

**2009-2010 Feasibility and Market Research Study  
For  
Commercial Hop Production in New England**

**September 30, 2010**



Four Star Farms hopyard, photo credit: r.wilson

**Prepared by  
Rosalie J. Wilson Business Development Services  
rosaliewilson.com**

With funding from:

Vermont Agency of Agriculture, Food, and Markets  
Massachusetts Department of Agricultural Resources

## Table of Contents

Executive Summary.....	2
Background .....	3
Methodology.....	6
Initial findings.....	7
Market Research Survey Details .....	10
Production Feasibility .....	18
Other Issues Affecting Growing Capability and Commercial Production.....	24
Conclusions .....	35
Next Steps .....	42

Appendix A - Sources of Information

Appendix B - List of Persons Consulted

Appendix C - Brewer Questionnaire Template

Appendix D - Cash Flow Scenarios

Appendix E - Sample Hopyard Designs

Appendix F - Hopyard Establishment Costs Per Acre

Appendix G - Laboratory Analysis Service Providers

Appendix H - Expired Hop Harvester Patents

Appendix I - Fuji Impulse Nitrogen Flush- Vacuum Sealer Product Information

## Executive Summary

The Vermont Agency of Agriculture Food and Markets and the Massachusetts Department of Agricultural Resources commissioned this research project to study the economic and logistic feasibility of commercial hop production in New England. The goal is to expand opportunities for New England growers to generate a profitable income from their land. This report has determined that is feasible to grow a commercial hop crop in New England:

- A. There is sufficient demand from the brewing community to support a minimum of 100 acres in production.
- B. There is sufficient price point elasticity to afford producers an ability to generate a profit, and a reasonable time frame for return on investment.
- C. The information, technology, and equipment now exist for smaller scale, 1-10 acre commercial hop operations.
- D. Aside from potential limitations of topsoil depth to bedrock, New England's growing climate and conditions are well suited to hop production.

The four scenarios in which a grower could yield a positive net income from growing hops are as follows:

Scenario 1: Participating in a value-share growing program with Atlantic Hops

Scenario 2: Selling whole hops, minimally processed direct to brewers

Scenario 3: Using Atlantic Hops for processing services and selling pelletized hops direct to brewers

Scenario 4: Selling do-it-yourself pelletized hops direct to brewers

### Income Potential and Return On Investment

	Scenario 1	Scenario 2	Scenario 3	Scenario 4
Average Yield Per Acre	1,500 dried lbs	1,500 dried lbs	1,500 dried lbs	1,500 dried lbs
Average Net Income Per Acre	\$4,640	\$5,090	\$5,090	\$12,910
Average Return On Investment for 1 <sup>st</sup> Acre	5 years	5 years	6 years	4 years
Level of Individual Risk	Low	Moderate	Moderate	High
assuming a \$10/lb price point for whole dried hops, \$15/lb for pelletized hops, and \$9/lb return from the value-share program				

While the potential to generate net income per acre is highest in scenario four, in which the grower creates the value-added finished product on site, the ultimate recommendation is to adopt scenario one, in which growers participate in a value-share growing program with Atlantic Hops. This is because scenario one represents the least risk while still presenting a strong potential for financial return.

In all instances, in order to reach a reasonable income and rate of return on investment, a commercial grower will need to utilize mechanical harvesting and sorting. In order to minimize risk from crop failure, and to stagger harvest times for logistical ease, it is highly recommended that the grower also divide the hopyard into thirds and adopt a 3 variety planting.

### Background

New England was home to a vibrant hop trade through the beginning of the Twentieth Century. In fact in 1900, New York was the largest producer of American hops, generating 49% of the entire U.S. yield. By the end of Prohibition, however, much of the hop industry had migrated to the Pacific Northwest. This was due to advances in mechanization that made larger scale farming a reality, complementing West Coast geography, and the decimation of the Eastern crops by a disease known as downy mildew. Downy mildew is a crippling disease because it can cause short and long term damage, impacting a specific year's harvest, and potentially killing the plants themselves.<sup>1</sup> The potential to kill the plant is a significant issue with a crop such as hops, because they are a perennial plant and take three to four years to establish.

Why is there an interest in the commercial viability of growing New England hops, and why now?

1. The beer industry is a mature industry with demonstrated longevity and stable consumption. This translates into stable market demand for raw ingredients such as hops. Even in the midst of one of the worst recessions in history, 2009 U.S. beer sales only decreased 2.2%.<sup>2</sup>
2. In the 1970's a segment of the brewing industry, craft brewing, began to develop popularity in the Northeast, particularly in New England and Quebec. Craft brewers, originally considered fringe, are now accepted in the mainstream beer

---

<sup>1</sup> Barth, H.J., Klinke, C., Schmidt, C. The Hop Atlas. 1994. Nuremberg, Germany. Joh, Barth & Sohn. pp12-14.

Jason Perrault. Perrault Farms. Guest Speaker. 2010 Winter Hops Conference. UVM Extension. 3/26/2010.

<sup>2</sup> <http://www.brewersassociation.org/pages/business-tools/craft-brewing-statistics/facts>

industry and make up 5% of the total US beer market share.<sup>3</sup> Not only does the category now make up a respectable share of overall beer sales, it continues to rise as the shift in consumption trends away from consuming volume quantities of mass-marketed, low cost beer, to selective, smaller quantities of higher quality products.<sup>4</sup>

A 2007 report expressed this trend as follows:

The Brewers Association, the trade association that tabulates industry data for craft brewers, reports craft beer sales and growth continue to break records. The volume of craft beer sold in the first half of 2007 rose 11% compared to this same period in 2006 and dollar growth increased 14%. For the first time ever craft beer has exceeded more than a 5% dollar share of total beer sales.

Overall, the U.S. beer industry sold one million more barrels in the first half of 2007 compared to 2006, with 400,000 of these new barrels produced by craft breweries. This equates to 3.768 million barrels of craft beer sold in the first two quarters of 2007 compared to 3.368 million barrels sold in the first half of 2006.

Scan data from Information Resources, Inc. provide additional data points that confirm strength for the segment. Craft beer sales in the supermarket channel through July 15, 2007 showed a 17.4% increase in dollar sales compared to the same period in 2006. This growth in sales was higher than any other alcohol beverage category.

"The 1,400 small, independent and traditional craft brewers in the U.S. have hit their stride," said Paul Gatza, Director of the Brewers Association. "United States craft brewers are making many of the world's best beers, and the marketplace is responding."

Coupled with the growth statistics has been a tidal wave of media coverage in the first half of 2007 including NBC's Today Show on July 3 stating, "Beer is the new wine and can go with just about any food." Additionally, Gallup, in its latest poll on alcohol beverages, announced for the second straight year that "Beer Again Edges Out Wine as Americans' Drink of Choice."

Julia Herz, Director of Craft Beer Marketing for the Brewers Association, concluded, "Craft beer market share is steadily and consistently growing. A grassroots movement is responsible for this success as appreciators continue to trade up."<sup>5</sup>

---

<sup>3</sup><http://www.thefreelibrary.com/Craft+Beer+Segment+Continues+to+Set+the+Pace+for+the+Beer+Cateory...-a0167648025>

<sup>4</sup> François Biron. Agronome. Ministère de l'Agriculture des Pêcheries et de l'Alimentation Québec. Guest Speaker. 2010 Winter Hops Conference. UVM Extension. 3/26/2010.

<sup>5</sup><http://www.thefreelibrary.com/Craft+Beer+Segment+Continues+to+Set+the+Pace+for+the+Beer+Cateory...-a0167648025>

- To further express this point, while overall beer sales were down 2.2% in 2009, craft beer sales rose 10.3%.<sup>6</sup>
3. The nature of the craft beer industry is built on product differentiation, tradition, innovation, quality, integrity, and community.<sup>7</sup> These qualities all lend themselves to supporting a local commercial hop production effort. Craft brewers' desire for freshness and quality, their support of local economies, their interest in uniqueness as opposed to ubiquity all help influence their purchasing decision making, and thus they are not solely buying on price. This support has been researched and quantified through this feasibility study.
  4. The size and scale of the micro and craft breweries (they must produce less than 2 million barrels per year<sup>8</sup>) place them in a position to be able to work with smaller scale local commercial hop production. They can more easily adapt to incorporating local hops into their production and recipes, and their volume needs, or a portion of their volume needs, are of a size and scale that would be feasible for New England producers to attain and supply on a consistent basis.

What has been done to date?

In 1988, the Vermont Department of Agriculture initiated hop production trials with Catamount Brewing Co. of Windsor, Vermont. Those trials were expanded by Dr. Leonard Perry at the University of Vermont. Reports on those trials are available at <http://www.uvm.edu/~pass/perry/hops.html>.

In September 2008, a small team from Vermont and Massachusetts traveled to Germany, the Czech Republic and Belgium to learn more about equipment used there for harvesting and processing hops. The team met with numerous farmers who produced, harvested, and processed hops and with manufacturers of hop harvesting and processing equipment.<sup>9</sup>

In 2009 the Vermont Agency of Agriculture Food and Markets and the Massachusetts Department of Agricultural Resources secured USDA Specialty Crop Block grants for this feasibility study to be conducted and for UVM Extension to develop and establish an organic hopyard trialing 20 hop varieties and different cover cropping techniques.

---

<sup>6</sup> <http://www.brewersassociation.org/pages/business-tools/craft-brewing-statistics/facts>

<sup>7</sup> <http://www.brewersassociation.org/pages/business-tools/craft-brewing-statistics/craft-brewer-defined>

<sup>8</sup> <http://www.brewersassociation.org/pages/business-tools/craft-brewing-statistics/craft-brewer-defined>

<sup>9</sup> Information provided by Steve Justis, Vermont Agency of Agriculture, Food and Markets, August 2009.

## Methodology

To complete the feasibility study, the first step was to research market demand and product specifications for the finished product. Craft brewers, brew pubs and homebrew supply stores in ME, MA, NH, and VT were identified as the direct prospective target market for a New England grown hop.

A survey questionnaire was developed (see appendices). The questionnaire was available by Survey Monkey, as an e-mail attachment, and as a telephone interview. 72 brewers were contacted and requested to participate. Follow up was made by telephone and e-mail. 47 responses were received, a 65% response rate.

The intent of the survey was:

- to determine what varieties of hops these brewers use
- what volume of these hops they use
- what they pay
- how these prices fluctuate
- what purchasing relationships they are engaged in
- what the parameters or limiting factors of these relationships are
- what they would find most valuable in influencing their purchasing decision for New England hops
- what the finished product would need to be for them to consider using a New England hop
- what they would consider a fair price for a New England hop

After conducting the market research, the study turned to hop production feasibility. Could hops grow in New England, what are the bottlenecks to commercial production? Bottlenecks researched included:

- access to and cost of raw materials for hopyard establishment
- access to and cost of mechanized harvesting equipment
- access to and cost of secondary processing
- growing conditions
- issues affecting crop yield

Following research on the bottlenecks, production models for a 1 to 10 acre hopyard were explored. Four production models were developed that could present a financially and logistically feasible commercial hop growing venture.

The information was then summarized into this final report.

### Initial findings

Brewers who responded to this study were universally interested in buying New England hops: 94%, 44 out of 47 respondents indicated an interest in purchasing New England hops. This conclusion is supported by research conducted in 2009 by Duncan Hilchey of New Leaf Publishing and Consulting, Ithaca, NY.<sup>10</sup>

While the brewers who responded to this feasibility study may not be representative of the entire New England brewing community, their responses did achieve the market research goals of the study which were to

- A. Determine if there is sufficient demand to absorb a minimum of 100,000 lbs of dried, New England aroma hops per year, and at what price point
- B. Develop a highly qualified prospect list

The highly qualified prospect list is composed of those brewers who asked to remain involved as the project as research and development, unfolds. They are highlighted in **Bold** under the brewers consulted in the appendices.

### **Key purchasing decision making factors**

#### Price

Brewers are highly price sensitive. While they are interested in buying local hops, price will be a key factor. The primary price ranges considered as acceptable price points at which brewers would purchase local hops if they met their other requirements were: \$5/lb, \$8-10/lb, and \$10-15/lb. At the \$5-10/lb brewers would consider sourcing 100% of their hops from New England producers if the finished product was interchangeable with their existing supply in terms of product deliverable.

#### Product Quality

Making beer is both a science and an art form. There are many nuances that can affect the final product. Because of this, the ultimate achievement of a brewer is when they can consistently produce the same finished product in taste, aroma, appearance, and mouth-feel, brew after brew, from brewhouse to brewhouse. Because hops create a signature aroma and flavor profile for a beer, hops are a key ingredient in any beer recipe. Because the chemical make up of hops may change from harvest to harvest depending on growing conditions and geographic region, the more the brewer knows about the make up of each

---

<sup>10</sup> Hilchey, D. *The Market Potential for Northeastern-Grown Hops*. New Leaf Publishing and Consulting, Inc. 2009.

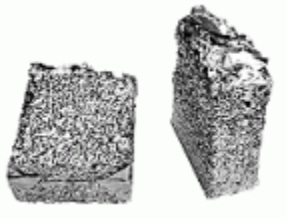
shipment of hops he receives the more he can adjust his recipe so that the end result will be consistent with prior brews.

To meet product quality requirements, New England hops will need to be submitted to a lab for chemical analysis and a chemical analysis will need to accompany each hop shipment.

### Product Specifications

While the brewer can't control the chemical makeup of a hop from harvest to harvest, he has come to expect his hops to look and perform a certain way.

In order to meet product specifications to be considered a viable alternative, a New England hop would need to be pelletized to a T-90 standard, packaged in Nitrogen flushed, vacuum sealed, foil laminated pouches, and encased in cardboard boxes. There are two standard offerings, four 11lb pouches to a 44 lb box, or one 44lb pouch to a 44lb box.



11lb pouches of vacuum sealed, nitrogen flushed hop pellets.  
Photo courtesy <http://hops-extracts.com>



T-90 Pellets.  
Photo courtesy <http://hopunion.com>

## ***Purchasing Decision Influencers in buying “local” (New England grown) hops***

### Stable price point

Brewers are frustrated and increasingly vulnerable to volatile price points and product scarcity of hops on the spot market. This is especially disconcerting to them as the craft beer category continues to grow and brewers of all scale and size compete for access to hops to meet their growing and existing market demand.

### Personal relationships

Brewers, similar to bakers and chefs, take their craft seriously and personally. They appreciate having connections to those providing their ingredients because they know that the quality of the ingredients will ultimately impact the quality of the finished product. Having growers that they can develop a long lasting, personal relationship with will help supersede price as the ultimate purchasing decision making factor.

### Environmental awareness

New England’s craft brewers are well aware that the majority of the inputs into their products currently originate from the Mid-West, West Coast, and Europe. Anything they can do to help reduce their carbon foot print by being able to purchase inputs from closer sources would be appreciated.

### Local economic stimulation

New England craft brewers also understand the notion of local economy. Most of our craft brewers are local or regional producers whose products stay in New England, therefore keeping their purchasing dollars in New England further reinforces the likelihood that their own products will be purchased.

### Marketing

Craft brewers often tightly wrap their geographic locations into their corporate identity, leveraging “a sense of place” as a distinguishing attribute in their sales and marketing. By purchasing local ingredients they can further strengthen this marketing message.

### Market Research Survey Details

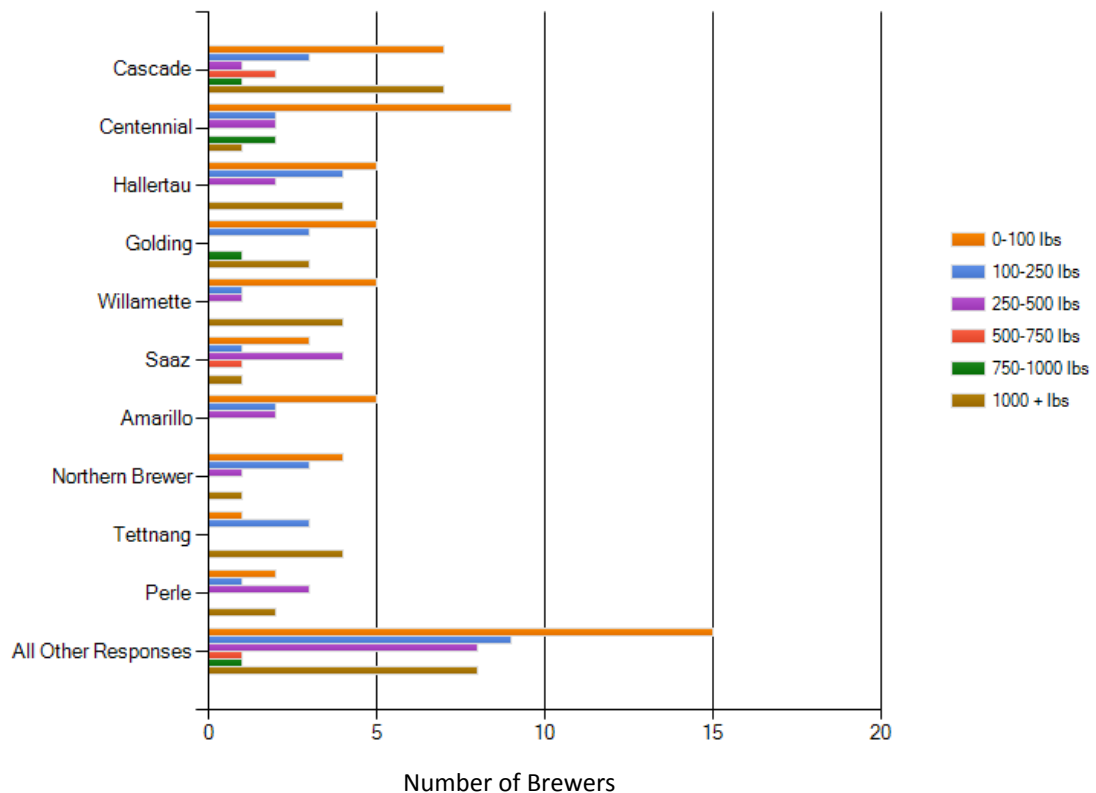
Of the 72 brewers, brew pubs, and home brew supply stores surveyed, 34 responded, for a total response rate of 47%. From the responses given, total barrels (bls) brewed (from 26 respondents) came to 370,970 bls per year, with an average of 14,268 bls per brewery. The smallest brewer claimed 210 bls per year, while the largest brewer cited 100,000 bls per year.

#### Hop Varieties & Volume

The most prevalent hop used by the brewers was Cascade, followed by Hallertau, Centennial, Golding, and Willamette, see chart below.

Total volume of hops used annually by 21 breweries reporting came to 126,482 lbs of dried hops per year, and 2,600 lbs of wet hops per year.

