Flax Fiber and Shive Products = Path Making in the 21ST Century

Presented to

Sask Industry & Resources

Sask Environment

Sask Ag & Food

by

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Flax in Saskatchewan

- Approximately 800,000 to 1,000,000 acres of flax are grown in Saskatchewan every year

Flax in Saskatchewan

- Most seed is exported and **crushed** to make linseed oil for linoleum, paints, stains, ink, form release agents

Flax in Saskatchewan

- BUT more and more seed is being **ground** for animal and human nutrition and health market products

Flax in Saskatchewan

- For every acre of flax grown, 0.5 to 2.0 tonnes of straw is produced

Traditional Uses for Flax Straw

- Specialty paper (e.g., cigarettes)
- Bale Shelters
- Fuel for straw stoves
- Duck Nesting Sites
- Lining Ditches
- Flax Straw Mulch
- Livestock Bedding

Traditional Flax Straw R&D has focused on:

- Collecting, processing and uses of straw SALVAGED from the back of a combine

- low value end uses that can use low quality straw (e.g., specialty paper, low end plastic composites)

Lack of Profitable End Uses = "The Straw Problem"
At present 15%-20% of flax straw used;
Remainder chopped and spread or burnt

Flax Straw Composition

- Fiber, Shive and Dust
- Fiber content in flax straw is variable
  - Range 2% to 30%
  - Normal 13% to 18%
- Shive 60% to 75%
- Remainder is Dust

BUT flax can be a four letter "f-word" for environmental sustainability. It is:

- Renewable
- Biodegradable
- Energy

  Efficient

What can we do to capture the potential?

- Find new ways to:
  - manage straw in the field
  - grade and value different types of straw
  - process different straws in different ways
  - use flax fiber and shive
  - improve cost-effectiveness of the above

What Higher Value Processors Don't Want

Weeds
or
Plastic
Mixed
With
Unretted
Straw

Weedy Fields

Lodged Crop

….What Higher Value Processors Don't Want

Badly Broken, Unretted Straw With Seed Holders

Seed Holders

...What Higher Value Processors Don't Want

"the come and take my garbage away attitude"

How can we manage it differently to make it profitable?

Use Stripper Header or Straight Cut as high as possible

Disc Bine standing straw or….

….Land Roll the standing straw

Rake up the straw after it is retted

Bale the retted straw

Fiber Yield

- Fiber Yield = Straw Yield x Fiber Content
  - **Straw Yield**
    - Traditional baling after combine
      - average 1.2 to 1.5 t/ha
      - range 0 to 2.5 t/ha
    - New methods may double these “salvaged” yields
  - **Fiber Content**
      - average 13 to 18%
      - range 2 to 30%
    - Agronomic research has found ways to cost-effectively increase fiber content

Fiber Content and Processing Cost

Example Showing how Fiber Content in Flax Straw Greatly Affects Profitability of Processing the Straw for Fiber				
Fiber Content of Straw		**5%**	**15%**	**25%**
Average payment to farmers	$/tonne	<8>	<8>	<8>
Average total cost for baling, hauling,				
Stacking, unstacking from field to factory	$/tonne	<42>	<42>	<42>
Cost to process 1 tonne of straw	$/tonne	<25>	<25>	<25>
Total cost of Straw + Processing	**$/tonne**	**<75>**	**<75>**	**<75>**
Straw needed to give 1 tonne of fiber	tonnes	20	6.7	4
= Cost of I tonne of fiber (Straw + Processing)	$/tonne	<1,500>	<500>	<300>
Average value of fiber fob Sask factory	**$/tonne**	**600**	**600**	**600**
Gross Margin (before fixed costs)	**$/tonne**	**<900>**	**100**	**300**

Fiber Production

- Influenced by the interaction of several Agronomic and Non Agronomic factors
  - growing season weather
  - variety sown
  - fertility
  - seeding rate
  - seeding date
  - type of soil
  - harvest management

Managed flax straw will allow us to profitably supply **fiber** for:

- Building products
- filtration industries
- geotextile products
- absorbency products
- textile spinning industry
- higher end plastic composites
- specialty and pulp sweeteners

Managed flax straw will allow us to profitably supply **shives** for:

- High end horse bedding
- pet bedding
- horticultural uses
- absorbency products
- building products
- biofuel

Crop Fibers Canada

- Initially a pilot plant in Saskatoon
  - will utilize different types of straw
  - use different processing methods
  - produce fiber and shive with various characteristics
  - develop proto-type grading systems
  - secondary processing -needle punch, card, etc.
  - work towards commercialization

Consider the case of flax fiber and shive for building products...

