Hilltown Farmers Biodiesel Project

Final Report

March, 2011

Field to Table, Inc.
177 Avenue A
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Hilltown Farmers Biodiesel Project
Progress Report

December, 2010

Executive Summary

Hilltown Farmers Biodiesel, LLC is a group of five farms in Franklin and Berkshire counties that began growing, harvesting, pressing and processing oil seed crops into biodiesel fuel in 2009. The farmers' prime motivation for this effort has been to produce their own fuel in order to reduce on-farm operating costs.

In 2009-2010, the Hilltown Farmers Biodiesel group (HFB) purchased a trailer mounted biodiesel processor and oilseed press, incorporated the business, provided member outreach and education, and began business planning with the key assistance of a Massachusetts Department of Agriculture *Agricultural Innovation Center* Grant and a USDA *Rural Business Enterprise* Grant. Members have worked together to do research, obtain seed and tools, share crop management practices, and press and process oil seed stock, as well as find, purchase, and share key pieces of equipment such as combines.

Mission:

"Hilltown Farmers Biodiesel, LLC is a cooperative specializing in the growing, harvesting, pressing of oil seed crops into oil fuel, biodiesel fuel and livestock feed in order to work towards energy independence, increase farm viability, and preserve open space."

The mobile, trailer mounted oil seed press and biodiesel processor are collectively owned and maintained by the members. This equipment is brought to each farm as needed to process oil into biodiesel from each farms' oil seed crops. In 2009 and 2010 crops grown were sunflower, Canola, and Crambe. The meal byproduct of pressing the seed into oil is a valuable high protein livestock feed.

The group has had an extensive and labor intensive startup period over the past twenty months, learning to grow, harvest, and store oilseed crops and learning to operate both the oilseed press and the biodiesel processor. Oilseed crop yields have been very low due to problems with weather, pests, and sub-optimal harvesting equipment. Processing of the 2009 oilseed harvest was delayed until 2010 by weather, farmer schedules, and technical problems with the oilseed press. This delay caused significant mold damage to the oilseed stored from the 2009 season and caused two of the farms to forego planting in the 2010 season.

As of December 2010 three farms have successfully pressed sunflower seeds into oil, one farm has successfully processed this oil into biodiesel, and one farm has also successfully processed waste vegetable oil (previously collected from area restaurants) into biodiesel.

All told, the value of fuel and livestock feed is about $7,900 instead of the $25,000 expected. HFB farmer investments in time and out-of-pocket costs totaled over $100,000 in the first year of the project (March 2009 to March 2010).

Despite the difficulties of a technically-challenging startup by a group whose time is very seasonally and weather-constrained, AND a substantial reduction in diesel fuel pricing since the study was started, on balance the group believes that this project is on its way to success and viability, and is committed to continuing its efforts. The group has advanced well along the (substantial) learning curves for harvesting, storing and pressing oilseed as well as processing oil into biodiesel. If diesel prices continue to rise and if the group is able to increase oilseed crop yields and reduce labor hours, then the project can be a feasible enterprise.

Background

At present there are several farm-scale (stationary) biodiesel processors in the New England area, and more are being built. There is one other farm-based *mobile* biodiesel processor in New England, and another mobile processor owned by the Organic Valley Dairy Cooperative (based in Wisconsin), which ventures east as far as upstate New York. The experiences of these pioneering efforts have greatly informed ours.

The conclusions from these experiences can be summarized as:

- Farm scale oilseed and biodiesel processing can provide economic benefit to farmers by reducing their on-farm fuel costs and by providing valuable byproducts (livestock feed);
- The learning curve for all of these enterprises (growing and harvesting oilseed; processing biodiesel from vegetable oil) is steep, and even steeper when attempting to do both at the same time; and
- Direct financial benefit is very dependent on the cost of diesel fuel and labor hours spent, and any benefit will not begin to accrue until after the learning curve is over.

Those contemplating either or both of these undertakings are forewarned to:

- Recognize the significant time investment that will be required to do this properly;
- Learn to process biodiesel using collected used vegetable oil separately from learning to grow, harvest, store and press oilseed; and
- Do all the research before and during the project that you can; learn from your fellow farmers!

Informed by these experiences, the Hilltown Farmers Biodiesel Cooperative was formed to demonstrate that Massachusetts farmers can produce biodiesel fuel locally, affordably, and sustainably in quantities relative to the needs of New England-size farms, thus stabilizing and/or reducing their operating costs. The finished fuel is intended for off-road use only and will be used to fuel farm machinery; heat homes, greenhouses, milking parlors and workshops, fuel maple syrup evaporators, power generators and other on-farm equipment.

This project is intended to enhance the financial stability of participating farms (and the local businesses they support), retain jobs, contribute to open space preservation, and decrease localized air pollution from diesel exhaust thereby increasing the health of farm workers. In addition, and a key goal, the Hilltown Farmers Biodiesel Cooperative is intended to be a model for farmers throughout the state to adopt and adapt to their specific areas and needs.

The equipment purchased with the assistance of this grant has enabled the farmer-members of the Co-op to produce their own on-farm fuel. The original intention was that this would occur at significant savings over current retail fuel prices (see “Economic Benefits” tables, below). In addition, one by-product of biodiesel production is a high quality livestock feed which the co-op members intend to use to supplement purchased feed, currently $380 per ton. The biodiesel processor and related equipment has been assembled as a mobile unit with the aim of enabling each member to process on the farm without the cost of erecting a dedicated building or trucking to and from a remote site.

Current Project Status:

Intended one-year deliverables were:

- Development and legal formation of the Hilltown Farmers Biodiesel Cooperative
- Specification, procurement, assembly and testing of a mobile biodiesel processor, to be owned and managed by the Cooperative
- Development of member services and resources, including guidance with finding appropriate rentable land, choosing crop varieties, crop management, oil seed storage, biodiesel processing, handling, storage and use, and byproducts handling, storage, and use
- Creation of business plan for the Hilltown Farmers Biodiesel Cooperative to ensure viability, growth and replicability
- Presentation of two hands-on workshops to area farmers, and distribution of final report

Cooperative development, business planning and legal services were provided by Field to Table, Inc., enabling the development of the co-op, legal incorporation of the Hilltown Farmers Biodiesel Cooperative, and project management, documentation and outreach. Field to Table also provided engineering support by a registered professional engineer.

Most of the deliverables have been accomplished, although over a longer time-span than originally expected. There have been a number of significant achievements:

- Development and legal formation of the Hilltown Farmers Biodiesel Cooperative, LLC;
- Specification, procurement, assembly and testing of the mobile biodiesel processor and mobile oilseed press trailer;
- Two growing seasons' experience with oilseed crops, including choice of crop varieties, crop management, harvesting, and storage;
- In-depth training by the processor manufacturer, and subsequent experience with biodiesel processing, handling, storage and use, plus byproducts handling, storage, and use;
- Presentation of one hands-on "how to" workshop and several displays at fairs.

In addition, along with substantial hours of learning, several key technical challenges were overcome:

- Modification to the oilseed press to allow it to handle sunflower seeds;
- Modifications to the methanol recovery system that allow it to work effectively;
- Learning how to properly store and clean oilseed such that the press works effectively and that the oil is processed while still viable; and
- Learning how to effectively harvest and store sunflowers, clean the harvested seed; and obtain better equipment to do so

Indeed, aside from the now well-understood need to press oilseed soon after harvest, the group consensus was that oilseed crop yield losses were primarily due to combining problems ("90%"), followed closely by pest damage.