**What are the top 5 hop varieties used by your brewery, and approximately how many pounds of each do you use? (If more than 1000 lbs are used, please specify below.)**



The total volume of Cascade hops used by 30 reporting breweries came to 81,860 lbs per year. Volumes of the next nine most prevalent hops were as follows:

Hallertau 6,436 lbs/yr from 15 respondents  
Centennial 5,400 lbs/yr from 16 respondents  
Golding 5,250 lbs/yr from 12 respondents  
Willamette 5,250 lbs/yr from 11 respondents  
Tettnang 4,850 lbs/yr from 8 respondents  
Perle 3,950 lbs/yr from 8 respondents  
Saaz 3,550 lbs/yr from 9 respondents  
Magnum 3,250 lbs/yr from 5 respondents  
Nugget: 2,750lbs lbs/yr from 4 respondents  
Northern Brewer 2,650 lbs/yr from 9 respondents  
Columbus 2,000 lbs/yr from 8 respondents  
Glacier 1,850 lbs/yr from 3 respondents

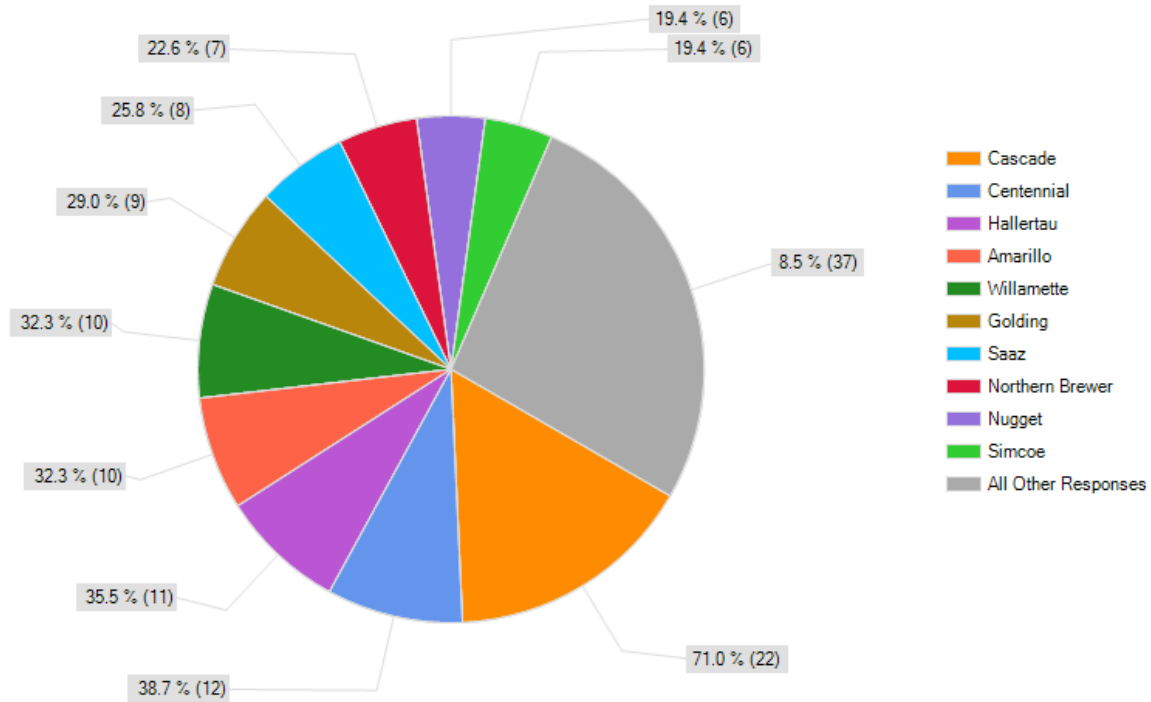
In addition to seeking to understand the brewers' current hop usage and volume, the study asked their preference in what varieties they would be more interested in seeing from a New England source, see chart on page 12.

Cascade topped the list with 71%, 22 of 31 respondents, demonstrating an interest in a New England Cascade. Centennial was the next most requested with 39%, 12 of 31 respondents, asking for it. The brewer responses present themselves favorably in terms of the logistical feasibility of being able to meet their variety preferences because Cascade and Centennial happen to be two of the varieties that outperform other varieties in New England.<sup>11</sup>

---

<sup>11</sup> Information derived from current New England hop growers including Eugene L'Etoile, 1997 UVM Extension Hops Trials, and UVM Extension Grower Survey.

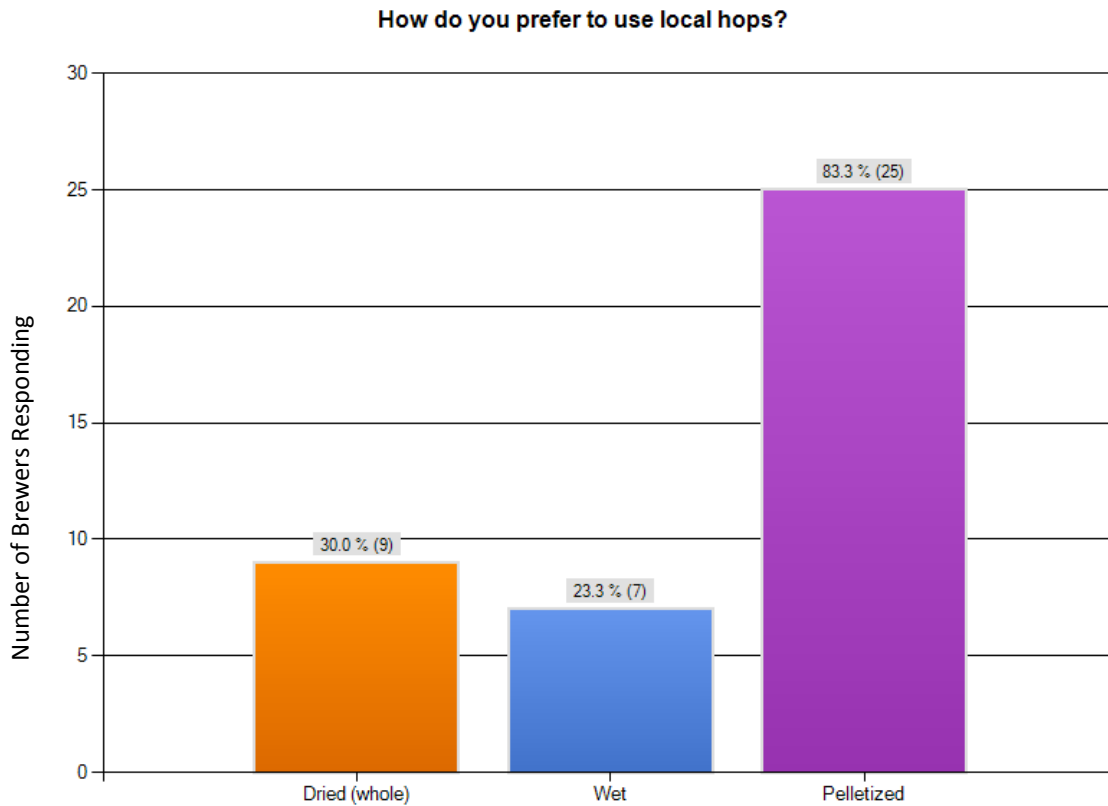
**Which varieties would you like to see more available from a local source?**



Whole Leaf vs Pelletized Hops

83%, 25 of 30 respondents, said they required pelletized hops. 30%, 9 of 30 respondents, said they use or could use dried whole hops. 23%, 7 of 30 respondents, said they could use wet whole hops. The total volume of wet, whole leaf hops used annually by these 7 respondents came to 2,600lbs. The total volume of dried whole leaf hops used annually by these 8 respondents came to 3,750 lbs, and the total volume of pelletized hops used by the 24 respondents came to 122,732 lbs (see chart on page 13).

At these volumes, wet hops could support less than one acre of commercial production, dry whole hops could support up to 4 acres, and pelletized hops could support up to 120 acres.



### Aroma vs Bittering

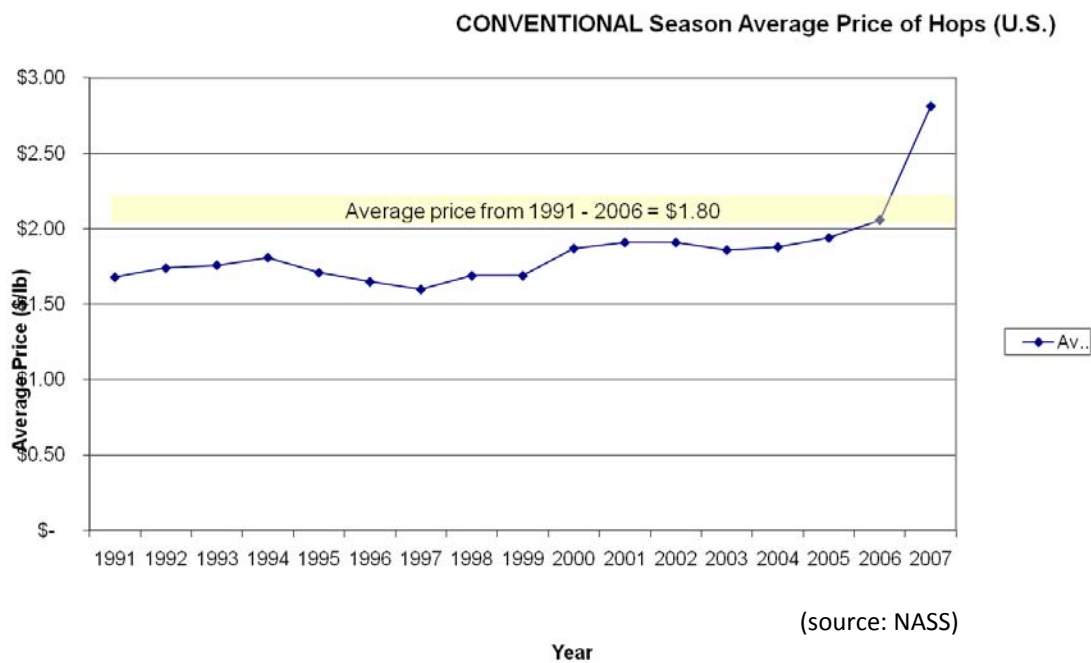
The feasibility of commercial hop production in New England will need to focus on aroma hops, or dual purpose hops over bittering hops from New England. This is because:

1. **Price:** Bittering hops function as their name says, they provide bitterness to a beer, the backbone upon which aroma hops then layer complexity, flavor and aroma. Because of this, bittering hops have evolved into a highly commoditized product with a non-elastic, price point averaging \$1-3/lb. Only large scale operations focused on efficiencies of scale can compete in this market. Aroma hops, on the other hand, maintain product differentiation capabilities that add value and can command a higher, and more elastic, price point. Aroma hops price points can range as high as \$25+/lb.
2. **Contracts:** Brewers typically lock in multi-year contracts for bittering hops. While they will also lock in contracts for certain quantities of aroma hops they know they need, they tend to reserve some of their budget for unexpected purchases, enabling them flexibility to experiment and innovate. This opens the door for them to purchase a New England hop.

3. Growing Conditions: Bittering hops are high alpha acid hops which are known to be difficult to grow in New England. Having a high alpha acid content is not a prerequisite to an aroma hop.
4. Craft Brewer Audience: Craft brewers are more likely to explore with new beer offerings, and seek out new, different or unusual aroma hop varieties. Craft brewers are more likely to appreciate the value of terroir, unique traits in a hop that are derived from the region in which it was grown, in an aroma hop.
5. Product Specifications: Because aroma hops can be added at different stages during the brewing process, there are opportunities for non-pelletized hops so even small scale commercial growers interested in selling whole dried or wet hops could participate.
6. Certain aroma hop varieties are particularly well suited to growing in New England and are also in high demand from the craft brewing community. These include Cascade, Centennial, Willamette, Chinook, and Nugget.

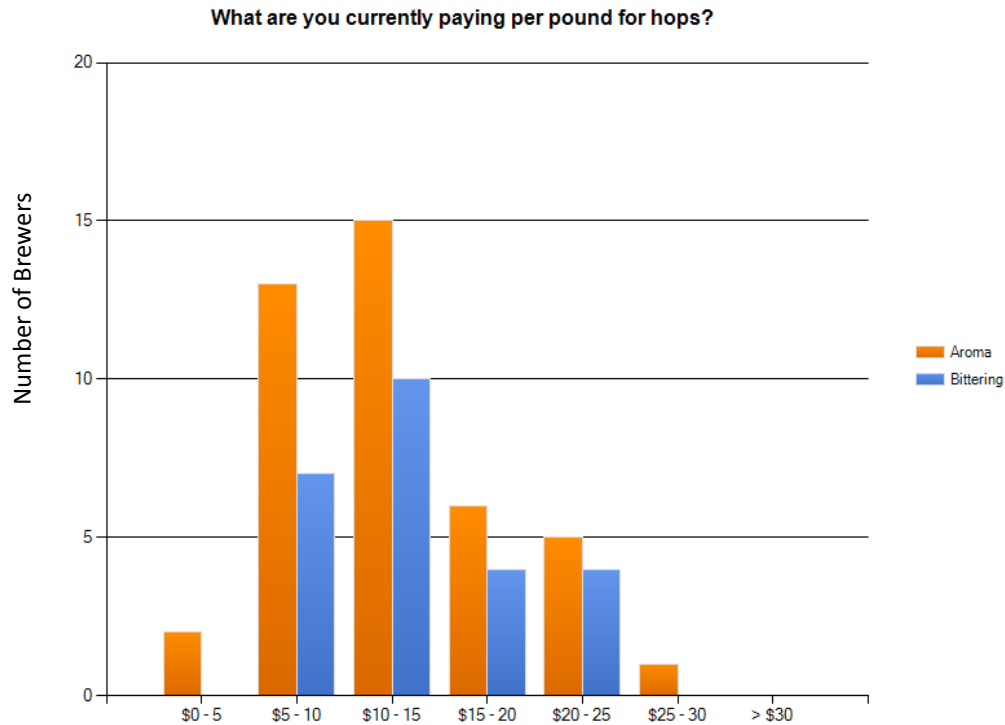
### Price Points

In terms of pricing the issue is complex. The historical average price for dried hops from 1991-2006 was \$1.80/lb, see chart below. However, in 2007, failed European crops, declining acreage worldwide, a Yakima warehouse fire and other factors conspired to send spot prices soaring from \$2 and \$3 a pound to \$30 or more.<sup>12</sup>



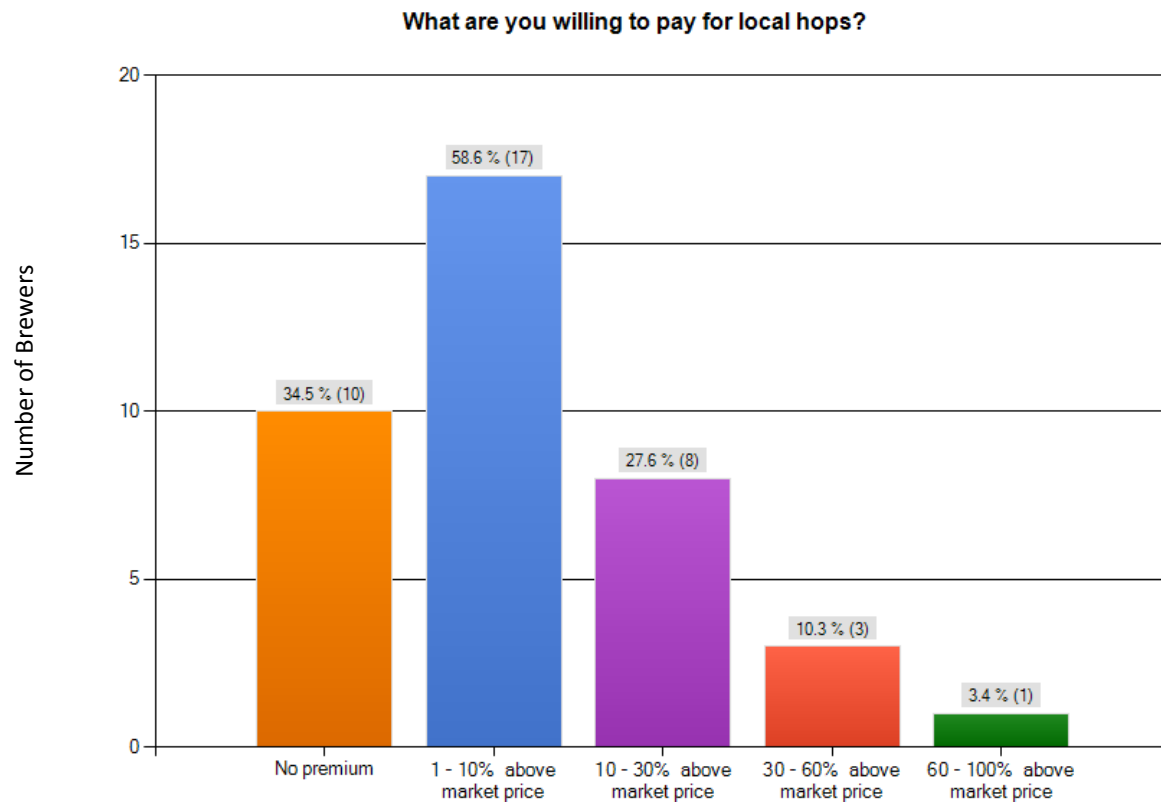
<sup>12</sup> Fayston, J. "The 2007 hops shortage is over, the glut of '09 is here..." The Oregonian.10/28/2009.

Brewers reacted by entering into multi-year contracts at the height of the crisis simply to ensure they would be guaranteed a supply of hops. In some cases this has tied brewers into 3-5 year contracts at a \$15-30/lb price point, not necessarily including shipping, even though the shortage is now over and the spot market pricing is back down to \$5/lb.



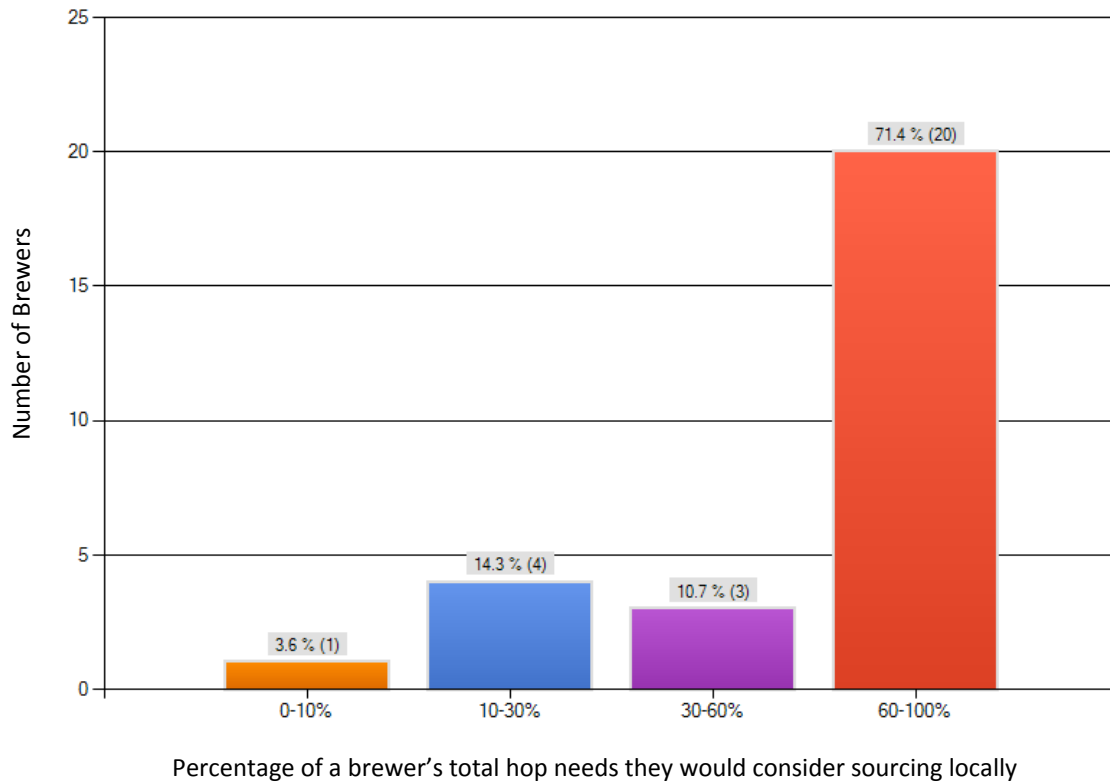
Because of the severe volatility in commodity pricing and product shortage that the brewing industry experienced, the majority of brewers surveyed reported that they would elect long term commitments with local growers over commodity contracts and spot market purchasing, and would be willing to pay a consistent price for this to happen even if the price were higher than the spot market price, as long as both parties felt they were being well served.

