

Using Agronomic Practices to Increase the per Hectare Yield of Flax Fibre



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by

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Background

- 600,000 to 800,000 ha of oilseed flax grown annually in Western Canada
- Flax straw has high levels of cellulosic fibre
- Flax fibre-related production research relatively new to Western Canada
- Want agronomic practices that increase fibre content, straw production and seed yield cost effectively

Fibre Yield

- 2 components to Fibre Yield
 - Straw Yield-more important to farmer
 - 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
 - Fibre Content-more important to processor
 - average 13 to 18%
 - range 2 to 30%
 - Important to farmer IF straw payment were based on fiber content

Fibre 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 1 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

Fibre 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

Geographic Location

- Results from two 2003 Saskatchewan Regional Variety Trial Locations

Location	Straw Yield kg/ha	Fiber Content %	Fiber Yield kg/ha
Watrous	1,013	16.8%	170
Kernan	349	11.1%	38

Agronomic Factors....

- Seeding Date and Fibre Yield
 - not conclusive but, in general, late seeding tends to increase fibre content and straw yield
 - BUT tends to decrease seed yield

.....Agronomic Factors

THE EFFECT OF SEEDING DATE ON FIBRE CONTENT, STRAW YIELD AND FIBRE YIELD

Site, Year	Seeding Date	Fibre Content %	Straw Yield kg	Fibre Yield kg/ha
Mel-01	Early	12.8	n/a	n/a
	Late	14.9	n/a	n/a
Mor-01	Early	17	n/a	n/a
	Late	12.7	n/a	n/a
IH-01	Early	8.3	n/a	n/a
	Late	10.8	n/a	n/a
Can-03	Early	15.7	2,120	331
	Late	18.2	2,780	519
IH-03	Early	13.6	680	93
	Late	14.8	960	142
Red-03	Early	15.8	1,030	163
	Late	17.4	1,550	214

Notes:

n/a = not available

Mel-01 = Melfort, SK 2001

Mor-01 = Morden, MB 2001

IH-01 = Indian Head, SK 2001

Can-03 = Canora, SK 2003

IH-03 = Indian Head, SK 2003

Red-03 = Redvers, SK 2003

.....Agronomic Factors

- Possible reasons why late seeding tends to give more fiber, but less seed
 - plant “bolts” in early July when temperatures are higher, resulting in taller stems
 - blooms in late July when more heat stress and lower pollination rate (less seeds to fill)
 - fiber “filling” in late Aug when plants less stressed
 - Photo-period effects ??

....Agronomic Factors....

- Seeding Method
 - Goals = 1) high fiber yield/ha; 2) consistent small stem sizes, 3) fast retting
 - Seed Bed Utilization (low to high)
 - Disc < Hoes < Sweeps
 - Impact on straw yield dependent upon seeding rates (i.e., wider seed spread pattern more important with heavier seeding rates)

....Agronomic Factors....

- Seeding Method
 - No noticeable impact on fibre content (dry years?)
 - but generally higher straw yield, higher per ha fiber yield and more consistent stem sizes with wider seed spread pattern
 - Consistent seeding depth very important for high plant counts/m² and for consistent stem diameters

....Agronomic Factors

THE EFFECT OF SEEDING METHOD ON FIBRE CONTENT, SALVAGED STRAW YIELD AND FIBRE YIELD (2003 - dry year)

Seeding Method	Fibre Content %	Salvaged		Stem Diam. mm
		Straw Yield kg/ha	Fibre Yield kg/ha	
Sweep	17.3	998	310	1.36
Hoe	17.2	864	276	1.49