Challenges remain, among them:

- Refining harvest methods to substantially increase yields;
- Upgrading all oilseed storage to moisture-proof bins and accomplishing pressing soon after harvest;
- Fully testing the methanol recovery system; and

- Exploring ways to reduce heat loss during cold season processing, including insulation, better engine heat recovery, and sheltered trailer siting.

Aside from many hours spent on several "learning curves", a key factor impacting project feasibility has been the reduction in the price of diesel fuel over the past two years. When the grant application was submitted, on-road diesel fuel was well over $4 per gallon. It declined to as low as $2.05 in March of 2009, and is now over $4.00 per gallon again (March 2011). Market volatility has had a significant impact on the economic viability of this project.

Despite the difficulties of a technically-challenging startup by a group whose time is very seasonally and weather-constrained, AND a substantial reduction in diesel fuel pricing since the study was started, on balance the group believes that this project is on its way to success and viability, and is committed to continuing its efforts. If diesel prices continue to rise, if the group is able to increase oilseed crop yields and reduce labor hours, then this effort can be feasible.

The group will continue to gather and analyze labor and expense figures to facilitate ongoing evaluation and refinement, working towards financial viability. In addition, the group will consider:

- Finding a better scheduling approach, and/or a heated shelter during the winter, to allow cool/cold weather processing with less energy and fuel outlay;
- Examining the usefulness of a core processing person, who would take the lead in operating and maintaining the biodiesel processing trailer; and
- Examine instrumentation/automation of some subsystems to reduce labor

Project Economics:

Below are three tables describing estimated savings from this project, as originally projected in the proposal submitted to the Massachusetts Agricultural Innovation Center Grant Program (August, 2008):

Projected Economic Benefit: Fuel Replacement (August '08):

Farm Type	*Estimated average fuel use per farm:*	*Estimated production of bd/farm:*	*Founding Co-op Farms (1)*	*Full Co-op Membership (2)*	*Four total Co-ops in Franklin County, (3)*
Dairy	4,000	2,000	$11,800	$35,400	$141,600
Horticultural and Vegetable farms, with greenhouses	2,500	2,000	$0	$17,700	$94,400
Beef production	1,200	1,000	$2,950	$8,850	$23,600
Total:			$14,750	$61,950	$76,700

Notes:
1. Founding farms consist of one dairy, one beef production farm, and one hay/grain farm. The Alibozek farm joined the group after the grant application was submitted.
2. Full Co-op membership are projected to include approximately 12 farms: 6 dairy, 3 veg/hort, and 3 beef farms
3. Four total co-ops of a similar size are projected to include 24 dairy, 16 veg/hort, and 8 beef farms

The table below describes the economic value of the meal byproduct as projected in the proposal, using a rate of 20 lbs. meal per gallon oil seed yield (with biodiesel yield approximately equal to oilseed yield). It is assumed that the cost of the meal production is accounted for in the biodiesel production cost.

Projected Economic Benefit: Feed Replacement (August '08):

Farm Type	*Estimated production of meal per farm (tons):*	*Founding Co-op Farms (3 farms)*	*Full Co-op Membership (12 farms)*	*Four total Co-ops in Franklin County, (12 farms each)*
Dairy	20	$8,000	$24,000	$96,000
Horticultural and Vegetable farms, with greenhouses	20	$0	$12,000	$64,000
Beef production	10	$2,000	$6,000	$16,000
		$10,000	$42,000	$176,000

Below are estimated fuel and livestock feed production figures, based on actual yields. Note the low tonnage per acre harvested, and low oil yield per ton. According to extensive research performed in Vermont, about 2 tons per acre should be expected for sunflowers (very similar results for 10 varieties tested)[1]. Another Vermont report examining the feasibility of on-farm biodiesel production with a shared mobile processor[2] uses a range of 0.55 to 1.1 tons per acre from several oilseed crops. Average HFB yields in the first season of operation are well below any of these figures, although at .48 tons per acre Freeman farm's yield approaches the low end used in the latter report.

Actual Results: Yield, Oil & Meal Production and Value:

2009 and 2010 Harvests:	*Actual:*			*Estimated:*	
	Balawender	*White:*	*Mason:*	*Freeman*	All Farms:
Acres planted:	30	30	6	10.5	76.5
Oilseed harvest (tons)	8	11	2	5	26
Tons per acre:	0.27	0.37	0.33	0.48	0.34
Oil Production (gallons):	375	180	55	234	844
Gallons per acre (adjusted)	18.75	12	27.5	22	20.1
Meal production (lbs.)	7,500	14,000	1,100	4,688	27,288
at 20 lbs per gallon oil					
Fuel value at $3.25/gallon:	$1,219	$585	$179	$762	$2,744
Feed Value at $0.19 /lb.:	$1,425	$2,660	$209	$891	$5,185
Total Value:	**$2,644**	**$3,245**	**$388**	**$1,652**	**$7,929**

Notes:
1. All harvests are from the 2009 planting season except the Mason farm; and only one harvest's figures are shown per farm.

[1] *Sunflower Research Trials 2009*, Dr. Heather Darby et al, University of Vermont Extension Service, Table 4
[2] *A Feasibility Analysis of a Mobile Unit for Processing Oilseed Crops and Producing Biodiesel in Vermont*, 2008, by Christopher Callahan P.E., for the Vermont Sustainable Jobs Fund, Table 8

2. In 2009 the Balawender farm harvested only 20 out of 30 acres due to crop damage and low moisture (poor growth) in one field. 20 acres were planted in 2010 and the crop looked excellent but farm schedules delayed harvesting and due to bird damage the yield was lower than in 2009: about 5 tons.
3. The White farm lost 6 of 11 tons to mold; and pressed oil quality was too low to process. This farm did not plant in 2010. However, they estimate a yield of 7 tons usable livestock meal (not 20 lb/gallon).
4. The Alibozek farm's 2009 crop harvest was very poor (2-3 Tons) due to pest destruction; pressing delays led to mold damage. This farm did not plant in 2010.
5. The Mason farm did not harvest its 2009 crop due to poor growth and pest damage, and estimates that 2/3 of 2010 crop was lost to poor combining.
6. In 2009 the Freeman farm sunflower crop had wind and bear damage, and poor harvesting of what remained due to an incorrect grain head. In 2010 a shorter sunflower was planted that had significant deer damage; only about 1.5 tons was harvested.

The *Vermont Sunflower Trials* report indicates bird damage averaging 50%[3] (included in their yield figures). HFB farmers reported significant bird damage, and also reported damage from bears, deer and windstorms. However, aside from high rain damage in 2009, HFB farmers believe that the most significant impact on yield have resulted from harvesting problems due to timing and suboptimal harvesting methods and equipment, which they believe are mostly solved.

Additional losses were incurred due to moisture and mold damage over the spring and summer of 2010 as pressing of the 2009 crop was delayed due to technical difficulties (see Review of Key Project Issues section).

HFB farmers expect better results in the future. However, it is worth noting that of the single farm (Balawender) which planted and harvested in both 2009 and 2010, the 2010 yield was even lower than 2009. The opposite was expected due to good growing conditions, the robust appearance of the crop, and better harvesting equipment. However, the farm schedule prevented timely harvesting and there was significant bird damage. This indicates the need to get every step right.

All told, the value of fuel and livestock feed are totaling just under $8,000 instead of the $25,000 expected. HFB farmer investments in time and out-of-pocket costs have been documented at over $100,000 in the first year of the project (March 2009 to March 2010).