Following is a chart demonstrating what brewers have suggested they would consider a fair price for New England hops. Note that the current spot market price is averaging \$5-8/lb.



A few of the brewers considered \$5/lb a fair price point and believed that was still favorable even though it's equivalent to current spot market pricing because historically spot market pricing has averaged \$1.80/lb and the spot market could easily slip back to this level. The majority felt that \$8-10/lb for New England hops would be reasonable.

**At the price point you've identified above, how much of your hops would you source locally if available?**



At the price point brewers identified as a price they felt fair for local hops, the study then asked how much of the total percentage of their hop needs they would source locally if it were available. The majority of brewers said they would be interested in sourcing 100% of their hop needs locally if the quality matched their expectations and the price point fell within \$5-10/lb. Above this price point brewers would still consider buying local hops but only as a percentage of their total hop needs.

## Production Feasibility

The first question to ask regarding production feasibility is, “can a New England grower grow what the brewers want?” As noted earlier in the research, the answer to this is: yes. Cascade is the most requested hop, and is a variety that grows well in New England. In addition to Cascade there are several other varieties that could grow well here and would be of interest to the brewing community. Brewers have also expressed an interest in experimenting with any new, unique cultivars the region can come up with. Having a hop unique to our region could strengthen the element of “terroir,” piquing global industry interest, and providing a reason to justify a premium price point.

### Growing Conditions

According to the Hops Atlas<sup>13</sup> optimal conditions for growing hops are as follows:

- a latitude between 35-55 degrees
- average temperature from April through September between 10-19°C
- average precipitation from April through September of 64 -569 mm
- average daylight during these months between 10-19 hrs/day

These findings were derived by taking the climate data for top hop growing regions in the world: George, South Africa; Tasmania and Victoria Australia; Rio Negro Argentina; Oregon and Yakima, US; Hallertau, Germany; Saaz, Czech; and Wye England.

In addition, the atlas identified well draining sandy loam as the best soil for growing hops.

Given these parameters, it looks like New England has every capability to compete for commercial hop growing. From a very basic feasibility capacity, the right growing conditions do exist:

- the average latitude is in the 40's
- the average temperature from April through September 15.5°C (60°F)
- the average precipitation from April through September is 525-550 mm
- the average hours of daylight from April through September is 13.5hrs/day
- the Farmland Classifications System for VT Soils highlights Franklin, Addison and Rutland counties as counties with sandy loam soils. Massachusetts soils in Franklin and Worcester Counties are also known to be well-drained, sandy loam soils.

---

<sup>13</sup> Barth, Joh Heinrich, Klinke, Christiane, Schmidt, Claus. The Hop Atlas. Joh Barth & Sohn, Nuremberg, Germany. 1994.

A key caveat for growing hops in New England, however, will be the issue of bedrock. To erect the hopyard trellis, the poles need to be seated at least 3-4' in the ground, which means one needs 3-4' of top soil before hitting bedrock. In much of New England the bedrock lies less than 3' below the surface. While it is possible to adapt and improve a poor growing medium, it is not so easy or cost effective to blast through bedrock. So care will need to be given to evaluating the bedrock situation for each prospective site prior to any decision being made on desire to establish a hopyard.

Now that parameters required for growing hops have been established, what will it cost to build a hopyard and grow hops, and is it cost effective?

### Infrastructure

As commercial hop growing moved West in the early 20<sup>th</sup> century, infrastructure for value added processing of hops in the Northeast died. In order to develop a resurgence of a commercially viable hop crop, tools, techniques, equipment, and services will be required to help growers establish their hopyards cost effectively, and provide them with the ability to transform their raw hops into the finished product brewers need.

At present, there are few hopyard suppliers growers can turn to for small scale commercial operations. Growers are often forced to pay retail prices for supplies such as rhizomes, cables, and the simple thought of being able to source up to one hundred 22-24' poles can be daunting. While accessibility is already a weakness, it can be exacerbated by the issue of quality. The sourcing of quality rhizomes in particular can be very difficult, even when buying from supposedly trusted sources. Both local growers and UVM Extension have received hops that were diseased, infested or otherwise of less than ideal quality.<sup>14</sup>

In addition to the difficulties involved in locating materials and supplies, the cost of establishing a hopyard can vary dramatically based on the design being used. Different designs will require more or less poles, more or less rhizomes, and so on. To provide an example of this, please refer to the appendices for a comparison of the supplies required and cost to establish a sampling of different hopyard designs.

### Infrastructure Solution

Gorst Valley Hops, was established in 2005 in Wisconsin to alleviate barriers to entry for small scale hop growers. The business has focused on identifying and solving the bottlenecks, and developing "best practices" for small scale hop growers to employ so that they can be commercially successful. Gorst Valley Hops has become a reputable source small mid-west growers interested in commercially growing hops can turn to.

---

<sup>14</sup> Phone conversations with Gene L'Etoile, Four Star Farm, and Rosalie Madden, UVM Extension, August, 2010.

The commercial model Gorst Valley has developed works such that all three parties- the brewer, the processor, and the grower- benefit.<sup>15</sup> The Gorst Valley model is based on a “value-share” charter grower program, in which the growers agree to send their annual hops harvest to Gorst Valley. In return, Gorst Valley provides them with their researched and tested high density hopyard design, technical assistance to implement it, ongoing technical support during the growing season for the first four years, direct sourcing and wholesale pricing of all the source materials required to establish their hopyard, access to equipment innovations and research and development, and a marketing outlet that strives for a fair and profitable price for 100% of their harvest. In this model Gorst Valley shares the proceeds of the hop sales 60-40 with 60% going back to the growers.

The ability for growers to have access to a replicable, proven design for optimal yield and productivity for a small scale commercial hopyard, complete with access to commercially available source materials at wholesale pricing, with quality assured rhizomes is the first requirement to creating a commercially viable hop crop. To this end, Atlantic Hops, a new venture being launched by Michael Roffman, in partnership with Gorst Valley Hops will be opening in the Northeast in 2011. Atlantic Hops intends to establish a Northeast value-share grower program and act as a distributor of Gorst Valley products and services to New England commercial hop growers.<sup>16</sup>

### Secondary Processing

Even with barriers to entry removed from the growing operation, issues persist. Access to secondary processing is the next hurdle. Brewers are looking for a T-90 pellet product, packaged in vacuum sealed, nitrogen flushed foil laminated pouches.

What is a T-90 Pellet, how is it made, and how is it packaged?

“T-90 Pellets (are) a milled and pelletized preparation from whole leaf hops... T-90 hop pellets are prepared from leaf hops which have been hammer-milled into a powder and the powder subsequently pelletized by passing through a conventional pellet die. They contain all the vegetative and lupulin material of raw leaf hops and can be used as a full replacement for leaf hops in the brewing process. Baled hops are broken up and passed into an air-stream which delivers them to a hammer-mill. Heavy foreign materials drop out and metal fragments are removed using magnets. The cone hops are milled until they pass through a sieve which is commonly of a 9-12 mm mesh. The powder from many bales is mixed and homogenized in a blender and then conveyed to a pellet die, most commonly 4 or 6 mm in diameter. The pellets are immediately cooled, normally to a temperature of between 1 - 7<sup>o</sup> C. Cooled pellets pass over a shaker where dust is removed and re-circulated through the plant. The "clean" pellets are packaged in

---

<sup>15</sup> Phone conversation with James Altwies, founder, Gorst Valley Hops, September 7, 2010.

<sup>16</sup> Phone conversation with Michael Roffman, founder, Atlantic Hops, August, 2010.

laminated, plastic/aluminum foil pouches, evacuated and boxed. The packs may be back-flushed with carbon dioxide or nitrogen gas to produce a soft pack container.”<sup>17</sup>

While it is possible to conduct this secondary processing on farm, many farms may not be interested in doing more than growing the crop, and many are finding it difficult to source and obtain satisfactory results with their secondary processing equipment.<sup>18</sup> Atlantic Hops will provide commercial processing of New England hops that will ensure secondary processing is no longer a barrier to entry, and that New England can produce a consistent, professional grade finished product. Atlantic Hops will offer its value-share grower program for growers who are simply interested in growing the crop, it will also offers it services for hire to growers who would like to grow and sell their own hops but would like to pay for the secondary processing services.

### Critical Mass

Even if each farm produces its own T-90 pelletized product that has been chemically analyzed, and packaged in a nitrogen flushed, vacuum sealed foil laminated pouch, the fact remains that most growers will be looking at an average size of a one acre hopyard, at least initially. A one acre hopyard is expected to yield an average of 1,500 dried pounds of finished product. This yield will limit the prospective target market because larger craft brewers will require more product than a single farmer can produce. Given the product of a single varietal will differ from farm to farm, a brewer cannot easily combine them, even if he adapts his recipe. According to Michael Gerhart, head brewer at Otter Creek Brewing, “We try to buy all our hops at one time and from the same crop so we know the information per hops will be standard for the whole crop we are buying and the recipe we will be making for that year.”<sup>19</sup>

By combining hops from multiple New England farms together, Atlantic Hops will be able to develop critical volume of each varietal it offers so that craft brewers of all size and scale can purchase from a homogeneous product. In combining multiple farms’ hops together, idiosyncrasies from each grower are also minimized, thus creating a product that is more consistently in line with the standard profile for that hop variety. By having critical mass, and a regional product that brands the region first and foremost, Atlantic Hops can attract awareness for the region’s efforts, which in the end will facilitate the marketing efforts of individual producers.

---

<sup>17</sup> <http://www.hopunion.com/hoppowderpellets.html>

<sup>18</sup> Conference Call with Roger Rainville, Borderview Farm and Ag Research Facility, 9/17/2010.

<sup>19</sup> Conference Call with Michael Gerhart, Head Brewer, Otter Creek Brewing Company, 7/6/2010.

## Cash flow

The final requirement is cash flow. Once the infrastructure is in place, can the hopyards operate in a manner that is financially feasible?

To assist its growers in becoming financially viable, Gorst Valley Hops, has researched growing and harvesting techniques to optimize yield, and is developing equipment for small scale acreage that optimizes efficiency. In the summer of 2010, for example, Gorst Valley Hops conducted harvesting studies to determine the most advantageous techniques for hand harvesting on a commercial scale. They also began testing a mechanical picker they designed.

According to estimates provided by local New England growers, UVM Extension, and a commercial grower in Washington, manual harvesting on average yields 1 lb of dried hops per hour,<sup>20</sup> see table below.

### Manual harvesting estimates given

Rick Pedersen, Pedersen Farms, NY	1 lb dried hops (1 bine) per hour (1lb/hr)
Jason Perrault, Perrault Farms, Inc, WA	100 people, 30 days, 13 acres (1.08lbs/hr)
Gene L'Etoile, Four Star Farm, MA	1 lb dried hops (1 bine) per hour(1lb/hr)
Leonard Perry, UVM Extension, VT	24 man hours to pick 5 lbs of dried hops, (0.21lbs/hour)

At a rate of 1 lb of dried hops per hour, it will be near to impossible to generate a positive cash flow for a commercial hop venture.

In the Gorst Valley Hops trials, however, they determined that if the grower cut the entire bine but only harvested the top one third of the bine, where 94% of the hop cones resided, the grower would reduce picking time by 42%, to 35 minutes per dried lb. By going a step further and “stripping the bine, and sorting the cones on a mesh screen,” the grower could reduce picking time to 20 minutes per dried lb. Using a mechanized picker and mechanized sorter, the grower can reduce the time to 3 minutes per dried lb, a 95% efficiency gain.<sup>21</sup>

If a grower were to employ Gorst Valley Hops harvesting techniques, and utilize a mechanical harvester and sorter, the hop feasibility equation can be transformed into a financially rewarding outlook for commercial hop growing in New England. Please refer to the attached cash flows for details.

<sup>20</sup> Information provided by Rick Pedersen, Pederson Farm, NY, 3/26/2010, Jason Perrault, Perrault Farms, WA, 3/26/2010, Gene L'Etoile, Four Star Farms, MA, 8/20/2010, and <http://www.uvm.edu/~pass/perry/hops.html>.

<sup>21</sup> E-mail communication from James Altwies, founder, Gorst Valley Hops, 9/14/2010.

Note that in all four scenarios of sales and distribution (participating in the value-share program; selling whole dried hops; using Atlantic Hops processing services; or doing on-farm pelletizing), only the cash flow models that employ “stripping and sorting” and “mechanized harvesting” offer a positive return on investment, and only the mechanized harvesting cash flow models offer the possibility of a substantial annual net income.

To develop the cash flows, the study assumed the following:

*Income*

price points for dried whole hops: \$10/lb

price point for pelletized hops: \$15/lb

income to grower from value-share program: \$9/lb (60% of \$15/lb)

*Expense*

operating expenses not including labor and processing: \$2,500/acre per year<sup>22</sup>

*Infrastructure Expense*

Growers involved in the value-share program can expect to pay approximately \$10,000 to establish a one acre hopyard. Growers not in the value-share program can expect to pay approximately \$12,000 to establish a one acre hopyard, see appendices for sample hopyard infrastructure budgets.

*Yield*

A yield of 1,500 dried pounds per acre was used as the average expected yield. This number was derived from historic average yields from Gorst Valley Hops growers from average yielding varieties.

---

<sup>22</sup> Conservative estimated derived from historic actual data from Gorst Valley Hops growers

## Other Issues Affecting Growing Capability and Commercial Production

According to experienced grower, Rick Pedersen, Pedersen Farms, NY, while hops may be a high maintenance crop, this is true of any field crop. In Rick's experience, hops are similar to field corn. If you know how to grow field corn successfully, you should be able to do well with hops.<sup>23</sup> Following are certain specific elements of the operation that can affect the success of commercial hop growers.

### Disease & Pests

Hops have been notorious as a crop that grows well in the wild but whose commercial cultivars tend to be problematic. Hops are easily susceptible to downy mildew, powdery mildew, aphids, and spider mites. A rigorous pest and disease management regime will be a required element of any commercial growing operation.

### Nutrients

Nutrients and soil amendments can both boost a plant's productivity and alleviate disease and pest pressure. Hops prefer a pH of 6.0-6.2, or a mildly acidic soil. Growers should test their fields annually and amend their soils to provide the ideal growing medium for their plants. Note that amending soils based on their specific needs is critical because over application of Nitrogen based fertilizer will cause "sappy growth" that is particularly susceptible to disease and pests.<sup>24</sup>

In addition to amending the soil for fertility, there are also amendments being designed to assist with disease and pest control. A new product from Germany for example, Biplantol Mykos V, is an organic amendment that is absorbed by the capillary root system and fortifies a plant's resistance to bacteria and fungal infestation including powdery and downy mildew. The result is a healthy and vital plant, which can more readily withstand pest and disease pressure.<sup>25</sup> UVM Extension is trialing other soil amendments and ground covers to be able to provide further recommendations for New England hop growers.

### Irrigation

Hops, similar to Cucurbitaceae enjoy, and require, watering, but overhead watering will encourage and spread disease. Therefore installation and use of drip irrigation is recommended for commercial growers. The bines also need good airflow and spacing between them to encourage a dry, disease free environment. Hop roots prefer a well

<sup>23</sup> *Hopping to It! Conference*, Rick Pedersen Presentation, March 26, 2010.

<sup>24</sup> Kneen, Rebecca. *Small Scale Organic Hop Production*. Left Fields BC. 2004.

<sup>25</sup> <https://www.biplantol.com/produkte.php?content=3>

drained soil. If a grower has heavy soil, installing a drainage system will be an important factor to help ensure a successful hopyard.

### Timing of Events in the Growing Season

Hops require specific timely attention to plant pruning, irrigation, and harvesting. Hops must be picked when fully ripe. Early harvesting can hinder lupulin development and lower alpha acid content by up to 20%. Late harvesting can lower them by as much as 10%.<sup>26</sup> In essence this is typical of any field crop. Experienced growers learn to understand the nuances of each crop they grow, and with a little experience and effort, especially being able to benefit from the knowledge of other small scale hop growing experts who have undergone recent trial and error such as the growers from Gorst Valley, bringing our New England growers up to speed is possible.

### Yield

Yield can vary greatly by variety, by weather conditions, and by individual farm growing practices, philosophies, and goals. As an example, a plant's individual yield can vary by as much as 40% depending on what time the irrigation was run prior to harvest. Because of this, James, at Gorst Valley Hops, has found it beneficial for farms to develop production goals and production metrics based on individual plant productivity instead of overall yield per acre. "When farms focus on helping each plant reach its full potential, they see an increase in overall yield because they identified with each plant growth stage, working to maximize the potential at each step, which in turn equates to more consistent yield. When growers measure crop inputs and production based on pounds per acre they tend to overlook the nuances of productivity. At our size and scale, a focus on efficiency over productivity negatively impacts financial return."<sup>27</sup>

At Gorst Valley Hops, an average producing hop variety can produce a low yield of 1,000 lbs of dried hops; an average yield of 1,500 lbs of dried hops, and a strong yield of 2,000 lbs of dried hops. Using the Gorst Valley Hops hopyard design and participating in the Atlantic Hops value-share grower program it is likely New England growers can achieve similar results.<sup>28</sup> Existing Northern grower Rick Pedersen, Pedersen Farm, NY averages 800-1,200 lbs of dried hops per acre (4,000-6,000 wet hops), however he acknowledged that his growing system is not fully optimized and he has not been able to provide individualized plant attention.<sup>29</sup> Gene L'Etoile

<sup>26</sup> Virant, Majda, Majer, Dusica. *Hop Storage Index – Indication of a Brewing Quality*. Institute of Hop Research and Brewing Zalec. January 2006.

<sup>27</sup> Email communication with James Altwies, founder, Gorst Valley Hops, 9/27/2010.

<sup>28</sup> Conference Call with James Altwies, founder, Gorst Valley Hops, 9/7/2010.

<sup>29</sup> *Hopping to It!* Conference, Rick Pedersen Presentation, March 26, 2010.

harvested 100 lbs of dried hops from 70 plants.<sup>30</sup> If this is extrapolated to the 1,283 plants per acre that Gorst Valley Hops recommends, this would extrapolate to a yield of 1,832 dried pounds per acre, which is in line with Gorst Valley Hops yield projections.

In estimating wet to dry yields, expect a shrinkage ratio of 1:5, therefore every wet lb harvested will yield 1/5<sup>th</sup> of a pound of dried hops.<sup>31</sup>

### Time to Maturity

When will hop plants reach full maturity?

It takes approximately four years for a hop bine to reach full maturity. In the first year expect no harvest, in the second year expect 40% of a full harvest, in the third year expect 90%, and in the 4<sup>th</sup> year plan on full production.<sup>32</sup>

1 <sup>st</sup> year	=	0% harvest
2 <sup>nd</sup> year	=	40% harvest
3 <sup>rd</sup> year	=	90% harvest
4 <sup>th</sup> year	=	100% harvest

### Low Trellis Systems/Curb Appeal

Another angle this research was to investigate was the interest or need for growing low trellis hops and the feasibility of doing so.

