Canadian Flax for Fiber: An Introduction

Prepared

by

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Existing Prairie Situation

- In last 10 years, area seeded to flax has been 700,000 to 900,000 ha/year
  - about 70% grown in Saskatchewan
  - about 25% grown in Manitoba
  - about 5% grown in Alberta

Canada is the Largest Exporter of Flax Seed

- Annual Area:
  500,000 - 900,000 ha
  (AVG 700,000)

- Annual Seed Production:
  500,000 - 1,100,000 t
  (AVG 850,000)

Canada: Flaxseed Area, Yield and Production of Seed

	Metric Units			English Units		
Crop Year	**Harvested Area (kha)**	**Seed Yield t/ha**	**Seed Production kt**	**Harvested Area (kac)**	**Seed Yield Bus/ac**	**Seed Production kt**
97/98	737	1.40	1,029	1820	22	1134
98 99	874	1.24	1,081	2,159	20	1,192
99/00	777	1.32	1,022	1,919	21	1,127
00/01	591	1.17	693	1,460	19	764
01/02	662	1.08	715	1,635	17	788
02/03	633	1.07	670	1,564	17	739
03/04	728	1.04	754	1,798	17	831
04/05	528	0.98	517	1,304	16	570
05/06	803	1.35	1,082	1,983	22	1,193
06/07	829	1.16	959	2,048	18	1,057
10 AVE	**716**	**1.18**	**852**	**1,769**	**19**	**940**

SOURCE:
Statistics Canada, Cereals and Oilseeds Review Series, Cat. No. 22-007

Potential Volume of Canadian Flax Fiber based on Traditional Harvest Methods

Type of Flax Field	Approx. Portion of fields	Approx. Area Kha	Salvageable Straw yield t/ha	Salvageable Straw Kt	Potential Fiber Kt	Potential Shive Kt
Too weedy, too short, too far, etc	20%	134	-	-	-	-
Less than knee height	50%	336	1.00	336	61	262
More than knee height	30%	202	1.50	303	55	236
Total		672		639	**116**	**498**

SOURCE: Author's estimates

Notes: 1) Traditional Harvest Methods = swath or straight cut; drop straw in windrows, bale windrows

2) Straw and fiber production numbers are based on a 10-year average of 672,000 ha and an estimated fiber content of 18%; shive content estimated at 78% and dust at 4% although actual content will vary considerably depending on the processing method used

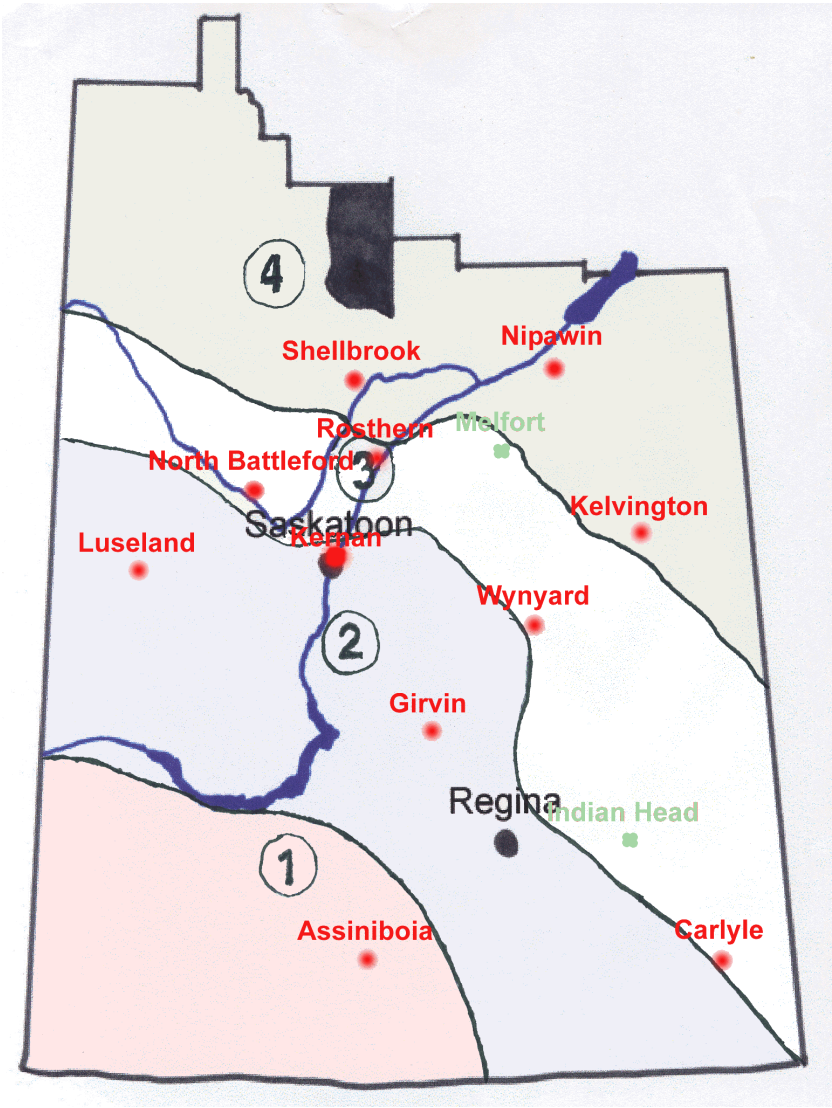
Existing Flax Straw Processors

- Pay C$5 - C$10 per tonne to farmers

- Spend additional C$30 - C$40 per tonne to get it inspected, baled, hauled and stored