Review of Key Project Issues:

Below is a review of key project areas since the project commenced in February, 2009:

Biodiesel Processing

The largest and most important piece of equipment, the biodiesel processor, was designed and manufactured by *Piedmont Biofuels* of Ashville, North Carolina. This model was chosen based on research conducted by HFB founder Dave Freeman, and by extensive conversations held with Piedmont during and after their showing of a similar mobile processor at an open house for the Farm-scale biodiesel processor at Stateline Farm (Bennington, VT) in 2008.

The biodiesel processor was ordered in February, 2009 and delivered to Heath in early September from the fabrication plant in North Carolina. Laboratory equipment (for biodiesel testing) was also ordered and arrived with the biodiesel processor.

The enclosed (vented) processing trailer includes all of the equipment required to process biodiesel in 200 gallon batches from vegetable oil, including methanol recovery, water washing,

[3] Ibid, Table 4

and a tank for the finished biodiesel. A 10 kW diesel generator is mounted on the front of the trailer and is equipped with heat recovery to provide supplemental heating to a heat transfer liquid circulated between various jacketed tanks on the trailer. Primary heat is provided by a 5 kW electric element. A single electric pump is used to pump all liquids, and a metal cabinet holds lab supplies, manuals, and other equipment.

The group did as much research as possible, but the real learning did not happen until the biodiesel processor arrived. Intensive training on the processor was conducted in early September 2009 at the Mason farm in Heath, led by Piedmont Biofuel's engineers, using waste oil collected by one of the farmers. Two 200-gallon batches were processed and more were processed after the engineers from Piedmont left. In all, six batches were processed throughout September, and many bugs were worked out. Also, the trailer's engine-generator had some problems and Piedmont brought a replacement along with some other parts on a return trip in October.

The group obtained a flowmeter to be able to track biodiesel usage by each member, electrical cable to allow connection to house current when possible to relieve the pressure on the engine-genset and to reduce noise during processing, and a length of pneumatic tubing to allow connection of the methanol recovery system to stationary farm compressors.

The methanol recovery equipment was designed to require compressed air to pull a vacuum to recover methanol vapor. However, it required more and higher pressure air than was available from compressors present at the Mason farm, and recovery time was significant even with enhanced air quantity and pressure. Piedmont addressed this by fabricating a revised vacuum tube (mounted on top of the methoxide tank). Limited operation of this revised system indicates that it appears to work. The group has procured a stainless steel finned tube heat exchanger (from an HVAC rooftop system) in case it is needed.

Based on the intensive startup processing experience, a revised operation and maintenance manual was prepared. The group also identified a number of needed signs and labels, and other supplies such as rags, safety glasses, oil absorbent, broom and dustpan, etc.

The general conclusion is that the processor performs very well. It was well designed and Piedmont has provided excellent support.

The revised methanol recovery system has yet to be fully tested since other problems during the spring and summer (as well as farm schedules) consumed all available time. And methanol recovery during the winter is difficult…as are all of the processes. In addition to insulating the tanks, sheltered siting will be explored.

Oil Storage and Pressing

The oil seed press is another key piece of equipment and research indicated that while the two likely products available in our capacity range were similar in terms of output, the less expensive option, manufactured by Zhengshou of China, required much more manual monitoring.

The group decided that the other option, a Komet manufactured by IBG Monforts of Germany, fit in better with our desired operational strategy, which required that the press operate on its own for at least two hours at a stretch without the need for checking or intervention. The unit was shipped to Boston in late July and picked up by one of the farmer members. The oilseed press was mounted on a trailer obtained by one of the member farmers. A large bin and other accessories were also obtained and installed. Due to weather and work delays, this trailer was not complete until early 2010.

A trailer base was purchased and the oilseed press mounted on it, along with a bin purchased for that purpose. The remaining accessories were assembled in the early March and significant work occurred in testing the oilseed press trailer in March and April.

While crambe and canola pressing went smoothly, significant problems were encountered in attempting to press sunflower seeds (which constituted most of the harvest). After many hours trying different approaches and hardware, much back and forth with the distributor and manufacturer as well as with other area farmers who have used oilseed presses, a solution was found and the press was working properly by late May. However, the delay brought the group into peak planting season and consequently oilseed pressing was further delayed.

The delay in pressing caused issues with moisture getting into the stored sunflower seed at several farms. Stored seed subject to moisture degraded and became moldy, dramatically reducing the amount of seed that could be pressed as well as the quality and amount of pressed oil and meal. It also can degrade the quality of the meal. For example, out of 11 tons harvested and stored at the White Farm, it is estimated that only 5 tons were in what was thought to be good enough condition to be pressed, and this amount only yielded about 180 gallons (see table above). Unfortunately, this oil did not pass the fatty acid test and was not of sufficient quality to process into biodiesel. Luckily, the meal was useful even though of lower quality; the cows loved it!

Crops and Cropping Practices:

Prior to commencement of the project and after several months of individual research, HFB members held a meeting in April 2009 to discuss a number of issues related to growing oilseed crops. Only one member had experience in growing any oilseed crops, so the first decision was about which oilseed crop the farmers should grow. The group decided to focus on sunflowers, which appeared to provide the fewest challenges yet has a high oil content. The work done in Vermont was critical in informing HFB's efforts, especially information gained in field trials at Stateline Farm and Borderview Farm[4].

Members shared information regarding planting, crop management, as well as moisture testing and harvesting of oil seed crops. Members also shared information on equipment such as combines, grain cleaners, augers, planting heads, and moisture testers.

Each farmer was in charge of obtaining their own storage equipment for both the oilseed and oil; while plans were made to share combines between farms that were closest to each other.

In 2009 and 2010 crops grown were sunflower (Helianthus annuus L.), Canola (brassica napus), and Crambe abyssinica. Harvest yields were reduced by poor growing conditions due to the rainy weather, destruction of seedlings by turkeys and deer, and consumption of mature sunflowers by deer, bear, and especially birds.

The crops were harvested in the fall and early winter. The Freeman farm has two combines, one of which is an AC 900 with a draper grain head. The other is a Gleaner K-2 with a 10 foot grain head. The White farm also has a Gleaner K with a 10 foot grain head and this combine is shared with the Mason farm. The Alibozek farm has a Gleaner F-2 with a corn and grain head, and the Balawender farm has a JD 4400. All farms experienced a learning curve with the combines and feel that too much of the 2009 crop was left in the field due to incorrect equipment and methods.

[4] *Homegrown Feed, Food & Fuel: The Market Potential of Farm-Scale Oilseed Crop Products in Vermont*, Emily Stebbins, for Vermont Sustainable Jobs Fund and Vermont Biofuels Association, February, 2008

Better results were foreseen and the three farms who planted in 2010 (Freeman, Mason, and Balawender) feel that their harvests went much more smoothly.

Storage of the oilseed crop varied from totes to wagons to bins. The plastic grain bin which the Freeman farm used seemed to provide moisture protection even though the 2009 crop was stored for about a year before it was pressed (it is being pressed now – December, 2010). The Mason farm stored its 2010 oilseed crop in a wagon covered with a tarp; but perhaps because this crop was pressed shortly after harvest, it had no moisture damage or other issues. The Alibozek farm also stored its 2009 crop in a tarped wagon, but that oilseed was completely damaged by moisture during the spring and summer of 2010. Similarly, the White farm used 2-ton totes with piping to circulate heated air and bring the moisture down in its 2009 crop, but the delays with the oilseed press left the crop sitting all spring and summer (2010) and significant molding was the result.