Traditionally grown hops are trained up strands of twine rigged across an 18-foot-high trellis system and then hand-tied at the top to a series of overhead cross wires. Come harvest, the hop-bearing vines are cut and hauled to picking and cleaning stations. With low trellis systems, plants train themselves up and across plastic mesh, or netting, on a 10-foot-high trellis system. Hops are harvested in the field by hand or using a mobile low-trellis hop picker. The vines are left on the mesh where they die off over the winter and re-grow the next spring.

The potential benefits of a low-trellis system include:

1. Better “curb appeal” especially for farms located in more urban environments such as Massachusetts. A low trellis system would be less visible from a distance and, being shorter in height, any spraying activities would draw less attention.

<sup>30</sup> Conference Call with Gene L’Etoile, Four Star Farm, 7/13/2010.

<sup>31</sup> *Hopping to It!* Conference, Rick Pedersen Presentation, March 26, 2010.

<sup>32</sup> E-mail correspondence from James Altwies, founder, Gorst Valley Hops, 9/23/2010.

2. Lower operating expenses. Lower trellises eliminate the need for stringing, in which twine is tied to the trellis wires, and training, in which the strongest shoots of each hop plant are trained up the string. They can also be easier to harvest. These changes could reduce annual labor expense by up to 30% per year.<sup>33</sup> Annual supplies expense can also be diminished because the mesh nets remain intact from year to year with a 10 year lifespan, unlike coir twine which needs to be replaced each year at an average cost of \$125/acre.<sup>34</sup> Low-trellis production systems also enable growers to apply pesticides with directed or covered sprayers that lower the amount of pesticides required, and they use less fertilizer, further reducing operating costs.<sup>35</sup>
3. Environmental benefits. Given the pesticides can be applied in a more targeted and direct effort, a lower amount of pesticides is required, thus lessening the amount of pesticide added to the environment and the risk for pesticide drift.<sup>36</sup> Conversely, however, this theory is questioned by Edward Page who notes that higher chemical use is required for tilling and pruning.<sup>37</sup>
4. Lower start up expenses/easier to establish. It is easier and less expensive to source and install 10-12' poles and nylon mesh than to purchase and install 20-24' poles and steel cabling. According to Edward Page, who did a cost comparison between high trellis and low trellis, it costs about half as much to set up a low trellis hopyard, \$6,000/acre.<sup>38</sup>

Despite these excellent benefits there are several issues affecting the commercial feasibility of growing low trellis hops in New England at this time.

1. Commercial low trellis harvesting equipment is cost prohibitive, ranging between \$200,000-\$400,000 per harvester.
2. Increased incidence of disease. According to Julien Venne, Project Manager at Québec's Centre de Recherche et de Développement Technologique Agricole de L'Outaouais, there is strong concern that in the Northeast's rainy, humid, and disease-prone climate, having bines over-winter would encourage disease if the spores of fungal diseases over winter on hop crowns and ligneous tissues. This could keep high levels of disease inoculums in the field and exacerbate the disease control process.<sup>39</sup> In the Pacific North West they are

---

<sup>33</sup> USDA-ARS. Lower Hop Trellises for Higher Profits. Crop Management. 21 January 2008.

<sup>34</sup> Ward, L. Yakima Herald-Republic. Some plastic mesh could save state hop farms. New technique has potential for the beer-making crop. May 30, 2005.

<sup>35</sup> USDA-ARS. Lower Hop Trellises for Higher Profits. Crop Management. 21 January 2008.

<sup>36</sup> <http://www.ars.usda.gov/is/AR/archive/jan08/hops0108.htm>

<sup>37</sup> Page, E. B. *Hop Trellising & Budgets*. 7/26/2008.

<sup>38</sup> Page, E. B. *Hop Trellising & Budgets*. 7/26/2008.

<sup>39</sup> Email Communication Julien Venne, Project Manager at Québec's Centre de Recherche et de Développement Technologique Agricole de L'Outaouais, 5/25/2010.

- experimenting with using disease resistant varieties and beating the bines off the mesh once they have frozen over in winter to counter this issue.
3. Limited varieties. Not all hops are suited to low-trellis management and many of the low trellis varieties that do exist are not in high-demand by the brewers.<sup>40</sup>
  4. Patents. Many low-trellis system and hop varieties are patented. This may present more difficulties and expense in sourcing varieties and hopyard supplies.
  5. Lower Yields. According to research conducted by Jason Perrault, Godin & Page, and John Henning, hops grown on a low trellis system will have a lower yield than high trellised hops. Yields could range anywhere from 20-50% less.<sup>41,42</sup> Because of this, geneticist John Henning is researching what gene or genes are responsible for shorter growth to aid in selection of hops varieties that may respond more favorably to low trellis systems.<sup>43</sup>

The conclusion regarding low trellis systems is that while it would be interesting to investigate, the clear path towards an immediate commercially viable hop crop would be to continue down the traditional high trellis hops path. The advent of more commercially available mobile harvesting machinery coupled with more research into low trellis hop varieties and the validation or refutation with respect to disease issues given the overwintering of hop crowns and ligneous tissues in New England winters will help further the discussion on the long term potential of a low trellis system. In the appendices is an expired patent for a mobile, low trellis harvester.

### On Farm/Do It Yourself Techniques

Given growers in New England have had to rely on their own ingenuity, trial and error, and personal expense to grow, harvest, and process hops in recent decades, several do-it-yourself, low cost solutions have been developed to solve production bottle necks.

#### *Do-It-Yourself Hop Pickers*

At present there are no commercially available hop pickers for 1-10 acre hopyards. Some farms have tried importing older machines from Eastern Europe, but access to parts and reliability are an issue. Because 1- 10 acre commercial hopyards were common in the early twentieth century, Germany alone had 80,000-100,000 hopyards that were one acre or less, and New York and Oregon operations of the time were

---

<sup>40</sup> Email communication with Rosalie Madden, UVM Extension, 5/25/2010.

<sup>41</sup> Page, E. B., Godin, R. "Hopyard Construction: Budgeting and Economics." CSU Ag Exp. Station.

<sup>42</sup> Email communication with Rosalie Madden, UVM Extension, 5/25/2010.

<sup>43</sup> <http://www.ars.usda.gov/is/AR/archive/jan08/hops0108.htm>.

comparable in size, yield, and production to these farms,<sup>44</sup> several patents for machines do exist for these scale operations. This study researched and re-circulated these patents in hopes new designs or machinists would be interested in building prototype machines that could be tested, and if effective, replicated and sold today. Copies of these patents are attached as appendices to this report. Three designs did emerge from this effort, two by local fabricator Hugo Gervais, and a third by Jeffery Cox. These designs would range in price from \$3,900 to \$27,000, the lower cost models handling approximately 1/3 of an acre and the more expensive models being able to handle multiple acres. Gorst Valley Hops is also designing and testing a small scale picker that will be able to manage up to an acre per hop variety, therefore a total of three acres if following the three variety hop planting. They plan to have the hop picker and a hop sorter combination available for sale through Atlantic Hops by 2012 for \$15,000 or less. All of these options are well under the \$250,000 expense of a picker designed for the large fields out West, and all able to provide a reasonable time frame for return on investment, of 5 years or less.

Note: When evaluating hop pickers it is essential to search for a design that will minimize “shatter” or damage to the hop. The average rate of damage experienced during hand harvesting hovers around 2%. Ideally one would want a mechanized picker to equal or improve on that rate. The Gorst Valley Hops picker is currently experiencing a shatter rate of below 2%.<sup>45</sup>

### *Do-It-Yourself Oasts*

Oasts can be built economically from materials around the farm. A five gallon pail with a 3” diameter computer fan and a mesh screen can dry up to a half pound of dried hops at a time (~2 hours worth of hand picking). A 30 gallon barrel garbage can with a 6” fan would further increase the volume of drying capacity; and a 16’x24’x8’ rectangle built out of wood or other materials, with an 18” to 2’ fan and a nylon mesh secured midway down could dry up to ¼ of an acre at a time.<sup>46</sup>

In addition to self-made options, Atlantic Hops will offer Gorst Valley Hops oast designs and oast kits for New England hop growers. The cost of a Gorst Valley Hops Oast will be highly dependent on the fan size needed as their design uses an inverse blowing technique, rather than blowing air into the hops, it is sucking air through the hops. An oast for a one acre hopyard oast will run approximately \$5,000, an oast for 2-5 acres will run approximately \$10,000 and an oast for 5+ acres will run approximately \$17,500.

---

<sup>44</sup> Barth, Joh Heinrich, Klinke, Christiane, Schmidt, Claus. The Hop Atlas. Joh Barth & Sohn, Nuremberg, Germany. 1994.

<sup>45</sup> Phone Conversation with James Altwies, founder, Gorst Valley Hops, 9/7/2010.

<sup>46</sup> Phone Conversation with New England hop grower Jonathan Blumberg, August 8, 2010.



Exterior view of a home made oast. Supplies are simple 2x4's to create the frame, 1x2's to affix the screen, a 4'x8' screen, tyvek to form the walls, and a circular fan. Picture of Gene L'Etoile's Four Star Farms, MA. Photo credit r.wilson



Inside of a home made oast, note the mesh screen installed partway up to allow air to circulate below and above the hops. Note the series of oasts in the background, enabling more volume to be drying simultaneously. Picture of Gene L'Etoile's Four Star Farms, MA. Photo credit r.wilson

### *Do-It-Yourself Sorting*

Sorting mechanisms enable a grower to go from hand picking hops one by one off the bine to stripping them into a pile on a sorting table and quickly extricating the hops from the chaff. Sorting is an area of the harvesting process that can greatly increase a grower's efficiency. James Altwies, founder of Gorst Valley Hops, notes that to be commercially viable, growers can't overly concern themselves with removing 100% of the stems and leaves. According to Altwies, the national industry standards allow for up to 2.5% of stem and leaf substance to remain attached to a hop and still be called hops. So one can leave up to an inch of stem attached to a hop and have it still approved as a hop. A homemade sorting system can be achieved through creating a series of sorting tables out of meshed screens affixed to a rectangular frame. A 1" screen would be used first to sort out big leaves, allowing the hops to fall onto a second .25" mesh screen that can then be used to sort out final debris and allow a sorter to remove any excess detritus from a hop before ushering the cones into boxes that can then be sent to dry.

For optimal efficiency, mechanizing one's sorting system is advised. Gorst Valley Hops offers a mechanized, angled, oscillating sorting system that has capacity for one acre per hop variety. The Gorst Valley Hops sorter combined with the Gorst Valley Hops hop picker is expected to be available from Atlantic Hops in 2012 at a total price point of \$15,000 or less.<sup>47</sup>

### *Do-It-Yourself Compacting*

Ideally hops should be compacted down to 10lbs per cubic foot and bailed. This will make them easier to transport and help retain their storage quality.<sup>48</sup> Once compacted and bailed the hops can remain in refrigerated storage until sold or pelletized. At present there are no known commercially available compressors specifically designed for small scale hop growers. Existing growers have suggested using a trash compactor, or pressing down on a bag of hops using a screw auger plate, as relatively effective means to compress their hops.<sup>49</sup>

Gorst Valley Hops is currently investigating the need for compressing mechanisms for small scale hop growers.

---

<sup>47</sup> Conference call with James Altwies, Founder, Gorst Valley Hops, 9/7/2010.

<sup>48</sup> Phone Conversation with New England hop grower Jonathan Blumberg, August 8, 2010.

<sup>49</sup> Phone Conversation with New England hop grower Jonathan Blumberg, August 8, 2010.

### *Do-It-Yourself Pelletizing*

As demonstrated in the market research, an overwhelming number of brewers prefer or can only use pelletized hops. A low cost solution to creating one's own pellets is to grind hops into a powder using a kitchen meat grinder,<sup>50</sup> or ideally, a hammer mill, and sending them into a small scale pellet mill equipped with a ¼" die. A ¼" die will produce the 6mm (T-90) pellet that brewers are accustomed to.

Small sized hammer mills can be purchased for \$1,700 or less, and small scale pellet mills can be found for under \$2,400, see PelletPros under additional persons consulted for more information.<sup>5152</sup>



Small Scale Pellet Pros Hammermill. 130lb/hr capacity

<sup>50</sup> Conference call with Roger Rainville, UVM Extension hop research farm, 9/17/2010.

<sup>51</sup> [http://www.pleasanthillgrain.com/hammer\\_mill\\_pulverizer.aspx](http://www.pleasanthillgrain.com/hammer_mill_pulverizer.aspx);

<http://www.meadowsmills.com/forsalehm.htm>

<sup>52</sup> <http://www.pelletpros.com/id68.html>



Small Scale Pellet Pros Pellet Mill. 80lb/hr capacity

Note: The key concern to remember when pelletizing is that heat created during the process can damage the hops. Take care to process slowly and stop as often as needed to allow the machines to cool down. The hops and hop pellets should not reach a temperature higher than 112°F. To keep an eye on the temperature you can use an infrared thermometer, which can be found at most hardware stores, for approximately \$20. You can also alleviate how quickly the pellets heat up by pouring fewer hops in at a time. According to Roger Rainville, if you keep the feed slow you can keep the temperature down and process an average of 10 pounds every few minutes.<sup>53</sup>

#### *Do-It-Yourself Chemical Lab Analysis*

Several laboratories offer chemical analysis services, an in-exhaustive list is provided in the appendices. At a minimum, growers will need to have an analysis for alpha and beta acids completed on their hops. Information on moisture and oil content, will also be a requirement from some brewers. Gorst Valley also does a physical exam of their hops using the guidelines provided by the American Society of Brewing Chemists and the USDA. A copy of the completed analysis should accompany each package of hops sold.

<sup>53</sup> Conference call with Roger Rainville, UVM Extension hop research farm, 9/17/2010.

### *Do-It-Yourself Vacuum Seal Packaging*

While it will be difficult to achieve a nitrogen flush on a budget, one can at a minimum vacuum seal their pelletized and whole dried hops at home with simple tools such as the FoodSaver, home use food grade vacuum seal systems, that cost under \$200,<sup>54</sup> or by using vacuum seal Space Bags that are a larger solution and could meet the brewers requests for 11 lb and 44 lb packages.<sup>55</sup>

Note: Packaging and equipment needs to be food safe.

### *Do-It-Yourself Nitrogen/CO2 flushing and Vacuum Sealing*

For a more professional and commercial operation one can invest in a food grade nitrogen flushing, vacuum sealing machine for less than \$30,000. Several models of small scale machines that combine flushing with nitrogen and vacuum sealing are available from India, such as the two shown here by Fuji Impulse America<sup>56</sup> and Indvac<sup>57</sup>. The providers of the machines can also supply the foil laminated pouches required for packaging. The Fuji Impulse VG-602 which can provide up to a 600 mm length seal, ranges from \$21,000-24,000 and a set of 200 foil laminated pouches that would fit 11 lb/pouch run \$330/order. The complete product specifications for the Fuji Impulse VG-402/602 series are located in the appendices.



Fuji Impulse VG-402/602 Series Micro-Computer Controlled Nozzle type Vacuum and Gas Flushing Impulse Sealer.



Indvac nozzle type flushing and sealing machine.

<sup>54</sup> <http://www.foodsaver.com/Category.aspx?id=c&cid=87>

<sup>55</sup> <https://www.spacebag.com/10/PriceList.dtm>

<sup>56</sup> <http://fujiimpulseamerica.thomasnet.com/viewitems/impulse-sealers-vacuum-gas-flush-sealing/-controlled-nozzle-type-vacuum-gas-flushing-sealer>

<sup>57</sup> <http://www.indvacindia.com/nozzle-type-flushing-sealing-machines.htm>

### *Do-It-Yourself Climate Control*

Hops need to be kept between 26-32°F. This can be achieved through any regular household freezer, or growers can invest in walk-in freezer/cooler storage units. Growers can also lease space from commercial climate controlled warehouses such as Vermont Refrigerated Storage.<sup>58</sup>

### **Conclusions**

This report has determined that is feasible to grow a commercial hop crop in New England. There is sufficient demand, there is sufficient price elasticity, and there is now the information, technology, supplies, and equipment available to meet the needs of a 1-10 acre commercial hopyard.

There are four ways that appear commercially feasible for growing hops in New England:

- Scenario 1: Participating in a value-share growing program with Atlantic Hops
- Scenario 2: Selling whole hops, minimally processed direct to brewers
- Scenario 3: Using Atlantic Hops for processing services and selling pelletized hops direct to brewers
- Scenario 4: Selling do-it-yourself pelletized hops direct to brewers

In all instances, the best potential for return on investment and net income exists when the grower utilizes mechanical harvesting and sorting.

---

<sup>58</sup> For contact info see Barney Hodges, Vermont Refrigerated Storage, under additional persons consulted.

## Income Potential and Return On Investment

	Scenario 1	Scenario 2	Scenario 3	Scenario 4
Average Yield Per Acre	1,500 dried lbs	1,500 dried lbs	1,500 dried lbs	1,500 dried lbs
Average Net Income Per Acre	\$4,640	\$5,090	\$5,090	\$12,910
Average Return On Investment for 1 <sup>st</sup> Acre*	5 years	5 years	6 years	4 years
Level of Individual Risk	Low	Moderate	Moderate	High

While the potential to generate net income per acre is highest in scenario four, in which the grower creates the value-added finished product on site, the ultimate recommendation is to adopt scenario one, in which growers participate in a value-share growing program with Atlantic Hops. This is because scenario one represents the least risk while still presenting a strong potential for financial return.

### 1. **Best Solution: Participate in Atlantic Hops value-share growing program**

#### Benefits:

- Least Infrastructure Expense
- Unlimited access to Gorst Valley Hops Technical Assistance and Resources
- Applicable to All Growers
- No secondary processing or sales and marketing required of the grower
- Lowest Risk

Encourage growers to participate in the Atlantic Hops value-share grower program. The Atlantic Hops Value Share Grower program will seek to minimize risk to its growers at every stage in the growing, production, and sales and marketing process by providing them with technical, logistical, and infrastructure support. Farms in the value-share program will benefit from wholesale pricing on hopyard supplies, complimentary technical assistance, tried and tested hopyard designs and production techniques – these efforts as designed to assist in optimizing production efficiency and yield. Then Atlantic Hops will use its expertise and equipment to process a high quality finished product that meets the product specification and volume needs of the brewing community, and market and sell the product at a price that returns a fair profit to its growers.

*Hopyard:*

Recommend starting with one acre and expanding up to ten acres. Use a 3 variety planting, with 1/3 of hopyard per variety to stagger harvest times and minimize threat to entire crop from weather, pest or disease issues that may affect a particular variety.

*Economic feasibility:*

Anticipated hopyard infrastructure expense per acre: \$10,000

Anticipated harvesting infrastructure expense:

Oast (Year 2): \$5,000 for 1<sup>st</sup> acre  
 \$10,000 for 2-5 acres  
 \$17,500 for 5+ acres

Mechanical Picker (Year 3) \$5,000 for up to 3 acres

Mechanical Sorter (Year 3) \$5,000 for up to 3 acres

Total Infrastructure Expense for First Acre: \$25,000

Total Operating Expense Per Acre: \$8,860

Total Gross Income at 100% Production: \$13,500  
 (assuming receiving \$9/lb for whole dried hops from Atlantic Hops)

**Net Income Per Acre: \$4,640**

**Return on Investment for First Acre: 5 years**

## 2. Good Solution: Sell whole hops, minimally processed direct to brewers

### Concerns:

- Limited access to Gorst Valley Hops knowledge and resources
- Market demand can only sustain a few growers
- Growers will need outgoing sales personality
- Growers will need to make time for sales and marketing
- Lack of sufficient climate controlled storage- space could be an issue.
- Moderate risk

Encourage growers to invest in mechanical harvesting and sorting, use a high hop trellis system, send hops to a lab for chemical analysis and sell dried, whole hops directly to brewers. This solution does present a solid potential for profit and return on investment with minimal secondary processing required. The

issues will be potential issues with quality of the finished product; limited demand for a whole hop product; limited storage space unless the product is compacted, or significant climate controlled warehouse space can be leased; and reliance on the grower's ability to secure sales of his product.