Existing Prairie Situation

- Flax can be grown across Saskatchewan but in last five years, generally most competitive in dark brown (2) and black (3) soil zones



Existing Prairie Situation

- Handling flax straw is a problem

- Usually dealt with by:
  - chopping and spreading (with difficulty!)
  - burning (may be banned soon?)
  - selling for $5 - $10/tonne to processors
  - selling to local users (e.g., Ducks Unlimited)
  - using on the farm

Existing Prairie Situation

- Farmers
  - usually NO knowledge of how to improve quality and retting of straw
  - need financial incentives to improve quantity, quality and retting of straw

Recent Prairie R&D……

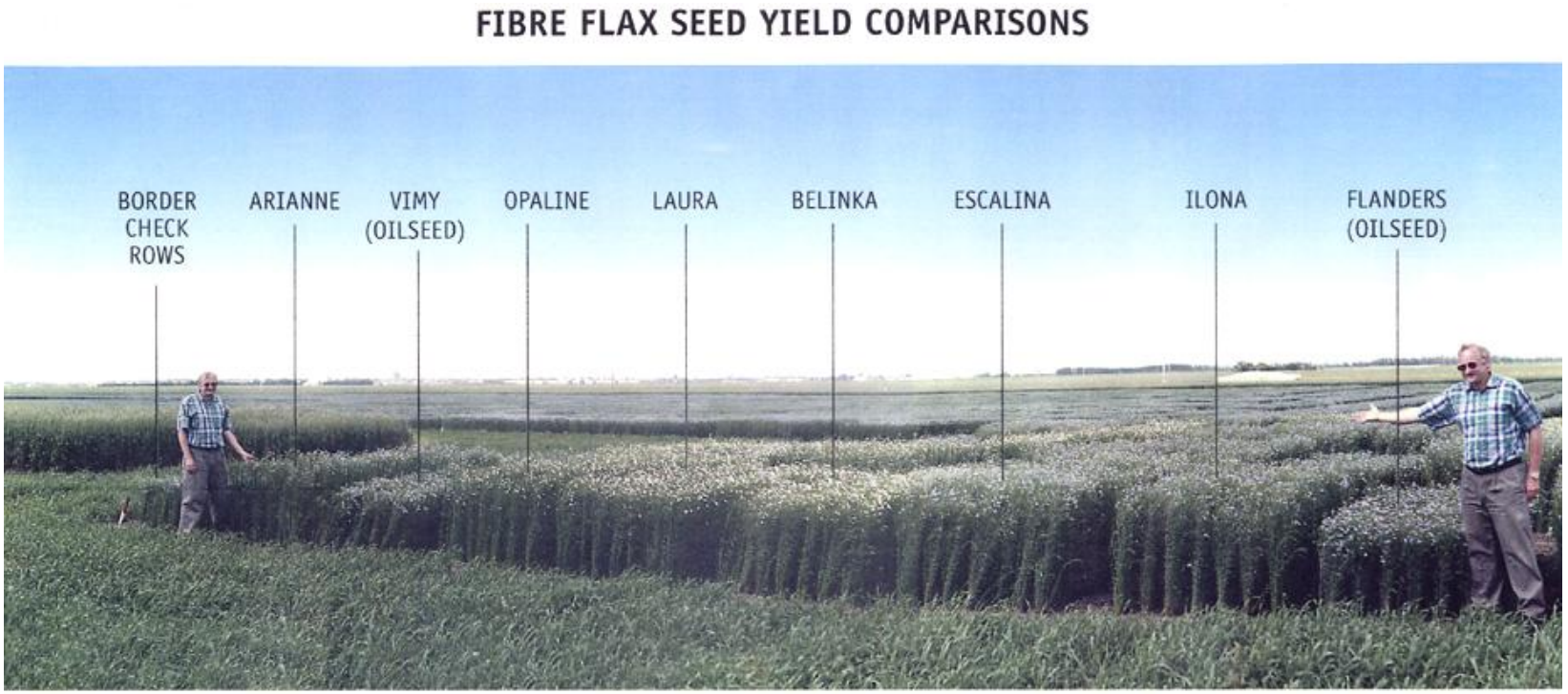
- there are **very significant differences** in the amount of fiber that can be produced from an acre of land depending on varieties, agronomic practices and weather

- **fiber flax varieties grow well** in areas suited to oil seed flax varieties

- **textile quality fibers can be produced** on the Prairies in most years if proper management practices are implemented

