2007 Final Report
Project Title: Oilseed Research and Demonstration Trials
University of Vermont Extension
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During 2007, there were several on-farm trials established throughout Vermont. Trials were established in Alburgh, West Addison, North Bennington, and Shoreham. The season brought many challenges to the producers. However, overall there was much valuable information gathered from this year's oilseed trials. Below is a summary of information collected from the trials.

On-Farm Trials:

Planting at TioGrain Farm.

1) TioGrain Farm (Shoreham)
The sunflower trial was planted on May 9, 2007. The varieties planted at this site included Seeds2000 Defender, Interstate 6039, Interstate 6111, and Croplan803. The sunflowers were seeded at 22,000 seeds to the acre. The sunflowers were seeded in 30 inch rows. The soil at the farm site was Vergennes clay.

The soil was extremely dry at seeding and there was no substantial rain at the site until 3 weeks after seeding. This resulted in a crop failure due to extremely low germination. Dry conditions sh particularly problematic for germinating seeds in soils with high clay content, such as those at the Shoreham site. The sunflowers that germinated and grew through out the season were ready for harvest in early November. Unfortunately, the birds grazed the sunflowers and left little for harvest. The Orwell site was considered a complete loss.

2) Boivin Farm (West Addison)
A trial of four varieties of soybeans was planted in West Addison on May 26. The varieties in this trial are all suitable for production on a conventional farm (Chemgro 4329, Pioneer 93M11, Croplan 4142393, and Croplan 11939-40). The soybeans varieties were selected based on adaptability and enhanced oil content. The soybeans were seeded at 185,000 plants to the acre into 7.5 inch rows. The soil at the farm site was Vergennes clay. The soil was extremely dry at seeding and there was no substantial rain at the site until 3 weeks after the seeding. The soybeans experienced delayed emergence. However, there was sufficient germination to continue the trial.

Like many plantings of soybeans in Vermont this year, the soybean trial in West Addison had a severe infestation of soybean aphids. Fortunately, the growers had been scouting the field and were able to implement appropriate control measures. The trials were ready for harvest in November. However, due to a lack of storage facilities the farm has not harvested the beans. At the time of this report the farm was constructing grain bins for soybean storage. The farmer's plan is to harvest the beans as soon as there is a storage facility. In addition, the West Addison farm seeded 4 acres of KAB36 canola seed. KAB36 canola is a discontinued open pollinated variety. The canola was seeded at 5 lbs to the acre in late June. The canola was harvested in November and yielded approximately 1.5 tons. The seed is being dried and processed for seed sale to local farmers this spring.

3) Stateline Farm (North Bennington)

The trial at Stateline Farm in North Bennington was planted on May 9 and included 6 varieties of sunflower (Hysun1521, Interstate 6111, Seeds2000 Defender, Interstate 6039, IS6521 and IS4049); and one variety each of mustard, canola (Croplan 601), soybean, and flax (golden). In addition to the oilseed crops, three varieties of Sorghum (Bella, Sugar Drip & Umbrella) and three varieties of sugar beets (Beta 5310, Beta 5451, and M-64) are being grown for potential use in bio-diesel production. Crop growth was normal throughout the season. Weed pressure continues to be one of the main challenges to growing (and harvesting) canola and mustard. More effective organic weed control methods need to be developed for these crops.