All crops will require much better cleaning and the grain cleaner which the Freeman farm obtained is being modified to be more effective.

Legal and Organizational Structure

The group intended from the start to be a cooperative, and forming a legal structure was one of the deliverables from the grant funding. To that end, several meetings were held over the summer and fall of 2009, facilitated by Patrick Deluhery, Esq. and Christine Serrentino of *Field to Table, Inc*. The meetings provided a venue to educate the group on incorporation options for group-based businesses and to discuss the benefits and challenges of cooperatively managed businesses. Eventually the group decided that an LLC model better suited their operation, but that they would operate on cooperative principles.

The operating agreement was finalized in early 2010. The group also discussed member policies related to how the cooperative will conduct its business and what the coop should charge its members for processing.

Based on these discussions a subcommittee developed detailed policies related to membership issues, and a final draft was submitted for acceptance during early April 2010. These policies include:

- Charges for biodiesel and oilseed processing
- How to deal with new members and members who want to leave
- Processing methods and charges for non-members
- Procedures for use of the oilseed press and the biodiesel processor

Forms required by these policies: a processing schedule, the item transfer checklist and the inventory checklist, were drawn up and distributed by Lisa Turner, HFB Manager (see attachments).

Codes, Permitting, and Safety Practices

A major area of research during the first six months of the project was into building, fire, and other Codes related to storage and handling of methanol and potassium hydroxide (lye). Permitting for deployment of the mobile biodiesel processor was checked with each farm's local fire department. Members researched availability and pricing for UL rated liquid storage tanks for the processed biodiesel fuel and each developed a plan for their own on-farm storage of oil, methanol, and lye.

In July 2009 a meeting was held with the State Fire Marshall and Fire Chiefs from the towns of Hawley, Health, Adams and Cheshire to discuss the codes and regulations for the storage and handling of methanol, and permitting for the over road deployment of the mobile biodiesel processor. Subsequently, HFB members applied to their town fire chiefs for the necessary permits.

Members also shared information and best practices and participated in a Biodiesel Safety webinar sponsored by the National Center for Appropriate Technology in January 2010: *DIY Biodiesel: Keeping It Safe, Keeping It Legal.*

Outreach and Education

Outreach for the HFB project has two aims: one is to educate the general public about our efforts and the value of this project. The second is to inform and educate farmers who might be potential future members of either this coop or an offshoot (which was a key purpose of the MA AIC funding).
Interest in the project by area media, other farmers, and those interested in fuel self-sufficiency has been high.

Outreach events to date have been designed for both audiences and have included:

A press conference on March 6, 2009 in Turners Falls announced the project and receipt of the grant.

A ceremony by the US Postal Service at at the White Farm on May 2, 2009.

Three large laminated posters, handout materials and photographic displays were designed and produced for a tabling display:

- Who is Hilltown Farmers Biodiesel?
- What are Oilseed Crops?
- What is Biodiesel?

Additional materials were assembled as part of a standard "HFB" display and have been used numerous times.

David Freeman and Doug Mason gave presentations describing the project at the Heath Fair in August of 2009 and 2010.

Several members exhibited at the Hancock Shaker Village Fall Harvest Festival in late September 2009 to wide interest from the visitors and enthusiastic hosting by the Village administrators (who had also participated in oilseed crop trials with Dr. Om Parkash of UMass).

The first of two planned HFB Open Houses was held November 18th at the Balawender Farm In Cheshire. About 30 attended, including members of the press, area farmers, state officials and others. Member farmers described biodiesel processing and showed how sunflowers were pressed into oil and livestock feed using the oilseed press. An educational display and a continuous photo slide show of oilseed crop growing and harvesting by the member farmers was shown.

In the spring HFB members were invited by Heather Darby of the University of Vermont to make a presentation at the New England Farm Energy conference in Manchester, NH on March 15 and 16. The session was well attended and we had many questions. The conference also provided a

wealth of helpful information and discussions as well as contacts with others in New England involved in similar efforts.

It was originally intended that another open house presentation be scheduled sometime in the spring of 2010. The technical issues with the oilseed press delayed this until the fall, when other issues with oilseed spoilage emerged. At this point we do not plan an open house until we can show further success.

Membership

It was originally envisioned that up to twelve future farms within a radius of 40 miles would join the founding coop as members. In addition, the group would develop a "best practices" method to replicate this model elsewhere in Massachusetts.

However, the group decided to hold off on welcoming new members until it had successfully completed a complete cycle (that would normally have been done in one year): growing, harvesting, storing, pressing, and processing oil into biodiesel. Due to the difficulties and delays described above, members only got to that point in December 2010, using oilseed grown in the 2009 season.

Related Experiences:

The Hilltown Farmers Biodiesel Cooperative project was inspired and benefited greatly from those who have gone before us. The climate for farm-scale oilseed fuel, whether biodiesel or straight vegetable oil, is problematic. Several groups in various parts of the country have undertaken a wide variety of initiatives including:

- Crop trials on what oilseed crops and varieties work best in different regions
- Research on crop practices, harvesting methods and equipment, and storage and drying
- Research on pressing oilseed crops and converting them to biodiesel

Based on conversations and reports from several of these projects over the past several years, the learning curve is steep and labor intensive. Every step of the way involves significant research and time, as well as cash investment. We have certainly found that to be the case.

The pioneering projects described below continue to provide the HFB project with the knowledge base and networking that is critical to efforts such as ours. Together, we can figure out the best road forward.

The Vermont Biofuels Initiative

The Vermont Sustainable Jobs Fund (VSJF) and the Vermont Biofuels Association (VBA) created the Feed & Fuel Project in 2006 to focus a portion of its biofuels market development work on exploring the feasibility of a farm-based liquid biofuels, livestock feed, and food- grade oil co-production systems in strategic locations around the state. [5]

[5] From: *Homegrown Feed, Food & Fuel: The Market Potential of Farm-Scale Oilseed Crop Products in Vermont*, February 2008, prepared for Vermont Sustainable Jobs Fund and the Vermont Biofuels Association, by Emily J. Stebbins, Department of Community Development & Applied Economics, University of Vermont

The Feed & Fuel Project is a partnership between VSJF and VBA. Several other academic and private organizations and individuals contributed research, findings, resources, and information to the project. UVM Extension and the UVM Center for Sustainable Agriculture led research on crop trials and farm-scale biodiesel production during the 2006 and 2007 growing season, while researchers at the UVM Department of Community Development and Applied Economics compiled this report and explored the current and potential markets for oilseed co-products.

This project has been responsible for significant research into the viability of oilseed crops in the Vermont/New England environment:

> From VSJF *2009 Annual Report*: "Continued funding of Dr. Heather Darby's (UVM Extension) research & technical assistance team is enabling farmers across the state to learn more about oilseed crop production, including four new grantees: Clearbrook Farm Shaftsbury), North Hardwick Dairy (Hardwick), Ekolott Farm (Newbury), and Woods Market Garden (Brandon). A $65,000 grant to Rainbow Valley Farm (Brandon) has helped the Mordasky family develop an on-farm, commercial biodiesel production facility for West-Central Vermont.