.....*Recent Prairie R&D*

- **IF oilseed flax** straw is managed and treated in the **same** way as fiber flax, the **quality of the fiber** is very **similar**, however, fiber production per unit area is generally less because of shorter plants, lower fiber content and lower seeding rate



……*Recent Prairie R&D*

- flax straw on the Prairies **will ret** in the fall or early spring if **non-traditional** straw management techniques are used

- without retting, only 20-80% of actual bast fiber can be extracted and fiber will not be easy to completely clean or to divide into very thin diameter (i.e., fine) fibers and hence will be significantly lower in value

….Variety Selection

Linseed Flax Varieties

(Ranges Depends Upon Variety and Year)

- Fibre Contents
  - Average 15-20%
  - Range 2%-27%
- Salvageable Straw Yields*
  - Average 0.9-1.3 t/ha
  - Range 0.2-2.2 t/ha
- Fiber Production
  - Average 0.13-0.26 t/ha
  - Range 0.00-0.60 t/ha

* if just baling straw dropped behind combine

Note: Could be 2X or 3X with changes in agronomic practices and harvest methods

Table 1: Average Fiber Content at Plot Locations *(Average of 2001 to 2003)*

Location	Fiber %
Assiniboia	17.2
Nipawin	16.7
Battleford	15.9
Carlyle	14.5
Wynyard	13.5
Shellbrook	12.9
Luseland	11.5
Rosthern	11.1
Girvin	10.8
Kelvington	7.8
Kernen	3.6

Table 2: Indices of Linseed Fiber Content Site Average = 100 *(Average of 2001 to 2003)*

	---Fiber Content Index---			
Variety	**Area 1**	**Area 2**	**Area 3**	**Area 4**
CDC Arras	97	91	98	90
CDC Bethune	93	92	96	76
AC Carnduff	107	106	106	113
AC Emerson	105	110	108	112
Flanders	108	100	101	98
FP1082	104	89	106	99
FP1094	101	102	93	94
FP1096	94	77	82	90
AC Lightning	95	97	85	92
CDC Normandy	94	104	91	100
Taurus	103	106	112	107
CDC Valour	83	114	99	92
Vimy	104	96	109	102
AC Watson	102	111	100	104
Solin				
Linola™ 989	96	101	99	107
Linola™ 1084	112	104	114	124
Site Average (%)	17%	10%	13%	12%

Table 3: Indices of Linseed Seed Yield Site Average = 100 *(Average of 2001 to 2003)*

	---Seed Yield Index---			
Variety	**Area 1**	**Area 2**	**Area 3**	**Area 4**
CDC Arras	110	94	103	103
CDC Bethune	114	116	103	98
AC Carnduff	97	98	98	88
AC Emerson	87	90	98	89
Flanders	113	109	104	112
FP1082	81	84	94	59
FP1094	100	98	96	103
FP1096	97	92	94	113
AC Lightning	101	101	102	109
CDC Normandy	99	109	103	112
Taurus	107	109	112	105
CDC Valour	108	114	107	103
Vimy	107	105	106	94
AC Watson	89	89	98	98
Solin				
Linola™ 989	92	90	92	101
Linola™ 1084	98	101	91	111
Site Average (kg/ha)	1,774	1,011	1,759	959

Why aren’t flax straw processors and manufacturers using our flax straw?

Constraints...

- perception that rewards are low
  - existing Prairie processors have concentrated on low end markets because they believed it was not possible to improve the quality of flax straw (but did almost no research)
  - potential new entrants do not know that the production of higher quality flax fiber is possible in the prairies

…Constraints

- past experience with salvaged flax straw has given straw that is often inconsistent, unretted, short, low fiber content, many seed holders, contaminated with plastic, fields far apart

  => **only target low end markets**

- European processors think “salvaged” prairie oilseed straw it is too risky and has too low a potential return to ensure a profitable venture (“what is” vs. “what could be”)

  => **no investment on the Prairies**

...Background

- Flax fibre-related production research relatively new to Western Canada
- Biolin Research Inc. has been involved in most of the flax fibre-related research done in Western Canada in the last ten years
- Biolin has developed manual and Near InfraRed (NIR) methods to determine fibre content in intact flax stems

Recent Flax Straw Developments...

- NIR system developed to quickly estimate fiber content in intact, unretted straw
- Analyzed thousands of straw samples for fiber content from different years, different locations, different varieties and different agronomic practices
- Developed an understanding of how different factors influence fiber content

Recent Flax Straw Developments...

- On small scale, have found ways to cost effectively increase fiber yields from oilseed flax by three or four fold

- On small scale, have successfully produced flax fibers suitable for textile and all other applications under Western Canadian growing conditions using oilseed flax

...Recent Developments

- Work being done to lower the cost of “cottonizing” flax

- Development of successful field retting systems for the prairies

...Recent Developments

- Improved flax straw processing systems
- Research has shown the prairies can be potential low cost supplier of medium and even high quality fiber

...Recent Developments

- Increased interest by fiber based companies
- Lobbyists trying to stop burning of agricultural residues

Recent Developments

- The Saskatchewan Flax Development Commission has been formed, has funds and wants to develop added value opportunities for straw and fiber

...Recent Developments

- Technology advancement by Biolin Research Inc. in testing of fiber content and sampling techniques to better equip the farmer with the knowledge of what they have growing in the field.