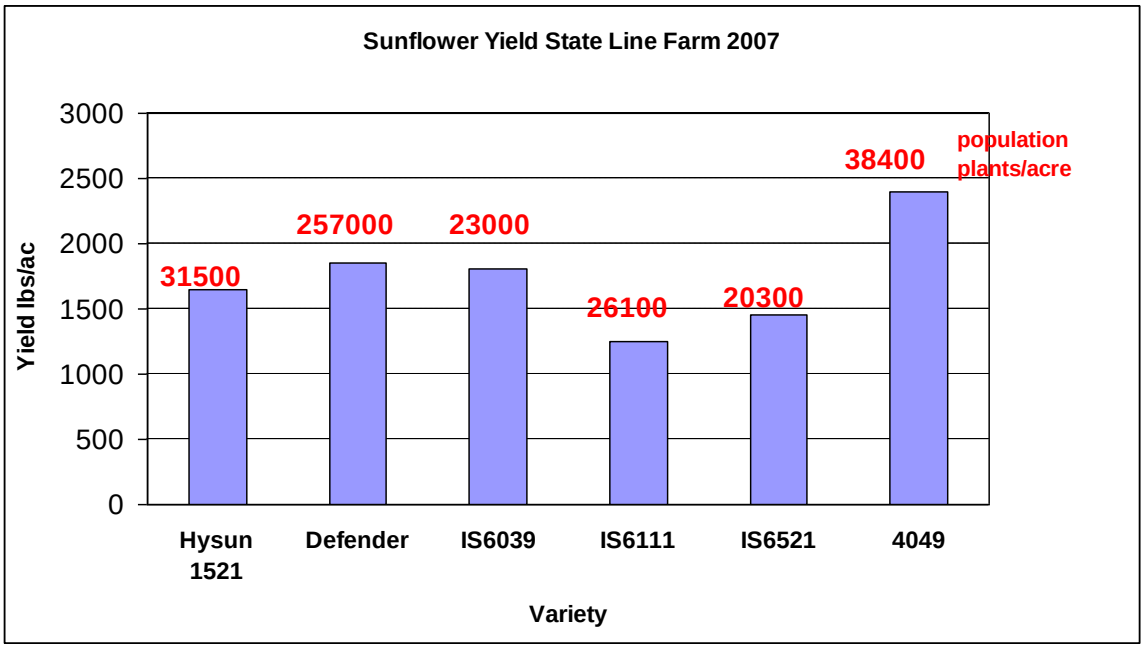
Canola and mustard trials were harvested at Stateline Farm on August 14. One pass of each crop was collected by taking an eight foot combine down the center of the 12 ft planting for a length of 784 ft. Yield data are listed below.

Crop (variety)	Yield (lbs/acre)	Moisture
Canola (601)	792	15.2%
Mustard (golden)	861	11.1%

Trial harvest at Stateline Farm.

An extremely dry season led to earlier than normal harvests of the sunflower crop. The sunflowers from the variety trials were harvested during the month of September. The sunflowers were harvested with a two row corn head modified to fit a combine. The yields were measured by harvesting the length (approximately 734 ft) of the field and measuring the weight of the harvested seeds. The moisture recorded at harvest was ideal for storage and for pressing.

The yield of the sunflowers ranged from 1247 to 2397 lbs per acre. The yield appeared to be partially dependent on variety, level of bird damage, and plant population. For example, hybrid IS6111 was the earliest maturing variety and also experienced the most bird damage. Naturally, this led to IS6111 producing the lowest yield compared to the other hybrids. It is also difficult to compare the sunflower hybrids due to variation in plant population. The plant population varied considerably among harvested plots. The variation was most likely due to seed size differences at planting.



The sunflowers were pressed for oil on October 24. For each of the six varieties, a 50 lb subsample was pressed and oil was measured. A summary of the results are given below:

Variety	Yield (lbs/acre)	Moisture	Oil (%)	Oil (gal/acre)
Hysun1521	1643	7%	29%	64
Defender	1854	8%	27%	66
IS6039	1806	10%	33%	79
IS6111	1247	6%	29%	48
IS6521	1454	8%	36%	71
IS4049	2397	8%	37%	119

Oil yield for most varieties did not reach the 84 gal/acre oil yield of the one variety grown in last year's trial. However, three of the six varieties grown exceeded the national average of 70 gal/acre. It was interesting to note that the variety which was seeded at the highest rate (IS4049) produced the highest yield and the highest percent oil content, resulting in 119 gal oil/acre. The variety IS6521 has extremely high oil content and should be investigated further. These results suggest that plant population may have an effect on yield and oil content in Vermont's climate. More research is needed to determine ideal plant population. Oilseed meals from the sunflowers have been sent to DairyOne for analysis and should be complete in approximately two weeks.

Borderview Farm (Alburgh, VT)

There were several replicated trials established at Borderview Farm in Alburg. A canola variety trial with three varieties (Croplan 601, Croplan Python, and Oscar) was planted on May 23, 2007. The experimental design was a randomized complete block with four replicates. There are a very limited number of non-GMO varieties available to producers in the United States. It may be advantageous to acquire non-GMO canola varieties from Canada or Europe. This trial was established to compare the yield of non-GMO varieties. The plots were seeded at 5 lbs to the acre and to a depth of ½ inch. Plot size was 5' x 25 ft. The herbicide Trifluralin was applied prior to planting for weed control. One hundred pounds of 10-17-20 starter fertilizer was applied to the plots at planting. In addition to the variety trial there was a seeding rate, nitrogen rate, and row spacing study initiated in May. These projects were funded through the USDA SARE program.