In 2009, the University of Vermont Extension Crops and Soils Team conducted several sunflower research projects. A number of agronomic topics were investigated including pest control strategies, nitrogen management, and variety selection. Many farmers are engaged in on-farm fuel production endeavors. In order for on-farm fuel production to be feasible farmers must be able to reliably produce a high yielding crop. Therefore the overall goal of this research has been to develop best agronomic practices for sunflower production in New England.[6]

Stateline Farm in North Bennington, VT, is the site of an innovative farm-scale biodiesel and ethanol production facility which has been a model and an inspiration for the HFB project. This facility was built as a result of research undertaken by the many partners of the Vermont Biofuels Initiative, which also developed a set of crop trials of various oil-seed varieties around Vermont.

Stateline Farm's experience has been critical in supporting this project. Another related project, completed by the engineer who designed Stateline Farm's system, explored the feasibility of a mobile farm-scale processor. This report concludes:

> "…oilseed processing in Vermont is predicted to be a feasible and profitable opportunity based on the results of this study. It is technically feasible to transport appropriately sized equipment with a truck and small trailer to remote locations to provide processing services. It is also estimated that the cost of processing is below the market value of certain outputs (biodiesel and organic meal). A key challenge to such an operation will be establishing a sufficient initial market to breakeven at a reasonable price while also planning on future growth to capitalize on economies of higher volume production. As production volume increases, the breakeven price will decrease and higher profit can be realized at the same market price."[7]

Wagner Woods Biodiesel Project

In early 2009 HFB members visited Wagner Woods farm in Amherst, MA to tour their equipment and learn about their experiences making biodiesel. For a few years they have been processing used vegetable oil to make biodiesel. Starting in 2008 they planted sunflowers and made

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[6] *Sunflower Research Trials 2009*, Dr. Heather Darby et al, University of Vermont Extension Service

[7] *A Feasibility Analysis of a Mobile Unit for Processing Oilseed Crops and Producing Biodiesel in Vermont*, 2008, Christopher Callahan P.E., for the Vermont Sustainable Jobs Fund

biodiesel with virgin oil from the sunflowers. The Wagners also participated in Crambe field trials with Om Parkesh of UMass. In areas where the rainy summer kept the ground soaked, the crambe did poorly. In dryer sections, the crambe did better.

Their current processor makes 40 gallon batches, but they are purchasing larger tanks which will enable them to make 300 gallon batches. They made 6,000 gallons of biodiesel last year and had to process oil quite frequently.

The processor is located in a large, heated shop building; next year they plan to move the processor into the barn that has the seed cleaner and seed press. The shop building has radiant heat in the concrete floor, so they spread the seed on the floor for drying, and then regularly turn it over with shovels.

The Wagners use an old milk bulk tank to pre-heat oil to between 120 and 140 degrees. They have a garden hose (with hot water fed from an outdoor woodstove) making a loop in the bulk tank.

They have used the biodiesel in all their (off road) earth moving equipment with no problems. In cold weather, equipment that is garaged can be started with the biodiesel and kept running. They have not had to store much biodiesel as they use it as fast as they make it. The glycerin byproduct is composted.

The Wagners have a Chinese seed press which they bought because the price was so much lower than other presses; however, they believe that the quality of the construction is poor and find it messy to operate. They did press the seed twice, but found it to be quite labor intensive. Meal from the pressing is sold to a dairy farmer.

The Oyster River Biofuel Initiative

Dorn Cox of Tuckaway Farm in coastal New Hampshire is a founding member of the Oyster River Biofuel Initiative (ORBI) and has been responsible for designing and constructing the existing biodiesel and educational facility at Tuckaway Farm. Over the past several years, Dr. Becky Grube, an associate professor from the University of New Hampshire and sustainable horticultural crop specialist, collaborated with Dorn Cox to conduct research into the feasibility of sunflowers as a biodiesel feedstock. Sunflowers were chosen because of their ability to grow well in New Hampshire and their higher oil yield. Grube and Cox estimate 130 gallons of biodiesel can be made per acre of sunflowers. Grube said that through research, they hope be able to identify a new feedstock that "local farmers can use to fuel their energy needs without having to rely on something that is imported."

The experiment is the first of its kind at the University of New Hampshire, Grube said. There are similar research projects being done at the University of Maine and the University of Vermont.

In telephone conversations with Dorn plus an on-site tour of his farm (November 2010), HFB learned about his group's experiences with oilseeds and biodiesel processing.

Dorn and others started processing biodiesel using waste vegetable oil about seven years ago. Over the next few years they began to learn how to grow and press oilseed crops (sunflower and canola primarily), and processed about 5,000 gallons over that period. One lesson learned was that since Dorn and the other cooperative's member farms are organic, the highest value end product for oilseed crops is clearly food-grade organic sunflower and canola oil rather than biodiesel fuel. As a result of a trial giveaway of oil to local specialty stores, the group found that 8 ounces of organic sunflower oil is worth $12 retail; as a result the coop is moving towards selling

oil rather than processing it into fuel. "Biodiesel is, in the end, and indication that there is surplus to burn", commented Dorn.

A major consequence of these efforts was a growing awareness of the energy balance involved in producing oilseed crops and biodiesel, and of the need to take a more "whole systems" approach to farming inputs. This led the group to focus on growing and processing grains during the last several years, since "there is a need to rotate oilseed crops and grains are a natural choice". Dorn helped found the Great Bay Grain Cooperative with nine other area farms and brought in USDA conservation innovation grants through NRCS and NH Charitable Foundation to help build the local knowledge base around local grain and oil seed production and processing. These efforts include investigating organic no-till rotations of oilseed and grain crops to reduce overall fuel inputs and improve energy balances. The coop is experimenting with cover crops and organic no-till methods to reduce fuel, equipment passes and increase soil fertility as well as enhance local self-sufficiency. "We want to perform multiple operations in a single pass, and reduce how deep the iron goes into the soil" in order to reduce power (and fuel) as well as to preserve soil structure.

> "…"The best situation for the Cox farm would be to sell the high-value organic sunflower oil to local restaurants and then recover the wastes from that same product to use as a feedstock for biodiesel refining. "The original intent was to produce biodiesel from the sunflower oil, but organic extruder press oil is so much higher priced [than biodiesel] right now," Cox says.
>
> - *From the February 2007 Issue "Biodiesel" magazine; still true as of November, 2010 as confirmed by Dorn.*

As Dorn put it, much of the infrastructure is the same for grains as for oilseed crops, and grains are easier in that the processing can be simpler. For example, once farmers found oilseed equipment suited to the Northeast such as planters, combines, storage bins and cleaning equipment; and went through the (extensive) learning curve for these crops, it was relatively simple to move to grains such as wheat and rye. These crops do not require pressing, and initial indications are there is a strong market for locally grown, organic grains in the New Hampshire seacoast region. In addition, the grain crops are proving to be an excellent replacement for organic livestock feed currently imported into the area. Most of the coop farms have livestock and are able to use the grain they grow right on the farm. They are also exploring selling organic grain to local bakeries and stores.

However, the group hasn't abandoned biodiesel and is currently reinvigorating their biodiesel processing efforts. They've received a grant to completely redesign the mobile biodiesel processor and rebuild it to make the system completely modular and easier to operate whether each "module" (such as filtering, heating, mixing, washing, etc.) is mounted on a trailer or sited in a stationary location. The new 30 foot trailer will have shutter sides and each subsystem module will be pallet mounted (to allow removal). All operations will be able to be performed while standing outside the trailer.