...Recent Related Developments

- Conferences, workshops, feasibility studies
- Pilot Plant for processing small lots of fiber
- Fields trials
- Further end use trials and communication with potential end users
- Testing and grading systems being developed

...Recent Related Developments

- Education (farmers, lenders, government people, possible users and processors)

- Flax straw, fiber and shive processing pilot plant, education center and testing facility being expanded in Saskatoon (Crop Fibers Canada)

Crop Fibers Canada Vision

To help create a wide spectrum of profitable businesses based on the production, processing and/or use of flax straw, fiber and shive

Crop Fibers Canada

- is a concept and work-in-progress
- is a pilot plant (Phase 1 almost complete)
- is an education center
- is a testing center
- should be a “catalyst” for the industry

Organaleptic Testing

- Using the human “organs” of eyes, nose, and skin to see, smell and touch to judge certain properties and give a ranking or comparison of one test specimen with another specimen

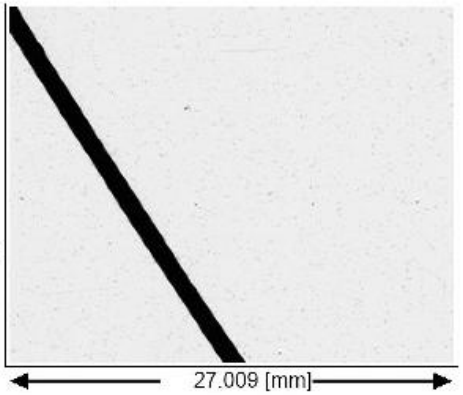
- examples: buying fruit at a supermarket or judging at a dog show

Straw Diameter Testing

IST Ag

REPORT Fibre Thickness

First image : 060511t534.jpg
lot/file no : 060511T534
Quality : STRAW DIA.
Controller : CHRISTINE
Application : Straw Diamaeter
Measuring Mask : ALF300ESTR
Comment : STRAW DIA.



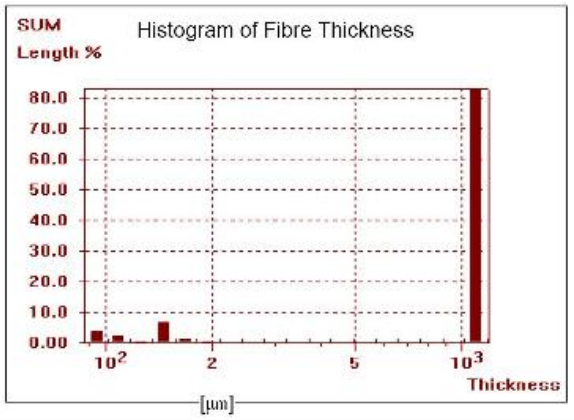
Set-up Parameters & Limits

Resolution :	300	[dpi]
Min.thickness :	5.000	[µm]
Max.thickness :	5000.000	[µm]

Major Results from

Counted objects : 34
Fibre Thickness : 238.83 [µm]
Median Fibre Thickness : 131.61 [µm]
lwt Fibre Thickness : 1048.26 [µm]
Measured objects image fraction [%] : 0.89
All objects image fraction [%] : 8.03

Curvature : 0.00278424
Rectangularity : 0.9502, s: 0.0508
Object area fraction [%] : 11.03



Percentile	
0.0	[%]
88.03	[µm]
5.0	[%]
94.15	[µm]
10.0	[%]
100.90	[µm]
20.0	[%]
125.02	[µm]
35.0	[%]
151.37	[µm]
50.0	[%]
1048.26	[µm]
100.0	[%]
1177.62	[µm]

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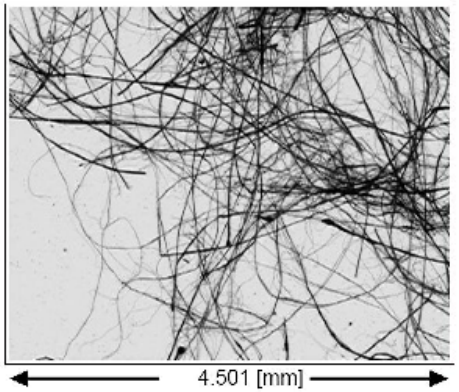
Date : May192006 Signature :

Fiber Fineness (Diameter) Distribution

IST Ag

REPORT Fibre Thickness

First image : 060511t901.jpg
lot/file no : 060511T901
Quality : STRAW DIA
Controller : CHRISTINE
Application : Fiber Diamaeter
Measuring Mask : ALF1800LE
Comment : STRAW DIA.