*Hopyard:*

Recommend starting with one acre and expanding up to ten acres. Use a 3 variety planting, with 1/3 of hopyard per variety to stagger harvest times and minimize threat to entire crop from weather, pest or disease issues that may affect a particular variety.

*Economic feasibility:*

Anticipated hopyard infrastructure expense per acre: \$12,000

Anticipated harvesting infrastructure expense:

Oast (Year 2):	\$5,000 for 1 <sup>st</sup> acre
	\$10,000 for 2-5 acres
	\$17,500 for 5+ acres

Mechanical Picker (Year 3)	\$5,000 for up to 3 acres
----------------------------	---------------------------

Mechanical Sorter (Year 3)	\$5,000 for up to 3 acres
----------------------------	---------------------------

Total Infrastructure Expense for First Acre: \$27,000

Total Operating Expense Per Acre: \$9,910

Total Gross Income at 100% Production: \$15,000  
(assuming selling whole dried hops at \$10/lb)

**Net Income Per Acre: \$5,090**

**Return on Investment for First Acre: 5 years**

### 3. **Good Solution: Use Atlantic Hops processing services, sell pelletized hops direct to brewers**

#### Concerns:

- Limited access to Gorst Valley Hops knowledge and resources
- Individual farm volume could be a limitation on market demand
- Growers will need outgoing sales personality
- Growers will need to make time for sales and marketing
- Moderate risk

Encourage growers to adopt mechanical harvesting and sorting, utilize a high trellis hops system, and contract processing and packaging of their hops from Atlantic Hops. Retrieve the finished product and sell individual farm hops directly to brewers. In this solution growers can take advantage of processing services to produce the finished product brewers are looking. This enables the grower to focus his attention on his core competency- growing the raw product, and engaging others for their core competencies. This helps ensure everyone's time is best used, and that risk to quality of the finished product is minimized.

#### *Hopyard:*

Recommend starting with one acre and expanding up to ten acres. Use a 3 variety planting, with 1/3 of hopyard per variety to stagger harvest times and minimize threat to entire crop from weather, pest or disease issues that may affect a particular variety.

#### *Economic feasibility:*

Anticipated hopyard infrastructure expense per acre: \$12,000

Anticipated harvesting infrastructure expense:

Oast (Year 2):	\$5,000 for 1 <sup>st</sup> acre
	\$10,000 for 2-5 acres
	\$17,500 for 5+ acres

Mechanical Picker (Year 3)	\$5,000 for up to 3 acres
----------------------------	---------------------------

Mechanical Sorter (Year 3)	\$5,000 for up to 3 acres
----------------------------	---------------------------

Anticipated processing infrastructure expense:

2 Chest freezers (Year 2):	\$2,000
----------------------------	---------

Total Infrastructure Expense for First Acre: \$29,000

Total Operating Expense Per Acre: \$17,410

Total Gross Income at 100% Production: \$22,500  
(assuming selling pelletized hops at \$15/lb)

**Net Income Per Acre: \$5,090**

**Return on Investment for First Acre: 6 years**

#### 4. **Risky Solution: Selling do-it-yourself pelletized hops direct to brewers**

##### Concerns:

- Limited access to Gorst Valley Hops knowledge and resources
- Issues with processing could impact success
- Volume and product quality could be a limitation on market demand
- Growers will need outgoing sales personality
- Growers will need to make time for processing, sales and marketing
- High risk

Encourage growers to adopt mechanical harvesting and sorting, utilize a high trellis hops system, purchase a hammer mill, pellet mill and vacuum, nitrogen flush sealing machine. This solution represents the greatest potential for income and return on investment, and also the greatest risk to the grower. The grower will be on his own for all aspects of growing, harvesting, producing, and selling a finished product that meets the product specifications of the brewing community, at a volume and price point that generates a positive return. If the grower can maintain an average yield of 1,500lbs of dried finished product, achieve the quality standards of the brewing industry, and develop the sales and marketing skills to market the product, the grower can stand to generate up to \$12,910 in net income per acre.

##### *Hopyard:*

Recommend starting with one acre and expanding up to ten acres. Use a 3 variety planting, with 1/3 of hopyard per variety to stagger harvest times and minimize threat to entire crop from weather, pest or disease issues that may affect a particular variety.

##### *Economic feasibility:*

Anticipated hopyard infrastructure expense per acre: \$12,000

Anticipated harvesting infrastructure expense:

Oast (Year 2):	\$5,000 for 1 <sup>st</sup> acre
	\$10,000 for 2-5 acres
	\$17,500 for 5+ acres

Mechanical Picker (Year 3)	\$5,000 for up to 3 acres
----------------------------	---------------------------

Mechanical Sorter (Year 3)                      \$5,000 for up to 3 acres

Anticipated processing infrastructure expense:

2 Chest freezers (Year 2):                      \$2,000

Vacuum-Nitrogen Flush Sealer (Year 2):    \$24,000

Pellet Mill (Year 2):                            \$2,400

Hammer Mill (Year 2):                         \$1,700

Total Infrastructure Expense for First Acre: \$57,100

Total Operating Expense Per Acre:         \$9,590

Total Gross Income at 100% Production:    \$22,500  
(assuming selling pelletized hops at \$15/lb)

**Net Income Per Acre:                            \$12,910**

**Return on Investment for First Acre:        4 years**

## Next Steps

It is evident there is strong demand for local hops, and good potential for the ability to grow hops profitably in New England. The infrastructure, which was originally a key barrier to market, is now being developed to support small scale commercial growers in New England.

If producers go through the effort of investing time and capital into starting a commercial hop venture, but lack the support they need to develop their business plan and gain access to necessary technical expertise, the effort may well be lost.

Following is a recommendation for how Vermont Agency of Agriculture, Food and Markets and the Massachusetts Department of Agricultural Resources could ensure that such an endeavor is given its best opportunity for success:

1. Assist Atlantic Hops in establishing its operation.

New England needs the processing capabilities to produce a professional product that will meet market expectations. It also needs access to the equipment, and technical expertise Gorst Valley Hops has already developed and tested for its small scale Mid-West farmers. Having a processing facility that is willing to process the product and partner with the farms with a mission of providing a good product at a fair value to brewers and returning a fair, profitable income to the producers is a win-win.

2. Outreach to existing growers/farmers

The agencies will need to reach out to existing growers. Some of the many reasons hops are cited as difficult to grow are because they are being grown by people who don't grow crops for a living. Most of the basic issues with hops are the same basic issues you will find with any other crop (they need well drained soil, they need fertilizer, they need pest control, they need dedicated timing- the harvest is everything...). Producers who grow acres of corn, vegetables, and grains already know and understand the fundamental elements of what it takes to grow a crop successfully. Existing and experienced growers and farmers need to be the target audience if growing hops is to be developed as a commercial enterprise.

3. Business Planning & Coordination with the state Farm Viability Programs.

With each farm, given this is a new venture and unexplored territory for them, and also a new crop for the region, having them go through the business planning process for implementing the new crop and evaluating its impact on the farm business and family quality of life will be essential. This will help ensure that each farm can map out on paper how they would go about implementing

the new crop, understand what it would take on their particular farm, what it would cost, and what the potential return would be. They must be able to understand and evaluate how it might impact other areas of the farm and whether the net return would be better than continuing with their current production or not. It is important that this step be done while still in planning mode, so a decision on whether implementing the plan is in their best interest or not is made before any additional resources, time, and effort have been allocated.

#### 4. Implementation and Business Planning Technical Assistance

Provide ongoing support for the farms for 4 years after initial implementation to help assist with analyzing, planning, and decision making for the new venture and the overall farm operation. This includes business plan review, analysis and updating, and technical expertise specific to areas of concern- production, processing, sales and marketing, etc. This third party, objective support will help ensure concerns are addressed proactively thus providing a larger degree of likelihood of success for each farm, and their long term commitment to the project.

##### **Action Items**

1. Identify 10 growers in MA & VT who would be interested in participating in Atlantic Hops Value-Share Grower Program
2. Vet farm sites
  - a. Conduct a site visit to evaluate the logistical feasibility of each farm. At a minimum the site will need 3' of top soil before reaching bedrock. Atlantic Hops will also assess each farm's site for additional attributes such as soil structure, water holding capacity, and seasonal wind loads.
3. Work with the growers to explain the opportunity, and enroll them in the program. This will require a commitment of establishing a one acre hopyard at an expense of \$10,000 and the purchase of a picker, sorter, and oast, for an additional expense of \$15,000 over years two and three.
4. Potentially finding funding to offset cost of capital infrastructure expense for the first ten growers, or for dairy farmers wishing to participate.
5. Begin Farm Viability business planning and Atlantic Hops Value-Share Growing Program technical assistance with each farm.
6. Atlantic Hops will provide oversight and guidance with Technical Assistance during establishment of the hopyard, and growing and harvest for first four years.

7. Maintain communication loop with the brewing community. Let the brewers in the highly qualified prospect list (see brewers in **Bold** in the appendices) know of the plan, engage them in the R&D phase, and leverage their input and feedback to develop a finished product that will meet their approval and be ready for sale by year 3.
8. Provide on going Farm Viability business planning and technical assistance services
  - a. Provide an annual business plan review, analysis and plan for the upcoming year. For first four years
  - b. Provide ongoing annual Technical Assistance in specific areas of expertise as needed for each farm. For first four years

### **Budget**

10 farms

Year 1	Per Farm	#Farms		Total
Hopyard Infrastructure	\$10,000	10		\$100,000
Business Plan	\$4000	10		\$40,000
Technical Assistance in Areas of Expertise	\$3000	10		<u>\$30,000</u>
			<b>Total Budget Year 1</b>	<b>\$170,000</b>
 Years 2-4	 Per Farm/Year	 #Farms	 Years	 Total
Harvest/Drying Infrastructure	\$15,000	10		\$150,000
Annual Business Plan Review and Analysis	\$2000	10	3	\$60,000
Annual Technical Assistance In Areas of Expertise	\$2000	10	3	<u>\$60,000</u>
			<b>Total Budget Next Three Years</b>	<b>\$270,000 (\$90,000/year)</b>

## Appendix A- Sources of Information

- Barth, H.J., Klinke, C., Schmidt, C. The Hop Atlas. 1994. Nuremberg, Germany. Joh, Barth & Sohn.
- Fayston, J. "The 2007 hops shortage is over, the glut of '09 is here..." The Oregonian. 10/28/2009.
- Hilchey, D. *The Market Potential for Northeastern-Grown Hops*. New Leaf Publishing and Consulting, Inc. 2009.
- Kneen, Rebecca. *Small Scale Organic Hop Production*. Left Fields BC. 2004.
- Neve, R. A. Hops. Champman & Hall. 1991.
- Page, E. B. *Hop Trellising & Budgets*. 7/26/2008.
- Page, E. B., Godin, Ron. "Hopyard Construction: Budgeting and Economics." CSU Ag Exp. Station.
- Tomlan, M. Tinged With Gold Hop Culture In The united States. University of Georgia Press. Georgia. 1992
- USDA-ARS. Lower Hop Trellises for Higher Profits. Crop Management. 21 January 2008.
- Virant, Majda, Majer, Dusica. *Hop Storage Index – Indication of a Brewing Quality*. Institute of Hop Research and Brewing Zalec. January 2006.
- Ward, L. Yakima Herald-Republic. Some plastic mesh could save state hop farms. New technique has potential for the beer-making crop. May 30, 2005.

## Internet Resources

- <http://www.brewersassociation.org/>
- <http://www.thefreelibrary.com/Craft+Beer+Segment+Continues+to+Set+the+Pace+for+the+Beer+Category...-a0167648025>
- <http://hops-extracts.com>
- <http://hopunion.com>
- <http://www.uvm.edu/~pass/perry/hops.html>
- <http://fujiimpulseamerica.thomasnet.com/viewitems/impulse-sealers-vacuum-gas-flush-sealing-/-controlled-nozzle-type-vacuum-gas-flushing-sealer>
- <http://www.indvacindia.com/nozzle-type-flushing-sealing-machines.htm>

<https://www.biplantol.com/produkte.php?content=3>  
<http://www.ars.usda.gov/is/AR/archive/jan08/hops0108.htm>  
[http://www.pleasanthillgrain.com/hammer\\_mill\\_pulverizer.aspx](http://www.pleasanthillgrain.com/hammer_mill_pulverizer.aspx);  
<http://www.meadowsmills.com/forsalehm.htm>  
<http://www.pelletpros.com/id68.html>  
<http://www.foodsaver.com/Category.aspx?id=c&cid=87>  
<https://www.spacebag.com/10/PriceList.dtm>  
[http://blog.foothillhops.com/2009/01/01/foothill\\_hops\\_20091114521flv.aspx](http://blog.foothillhops.com/2009/01/01/foothill_hops_20091114521flv.aspx)  
<http://www.central-vt.com/climate/climate.htm>  
<http://www.lindemanarchives.com/LA%20History.html>  
<http://www.rssweather.com/climate/Vermont/Burlington/>  
<http://maps.google.com/maps/ms?hl=en&ie=UTF8&msa=0&msid=114006202269755079477.00048524ed0b04bf595d6&ll=42.366662,-71.235352&spn=2.840979,5.767822&z=7&source=embed>  
<http://www.massbrewersguild.org/craft-beer/index.php/member-breweries/>  
<http://groups.google.com/group/vermont-hops/topics>  
<http://www.indiehops.com/>  
<http://www.freshops.com/>  
<http://www.gorstvalleyhops.com/>  
<http://www.examiner.com/hops-in-madison/hops-growing-business-2007-shortage-revisited>  
<http://www.examiner.com/beer-in-national/top-ten-hop-varieties-used-by-american-craft-brewers>  
<http://vermontbrewers.com/>  
<http://www.lewbryson.com/nyprogress.htm>  
<http://www.freepatentsonline.com/>  
<http://www.czhops.cz/tc/bibliography/bibliography10.html>  
<http://www.youtube.com/user/cohopsfarmer#p/a>  
<http://www.northeasthopalliance.org/>  
<http://www.wolf-heiztechnik.de/en/pkp/unternehmen/historie.html>  
<http://meeting.asbcnet.org/default.cfm>

**Appendix B – List of Persons Consulted  
Growers and Hop Experts**

Dwayne Wheeler  
Claremont, NH  
(603) 542-3870

Eugene (Gene) L'Etoile  
Four Star Farms  
496 Pine Meadow Road  
Northfield, MA  
(413) 498-2968  
fourstar1@comcast.net

Francois Biron  
Conseiller aménagement, innovation et agroenvironnement  
Ministère de l'Agriculture, des Pêcheries et de l'Alimentation  
Centre de services agricoles de Gatineau  
999 rue Dollard  
Gatineau, Québec, CANADA J8L 3E6  
(819) 986-8544 x 236  
Francois.biron@mapaq.gouv.qc.ca

Heather Darby  
University of Vermont Extension  
Agronomist and Nutrient Management Specialist  
278 S. Main St  
St. Albans, VT 05478  
(802) 524-6501 x 206  
heather.darby@uvm.edu

James Altwies  
Gorst Valley Hops  
608-228-3117  
james@gorstvalleyhops.com

Jason Perrault  
Perrault Farms, Inc.  
11051 Lateral "A"  
Toppenish, WA 98948  
(509) 848-2497

Jonathan Blumberg  
83 South Stanley Hill Rd  
Vassalboro, ME 04989  
(207) 923-3123

Julien Venne  
Centre de recherche et de développement technologique agricole de l'Outaouais  
(CRÉDÉTAO)  
188, rue Jeanne-D'Arc, suite 200  
Papineauville, Québec, CANADA J0V 1R0  
(819) 427-5511 x 461  
Jv.credetao@videotron.ca

Larry & Kate Fisher  
Foothill Hops  
fhhops@dreamscape.com  
(315) 495-2451

Michael Roffman  
Atlantic Hops  
PO Box 1055  
Larchmont, NY 10538  
(914) 834-5130  
mike@atlantichops.com

Peter Hingston  
Jeffrey Cox  
Cherry Hill Farm  
409 Highland Road  
Springfield, VT 05156  
(802) 885-5088  
cherryhillfarm@vermontel.net  
jeffreybcox@gmail.com

Puterbaugh Farms  
Hops Direct, LLC  
686 Green Valley Road  
Mabton, WA 98935  
(888) 972-3616  
<http://www.hopsdirect.com/>

Rick Pedersen  
Pedersen Farms  
1798 County Road 4  
Seneca Castle, NY  
(315) 781-0482  
info@pedersenfarms.com

Roger Rainville  
Borderview Farms & Ag Research Facility  
146 Line Rd.  
Alburgh, VT 05440  
(802) 796-3292  
rcra@fairpoint.net

Rosalie Madden  
Crops and Soils Technician  
UVM Extension  
278 S. Main St., Suite 2  
St. Albans, VT 05478  
(802) 524-6501 x 445

Steve Parks  
American Brewers Guild  
Abgbrew.com  
[abgbrew@gmail.com](mailto:abgbrew@gmail.com)

Anthony (Tony) Palmiero  
Tractor Logging  
345 East Church St.  
East Hardwick, VT 05836  
(802) 472-6503  
ajpalmiero@vtlink.net

## Brewers/Brew Pubs/Homebrew Suppliers

### **MAINE**

**Allagash Brewing**  
Jason Perkins, head brewer  
100 Industrial Way  
Portland, ME 04103  
(800) 330-5385  
jasonperkins@allagash.com

**Andrews Brewing Company**  
Andy and Ben, brewers/owners  
4975 High St.  
Lincolnton, ME 04849  
(207) 763-3305  
andrewsbrewingco@tidewater.net

Atlantic Brewing Company  
Doug, brewer  
15 Knox Road  
Bar Harbor, ME 04609  
(207) 288-9513  
doug@atlanticbrewing.com

**Bar Harbor Brewing Co**  
8 Mount Desert Street  
Bar Harbor, ME 04609  
(207) 288-4592

Belfast Bay Brewing Company  
100 Searsport Ave.  
Belfast, ME 04915  
(207) 338-4216  
www.belfastbaybrewing.com

**Black Bear MicroBrewery**  
Tim Gallon, owner/brewer  
19 Mill Street, Suite 4  
Orono, ME 04473  
207-949-2880  
tim@blackbearmicrobrew.com

Bray's Brewpub & Eatery  
Rob, brewmaster  
678 Roosevelt Trail  
Naples, ME 04055-0548  
(207) 693-6806

Casco Bay = Shipyard, see Shipyard

Federal Jacks Brewpub & Restaurant  
8 Western Avenue  
Kennebunk, ME 04043  
(207) 967.4322

Geary's  
Steve Spear, head brewer  
38 Evergreen Drive  
Portland, ME 04103  
(207) 878-2337

Gritty McDuff's  
Andrew Heyner & Jake, brewers  
396 Fore Street  
Portland, ME 04101  
(207) 772-BREW

Inn on Peak's Island  
33 Island Ave  
Peaks Island, ME 04108  
(207) 766-5100

Kennebec River Brewery  
Jim, head brewer  
Forks Resort Center  
The Forks, ME 04985  
800-765-7238

Liberal Cup Public House & Brewery  
115 Water St.  
Hallowell, ME 04347  
(207) MAD-BREW