A key difference between their processor and HFB's is that theirs uses compressed air-powered pumps rather than electrical pumps. This reduces explosion hazard by isolating the electrical equipment (the genset and the compressor) away from the biodiesel processing modules, and replacing wiring runs with compressed air lines. While the modular design uses more pumps, each module is simpler to operate and therefore easier to avoid errors, a concern when using hazardous chemicals such as methanol and potassium hydroxide.

The group has a new seed cleaner (a Farm King, $4,300 delivered) which aids greatly in cleaning the harvested grains and oilseed. Dorn's group has experienced the issues with moisture and mold and the need for dry oilseed storage; they now have several used galvanized standing bins

of the type that HFB is now looking at. In sum, oilseed growing, harvesting, storing and pressing has been a "huge learning curve".

At this point, the group is not sure a mobile processor is the best approach given the potential for breakage while moving the equipment from farm to farm, and other logistical issues. "Its not that hard to move grain…but there are big liability issues moving this (processing) equipment". They are thinking that perhaps once a farm becomes familiar with oilseed pressing and biodiesel processing, they might elect to buy their own equipment, as it can be done relatively cheaply.

HFB will be staying in touch with Dorn and his group and following his progress as he rebuilds their processor. As to economic feasibility, Dorn's response to that inquiry was that their group was formed as a nonprofit and so their biggest focus is educational. As to fee structure, its still being worked out.

Organic Valley Diary Coop's Biodiesel Project

La Farge-based Organic Valley Family of Farms-CROPP Cooperative ("Organic Valley") is the nation's largest cooperative of organic farmers and one of the nation's leading organic brands. Organized in 1988, it represents 1,630 farmers in 33 states and four Canadian provinces. Focused on its founding mission of saving family farms through organic farming, Organic Valley produces a variety of organic foods, including organic milk, soy, cheese, butter, spreads, creams, eggs, produce and meat, which are sold in supermarkets, natural foods stores and food cooperatives nationwide.

In 2008, the cooperative launched its Farmer Renewables and Energy Program (FREP) and its Sustainable Biodiesel Initiative. Both programs provide farmer-owners with assistance in incorporating renewable energy options on their farms, such as sustainable biodiesel, solar and wind. As their website describes it:

> "In 2008, we began to build the Farmer Renewable Energy Program (FREP). Our mission is to promote on-farm renewable energy projects and energy efficiency measures, and to encourage sustainable agriculture viability through research, development, and education…
>
> In the past few years we began to look deeper into what really qualifies as "sustainable fuel." We wanted to identify candidate non-food, non-GMO, organic oil seed crops to use as biofuel. So we got busy and established a system to grow, harvest, press, convert and run a variety of contenders without ever leaving the farm.
>
> We have so far invested two seasons growing and researching camelina (a small false flax) and sunflowers. Both of these crops have shown strong promise in our test fields. For example, farmers are seeing not only a high yield of oil (80–110 gallons per acre) but also 1200–1500 pounds of feed meal per acre as well…We completed our mobile biodiesel system in 2008 and successfully created biodiesel from our crops of sunflowers and camelina to power some of our vehicles and equipment…"[8]

Since 2003 the mobile oilseed and biodiesel processor "has logged over 2 million miles" according to Jake Wedeberg, Sustainability Coordinator for Organic Valley. Their mobile processing unit incorporates oilseed pressing and storage into a single trailer. Over the years many of the functions have been instrumented and automated in order to allow 24 hour per day operation with greatly reduced labor inputs ("Our aim is one hour per day"). Six farms participated in 2009, and 18 in 2010. They have pressed camelina, soybeans, sunflowers, and hazelnuts,

[8] http://www.organicvalley.coop/about-us/sustainability/on-farm-sustainability/

using a $12,000 Kerncraft press ("middle of the road; wish it was bigger"). He admired our Komet (as did Dorn Cox).

Jake and an assistant provide the main labor, with help from the farmer. The charge is $1 per gallon for processing.

HFB spoke with Jake and hosted a visit by him at the White Farm in late October 2010, as he happened to be in upstate New York at the time. At the White Farm Jake viewed the oilseed pressing that was underway and looked at the biodiesel trailer, which was also located there at that time. The seed being cleaned and pressed had undergone significant moisture and mold damage, and Jake confirmed what we were learning, that "cleaning and drying are a big deal", and that variability of seed cleanliness as well as size and type can lead to difficulties with press heads: "Debris varies widely farm to farm..stones, sand, screws (in the seed) really wears out the equipment".

According to Jake the two biggest issues they've seen are moisture and debris in the oilseed crops, and incorrect scale of the operation. As a result the economic feasibility of this effort is "iffy – there are many issues". Currently Organic Valley is viewing this effort as a service to their members as well as educational. However, "its not likely they would build another processor, though they may scale up the existing one…(processing) is very time consuming; farmers can't do this plus all their other work…As it stands now, it's a great idea, but it's the first generation." Jake noted that their experience indicates that a better model might be for a group of farmers in a region to have a centralized facility, with maybe 3 or 4 central processors per state, with trained staff and the right scale to allow better asset utilization and better numbers.

The group did not get a chance to see the Organic Valley processor, though we are looking forward to seeing a video of it soon.

Project Funding

This project was funded with the key support of the Massachusetts Department of Agriculture's Ag Innovation Center Program. The Hilltown Farmers Biodiesel project was awarded $109,000 in February of 2010. These funds primarily supported the purchase of a mobile biodiesel processing plant and an oilseed press. The member farmers provided a 50% match consisting of both out-of-pocket expenses for equipment and materials, and in-kind labor. Based on careful documentation by the farmer-members, their total in-kind and out-of-pocket match exceeded $110,000 (see the Appendices).

The project was also awarded a $16,720 USDA Rural Business Enterprise Grant to support the development of the organization. The grant paid for legal Incorporation and development of the Member Agreement and Operations Plan and other organizational documents, as well as business planning.

Conclusions; What's Next?

Projections for next year and beyond have been developed using figures for supplies and equipment from the well-documented 2009 season, modified for recurring (as opposed to startup) activities. Labor hours going forward are estimated as shown.

Hilltown Farmers Biodiesel LLC Projected Income/Expense

	Projections	
	2011	**2012**
Estimated Gross Income		
Biodiesel Processing Fees		
Members:	1,617	2,102
Non-Members:	1,500	1,500
Oilseed Processing Fees		
Members:		
Non-Members:		
Total Income	**3,117**	**3,602**
Estimated Expenses		
Labor	14,400	18,720
Seeds/Fertilizer, etc.	6,755	8,781
Equipment	3,483	3,483
Fuel	1,580	2,054
Fire Certification	500	500
Methanol	2,587	3,363
KOH	1,709	2,222
Other supplies	500	650
Utilities	0	200
Insurance	750	750
Other	250	250
Accounting	150	150
Legal	250	250
Total Expenses	**32,664**	**41,374**
Value of diesel fuel replaced:	14,805	19,246
Value of livestock feed replaced:	17,556	22,823
Total Value of goods produced:	**32,361**	**42,069**
Net Income	**$2,814**	**$4,298**

These projections show a modest but positive net income is possible. Assumptions are described below. A relatively modest yield of 60 gallons per acres has been used. If the Vermont trials are any indication, the group should be able to achieve that yield level, if not better.

At this point a huge amount of experience has been gained and the group is cautiously optimistic that the project can be economically feasible if labor costs are brought under control and yields improve. And if diesel fuel costs remain at current prices or rise. As one farmer put it:

> "…even though it was a rough, hard, trying, annoying, aggravating, maddening, fruitless, costly, backbreaking year...I guess we'll proceed. Biodiesel really does seem to be part of the future, so we are perhaps in on the ground floor. (I think we're in the basement, to be exact). I'll keep my chin up."