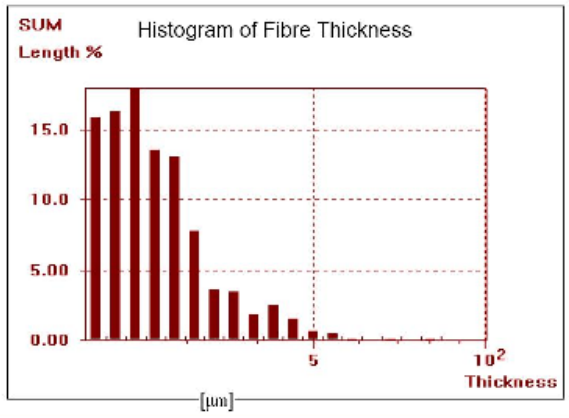
Set-up Parameters & Limits

Resolution :	1800	[dpi]
Min.thickness :	20.000	[µm]
Max.thickness :	5000.000	[µm]

Major Results from

Counted objects : 926
Fibre Thickness : 26.62, s: 6.45 [µm]
Median Fibre Thickness : 24.85 [µm]
lwt Fibre Thickness : 25.92 [µm]
Measured objects image fraction [%] : 0.74
All objects image fraction [%] : 98.82

Curvature : 0.00416015
Rectangularity : 0.9594, s: 0.0539
Object area fraction [%] : 0.75



Percentile	
0.0	[%]
20.01	[µm]
5.0	[%]
20.62	[µm]
10.0	[%]
21.15	[µm]
20.0	[%]
22.32	[µm]
35.0	[%]
24.00	[µm]
50.0	[%]
25.92	[µm]
100.0	[%]
83.49	[µm]

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Date : June012006 Signature :

Shive Size Distribution

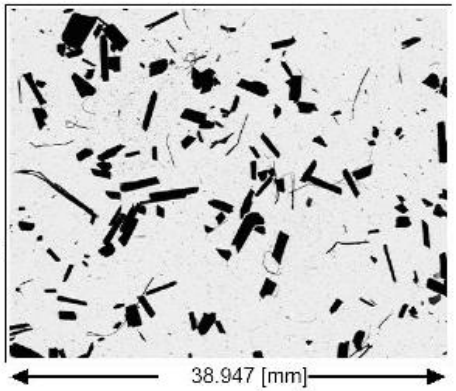
IST Ag

REPORT grit size

First image : 060511t1520.jpg
lot/file no : 060511T1520
Quality : SHIVE DIA.
Controller : CHRISTINE
Application : Powders 300dpi
Measuring Mask : APD300E5H
Comment : SHIVE DIA.

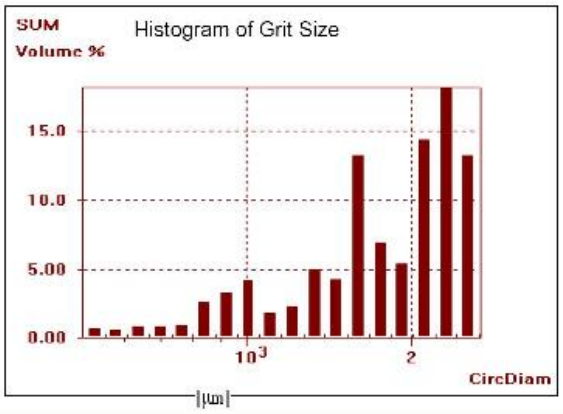
Set-up Parameters & Limits

Resolution :	300	[dpi]
MinGrainSize :	500.000	[µm]
MaxGrainSize :	50000.000	[µm]



Major Results from

Counted particles :	64	
grit size : 1057.38, s: 518.71		[µm]
Median grit size :	913.83	[µm]
vol.wt grit size :	1969.26	[µm]



Percentile	
0.0	[%]
505.53	[µm]
5.0	[%]
857.23	[µm]
10.0	[%]
949.79	[µm]
20.0	[%]
1318.04	[µm]
35.0	[%]
1545.34	[µm]
50.0	[%]
1969.26	[µm]
100.0	[%]
2654.46	[µm]

