2016 Oilseed Flax Yield Trial

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Background

Designing long term rotations is challenging from an economic standpoint. Depressed market prices for small grains are putting pressure on the potato crop to generate a high percentage of total farm income therefore increasing the frequency of potato in the crop rotation. Determining higher value rotation crops, researching how to produce them successfully in Maine, and defining reliable markets are critical steps to designing successful 3 to 4 year crop rotations.

Flax *(Linum usitatissimum)*, is an annual broadleaf crop that grows well in cool temperatures. Flax is primarily produced in the arid climates of the North Central and Western US and Canada. Flax can be either brown or yellow seeded and can be grown for fiber or seed production. Average mid-western prices for flax as of January 2016 were $12 per bushel. Potential regional markets for non-GM food processing and animal feed suggest that flaxseed production research is worthwhile.

If flax can be successfully produced in Maine, it could play a beneficial role in extending and adding value to potato cropping systems.

Objective

The objective of this proposal is to investigate whether flax can be successfully grown in Maine and integrated into current potato and grain rotations in order to decrease the frequency of potatoes to once every 3 years.

Materials and Methods

Brown oilseed flax (var. Neela and Prairie Thunder) were planted on May 19, 2016 at the University of Maine's Aroostook Farm in Presque Isle. The soil type was Caribou Loam and the previous crop was potatoes. The plot was prepared using a disk harrow and field cultivator just prior to planting. Soil test values are listed in Table 1. The experimental design was a strip trial with each variety representing a treatment. Treatments were replicated six times in plots that measured 6 feet wide by 25 feet long (150 square feet). Plots were planted using a cone seeder with 6.5 inch row spacing.

Table 1. Soil Test Values

pH	OM	CEC	P	K	Mg	Ca	S	Zn	B
	%	me/100g	lbs/a	lbs/a	lbs/a	lbs/a	ppm	ppm	ppm
5.8	3.4	6.38	21.18	476.3	262.8	1570	6.5	0.5	0.2

Seeding rates, seeding depths, seed treatments, and herbicide selections (Table 2), were based on recommendations from production manuals published by North Dakota State University and Flax Council of Canada. Seed treatment was Maxim 4FS (fludioxonil) at a rate of .16 ounces per hundredweight. Pedigreed seed was sourced from Meridian Seeds (Cassleton, ND) and was of registered class.

Table 2. Seeding Information

	Rate	Depth	Population	Seed Treatment
	lbs/acre	inches	Plants/acre	product
N FLAX	56	1	3,049,200	Maxim 4FS
PT FLAX	54	1	3,049,201	Maxim 4FS

Flax was harvested using a Wintersteiger™ Nursery Master combine. Samples were cleaned using an A.T. Ferrell Clipper™ Model 400 air screen office tester seed cleaner. Moisture and test weight were measured using a DickeyJohn™ GAC 2100 AGRI grain analyzer.

Adequate soil moisture and warm temperatures contributed to rapid germination and emergence in all treatments. Emergence of flax was noted on May 24, 5 days after planting (DAP). Flax plots received a pre emergence application of Callisto (mesotrione) at a rate of 6 ounces per acre on May 20, 2016. Flax varieties received 35 pounds per acre of nitrogen (as urea) topdressed at stem extension on June 23.

Plant stands were assessed once the crops had fully emerged on June 02 to determine if the target plant populations had been achieved. Plant stand counts were taken from 3 locations per replication and averaged. Table 3 shows the target versus actual stand counts. In all cases, actual plant stand densities were slightly higher than target populations.

Table 3. Target versus Actual Plant Populations

Crop	Target	Actual	Increase/(Decrease)	Difference from Target	
	pl/ft²	pl/ft²	pl/ft²	pl/Acre	%
N FLAX	70	79	9	+392,040	+11.4
PT FLAX	70	70.7	0.7	+30,492	+1

Plots were monitored frequently throughout the season to document growth stages as well as scout for diseases. On July 5, Neela flax was at growth stage 6 (buds visible) and 15.5 inches tall. Prairie Thunder flax was in early growth stage 7 (first flower visible) and measured 19.5 inches tall. No foliar diseases were present and no fungicide application was made at any point during the growing season.