Assumptions: Inputs for Five Farms, Acreage as in 2009 Season (roughly 77 acres)

Likely Inputs going forward:

Labor	$14,400.00	Assumed 80 hrs growing, 40 pressing, and 120 hours processing per farm, at $12/hour
Seeds/Fertilizer, etc.	$7,064.88	From 2009
Equipment	$3,483.40	Amortized over 5 years
Fuel	$1,580.00	From 2009
Fire Certification	$500.00	
Methanol	$2,587.20	These are at 50 gal methanol per 200 gal batch
KOH	$1,709.40	These are at 20 lb KOH per 200 gal batch; use CC rpt cost
Other supplies	$500.00	Estimated (gloves, lab supplies, etc.)
Annual Costs:	**$31,824.88**	

Gallons: 4620 From 77 acres x 60 gal/acre (CC report uses 44 to 117 gal/acre range)

Fees: $1,155.00 at 25 cents/gallon
$1,617.00 at 35 cents/gallon

Value of fuel at 40 gal/acre: $14,805 at current value of $3.25/gal for diesel, x 98.6% to allow for fuel used in processing

Value of meal $17,556 at 19 cents per lb per White Farm. Yield is 20 lb. per gallon (CC report uses 770 to 1320 lb/acre, or 17.5 to 30 lb meal/gallon oil

Cost of Supplies:

Methanol $2.25/gallon for 4-8 drums; a reasonable figure: our 10/09 data showed range of 1.87 to 2.52/gallon. Assume 50 gal per 200 gal batch or .25 methanol/gall bd or $0.56/gal bd

KOH/caustic potash: $1.38/lb for 10 bags actual cost (Members also saw figures of $1.45 to 1.10/lb) Use 20 lb per 200 gal batch, or .1lb/gal or 14 cents per gallon- CC rpt uses 37 cents/gal

DEDUCTED from value of fuel figure: 1.4 gallons fuel used per 100 lb processed (from Chris Callahan report)

Appendices

- Farm match spreadsheet
- HFB forms and checklists
- Article on Organic Valley Biodiesel Processor
- Articles of Incorporation
- Bylaws

(Note: this list may be revised and added to in the final submission. Also, the last two items will be included in the final submission.)

Farm Match Spreadsheet – Founding Year

All Farms Farm work valued at: $25.00 per hour

Farm Match:	*Q1: Jan-Mar '09*	*Q2: Apr-Jun '09*	*Q3: Jul-Sept. '09*	*Q4: Oct-Dec '09*	*Q5: Jan-Mar '10*	*Q6: Apr-Jun '10*	*Q7: Jul-Aug '10*
Labor Hours:	200	437	691	326	129	23	0
Labor Dollars @ $25/hour:	$4,992.50	$10,922.50	$17,275.00	$8,150.00	$3,225.00	$575.00	$0.00
Out of Pocket Expenses:							
Equipment & Supplies	$3,925.00	$24,474.22	$20,039.88	$9,422.55	$3,002.24	$2,060.07	$0.00
Travel expenses (meals, tolls, etc.)	$0.00	$173.60	$279.90	$13.51	$13.51	$89.65	$0.00
Miles:	2926	2228	1461	2213	1020	0	0
Mileage Value @ $0.40/mile:	$1,170.40	$891.20	$584.40	$885.20	$408.00	$0.00	$0.00
TOTAL:	$10,287.60	$36,898.42	$38,870.18	$18,797.26	$6,777.75	$2,747.72	$0.00

GRAND TOTAL: $114,378.93

Biodiesel Processing Trailer – Supplies Inventory List:

PACKING TAPE(1)
DRY ERASER BOARD/PENS/ERASER
KOH MASK (1)
PLASTIC SAFETY GOGGLES (4)
RESPERATOR MASKS (2) WHITE, CLOTH-LIKE
POLY/PLASTIC CLEAR GLOVES, DISPOSABLE (USED PACK OF 100)
WATER TEST KIT INCLUDES:
GREEN WATER TEST VESSEL CONSISTING OF CUP, CAP, GAGE, GASKET, PRESSURE RELIEF VALVE
REAGANT A (CALCIUM HYDRIDE) (26 pkgs as of 8-16-2010)
REAGANT B (DRIED SOLVENT), WE BEGAN WITH A 3 PINT JUG (almost full as of 8-16-2010)
SCISSORS, Q-TIPS, WASH BOTTLE
SMALL GLASS BEAKER, 10 ML (green plastic clip indicator)
MEDIUM GLASS BEAKER, 50 ML (Yellow plastic clip indicator)
LARGE GLASS BEAKER, 100 ML (red plastic clip indicator)
15 PLASTIC, CONICAL VIALS, CLEAR IN COLOR WITH BLUE LIDS (10 with lids, 5 with no lids)
2 BOLLTES BROMOPHENOL BLUE (15 ML EACH) (1 is 3/4 full, one is 1/2 full as of 8-16-2010)
2 BOTTLES PHENOLPHTHALEIN (15 ML EACH) (close to full, 8-16-2010)
1 GLASS HYPODERMIC SYRINGE IN BLUE/WHITE BOX
2 PAIR LARGE, RUBBER GLOVES, NOT DISPOSABLE
1 BOX NITRATE EXAM GLOVES, DISPOSABLE
1 NOTEBOOK WITH ALL INSTRUCTIONS AND 1 MANUEL, TO BE LEFT WITH PROCESSER
1 GALL. DISTILLED H20, TO CLEAN GLASSWARE & PREPARE 1.N KOH SOLUTION (3/4 full, 8-16-10
1 FLOW METER WITH INSTRUCTIONS FOR INSTALLATION (CURRENT READING IS 25.5)
1 ORANGE, PLASTIC BASIN
1 CLEAR, PLASTIC FUNNEL(FOR ADDING KOH FLAKES TO METHODIDE TANK)
1 JUG ACETONE, (SHOULD ALWAYS BE 99% ACETONE)(3/4/ FULL, 8-16-2010)
.1N KOH (1/2 FULL, 8-16-2010)
.01N HCL (HYDROCHLORIC ACID)
1 AGENT B PLASTIC CONTAINER
1 PLASTIC SCOOP FOR KOH FLAKES
1 PLASTIC VINEGAR CONTAINER (IF YOU GET KOH FLAKES ON YOU, WASH SKIN WITH VINEGAR)
1 MAGNETIC MIXER
1 SMALLER DIGITAL SCALE(WITH ATTACHED PLUG IN CORD,WIEGHS OUR SAMPLES.)
1 LARGER DIGITAL SCALE, GREY. (WITH PLUG IN CONTROLS TO WEIGH KOH FLAKES)
BEAKERS
3 GLASS, 250 ML
1 GLASS, 125 ML
1 GLASS, 150 ML
3 GLASS, 250 ML MEASURING BEAKERS WITH PLASTIC SYRINGE THAT STATES "OIL SAMPLE ONLY
2 GLASS BURETS WITH 1 HOLDER THAT HOLDS BOTH BURETS

Biodiesel Processing Trailer – Supplies Inventory List (continued):