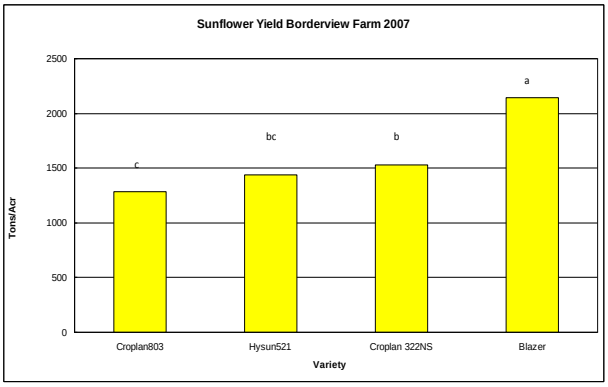
The canola trials were harvested on September 5th. Seed from the plots were weighed to calculate yield per acre. Based on this year's research we would conclude that a seeding rate of 6 – 12 lbs will provide optimum yields in canola. Seeding costs could be reduced by seeding at the 6 lb rate. The heavier seeding rates of 22 and 29 resulted in severe lodging and ultimately would result in disease and harvest issues. It appears that 90 lbs of nitrogen per acre provides a significant yield increase compared to lower rates. Lastly, row spacing did not seem to have an obvious impact on yield. However, it may have an impact of disease. It is possible that the wider rows would allow for more air circulation. The seeding rate, row spacing, nitrogen rate trial will be conducted in 2008. Non-GMO canola continues to yield well in Vermont. This year all yields were over one ton per acre. This exceeds the national average of 1600 lbs per acre. The open pollinated variety was the lowest yielding. The hybrids performed similarly. The variety trial data is reported below:

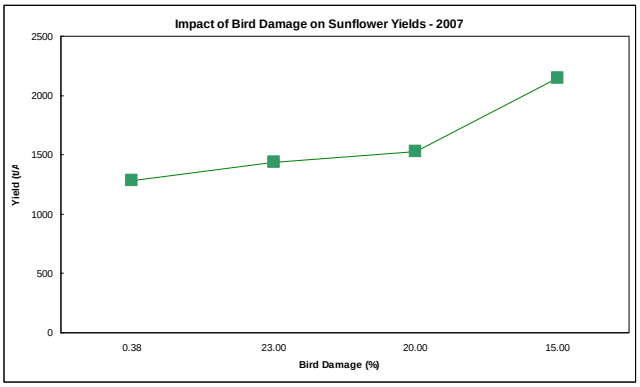
Variety	Yield tons/acre
Croplan 601	1.58b
Oscar	1.30a
Croplan Python	1.68b

A sunflower variety trial was planted on May 23, 2007. The varieties included Seeds2000 Blazer, Croplan 803, Hysun 521, and Croplan 322NS. The hybrids were considered early season varieties. The experimental design was a randomized complete design with 4 replicates. The plots were 10' x 200'. Plots were planted at 27,000 plants per acre and to a depth of 1inch. A preplant treatment with Trifluralin was used to control weeds.

Plots were harvested with an Almaco plot combine on October 17, 2007. The moisture content of the harvested sunflowers was higher (12.5%) than recommended (9%) for storage and for oil pressing. The harvest population was 21,000 plants per acre. This is considerably lower than the target population of 26,000 plants to the acre.

Yields ranged from 1247 to 2146 lbs per acre. Yields were correlated to bird damage. Yields are reported below:





The sunflowers and canola were pressed for oil in November and December. For each of the four sunflower varieties, a 50 lb subsample was pressed and oil was measured. The canola seed heated immediately following harvest. The varieties were mixed in an attempt to dry the seed using an aerator. Unfortunately the seed still molded due to the heating. A summary of the sunflower and canola oil results are given below:

Sunflower Variety	Yield (lbs/acre)	Moisture	Oil (%)	Oil (gal/acre)
Hysun1521	1439	12%	24%	46
Blazer	2146	13%	29%	83
Croplan 803	1247	12%	24%	40
Cropplan 322NS	1527	13%	24%	48

The data provided above was the first seed to be processed through the press at Borderview Farm. As Borderview Farm became more familiar with the press and its operation it was reliably extracting 32% oil from sunflowers. The higher moisture content may also have impacted oil content. The Seeds2000 Blazer had the highest seed and oil yield compared to the other varieties.