**Maine Coast Brewing Company**  
102 Eden Street  
Bar Harbor, ME 04609  
(207) 288-4914

**Peak Organic Brewing Co.**  
Jon Cadoux, owner/brewer  
110 Marginal Way #802  
Portland, ME 04101  
(207) 586-5586  
jcadoux@peakbrewing.com

**Oak Pond Brewery**  
101 Oak Pond Rd  
Skowhegan, ME 04976  
(207) 474-3233

Sea Dog Brewing Co.  
26 Front Street  
Bangor, ME 04401  
(207) 947-8009

**Sebago Brewing Company**  
Tom, brewer  
48 Sanford Drive  
Gorham, ME 04038  
(207) 856-2537

**Shipyards Brewing Co**  
Alan Puglsey, owner  
David Hall, head brewer  
86 Newbury St.  
Portland, ME 04101  
(207) 761-0807  
apugsley@shipyards.com  
dhall@shipyards.com

Sunday River Brewery  
Stu Mason, brewer  
1 Sunday River Road  
Bethel, ME 04217  
(207) 824-4ALE

Note: call on Mondays

**MASSACHUSETTS**

Boston Beer Works  
Tim Morse, Corporate Brewer  
61 Brookline Ave  
Boston, MA 02215  
(617) 896-2300

**Berkshire Brewing Company Inc.**  
**Gary A. Bogoff, owner**  
**12 Railroad Street**  
**South Deerfield, MA 01373**  
**Tel (413) 665-6600**  
**BBC@berkshirebrewingcompany.com**

**Blue Hills Brewery**  
**Todd, sales**  
**1020 Turnpike Street #3B**  
**Canton, MA 02021**  
**(781) 821-2337**  
**comments@bluehillsbrewery.com**

The Boston Beer Company  
Jennifer Granville  
One Design Center, Suite 850  
Boston, MA 02210  
(617) 368-5000

**BrewBank**

**Cambridge Brewing**  
**Will Meyers, brewmaster**  
**1 Kendall Square, Bldg 100**  
**Cambridge, MA 02139**  
**617-494-1994**  
**will@cambridgebrewingcompany.com**

Cambridge Commons Brewery  
Ginger, owner  
Cambridge, MA  
(978) 551-6477

**Cape Ann Brewing**  
**Jeremy Goldberg, brewer**  
**27 Commercial Street**  
**Gloucester, MA 01930**  
**(978) 281-4782**  
**Jeremy@capeannbrewing.com**

**Cape Cod Beer**  
**Beth & Todd Marcus, owners/brewers**  
**1336 Phinney's Lane**  
**Hyannis MA 02601**  
**(508) 790-4200**  
**beth@capecodbeer.com; brewer@capecodbeer.com**

Cisco Brewers  
Jay, brewer  
P.O. Box 2928  
Nantucket MA 02584  
(508) 325.5929  
jay@ciscobrewers.com

**BYOB (Cody) Brewing Company**  
**Sean Cody - Brewer/Owner**  
**36 Main St.**  
**Amesbury, MA 01913**  
**(978) 378-3424**  
**sean@codybrewing.com**

Gardner Ale House  
Dave Richardson  
7 Parker St.  
Gardner, MA 01440  
(978) 669-0122  
dave@gardnerale.com

**Harpoon Brewery**  
**Al Marzi, V.P. Operations**  
**Sean Cornelius, assistant V.P. Operations**  
**306 Northern Ave.**  
**Boston, MA 02210**  
**(888) HAR-POON**  
**amarzi@harpoonbrewery.com; scornelius@harpoonbrewery.com**

**Haverhill Brewery**  
John Curtis, brewer  
100 Washington Street  
Haverhill, MA 01832-5500  
(978) 373-2337  
tapbrewpub.com

**Mayflower Brewing Company**  
Drew, brewer  
12 Resnik Rd  
Plymouth, MA 02360  
(508) 746-2674  
Drew@mayflowerbrewing.com

**Mercury Brewing Company**  
Dan, brewer  
23 Hayward St.  
Ipswich, MA 01938  
(978) 356-3329  
dhlipke@hotmail.com

**Northampton Brewery Bar-Grille (John Harvard's Brew House)**  
Maria Poulinas, brewer  
11 Brewster Court  
Northampton, MA 01060-3801  
(508) 875-2337  
jhbh\_fram@bcginc.com

**Opa Opa Steakhouse & Brewery**  
Themis, owner  
169 College Highway  
Southampton, MA 01073-9320  
(413) 527-0808  
opaopasteakhousebrewery.com

**Pittsfield Brew Works**  
34 Depot Street  
Pittsfield, MA 01201-5130  
(413) 997-3506  
pittsfieldbrewworks.com

Rock Bottom Restaurant & Brewery  
Scott Brunelle, brewmaster  
115 Stuart Street  
Boston, MA 02116  
(617) 742-2739  
rockbottom.com  
Note: Best time to call is 9-10 am.

**Wachusett Brewing Company**  
**Dave Howard, "Howie" head brewer**  
**175 State Road East**  
**Westminster, MA 01473**  
**(978) 874-9965 x 30**  
**howie@wachusettbrew.com**

Watch City Brewing Company  
Jocelyn and Frank, owners  
Aaron Mateychuck, brewer  
256 Moody Street  
Waltham, MA 02453  
(781) 647-4000  
watchcitybrew.com

**NEW HAMPSHIRE**

**Granite Cask**  
**6 King's Square Unit A**  
**Whitefield, NH 03598**  
**(603) 837-2224**  
**brew@granitecask.com**

**Mount Washington Home Brew Supply**  
**A Division of Merrill's Agway**  
**678 Meadow Street**  
**Littleton, NH 03561**  
**603-444-8803**  
**mtwashhomebrew@hotmail.com**

**Portsmouth Brewery**  
**Tod, brewer**  
**56 Market Street**  
**Portsmouth, NH 03801**  
**603-431-1115**  
**tod@portsmouthbrewery.com**

Smuttynose Brewing Co  
David, Executive Brewer  
225 Heritage Ave  
Portsmouth, NH 03801  
(603) 436-4026

**Seven Barrel Brewery**  
**Plainfield Road**  
**Colonial Plaza, Rt 12-A**  
**West Lebanon, NH 03784**  
**(603) 298-5566**

**Tuckerman Brewing Company, LLC**  
**Kirsten Neves**  
**Managing Member**  
**PO Box 1058**  
**64 Hobbs Street**  
**Conway, NH 03818**  
**(603) 447-5400**  
**kirsten@tuckermanbrewing.com**

**White Birch Brewing**  
**Bill, brewer/owner**  
**1368 Hooksett Rd, Unit 6**  
**Hooksett, NH 03106**  
**(603) 244-8593**

**VERMONT**

**The Alchemist**  
**23 South Main Street**  
**Waterbury, VT 05676**  
**(802) 244-4120**

**Bobcat Cafe & Brewery**  
**Mark Magiera, brewer**  
**5 Main Street**  
**Bristol, VT**  
**(802) 453-3311**

**Brewery at the Trapp Family Lodge**  
**Alan Van Anda, brewer**  
**700 Trapp Hill Road**  
**PO Box 1428**  
**Stowe, VT 05672**  
**802-253-8511**

**Hill Farmstead Brewery**  
**Shaun Hill, owner/brewer**  
**403A Hill Road**  
**Greensboro Bend, VT 05842**  
**(802) 533-7450**

Jasper Murdock's Alehouse/Norwich Inn  
Patrick Dakin, brewer  
325 Main Street  
P.O. Box 908  
Norwich, VT 05055  
(802)-649-1143

Lawson's Finest Liquids  
Sean Lawson, owner/brewer  
Warren, VT 05674  
(802) 272-8436  
lawsonsfinest@inbox.com

**Long Trail**  
**Matt Quinlin, brewmaster**  
**5520 US Route 4**  
**Bridgewater Corners, VT 05035-9600**  
**(802) 672-5011 x 207**  
**mattq@longtrail.com**

Madison Brewing  
428 Main Street  
Bennington, VT 05201  
(802) 442-7397

**Magic Hat Brewing Company**  
**Todd Haire, brewer**  
**5 Bartlett Bay Road**  
**South Burlington VT 05403**  
**802-862-6114 x 2012**

**McNeill's Pub & Brewery**  
**Ray McNeill, owner/brewer**  
**90 Elliot Street**  
**Brattleboro, VT 05403**  
**(802) 254-2553; raymcneill@hotmail.com**

Northshire Brewery  
108 County Street  
Bennington, VT 05201  
(802) 681-0201

**Otter Creek Brewing**  
**Mike Gerhart, brewmaster**  
**793 Exchange Street**  
**Middlebury, VT 05753**  
**(802) 388-0727**  
**mgerhart@ottercreekbrewing.com**

**Rock Art**  
**Renee and Matt Nadeau, owners/brewers**  
**234 Wilkens Street**  
**Morrisville, VT 05661**  
**(802) 888-9400**

**South Royalton Market**  
**Scott Russell, homebrew manager**  
**105 Chelsea St**  
**South Royalton, VT 05068**  
**(802) 763-2400**

**Switchback Brewing Co.**  
**Bill Cherry, owner/brewer**  
**160 Flynn Avenue**  
**Burlington, VT 05401**  
**(802) 651-4114**  
**wrcherry@pshift.com**

**The Perfect Pear**  
**Adam Colter, owner/brewer**  
**48 South Main Street**  
**Bradford, VT 05033**  
**(802) 222-5912**  
**ppc@pshift.com**

The Shed Brewery  
Jim Conroy, brewer  
1859 Mountain Road  
Stowe, VT 05672  
(802) 253-4364

Three Needs Brewery  
207 College Street  
Burlington, VT 05401  
(802) 658-0889

Trout River Brewery  
Dan & Laura Gates, owner/brewers  
Route 5; P.O. Box 165  
Lyndonville, VT 05851  
(802) 626-9396

**Vermont Homebrew Supply**  
**147 E. Allen Street**  
**Winooski, VT 05404**  
**(802) 655-2070**  
**vtbrew@myfairpoint.net**

**The Vermont Pub & Brewery**  
**144 College Street**  
**Burlington, VT 05401**  
**(802) 865-0500**

**Zero Gravity Craft Brewery**  
**Destiny, brewer**  
**15 St. Paul Street**  
**Burlington, VT 05401**  
**(802) 861-2999**

### **Additional Persons Consulted**

Allen Matthews  
Center for Sustainable Agriculture  
106 High Point Center- Room 312  
University of Vermont  
Colchester, VT 05446  
(802) 318-1041

Atul Kant Verma  
Managing Partner  
Elegant Engineers, An ISO 9001:2008 Certified Company  
C- 82, Sector - 10, Noida - 201301 (U.P.)  
INDIA  
Tel: 91 120 2525503 / 2444892  
Mobile: 91 98101 46982  
E-mail: elegant11@satyam.net.in  
elegant117@gmail.com  
Website <http://www.elegantengineers.com>  
<http://www.pouch-packing.com>

Barney Hodges III  
Vermont Refrigerated Storage  
1287 North Bingham St.  
Cornwall, Vermont  
bhodges@shoreham.net  
[www.sunriseorchardsvt.com](http://www.sunriseorchardsvt.com)  
(802) 989-0255

Dauenhauer Manufacturing, Inc.  
111-125 Fifth Street / PO Box1744  
Santa Rosa, CA 95402  
(707) 546-0577  
[www.dmfg.com](http://www.dmfg.com)

Enid Wonacott  
Executive Director  
NOFA VT  
PO Box 697  
Richmond, VT 05401  
(802) 434-3821  
[elila@sover.net](mailto:elila@sover.net)

Hugo Gervais  
Custom Fabrication  
hagervais@gmail.com

India Burnett Farmer  
Program Director  
Rutland Area Farm and Food Link  
P.O. Box 561  
East Poultney, VT 05741  
(802) 417-7331  
india@rutlandfarmandfood.org

Jun Sota  
Fuji Impulse America  
JSota@FujiImpulseAmerica.com  
(847) 236-9190  
www.fujiimpulseamerica.com

Macy Mullican  
Shelburne Vineyard  
The Vermont Food Project, refrigerated warehouse  
(802) 734-3431

Pellet Pros, Inc.  
4004 W. Kimberly Rd.  
Suite C  
Davenport, IA 52806  
(563) 386-4300  
pelletpros@questoffice.net

Steve Justis  
Vermont Agency of Agriculture Food, and Markets  
116 State St.  
Montpelier, VT 05620  
(802) 828-3829

## Appendix C – Brewer Questionnaire Template

What is the name of your brewery?

How many barrels do you brew per year?

What are the top five hops you use?

1.

2.

3.

4.

5.

How much of each do you use per year? (in lbs)

1.

2.

3.

4.

5.

How much total aroma hops do you use per year? (in lbs)

How much total bittering hops do you use per year? (in lbs)

Which varieties of hops (if not listed in the five above) would you like to see available more locally?

How do you prefer to use hops (whole, pelletized)? Please describe

What are the product specifications and quality requirements we would need to be able to meet for you to consider buying from a local source? Please describe (ie packaging, lab analysis, pelletized vs whole, etc, etc)

How do your hops come packaged and shipped?

Are you under contract for your hops?

If so would/could you consider buying local hops and when does your contract come up for renewal? Could you buy local hops even if you are under contract and if so up to how much of your total volume of hop usage?

What is your current source for hops? Please list suppliers and state/country.

What are you currently paying for your hops?

Does this include shipping?

If not, what do you pay for shipping?

How much of your total hop volume would you be willing to buy locally if it met your quality requirements and product specifications?

Would you prefer a stable price for local hops that may or may not reflect the market rate but is a stable price that you and the grower can both depend on? Or would you prefer the hops compete at market rate?

If you would prefer to be able to rely on a known price for a known product, what would you see as a fair rate that you would consistently be willing to agree to?

If the product were to compete at market rate what would you say is the average rate we should expect to charge (if this differs from the fair rate you list above)?

Would you be willing to pay a premium for local hops?

If yes, how much would you be willing to pay above what you are currently paying? 10%, 20%, 50%, 100%, etc?

If you were willing to pay a premium for local hops, would this change the volume of local hops you would buy (ie if you pay more you might buy less?) Is this so and if so, how would the volume of local hops you purchase change?

Why are you interested in buying hops locally?

Are you interested in organic hops?

What is the best way to communicate with you?

Other thoughts/comments/suggestions?

## Appendix D – Cash Flow Scenarios

### **Scenario 1: Grower participating in the Atlantic Hops Value-Share Grower Program, Growing 1 Acre**

Cash flow 1: demonstrating cash flow if no efficiencies in production are utilized

Cash flow 2: demonstrating cash flow if grower harvests only top 1/3 of the bine

Cash flow 3: demonstrating cash flow if grower harvests only top 1/3 of the bine, and manually strips and sorts

Cash flow 4: demonstrating cash flow if grower harvests only top 1/3 of the bine, and mechanically strips and sorts

Courtesy: Vermont Farm Viability Enhancement Program

**CASH FLOW PROJECTION**

Scenario: Participating in Atlantic Hops Value Share Grower Program

**No Optimization in Harvesting**

Production Information	Projection			
	Year 1	Year 2	Year 3	Year 4
Number of acres	1	1	1	1
Production Level	0%	40%	90%	100%
Quantity of dried hops sold (lbs/year)	0	600	1350	1500
Pounds of dried hops per acre per year	0	600	1350	1500
Average price paid to grower per dried pound	9	9	9	9
Return on Investment in Years	(2)			
Annual Net Income at 100% Production	\$ (9,610)			
<b>Cash Receipts</b>				
Hops Sold	\$ -	\$ 5,400	\$ 12,150	\$ 13,500
<b>TOTAL CASH RECEIPTS</b>	<b>\$ -</b>	<b>\$ 5,400</b>	<b>\$ 12,150</b>	<b>\$ 13,500</b>
<b>Cash Expenses</b>				
<b>Variable Expenses:</b>				
Chemicals	\$ -	\$ -	\$ -	\$ -
Conservation expense	\$ -	\$ -	\$ -	\$ -
Custom hire	\$ -	\$ -	\$ -	\$ -
Trellising supplies- twine, w clips, etc.	\$ -	\$ -	\$ -	\$ -
Fertilizer	\$ -	\$ -	\$ -	\$ -
Fuel and oil	\$ -	\$ -	\$ -	\$ -
Labor hired (incl. FICA, workers comp, etc.)	\$ -	\$ -	\$ -	\$ -
Repairs, maintenance	\$ -	\$ -	\$ -	\$ -
Electricity for drying	\$ -	\$ -	\$ -	\$ -
Supplies	\$ -	\$ -	\$ -	\$ -
Sub total Variable Expenses	\$ 2,500	\$ 2,500	\$ 2,500	\$ 2,500
Labor	\$ -	\$ -	\$ -	\$ -
Spring/Summer Labor 500 hrs/acre @ \$10/hr	\$ 5,000	\$ 5,000	\$ 5,000	\$ 5,000
Harvest Labor 1 hr/dried lb 1,500hrs @ \$10/hr	\$ 15,000	\$ 15,000	\$ 15,000	\$ 15,000
Sub total Labor	\$ 20,000	\$ 20,000	\$ 20,000	\$ 20,000
Other Variable Expenses	\$ -	\$ -	\$ -	\$ -
Freight/Shipping estimating 2,000lbs NMFC classification 100	\$ 610	\$ 610	\$ 610	\$ 610
Other:	\$ -	\$ -	\$ -	\$ -
Sub total Other Variable Expenses	\$ 610	\$ 610	\$ 610	\$ 610
<b>Total Variable Expenses:</b>	<b>\$ 23,110</b>	<b>\$ 23,110</b>	<b>\$ 23,110</b>	<b>\$ 23,110</b>
<b>Fixed Expenses:</b>				
Auto & truck	\$ -	\$ -	\$ -	\$ -
Interest, farm share	\$ -	\$ -	\$ -	\$ -
Insurance, farm share	\$ -	\$ -	\$ -	\$ -
Property tax, farm share	\$ -	\$ -	\$ -	\$ -
Rents paid—land, buildings	\$ -	\$ -	\$ -	\$ -
Rents paid—equipment, livestock	\$ -	\$ -	\$ -	\$ -
Utilities, farm share	\$ -	\$ -	\$ -	\$ -
Other:	\$ -	\$ -	\$ -	\$ -
Other:	\$ -	\$ -	\$ -	\$ -
Other:	\$ -	\$ -	\$ -	\$ -
Other:	\$ -	\$ -	\$ -	\$ -
<b>Total Fixed Expenses</b>	<b>\$ -</b>	<b>\$ -</b>	<b>\$ -</b>	<b>\$ -</b>
<b>TOTAL CASH EXPENSES</b>	<b>\$ 23,110</b>	<b>\$ 23,110</b>	<b>\$ 23,110</b>	<b>\$ 23,110</b>
<b>RECEIPTS MINUS EXPENSES</b>	<b>\$ (23,110)</b>	<b>\$ (17,710)</b>	<b>\$ (10,960)</b>	<b>\$ (9,610)</b>
<b>Plus CAPITAL CONTRIBUTIONS</b>				
grants	\$ -	\$ -	\$ -	\$ -
loans	\$ -	\$ -	\$ -	\$ -
off-farm income	\$ -	\$ -	\$ -	\$ -
other	\$ -	\$ -	\$ -	\$ -
<b>Plus CAPITAL SALES</b>				
equipment	\$ -	\$ -	\$ -	\$ -
<b>Less CAPITAL EXPENSE</b>				
mechanical harvester	\$ -	\$ -	\$ -	\$ -
sorter	\$ -	\$ -	\$ -	\$ -
oast 1 phase, 3/4 hp	\$ -	\$ 5,000	\$ -	\$ -
one acre hop yard- Atlantic Hops Value-Grower Set Price	\$ 10,000	\$ -	\$ -	\$ -
<b>Total Capital Expense</b>	<b>\$ 10,000</b>	<b>\$ 5,000</b>	<b>\$ -</b>	<b>\$ -</b>
<b>Less DEBT SERVICE</b>				
List Loan Principal Payments	\$ -	\$ -	\$ -	\$ -
<b>Plus STARTING CASH</b>	<b>\$ -</b>	<b>\$ (33,110)</b>	<b>\$ (55,820)</b>	<b>\$ (66,780)</b>
<b>NET RETAINED CASH EARNINGS (DEFICIT)</b>	<b>\$ (33,110)</b>	<b>\$ (55,820)</b>	<b>\$ (66,780)</b>	<b>\$ (76,390)</b>
- Income Taxes (estimate at 33%)	\$ -	\$ -	\$ -	\$ -
Less Family Living	\$ -	\$ -	\$ -	\$ -
- Capital Reserve	\$ -	\$ -	\$ -	\$ -
<b>NET AFTER CAPITAL RESERVE, FAMILY LIVING AND INCOME TAX ALLOCATION</b>	<b>\$ (33,110)</b>	<b>\$ (55,820)</b>	<b>\$ (66,780)</b>	<b>\$ (76,390)</b>