		FILTERS						
5, IN LINE FILTERS, #70057								
1 METAL, SCREEN FILTER, APPROX. 4" X 12"								
2 CLOTH FILTERS (WHITE, THEY LOOK LIKE MITTENS)								
1 BAG PLASTIC, CLEAR, CONICAL VIALS WITH BLUE TOPS								
1 PLASTIC BEAKER, 1000 ML								
1 PLASTIC BEAKER, 250 ML								
1 METAL ROAD, ABOUT 10" LONG WITH BLACK FASTENERS ON IT(EXTRA BURET HOLDER?)								
		CONTAINERS						
1 WITH GREEN CAP, LABELED METHANOL								
1 WITH YELLOW CAP, LABELED ISOPROPANOL								
1 WITH RED CAP, LABELED ACETONE								
1 BOX PAPER RAGS (GONE, 8-16-2010) (each supply your own?)								
A POWER CORD APPROX. 150 FEET LONG								
A 50 FOOT LONG (APPROX.) WATER LINE, BLACK, ABOUT 1" IN DIAMETER								
SET OF PORTABLE STEPS TO STAY WITH TRAILER								
1 PLASTIC HEAD/FACE SHIELD								
1 GROUND ROD APPROX. 3 FEET LONG TO STICK IN GROUND **BEFORE WE PROCESS**								
1 GLASS SPARE CYLINDER SIGHT FLOW INDICATOR WITH 2 NEW GASKETS (AND 2 OLD ONES)								
ONE LARGE PLASTIC JOG WITH APPROX. 4 GALLONS MINERAL OIL)								
ONE GALLON MURIATIC ACID								
THESE ITEMS ARE TO REMAIN WITH THE PROCESSER AT ALL TIMES. OTHER ITEMS THAT WE								
MAY NEED TO PROCESS ARE THE RESPONSIBILITY OF THE INDIVIDUALS USING THE PROCESSER.								
THERE ARE SEVERAL ITEMS WE EACH WILL NEED TO SUPPLY FOR OURSELVES WHEN IT IS								
OUR TURN TO PROCESS. (FOR EXAMPLE: CLOTH RAGS, A CALCULATOR, A TIMER WITH ALARM,								
GOOD FLASHLIGHT, DISH DETERGENT, POWER STRIP, EXTENSION CORDS, WASH TUBS,								.
KOH (ABOUT 25 POUNDS PER BATCH OF FUEL), METHANOL (ABOUT 50 GALLONS PER BATCH								
OF FUEL), ISOPROPAL ALCOHOL (AT LEAST 92%).								

Biodiesel Processing Log:

DATE	BEGINNING READING	ENDING READING	GALLONS PRODUCED	PROCESSED BY	PAID	DATE PAID
OCT. 2009	NOT YET IN USE	NOT YET IN USE	650	DOUG MASON	$227.50	JAN. 27 2010
JAN. 2010	25.5					
JULY, 2010	GARY AND SHARYN HAD THE PROCESSER FROM 7-3-2010 TO 8-17-2010. NO GALLONS PROCESSED TO FRUITION YET.					
DEC. 2010			TBD	DOUG AND RICK	NOT YET	

Oilseed Press Procedure:

DISASSEMBLING THE SEED PRESS

1. TAKE OFF TWO OUTER HEATING COLLARS, THEN TWO INSIDE HEATING COLLARS

2. TAKE OFF CYLINDER THAT THE GRAIN PELLETS COME OUT OF (TURNS OFF TO THE LEFT)
3. TAKE OFF INNER CYLINDER THAT THE OIL COMES OUT OF (TURNS OFF TO THE RIGHT)
4. CLEAN OUT ALL HOLES, CREVICES, THREADS AND GROOVES THOROUGHLY WITH AIR COMPRESSER.

ASSEMBLING THE SEED PRESS

1. INNER CYLINDER THAT THE OIL COMES OUT OF TURNS ON TO THE LEFT

2. OUTER CYLINDER THAT THE GRAIN PELLETS COME OUT OF TURNS ON TO THE RIGHT, STAR SIDE IN
3. REPLACE THE RUBBED CLEAN INNER COLLAR

4. REPLACE OUTER HEATING COLLAR (WITH THE 3 SCREWS)

*SOMETIMES BOTH HEATING COLLARS COME OFF TOGETHER.

** KEEP THE LEFTSIDE PARTS WITH THE LEFT SIDE SCREW AND RIGHT ONES WITH THE RIGHT SIDE SCREW

STARTING THE PRESS FOR THE DAY

USE # 10 SIZE NOZZLES (FOR SUNFLOWERS)
HEAT UP THE EMPTY PRESS FOR 5 - 10 MINUTES

SLOWLY..INTRODUCE SEEDS INTO FUNNELS
TURN OFF HEAT
GRADUALLY INCREASE SPEED, THE HIGHEST BEING ABOUT 6 1/2

TURN TO LOWEST SPEED BEFORE SHUTTING DOWN AND LET IT RUN EMPTY.

CLEAN OUT THE TWO SCREWS THOROUGHLY.

Traveling biodiesel processor boosts self-sufficiency of local farms

BY LIZ LAWYER •ELAWYER@GANNETT.COM • SEPTEMBER 29, 2010, 6:45 PM Ithaca Journal

LANSING -- The 800 gallons of biodiesel Chuck and Andra Benson pressed from their canola seeds this week won't last long on their dairy farm, which consumes about 10,000 gallons of fuel a year. But the Bensons believe that's a small price to pay for the degree of self-sufficiency that processing their own fuel provides.

The Bensons' Bensvue Farm is part of the Organic Valley Cooperative, which owns a traveling oil press and biodiesel processor that make rounds throughout the country in a trailer driven by Jake Wedeberg, a sustainability coordinator for the co-op. Wedeberg visits farms to press oil from seeds and then process the oil into biodiesel.

Chuck Benson said it now takes only about 16 of their 1,000 acres to grow the fuel that powers all of the machinery on the 600-cow farm. "It's amazing to me," Chuck Benson said. "Back in the horsepower days, a certain amount of acreage had to be set aside to grow food for the work units."

Wedeberg said the co-op, based in Wisconsin, has only offered the processor as a service to its members for two years. Last year, they began with six participating farms. This year there are 16 and he's not aware of other farming co-ops with a similar service.

"It makes total sense," Wedeberg said. "It makes farms more self-sufficient, with one less check to write at the end of the month."

Oil can be extracted from a range of crops, including soybeans, sunflowers, hemp and pumpkin seeds. Ed Scheffler, a dairy farmer at Ed and Eileen Scheffler Farm in Groton, said he is also experimenting with the processor for the first time this year with five acres of sunflowers.

"We're just looking at it from a sustainability standpoint," he said. "If we can grow a little bit of our own fuel, we'll be sequestering carbon out of the air ... and putting carbon back into the soil with the crop residue."

Besides, he points out, traditional fuel is not likely to get any cheaper. "It appears to be really efficient," besides only costing about $1 per gallon to process, Andra Benson said. "And you get two useful byproducts." Besides the biodiesel, the process yields protein meal that can be fed to dairy cows and glycerin, which can be sold, used to make soap or burned in a waste oil furnace.

Chuck Benson said he'd like to continue to pursue growing oil crops. But being totally self-sufficient in their fuel needs may be a few years away; in order to provide for all of the farm's needs, they would have to grow 100 acres of canola, he said.

"We think it's amazing," Andra Benson said. "Organic Valley wants to promote using biofuels, so they started providing this service to encourage it. Most farms are small and don't grow acres and acres. It's hard to find someone willing to press it."

But once the growing, harvesting and the three-day pressing process are done, all the products remain on the farm.

"We're using it now as we speak," Chuck Benson said.