Condition of Canola	Moisture	Oil (%)
No mold	10%	32%
Mold	11%	20%

Interestingly, there is a consistent 10% increase in oil extraction when sunflower and canola seed are double pressed through the oil extractor at Borderview Farm. Moldy seeds had a lower amount of extractable oil on the first press than seed in good condition. However, 15% additional oil was collected when the moldy seed was double pressed. Overall there is potential to increase the percent of oil from 32 to 42% by double pressing.

Oil Press at Borderview Farm

In other preliminary investigations seed was processed through the press up to seven times. Additional oil (6-8%) was extracted from the meal up to the sixth pressing. On the seventh press there was no additional oil. However, an economic and energy analysis needs to be conducted to look at the feasibility of additional presses. Borderview Farm has also found that the meal can be processed into an extremely stable pellet when pressed at least twice. Pelleting after pressing may result in a pellet that has a longer shelf life than unpelleted meals.

After one press, the meals of sunflower, canola, and moldy canola were analyzed for nutritional content at DairyOne. Overall, the meals contained a substantial amount of protein. The protein levels are similar to commercial meals. The sunflower meal contained almost half the amount of crude fat compared to canola meal. The amount of fat in the meals could impact the rumen function of dairy cattle if fed incorrectly. It is likely that double pressing the meals will further reduce the amount of fat in the meals. The level of crude fat continues to be an issue with locally pressed meals. Meals from the two press process will be analyzed in the future. Interestingly, the moldy canola appeared to be lower in protein and higher in fat. Certainly, this is a result of the lower oil extraction from moldy seeds.

Meal	Crude Protein (%)	Fiber (%)	Crude Fat (%)
Sunflower	35	22	18
Canola	30	22	32
Moldy canola	29	20	37

Outreach and Education:

There were several biofuel educational events held in 2007. Each event was well attended and provided a diversity of learning opportunities to individuals interested in biofuel production.

A field day was held on July 12, 2007 at Stateline Farm in North Bennington. This event was publicized through Agriview, and by mailing and emailing flyers. The attendance at the event was around 100 people, including farmers, biofuel advocates, and University representatives, and government officials. The event included tours of the crop trials and the biodiesel production facility, distribution of information on growing oilseed crops in Vermont, and discussions with the farmers participating in the project. The field day was a success and confirmed the fact that biofuel production is an area of great interest in Vermont.

Field day at Stateline Farm in July of 2007.

A field day was held on July 26, 2007 at Borderview Farm in Alburgh. This event was publicized through Agriview, and by mailing and emailing flyers. The attendance at the event was around 70 people, approximately half of those were farmers. The field day was a 5 hour event and included tours of many different research projects being conducted at Borderview Farm, including oilseed crop trials, small grain trials, alternative forage production, switchgrass trials, and crop rotation trials. There were workshop presentations of mortality composting and soil health. Heather Darby gave a crop tour of the oilseed trials and talked about production of sunflower and canola. There was scheduled to be a presentation on biofuel production, but unfortunately Dorn Cox was unable to attend. The oilseed/biodiesel portion of the workshop did seem to be a draw for participants, especially for those who were not able to attend the Field Day at Stateline Farm earlier in July.

In September, many of the collaborating farmers from our oilseed research sites participated in a field day held at the Dewavrin farm in Les Cedres, Quebec. Dewavrin farm is one of the premier growers of organic grains, soybeans and sunflowers in our area. The sunflowers at this farm are pressed to produce food – grade oil, which is a slightly different process than producing oil for biodiesel. Even so, the knowledge of crop production methods and rotations for growing sunflowers successfully and sustainably will continue to be valuable to Vermont farmers interested in oilseed production. There were 36 Vermont farms in attendance.

In addition, a regional biofuel conference was held in Bangor Maine on December 3 and 4th. There were presentations on canola, sunflower, and corn production/processing by speakers from North Dakota, Wisconsin, Maine, and Vermont. There were 8 Vermont attendees present at the meeting. The meeting provided a good amount of knowledge transfer among producers and speakers.

During the summer and fall there were several smaller educational events held at Borderview Farm. The USDA NRCS held a technology tour featuring farms that are implementing renewable energy strategies on their operations. There were representatives from USDA NRCS, USDA FSA, NOFA-VT, Agency of Natural Resources, Agency of Agriculture, Natural Resource Conservation Districts (NRCD), and legislators.
The Franklin/Grand Isle County NRCD held its annual farm tour in October. Approximately 25 representatives from NRCD, NRCS, and the farming community attended the tour. Lastly, there was an Across the Fence series aired in November highlighting the projects at Stateline Biofuels and Borderview Farm.