the soil. Producers could use a land roller or a disc bine to get the straw in contact with the ground. After the straw has retted, it can be raked into rows and baled.

8) Orientation of Straw Pieces - Normally when flax straw comes out of a combine, the pieces of straw are pointed in many different directions. However, in general, the more "aligned" the pieces of straw are, the easier it is to process the straw and the easier it is to comb out long clean fibers for much the same reason that straight hair is easier to comb out and re-arrange than is tangled hair.

The interactions of the above factors are very important to consider since flax straw becomes more and more valuable when more of these desirable factors are combined. Thus the highest value straw would be tall straw with a high fiber content that is aligned and retted evenly. This is, in fact, what is required to produce the best grades of flax fiber that are used in textiles. Somewhat lower value straw would be produced if only a few of these factors were combined.

Summary

There are several flax fiber market classes; each with different values and desired quality characteristics. Flax processors want tall, clean, retted straw with high fiber contents. For high value fiber production to occur from oilseed flax new straw management practices will have to be adopted by producers. The following is a review of the steps required to generate profit from oilseed flax straw for processors and producers.

The Producer or Processor should:
Sample fields to determine if processing is profitable. Profitability will depend on absence of weeds and litter, straw length, straw yield, fiber content, and distance. Use the NIR machine to determine the fiber content of flax straw to determine if it is profitable to process.

The producer should:
1) Select taller varieties with high fiber contents;

2) Increase seeding rates and seed bed utilization to increase fiber yields;
3) Cut the straw as high as possible with a straight cut header or a stripper header. This will maximize the height and amount of straw harvested;
4) Roll or disk bine the flax straw to promote retting. Spread the straw as wide as possible;
5) Let the straw ret;
6) Rake straw into windrows; and
7) Bale