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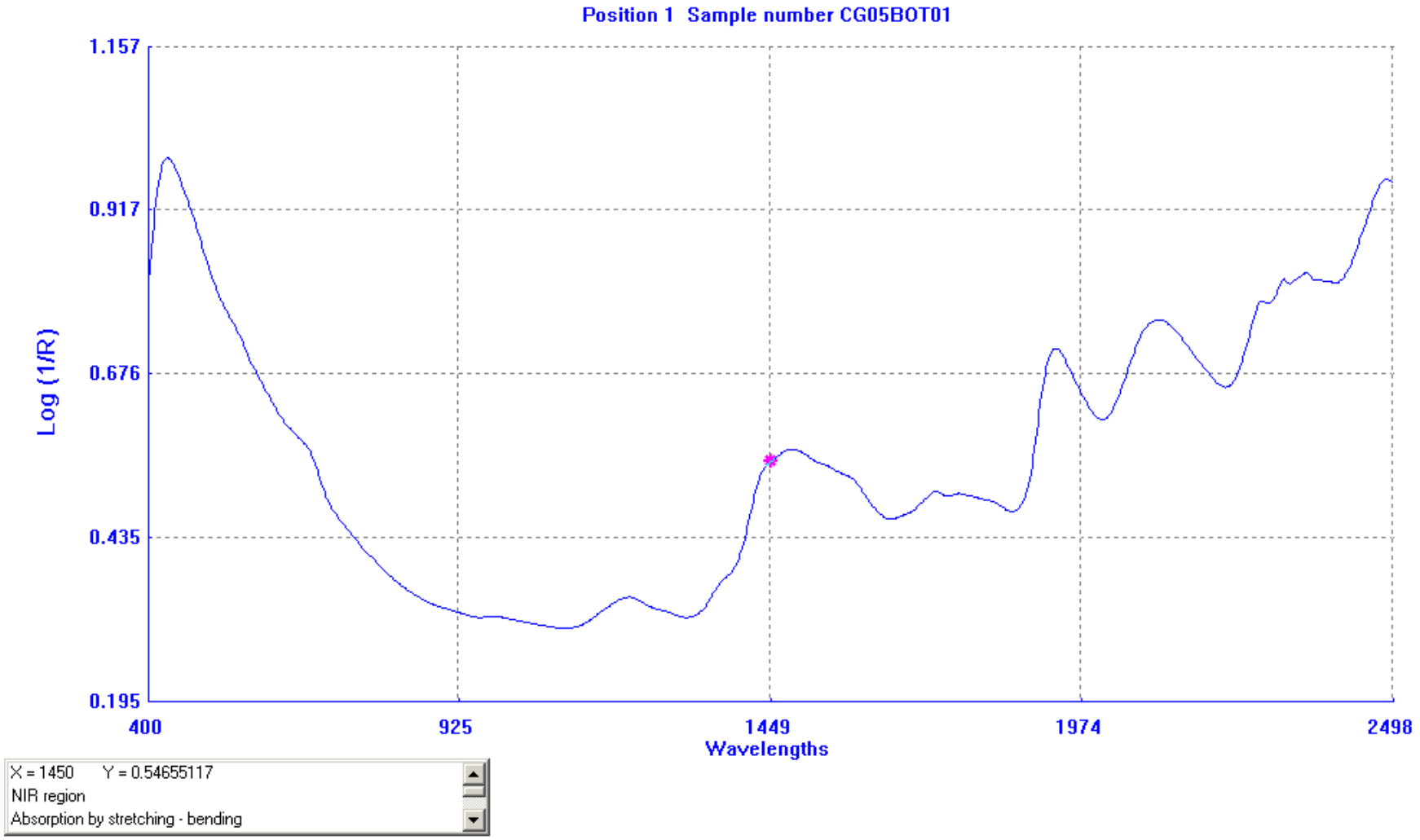
Date : June212006 Signature :