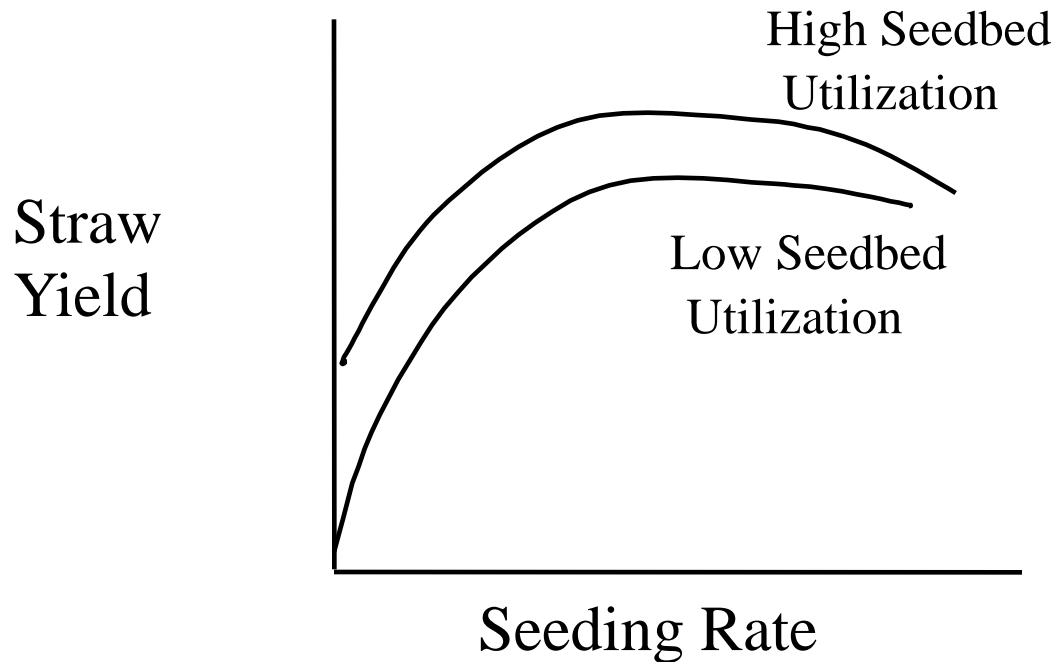
....Agronomic Factors....

- Seeding Rate
 - Results from 2003

Seeding Rate kg/ha	Fibre Content %	Salvaged Straw Yield kg/ha	Fibre Yield kg/ha	Stem Diameter mm
40	17.2	1,581	286	1.50
80	17.3	1,740	319	1.32
120	17.2	1,724	316	1.24

....Agronomic Factors

- Interaction of Seeding Rate and Seeding Method



Variety Selection....

- Not all varieties have the same fibre content
 - at Canora, SK 2003
 - Linola 1084 19.2%
 - AC MacBeth 13.8%
- Not all varieties have the same straw yield
 - at Canora, SK 2003
 - Linola 1084 1142kg/ha
 - AC MacBeth 742kg/ha

....Variety Selection....

- Hence not all Varieties have the same fibre yield/ha

- Canora 2003

- Linola 1084 219kg/ha
- AC MacBeth 102kg/ha

....Variety Selection

- Fibre Flax Varieties
 - Fibre Contents
 - Average 20-30%
 - Range 13%-40%
 - Straw Yields
 - Average 4.2-5.6 t/ha
 - Range 1.5-10t/ha
 - Depends upon variety and year

Combined Effects of Agronomic Practices: An Example

- Canora 2003

Variety	Seeding Rate kg/ha	Seeding Method	Seeding Date	Fiber Content %	Straw Yield kg/ha	Fiber Yield kg/ha
Taurus	40	Hoe	Early	14.2	1859	264
Flanders	80	Sweep	Late	21.5	3055	657

- If fibre is worth \$50-.80/kg then extra 393 kg of fibre **after processing** is \$197 -314/ha

Summary....

- Agronomy has significant influence on fibre content, straw yield and fibre yield
- Most agronomic practices that increase fibre yield are not expensive to implement

.....Summary

- More agronomic research (fertilizer, seeding dates, seeding rates etc.) is needed to prepare a management regime that maximizes profits for flax as a dual purpose crop

Flax -Stop the Burning! Start the Earning!



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