Results

In general, the 2016 growing season in Presque Isle, Maine was slightly warmer and wetter than the 30 year historical averages of NOAA data (1981-2010). Average daily temperature in May was 2.4°F higher than normal, June and July were .7°F and 1.2°F higher respectively, and August, September, and October were all 3°F higher than normal. Seasonal rainfall totaled 20.5 inches, an increase of 2.66 inches higher than normal (Table 4).

Table 5. 2016 weather data vs. 30 year averages (May 01-Oct 31)

Presque Isle, ME 04769	May	June	July	August	Sept	Oct
Average Temperature (°F)	53.9	61.4	66.8	66.6	58.6	46.5
Departure from Normal	2.4	0.7	1.2	3	3.6	3.2
Average Rainfall (In)	2.96	3.65	5.64	5.89	2.48	2.54
Departure from Normal	-0.37	1.17	1.56	2.13	-0.84	-0.99

*National Weather Service – Caribou, ME

Flax was harvested on September 13 (117 DAP). Lodging was minimal and did not negatively affect the ability to direct combine the crop.

Yield information is included in Table 5. Yields were corrected to storage moisture levels. Statistical analysis was not performed on this data and comparison of varietal performance is for informational purposes only. Values presented are averages from 6 replications of each treatment.

Table 5. Harvest and Yield Data

Crop	Harvest Area	Sample Weight	Moisture at Cleaning	Yield at Cleaning Moisture	Safe Storage Moisture	Yield at Storage Moisture	Yield at Storage Moisture
	FT^2	gr	%	Lbs/A	%	Lbs/A	Bu/A
N FLAX	**101.6**	**1766.2**	**7.4**	**1684.9**	**8.0**	**1696.9**	**30.3**
PT FLAX	**101.6**	**2025.3**	**7.4**	**1909.1**	**8.0**	**1921.4**	**34.3**

Discussion

Results from this project show that oilseed flax grown in Maine in 2016 produced yields comparable to the common production regions of the North Central and Mid-western United States and Canada.

Production resources from the North Central and Mid-western regions proved to be a useful tool in obtaining background information and providing initial management recommendations with regards to nutrient requirements, pest pressures and concerns, harvest and storage practices, plant population, and row spacing recommendations. While these recommendations worked well for 2016 in Maine, evaluation over several seasons will be helpful in determining the potential for flax in potato cropping systems.

From an agronomic standpoint, oilseed flax can perform well in Maine. Flax produced satisfactory yields with little disease or harvest issues. Future research plans should include investigating the following:

- Determining yield and disease response to:
  - Higher/Lower plant populations
  - Higher/Lower rates of nitrogen fertilizer
- Determine effects to potato crop and optimum placement in crop rotation
- Determine and develop marketing strategy for use as food, feed, and oil in the Northeast
- Residue management (flax straw)

In comparison to oats, flax has the potential to generate greater revenue per acre. Although input costs for flax are higher than for oats, the value of the flax on a per unit basis is substantially higher resulting in greater revenue over input cost per acre. If markets can be developed in Maine or other regional locations, oilseed flax could be an attractive agronomic and economic addition to potato crop rotations.

Table 6 show a breakdown of input costs, yield, and revenue potential. It should be noted that variable costs associated with planting, sprayer applications, harvesting, trucking, and storage are not included and are assumed to be the same for small grains.

Table 6. Return over Input Costs vs. Oats

	FLAX	OAT[3]
Seed	$17.00	$25.40
Inoculant	$0.00	$0.00
Herbicide	$34.00	$2.78
Fungicide	$0.00	$0.00
Fertilizer	$13.00	$13.00
TOTAL	$64.00	$41.18
YIELD[1]	17.0	38.0
$/CWT[2]	$21.42	$3.94
Gr. REV	$363.50	$149.72
ROInput	**$299.50**	**$108.54**

*[1] measured in CWT/A, *[2]USDA/AMS Jan 16, *[3]$7/bu seed cost, 38 lb bushel, 100 bu/acre