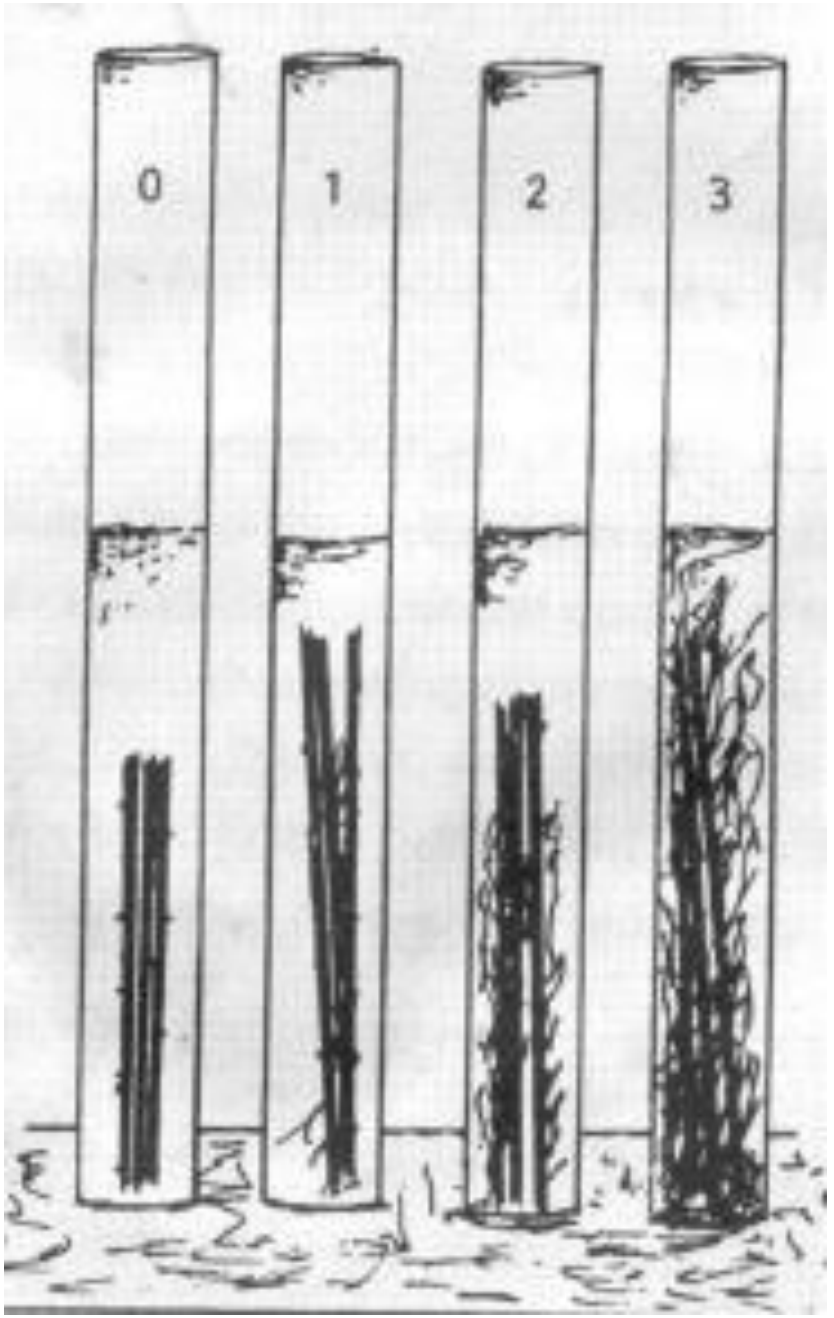
Fiber Content

- A **NIR system** that quickly estimates bast **fiber content** in flax straw
    - allows quick testing of fiber content for both research and commercial activities
    - took four years and 1,000s of samples to develop