Courtesy: Vermont Farm Viability Enhancement Program

CASH FLOW PROJECTION

Scenario: Participating in Atlantic Hops Value Share Grower Program

Optimized Manual Harvesting, Harvesting Only Top 1/3 of Bine

	Projection	Projection	Projection	Projection
	Year 1	Year 2	Year 3	Year 4
<b>Production Information</b>				
Number of acres	1	1	1	1
Production Level	0%	40%	90%	100%
Quantity of dried hops sold (lbs/year)	0	600	1350	1500
Pounds of dried hops per acre per year	0	600	1350	1500
Average price paid to grower per dried pound	9	9	9	9
Return on Investment in Years	(4)			
Annual Net Income at 100% Production	\$ (3,360)			
<b>Cash Receipts</b>				
Hops Sold	\$ -	\$ 5,400	\$ 12,150	\$ 13,500
<b>TOTAL CASH RECEIPTS</b>	<b>\$ -</b>	<b>\$ 5,400</b>	<b>\$ 12,150</b>	<b>\$ 13,500</b>
<b>Cash Expenses</b>				
<b>Variable Expenses:</b>				
Chemicals	\$ -	\$ -	\$ -	\$ -
Conservation expense	\$ -	\$ -	\$ -	\$ -
Custom hire	\$ -	\$ -	\$ -	\$ -
Trellising supplies- twine, w clips, etc.	\$ -	\$ -	\$ -	\$ -
Fertilizer	\$ -	\$ -	\$ -	\$ -
Fuel and oil	\$ -	\$ -	\$ -	\$ -
Labor hired (incl. FICA, workers comp, etc.)	\$ -	\$ -	\$ -	\$ -
Repairs, maintenance	\$ -	\$ -	\$ -	\$ -
Electricity for drying	\$ -	\$ -	\$ -	\$ -
Supplies	\$ -	\$ -	\$ -	\$ -
Sub total Variable Expenses	\$ 2,500	\$ 2,500	\$ 2,500	\$ 2,500
Labor	\$ -	\$ -	\$ -	\$ -
Spring/Summer Labor 500 hrs/acre @ \$10/hr	\$ 5,000	\$ 5,000	\$ 5,000	\$ 5,000
Harvest Labor harvesting only top 1/3 of the bine 35 min/lb1,500lbs/acre (875 hrs) @ \$10/hr	\$ 8,750	\$ 8,750	\$ 8,750	\$ 8,750
Sub total Labor	\$ 13,750	\$ 13,750	\$ 13,750	\$ 13,750
Other Variable Expenses				
Freight/Shipping estimating 2,000lbs NMFC classification 100	\$ 610	\$ 610	\$ 610	\$ 610
Other:	\$ -	\$ -	\$ -	\$ -
Sub total Other Variable Expenses	\$ 610	\$ 610	\$ 610	\$ 610
<b>Total Variable Expenses:</b>	<b>\$ 16,860</b>	<b>\$ 16,860</b>	<b>\$ 16,860</b>	<b>\$ 16,860</b>
<b>Fixed Expenses:</b>				
Auto & truck	\$ -	\$ -	\$ -	\$ -
Interest, farm share	\$ -	\$ -	\$ -	\$ -
Insurance, farm share	\$ -	\$ -	\$ -	\$ -
Property tax, farm share	\$ -	\$ -	\$ -	\$ -
Rents paid—land, buildings	\$ -	\$ -	\$ -	\$ -
Rents paid—equipment, livestock	\$ -	\$ -	\$ -	\$ -
Utilities, farm share	\$ -	\$ -	\$ -	\$ -
Other:	\$ -	\$ -	\$ -	\$ -
Other:	\$ -	\$ -	\$ -	\$ -
Other:	\$ -	\$ -	\$ -	\$ -
Other:	\$ -	\$ -	\$ -	\$ -
<b>Total Fixed Expenses</b>	<b>\$ -</b>	<b>\$ -</b>	<b>\$ -</b>	<b>\$ -</b>
<b>TOTAL CASH EXPENSES</b>	<b>\$ 16,860</b>	<b>\$ 16,860</b>	<b>\$ 16,860</b>	<b>\$ 16,860</b>
<b>RECEIPTS MINUS EXPENSES</b>	<b>\$ (16,860)</b>	<b>\$ (11,460)</b>	<b>\$ (4,710)</b>	<b>\$ (3,360)</b>
<b>Plus CAPITAL CONTRIBUTIONS</b>				
grants	\$ -	\$ -	\$ -	\$ -
loans	\$ -	\$ -	\$ -	\$ -
off-farm income	\$ -	\$ -	\$ -	\$ -
other	\$ -	\$ -	\$ -	\$ -
<b>Plus CAPITAL SALES</b>				
equipment	\$ -	\$ -	\$ -	\$ -
<b>Less CAPITAL EXPENSE</b>				
mechanical harvester	\$ -	\$ -	\$ -	\$ -
sorter	\$ -	\$ -	\$ -	\$ -
oast 1 phase, 3/4 hp	\$ -	\$ 5,000	\$ -	\$ -
one acre hop yard- Atlantic Hops Value-Grower Set Price	\$ 10,000	\$ -	\$ -	\$ -
<b>Total Capital Expense</b>	<b>\$ 10,000</b>	<b>\$ 5,000</b>	<b>\$ -</b>	<b>\$ -</b>
<b>Less DEBT SERVICE</b>				
List Loan Principal Payments				
<b>Plus STARTING CASH</b>	<b>\$ -</b>	<b>\$ (26,860)</b>	<b>\$ (43,320)</b>	<b>\$ (48,030)</b>
<b>NET RETAINED CASH EARNINGS (DEFICIT)</b>	<b>\$ (26,860)</b>	<b>\$ (43,320)</b>	<b>\$ (48,030)</b>	<b>\$ (51,390)</b>
- Income Taxes (estimate at 33%)		\$ -	\$ -	\$ -
Less Family Living	\$ -	\$ -	\$ -	\$ -
- Capital Reserve				
<b>NET AFTER CAPITAL RESERVE, FAMILY LIVING AND INCOME TAX ALLOCATION</b>	<b>\$ (26,860)</b>	<b>\$ (43,320)</b>	<b>\$ (48,030)</b>	<b>\$ (51,390)</b>

Courtesy: Vermont Farm Viability Enhancement Program

CASH FLOW PROJECTION

Scenario: Participating in Atlantic Hops Value Share Grower Program

Optimized Manual Harvesting, Harvesting Only Top 1/3 of Bine, Manual Stripping & Sorting

Production Information	Projection		Projection	Projection
	Year 1	Year 2	Year 3	Year 4
Number of acres	1	1	1	1
Production Level	0%	40%	90%	100%
Quantity of dried hops sold (lbs/year)	0	600	1350	1500
Pounds of dried hops per acre per year	0	600	1350	1500
Average price paid to grower per dried pound	9	9	9	9
Return on Investment in Years	38			
Annual Net Income at 100% Production	\$ 390			
<b>Cash Receipts</b>				
Hops Sold	\$ -	\$ 5,400	\$ 12,150	\$ 13,500
<b>TOTAL CASH RECEIPTS</b>	<b>\$ -</b>	<b>\$ 5,400</b>	<b>\$ 12,150</b>	<b>\$ 13,500</b>
<b>Cash Expenses</b>				
<b>Variable Expenses:</b>				
Chemicals	\$ -	\$ -	\$ -	\$ -
Conservation expense	\$ -	\$ -	\$ -	\$ -
Custom hire	\$ -	\$ -	\$ -	\$ -
Trellising supplies- twine, w clips, etc.	\$ -	\$ -	\$ -	\$ -
Fertilizer	\$ -	\$ -	\$ -	\$ -
Fuel and oil	\$ -	\$ -	\$ -	\$ -
Labor hired (incl. FICA, workers comp, etc.)	\$ -	\$ -	\$ -	\$ -
Repairs, maintenance	\$ -	\$ -	\$ -	\$ -
Electricity for drying	\$ -	\$ -	\$ -	\$ -
Supplies	\$ -	\$ -	\$ -	\$ -
Sub total Variable Expenses	\$ 2,500	\$ 2,500	\$ 2,500	\$ 2,500
Labor	\$ -	\$ -	\$ -	\$ -
Spring/Summer Labor 500 hrs/acre @ \$10/hr	\$ 5,000	\$ 5,000	\$ 5,000	\$ 5,000
Harvest Labor harvesting top 1/3 of the bine, stripping and sorting 20 min/lb 1,500lbs/acre (500 hrs) @ \$10/hr	\$ 5,000	\$ 5,000	\$ 5,000	\$ 5,000
Sub total Labor	\$ 10,000	\$ 10,000	\$ 10,000	\$ 10,000
Other Variable Expenses				
Freight/Shipping estimating 2,000lbs NMFC classification 100	\$ 610	\$ 610	\$ 610	\$ 610
Other:	\$ -	\$ -	\$ -	\$ -
Sub total Other Variable Expenses	\$ 610	\$ 610	\$ 610	\$ 610
<b>Total Variable Expenses:</b>	<b>\$ 13,110</b>	<b>\$ 13,110</b>	<b>\$ 13,110</b>	<b>\$ 13,110</b>
<b>Fixed Expenses:</b>				
Auto & truck	\$ -	\$ -	\$ -	\$ -
Interest, farm share	\$ -	\$ -	\$ -	\$ -
Insurance, farm share	\$ -	\$ -	\$ -	\$ -
Property tax, farm share	\$ -	\$ -	\$ -	\$ -
Rents paid—land, buildings	\$ -	\$ -	\$ -	\$ -
Rents paid—equipment, livestock	\$ -	\$ -	\$ -	\$ -
Utilities, farm share	\$ -	\$ -	\$ -	\$ -
Other:	\$ -	\$ -	\$ -	\$ -
Other:	\$ -	\$ -	\$ -	\$ -
Other:	\$ -	\$ -	\$ -	\$ -
Other:	\$ -	\$ -	\$ -	\$ -
<b>Total Fixed Expenses</b>	<b>\$ -</b>	<b>\$ -</b>	<b>\$ -</b>	<b>\$ -</b>
<b>TOTAL CASH EXPENSES</b>	<b>\$ 13,110</b>	<b>\$ 13,110</b>	<b>\$ 13,110</b>	<b>\$ 13,110</b>
<b>RECEIPTS MINUS EXPENSES</b>	<b>\$ (13,110)</b>	<b>\$ (7,710)</b>	<b>\$ (960)</b>	<b>\$ 390</b>
<b>Plus CAPITAL CONTRIBUTIONS</b>				
grants	\$ -	\$ -	\$ -	\$ -
loans	\$ -	\$ -	\$ -	\$ -
off-farm income	\$ -	\$ -	\$ -	\$ -
other	\$ -	\$ -	\$ -	\$ -
<b>Plus CAPITAL SALES</b>				
equipment	\$ -	\$ -	\$ -	\$ -
<b>Less CAPITAL EXPENSE</b>				
mechanical harvester	\$ -	\$ -	\$ -	\$ -
sorter	\$ -	\$ -	\$ -	\$ -
oast 1 phase, 3/4 hp	\$ -	\$ 5,000	\$ -	\$ -
one acre hop yard- Atlantic Hops Value-Grower Set Price	\$ 10,000	\$ -	\$ -	\$ -
<b>Total Capital Expense</b>	<b>\$ 10,000</b>	<b>\$ 5,000</b>	<b>\$ -</b>	<b>\$ -</b>
<b>Less DEBT SERVICE</b>				
List Loan Principal Payments				
<b>Plus STARTING CASH</b>	<b>\$ -</b>	<b>\$ (23,110)</b>	<b>\$ (35,820)</b>	<b>\$ (36,780)</b>
<b>NET RETAINED CASH EARNINGS (DEFICIT)</b>	<b>\$ (23,110)</b>	<b>\$ (35,820)</b>	<b>\$ (36,780)</b>	<b>\$ (36,390)</b>
- Income Taxes (estimate at 33%)		\$ -	\$ -	\$ -
Less Family Living	\$ -	\$ -	\$ -	\$ -
- Capital Reserve				
<b>NET AFTER CAPITAL RESERVE, FAMILY LIVING AND INCOME TAX ALLOCATION</b>	<b>\$ (23,110)</b>	<b>\$ (35,820)</b>	<b>\$ (36,780)</b>	<b>\$ (36,390)</b>

Courtesy: Vermont Farm Viability Enhancement Program

CASH FLOW PROJECTION

Scenario: Participating in Atlantic Hops Value Share Grower Program

Optimized Manual Harvesting, Harvesting Only Top 1/3 of Bine, Mechanized Stripping, Picking, & Sorting

Production Information	Projection		Projection	Projection
	Year 1	Year 2	Year 3	Year 4
Number of acres	1	1	1	1
Production Level	0%	40%	90%	100%
Quantity of dried hops sold (lbs/year)	0	600	1350	1500
Pounds of dried hops per acre per year	0	600	1350	1500
Average price paid to grower per dried pound	9	9	9	9
Return on Investment in Years	5			
Annual Net Income at 100% Production	\$ 4,640			
<b>Cash Receipts</b>				
Hops Sold	\$ -	\$ 5,400	\$ 12,150	\$ 13,500
<b>TOTAL CASH RECEIPTS</b>	<b>\$ -</b>	<b>\$ 5,400</b>	<b>\$ 12,150</b>	<b>\$ 13,500</b>
<b>Cash Expenses</b>				
<b>Variable Expenses:</b>				
Chemicals	\$ -	\$ -	\$ -	\$ -
Conservation expense	\$ -	\$ -	\$ -	\$ -
Custom hire	\$ -	\$ -	\$ -	\$ -
Trellising supplies- twine, w clips, etc.	\$ -	\$ -	\$ -	\$ -
Fertilizer	\$ -	\$ -	\$ -	\$ -
Fuel and oil	\$ -	\$ -	\$ -	\$ -
Labor hired (incl. FICA, workers comp, etc.)	\$ -	\$ -	\$ -	\$ -
Repairs, maintenance	\$ -	\$ -	\$ -	\$ -
Electricity for drying	\$ -	\$ -	\$ -	\$ -
Supplies	\$ -	\$ -	\$ -	\$ -
Sub total Variable Expenses	\$ 2,500	\$ 2,500	\$ 2,500	\$ 2,500
Labor	\$ -	\$ -	\$ -	\$ -
Spring/Summer Labor 500 hrs/acre @ \$10/hr	\$ 5,000	\$ 5,000	\$ 5,000	\$ 5,000
Harvest Labor harvesting only top 1/3 of the bine 3 min/lb- 1 min to pick, 2 min to sort 1,500lbs/acre (75 hrs) @ \$10/hr	\$ 750	\$ 750	\$ 750	\$ 750
Sub total Labor	\$ 5,750	\$ 5,750	\$ 5,750	\$ 5,750
Other Variable Expenses	\$ -	\$ -	\$ -	\$ -
Freight/Shipping estimating 2,000lbs NMFC classification 100	\$ 610	\$ 610	\$ 610	\$ 610
Other:	\$ -	\$ -	\$ -	\$ -
Sub total Other Variable Expenses	\$ 610	\$ 610	\$ 610	\$ 610
<b>Total Variable Expenses:</b>	<b>\$ 8,860</b>	<b>\$ 8,860</b>	<b>\$ 8,860</b>	<b>\$ 8,860</b>
<b>Fixed Expenses:</b>				
Auto & truck	\$ -	\$ -	\$ -	\$ -
Interest, farm share	\$ -	\$ -	\$ -	\$ -
Insurance, farm share	\$ -	\$ -	\$ -	\$ -
Property tax, farm share	\$ -	\$ -	\$ -	\$ -
Rents paid—land, buildings	\$ -	\$ -	\$ -	\$ -
Rents paid—equipment, livestock	\$ -	\$ -	\$ -	\$ -
Utilities, farm share	\$ -	\$ -	\$ -	\$ -
Other:	\$ -	\$ -	\$ -	\$ -
Other:	\$ -	\$ -	\$ -	\$ -
Other:	\$ -	\$ -	\$ -	\$ -
Other:	\$ -	\$ -	\$ -	\$ -
<b>Total Fixed Expenses</b>	<b>\$ -</b>	<b>\$ -</b>	<b>\$ -</b>	<b>\$ -</b>
<b>TOTAL CASH EXPENSES</b>	<b>\$ 8,860</b>	<b>\$ 8,860</b>	<b>\$ 8,860</b>	<b>\$ 8,860</b>
<b>RECEIPTS MINUS EXPENSES</b>	<b>\$ (8,860)</b>	<b>\$ (3,460)</b>	<b>\$ 3,290</b>	<b>\$ 4,640</b>
<b>Plus CAPITAL CONTRIBUTIONS</b>				
grants	\$ -	\$ -	\$ -	\$ -
loans	\$ -	\$ -	\$ -	\$ -
off-farm income	\$ -	\$ -	\$ -	\$ -
other	\$ -	\$ -	\$ -	\$ -
<b>Plus CAPITAL SALES</b>				
equipment	\$ -	\$ -	\$ -	\$ -
<b>Less CAPITAL EXPENSE</b>				
mechanical harvester	\$ -	\$ -	\$ 5,000	\$ -
sorter	\$ -	\$ -	\$ 5,000	\$ -
oast	\$ -	\$ 5,000	\$ -	\$ -
one acre hop yard- Atlantic Hops Value-Grower Set Price	\$ 10,000	\$ -	\$ -	\$ -
<b>Total Capital Expense</b>	<b>\$ 10,000</b>	<b>\$ 5,000</b>	<b>\$ 10,000</b>	<b>\$ -</b>
<b>Less DEBT SERVICE</b>				
List Loan Principal Payments	\$ -	\$ -	\$ -	\$ -
<b>Plus STARTING CASH</b>	<b>\$ -</b>	<b>\$ (18,860)</b>	<b>\$ (27,320)</b>	<b>\$ (34,030)</b>
<b>NET RETAINED CASH EARNINGS (DEFICIT)</b>	<b>\$ (18,860)</b>	<b>\$ (27,320)</b>	<b>\$ (34,030)</b>	<b>\$ (29,390)</b>
- Income Taxes (estimate at 33%)	\$ -	\$ -	\$ -	\$ -
Less Family Living	\$ -	\$ -	\$ -	\$ -
- Capital Reserve	\$ -	\$ -	\$ -	\$ -
<b>NET AFTER CAPITAL RESERVE, FAMILY LIVING AND INCOME TAX ALLOCATION</b>	<b>\$ (18,860)</b>	<b>\$ (27,320)</b>	<b>\$ (34,030)</b>	<b>\$ (29,390)</b>