Traditional Uses of Flax Fiber in Building Products

- Mixed with Stucco
- Linen Wallpaper, Drapes and Blinds
- Linen Upholstery
- Flax Carpets
- Geotextiles

Traditional Uses of Flax Shive in Building Products

- "Loose Fill" Flax for insulation
- Mulch
- Shive Board (like particle board)

New Uses for Flax Fiber and Shive in Building Products

- Plastic Composites- Shelving, Garbage Cans, Chairs, Desks
- Flax Insulation-Batting
- Acoustical Panels
- Filtration Products
- Concrete Reinforcement (with proper chemical treatment)

Flax Shive in Rotationally Molded Plastic Composites

Flax Fiber in plastic composites

Reasons Behind Increasing the Use of Flax Fiber in Building Products

- Environmental Movement In Europe
  - Stronger Regulations
  - Financial Incentives/Disincentives
    - Search for a Replacement for Glass Fiber
    - Research into Plastic Composites

Types of Flax Batt Insulation

Flax Insulation

The Building Insulation Case:

- “Carding” process for making flax insulation batting was 2 to 3 x price compared to glass fiber

- New “air laid” technology leads to flax insulation 1 to 2x price compared to glass fiber

- More flax insulation would be used but Europe is short of suitable flax fiber

Saskatchewan's Blue Prints for Flax Fiber and Shive Based Products……

- A significant amount of R&D has been conducted by Biolin Research Inc. and the SaskFlax Development Commission on:
  - Agronomy
  - Quality Traits
  - Processing
  - Human Capital
  - Industry Contacts
  - Budgets and Markets

…..Saskatchewan's Blue Prints for Flax Fiber and Shive Based Products……

- Agronomic Research:
  - Fiber Content
  - Straw Yield
  - Fiber Yield
  - Fiber Quality-Retting

…..Saskatchewan's Blue Prints for Flax Fiber and Shive Based Products……

- Quality
  - Development of Standards and Grading
  - ASTM

…..Saskatchewan's Blue Prints for Flax Fiber and Shive Based Products……

- Utilize the services of the Crop Fibers Canada Pilot Processing Plant

…..Saskatchewan's Blue Prints for Flax Fiber and Shive Based Products……

- Use existing Human Capital
  - World-Recognized North American Flax Fiber Expert
  - Biolin Research Inc. staff
  - Plant Breeders and Farm Researchers
  - Dept. of Agriculture and BioResource Engineering at University of Saskatchewan

…..Saskatchewan's Blue Prints for Flax Fiber and Shive Based Products……

- Develop Industrial Contacts in
  - insulation
  - non wovens
  - textiles
  - plastic composites
  - horticulture
  - concrete products

"Map" for Flax Fiber/Shive Products in the 21st Century

- Start small
- Learn Advantages and Disadvantages of flax products compared to competition
- Understand market potential and costs of production
- Work towards consistency of quality and quantity

Flax Insulation Challenges

- 4 -7 M$ Investment for Plant and Market Development
- Sufficient quantity and quality of flax straw
- Human Capital
- Products must meet building code requirements

Flax Batt Insulation

- Can be an environmentally friendly solution to an existing environmental problem
- Can decrease health problems (asthma, sick buildings)
- Can lead to new industries in rural areas
- Can generate higher incomes for farmers, processors and governments

Need a Holistic Approach to build a New Industry…..

- All stakeholders involved
- A common vision (expectations)
- Funds to quantify/qualify what is possible
- Supporting policies

Flax Canada 2015

- A Federal/Provincial/Industry Initiative
- Focus and stimulate funding to remove constraints and capture potential of flax
- Some new money but most funding expected to come from existing funding sources

- Do our goals and our potential help meet your Department's needs?

- What can we do to help meet your Department's goals and needs?

- Next Steps??

Flax Straw Products
Path Making in the 21ST Century

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