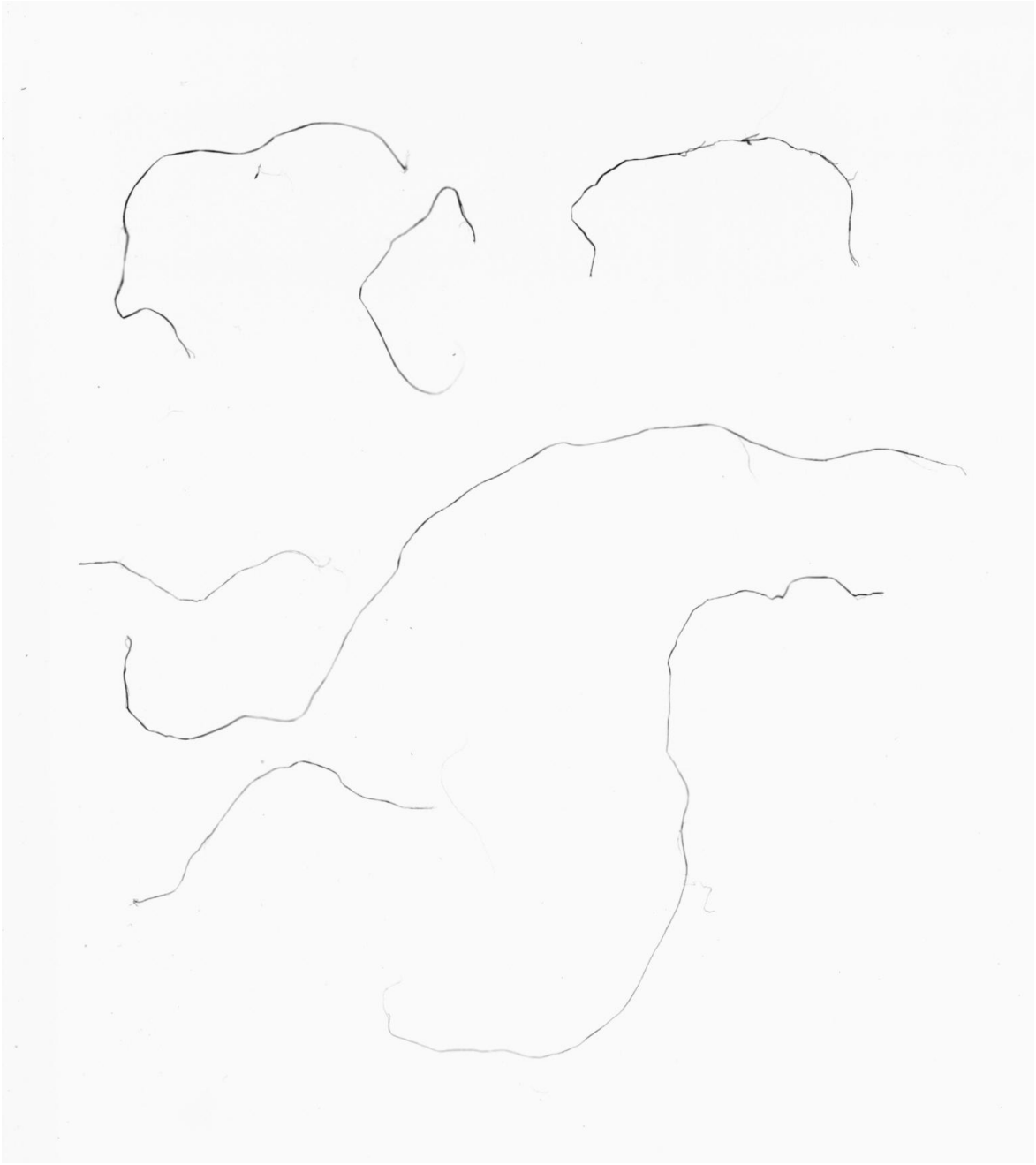
Fiber Content



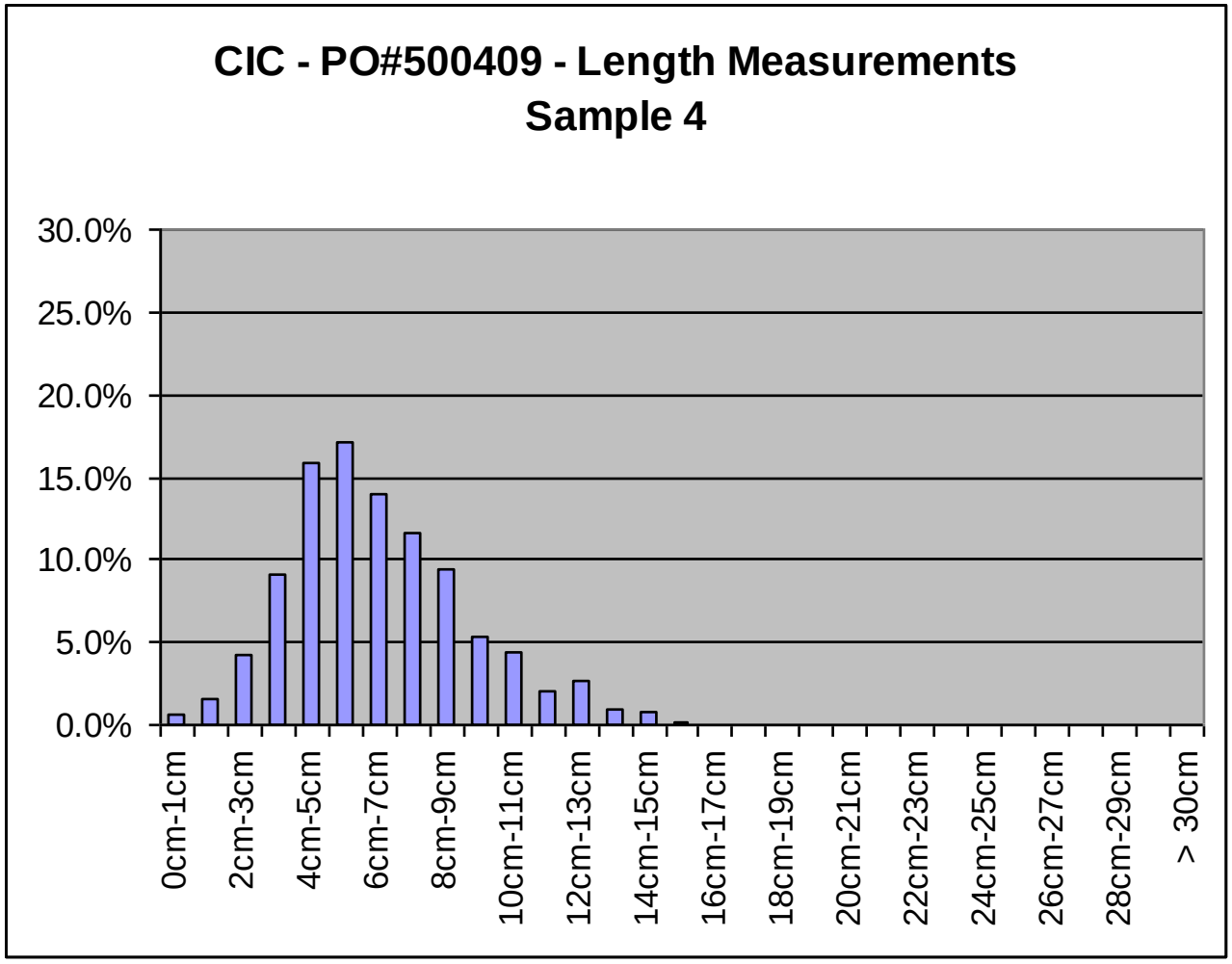
Degree of Retting



Kink & Crimp of Fiber



Length of Fiber Testing



Some Next Steps

- Select target markets
- Decide on processing equipment and quality and quantity of straw that is needed
- Select target straw collection areas
- Develop and implement plan to get desired quality and quantity of straw

Some Next Steps

- Make contingency plans for producing consistent products with straw that has variable quantity
- Initiate 3rd party testing of potential products
- Initiate test marketing
- ???

Any Questions or Comments?

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