## **Scenario 2: Grower growing hops to sell as whole dried hops**

Cash flow 1: demonstrating cash flow if no efficiencies in production are utilized

Cash flow 2: demonstrating cash flow if grower harvests only top 1/3 of the bine

Cash flow 3: demonstrating cash flow if grower harvests only top 1/3 of the bine, and manually strips and sorts

Cash flow 4: demonstrating cash flow if grower harvests only top 1/3 of the bine, and mechanically strips and sorts

**CASH FLOW PROJECTION**

Scenario: Selling Direct to Brewer, Whole Hops

**No Optimization in Harvesting**

Production Information	Projection			
	Year 1	Year 2	Year 3	Year 4
Number of acres	1	1	1	1
Production Level	0%	40%	90%	100%
Quantity of dried hops sold (lbs/year)	0	600	1350	1500
Pounds of dried hops per acre per year	0	600	1350	1500
<b>Average price per dried pound needed to break even</b>	<b>15.51</b>	<b>16.11</b>	<b>16.11</b>	<b>16.11</b>
<b>Projected Sale Price to Brewers</b>	<b>10.00</b>	<b>10.00</b>	<b>10.00</b>	<b>10.00</b>
<b>Return on Investment in Years</b>	<b>(2)</b>			
<b>Annual Net Income at 100% Production</b>	<b>\$ (9,160)</b>			
<b>Cash Receipts</b>				
Hops Sold	\$ -	\$ 6,000	\$ 13,500	\$ 15,000
<b>TOTAL CASH RECEIPTS</b>	<b>\$ -</b>	<b>\$ 6,000</b>	<b>\$ 13,500</b>	<b>\$ 15,000</b>
<b>Cash Expenses</b>				
<b>Variable Expenses:</b>				
Chemicals	\$ -	\$ -	\$ -	\$ -
Conservation expense	\$ -	\$ -	\$ -	\$ -
Custom hire	\$ -	\$ -	\$ -	\$ -
Trellising supplies- twine, w clips, etc.	\$ -	\$ -	\$ -	\$ -
Fertilizer	\$ -	\$ -	\$ -	\$ -
Fuel and oil	\$ -	\$ -	\$ -	\$ -
Labor hired (incl. FICA, workers comp, etc.)	\$ -	\$ -	\$ -	\$ -
Repairs, maintenance	\$ -	\$ -	\$ -	\$ -
Electricity for drying	\$ -	\$ -	\$ -	\$ -
Supplies	\$ -	\$ -	\$ -	\$ -
Sub total Variable Expenses	\$ 2,500	\$ 2,500	\$ 2,500	\$ 2,500
Labor	\$ -	\$ -	\$ -	\$ -
Spring/Summer Labor 500 hrs/acre @ \$10/hr	\$ 5,000	\$ 5,000	\$ 5,000	\$ 5,000
Harvest Labor 1 hr/dried lb 1,500hrs @ \$10/hr	\$ 15,000	\$ 15,000	\$ 15,000	\$ 15,000
Sub total Labor	\$ 20,000	\$ 20,000	\$ 20,000	\$ 20,000
Other Variable Expenses				
Freight/Shipping estimating 2,000lbs NMFC classification 100	\$ 610	\$ 610	\$ 610	\$ 610
Chemical Analysis	\$ 150	\$ 150	\$ 150	\$ 150
Processing (pelletizing and packaging)	\$ -	\$ 100	\$ 100	\$ 100
Climate Controlled Storage- rented climate controlled space	\$ -	\$ 700	\$ 700	\$ 700
Sales & Marketing	\$ -	\$ 100	\$ 100	\$ 100
Other:	\$ -	\$ -	\$ -	\$ -
Sub total Other Variable Expenses	\$ 760	\$ 1,660	\$ 1,660	\$ 1,660
<b>Total Variable Expenses:</b>	<b>\$ 23,260</b>	<b>\$ 24,160</b>	<b>\$ 24,160</b>	<b>\$ 24,160</b>
<b>Fixed Expenses:</b>				
Auto & truck	\$ -	\$ -	\$ -	\$ -
Interest, farm share	\$ -	\$ -	\$ -	\$ -
Insurance, farm share	\$ -	\$ -	\$ -	\$ -
Property tax, farm share	\$ -	\$ -	\$ -	\$ -
Rents paid—land, buildings	\$ -	\$ -	\$ -	\$ -
Rents paid—equipment, livestock	\$ -	\$ -	\$ -	\$ -
Utilities, farm share	\$ -	\$ -	\$ -	\$ -
Other:	\$ -	\$ -	\$ -	\$ -
Other:	\$ -	\$ -	\$ -	\$ -
Other:	\$ -	\$ -	\$ -	\$ -
Other:	\$ -	\$ -	\$ -	\$ -
<b>Total Fixed Expenses</b>	<b>\$ -</b>	<b>\$ -</b>	<b>\$ -</b>	<b>\$ -</b>
<b>TOTAL CASH EXPENSES</b>	<b>\$ 23,260</b>	<b>\$ 24,160</b>	<b>\$ 24,160</b>	<b>\$ 24,160</b>
<b>RECEIPTS MINUS EXPENSES</b>	<b>\$ (23,260)</b>	<b>\$ (18,160)</b>	<b>\$ (10,660)</b>	<b>\$ (9,160)</b>
<b>Plus CAPITAL CONTRIBUTIONS</b>				
grants	\$ -	\$ -	\$ -	\$ -
loans	\$ -	\$ -	\$ -	\$ -
off-farm income	\$ -	\$ -	\$ -	\$ -
other	\$ -	\$ -	\$ -	\$ -
<b>Plus CAPITAL SALES</b>				
equipment	\$ -	\$ -	\$ -	\$ -
<b>Less CAPITAL EXPENSE</b>				
mechanical harvester	\$ -	\$ -	\$ -	\$ -
sorter	\$ -	\$ -	\$ -	\$ -
oast	\$ -	\$ 5,000	\$ -	\$ -
one acre hop yard	\$ 12,000	\$ -	\$ -	\$ -
<b>Total Capital Expense</b>	<b>\$ 12,000</b>	<b>\$ 5,000</b>	<b>\$ -</b>	<b>\$ -</b>
<b>Less DEBT SERVICE</b>				
List Loan Principal Payments				
<b>Plus STARTING CASH</b>	<b>\$ -</b>	<b>\$ (35,260)</b>	<b>\$ (58,717)</b>	<b>\$ (69,674)</b>
<b>NET RETAINED CASH EARNINGS (DEFICIT)</b>	<b>\$ (35,260)</b>	<b>\$ (58,420)</b>	<b>\$ (69,377)</b>	<b>\$ (78,834)</b>
- Income Taxes (estimate at 33%)		\$ 297	\$ 297	\$ 297
Less Family Living	\$ -	\$ -	\$ -	\$ -
- Capital Reserve				
<b>NET AFTER CAPITAL RESERVE, FAMILY LIVING AND INCOME TAX ALLOCATION</b>	<b>\$ (35,260)</b>	<b>\$ (58,717)</b>	<b>\$ (69,674)</b>	<b>\$ (79,131)</b>

Courtesy: Vermont Farm Viability Enhancement Program

**CASH FLOW PROJECTION**

Scenario: Selling Direct to Brewer, Whole Hops

Optimized Manual Harvesting, Harvesting Only Top 1/3 of Bine

Production Information	Projection			
	Year 1	Year 2	Year 3	Year 4
Number of acres	1	1	1	1
Production Level	0%	40%	90%	100%
Quantity of dried hops sold (lbs/year)	0	600	1350	1500
Pounds of dried hops per acre per year	0	600	1350	1500
<b>Average price per dried pound needed to break even</b>	<b>12.51</b>	<b>13.11</b>	<b>13.11</b>	<b>13.11</b>
<b>Projected Sale Price to Brewers</b>	<b>10.00</b>	<b>10.00</b>	<b>10.00</b>	<b>10.00</b>
<b>Return on Investment in Years</b>	<b>(4)</b>			
<b>Annual Net Income at 100% Production</b>	<b>\$ (4,660)</b>			
<b>Cash Receipts</b>				
Hops Sold	\$ -	\$ 6,000	\$ 13,500	\$ 15,000
<b>TOTAL CASH RECEIPTS</b>	<b>\$ -</b>	<b>\$ 6,000</b>	<b>\$ 13,500</b>	<b>\$ 15,000</b>
<b>Cash Expenses</b>				
<b>Variable Expenses:</b>				
Chemicals	\$ -	\$ -	\$ -	\$ -
Conservation expense	\$ -	\$ -	\$ -	\$ -
Custom hire	\$ -	\$ -	\$ -	\$ -
Trellising supplies- twine, w clips, etc.	\$ -	\$ -	\$ -	\$ -
Fertilizer	\$ -	\$ -	\$ -	\$ -
Fuel and oil	\$ -	\$ -	\$ -	\$ -
Labor hired (incl. FICA, workers comp, etc.)	\$ -	\$ -	\$ -	\$ -
Repairs, maintenance	\$ -	\$ -	\$ -	\$ -
Electricity for drying	\$ -	\$ -	\$ -	\$ -
Supplies	\$ -	\$ -	\$ -	\$ -
Sub total Variable Expenses	\$ 2,500	\$ 2,500	\$ 2,500	\$ 2,500
Labor	\$ -	\$ -	\$ -	\$ -
Spring/Summer Labor 500 hrs/acre @ \$10/hr	\$ 5,000	\$ 5,000	\$ 5,000	\$ 5,000
Harvest Labor harvesting only top 1/3 of the bine 35 min/lb1,500lbs/acre @ \$10/hr	\$ 10,500	\$ 10,500	\$ 10,500	\$ 10,500
Sub total Labor	\$ 15,500	\$ 15,500	\$ 15,500	\$ 15,500
Other Variable Expenses				
Freight/Shipping estimating 2,000lbs NMFC classification 100	\$ 610	\$ 610	\$ 610	\$ 610
Chemical Analysis	\$ 150	\$ 150	\$ 150	\$ 150
Processing (pelletizing and packaging)	\$ -	\$ 100	\$ 100	\$ 100
Climate Controlled Storage- rented climate controlled space	\$ -	\$ 700	\$ 700	\$ 700
Sales & Marketing	\$ -	\$ 100	\$ 100	\$ 100
Other:	\$ -	\$ -	\$ -	\$ -
Sub total Other Variable Expenses	\$ 760	\$ 1,660	\$ 1,660	\$ 1,660
<b>Total Variable Expenses:</b>	<b>\$ 18,760</b>	<b>\$ 19,660</b>	<b>\$ 19,660</b>	<b>\$ 19,660</b>
<b>Fixed Expenses:</b>				
Auto & truck	\$ -	\$ -	\$ -	\$ -
Interest, farm share	\$ -	\$ -	\$ -	\$ -
Insurance, farm share	\$ -	\$ -	\$ -	\$ -
Property tax, farm share	\$ -	\$ -	\$ -	\$ -
Rents paid—land, buildings	\$ -	\$ -	\$ -	\$ -
Rents paid—equipment, livestock	\$ -	\$ -	\$ -	\$ -
Utilities, farm share	\$ -	\$ -	\$ -	\$ -
Other:	\$ -	\$ -	\$ -	\$ -
Other:	\$ -	\$ -	\$ -	\$ -
Other:	\$ -	\$ -	\$ -	\$ -
Other:	\$ -	\$ -	\$ -	\$ -
<b>Total Fixed Expenses</b>	<b>\$ -</b>	<b>\$ -</b>	<b>\$ -</b>	<b>\$ -</b>
<b>TOTAL CASH EXPENSES</b>	<b>\$ 18,760</b>	<b>\$ 19,660</b>	<b>\$ 19,660</b>	<b>\$ 19,660</b>
<b>RECEIPTS MINUS EXPENSES</b>	<b>\$ (18,760)</b>	<b>\$ (13,660)</b>	<b>\$ (6,160)</b>	<b>\$ (4,660)</b>
<b>Plus CAPITAL CONTRIBUTIONS</b>				
grants	\$ -	\$ -	\$ -	\$ -
loans	\$ -	\$ -	\$ -	\$ -
off-farm income	\$ -	\$ -	\$ -	\$ -
other	\$ -	\$ -	\$ -	\$ -
<b>Plus CAPITAL SALES</b>				
equipment	\$ -	\$ -	\$ -	\$ -
<b>Less CAPITAL EXPENSE</b>				
mechanical harvester	\$ -	\$ -	\$ -	\$ -
sorter	\$ -	\$ -	\$ -	\$ -
oast	\$ -	\$ 5,000	\$ -	\$ -
one acre hop yard	\$ 12,000	\$ -	\$ -	\$ -
<b>Total Capital Expense</b>	<b>\$ 12,000</b>	<b>\$ 5,000</b>	<b>\$ -</b>	<b>\$ -</b>
<b>Less DEBT SERVICE</b>				
List Loan Principal Payments				
<b>Plus STARTING CASH</b>	<b>\$ -</b>	<b>\$ (30,760)</b>	<b>\$ (49,717)</b>	<b>\$ (56,174)</b>
<b>NET RETAINED CASH EARNINGS (DEFICIT)</b>	<b>\$ (30,760)</b>	<b>\$ (49,420)</b>	<b>\$ (55,877)</b>	<b>\$ (60,834)</b>
- Income Taxes (estimate at 33%)		\$ 297	\$ 297	\$ 297
Less Family Living	\$ -	\$ -	\$ -	\$ -
- Capital Reserve				
<b>NET AFTER CAPITAL RESERVE, FAMILY LIVING AND INCOME TAX ALLOCATION</b>	<b>\$ (30,760)</b>	<b>\$ (49,717)</b>	<b>\$ (56,174)</b>	<b>\$ (61,131)</b>

Courtesy: Vermont Farm Viability Enhancement Program  
CASH FLOW PROJECTION

Scenario: Selling Direct to Brewer, Whole Hops

Optimized Manual Harvesting, Harvesting Only Top 1/3 of Bine, Manual Stripping & Sorting

Production Information	Projection		Projection	Projection
	Year 1	Year 2	Year 3	Year 4
Number of acres	1	1	1	1
Production Level	0%	40%	90%	100%
Quantity of dried hops sold (lbs/year)	0	600	1350	1500
Pounds of dried hops per acre per year	0	600	1350	1500
Average price per dried pound needed to break even	8.84	9.44	9.44	9.44
Projected Sale Price to Brewers	10.00	10.00	10.00	10.00
Return on Investment in Years	26			
Annual Net Income at 100% Production	\$ 840			
<b>Cash Receipts</b>				
Hops Sold	\$ -	\$ 6,000	\$ 13,500	\$ 15,000
<b>TOTAL CASH RECEIPTS</b>	<b>\$ -</b>	<b>\$ 6,000</b>	<b>\$ 13,500</b>	<b>\$ 15,000</b>
<b>Cash Expenses</b>				
<b>Variable Expenses:</b>				
Chemicals	\$ -	\$ -	\$ -	\$ -
Conservation expense	\$ -	\$ -	\$ -	\$ -
Custom hire	\$ -	\$ -	\$ -	\$ -
Trellising supplies- twine, w clips, etc.	\$ -	\$ -	\$ -	\$ -
Fertilizer	\$ -	\$ -	\$ -	\$ -
Fuel and oil	\$ -	\$ -	\$ -	\$ -
Labor hired (incl. FICA, workers comp, etc.)	\$ -	\$ -	\$ -	\$ -
Repairs, maintenance	\$ -	\$ -	\$ -	\$ -
Electricity for drying	\$ -	\$ -	\$ -	\$ -
Supplies	\$ -	\$ -	\$ -	\$ -
Sub total Variable Expenses	\$ 2,500	\$ 2,500	\$ 2,500	\$ 2,500
Labor	\$ -	\$ -	\$ -	\$ -
Spring/Summer Labor 500 hrs/acre @ \$10/hr	\$ 5,000	\$ 5,000	\$ 5,000	\$ 5,000
Harvest Labor harvesting top 1/3 of the bine, stripping and sorting 20 min/lb 1,500lbs/acre (500 hrs) @ \$10/hr	\$ 5,000	\$ 5,000	\$ 5,000	\$ 5,000
Sub total Labor	\$ 10,000	\$ 10,000	\$ 10,000	\$ 10,000
Other Variable Expenses				
Freight/Shipping estimating 2,000lbs NMFC classification 100	\$ 610	\$ 610	\$ 610	\$ 610
Chemical Analysis	\$ 150	\$ 150	\$ 150	\$ 150
Processing (pelletizing and packaging)	\$ -	\$ 100	\$ 100	\$ 100
Climate Controlled Storage- rented climate controlled space	\$ -	\$ 700	\$ 700	\$ 700
Sales & Marketing	\$ -	\$ 100	\$ 100	\$ 100
Other:	\$ -	\$ -	\$ -	\$ -
Sub total Other Variable Expenses	\$ 760	\$ 1,660	\$ 1,660	\$ 1,660
<b>Total Variable Expenses:</b>	<b>\$ 13,260</b>	<b>\$ 14,160</b>	<b>\$ 14,160</b>	<b>\$ 14,160</b>
<b>Fixed Expenses:</b>				
Auto & truck	\$ -	\$ -	\$ -	\$ -
Interest, farm share	\$ -	\$ -	\$ -	\$ -
Insurance, farm share	\$ -	\$ -	\$ -	\$ -
Property tax, farm share	\$ -	\$ -	\$ -	\$ -
Rents paid—land, buildings	\$ -	\$ -	\$ -	\$ -
Rents paid—equipment, livestock	\$ -	\$ -	\$ -	\$ -
Utilities, farm share	\$ -	\$ -	\$ -	\$ -
Other:	\$ -	\$ -	\$ -	\$ -
Other:	\$ -	\$ -	\$ -	\$ -
Other:	\$ -	\$ -	\$ -	\$ -
Other:	\$ -	\$ -	\$ -	\$ -
<b>Total Fixed Expenses</b>	<b>\$ -</b>	<b>\$ -</b>	<b>\$ -</b>	<b>\$ -</b>
<b>TOTAL CASH EXPENSES</b>	<b>\$ 13,260</b>	<b>\$ 14,160</b>	<b>\$ 14,160</b>	<b>\$ 14,160</b>
<b>RECEIPTS MINUS EXPENSES</b>	<b>\$ (13,260)</b>	<b>\$ (8,160)</b>	<b>\$ (660)</b>	<b>\$ 840</b>
<b>Plus CAPITAL CONTRIBUTIONS</b>				
grants	\$ -	\$ -	\$ -	\$ -
loans	\$ -	\$ -	\$ -	\$ -
off-farm income	\$ -	\$ -	\$ -	\$ -
other	\$ -	\$ -	\$ -	\$ -
<b>Plus CAPITAL SALES</b>				
equipment	\$ -	\$ -	\$ -	\$ -
<b>Less CAPITAL EXPENSE</b>				
mechanical harvester	\$ -	\$ -	\$ -	\$ -
sorter	\$ -	\$ -	\$ 5,000	\$ -
oast	\$ -	\$ 5,000	\$ -	\$ -
one acre hop yard	\$ 12,000	\$ -	\$ -	\$ -
<b>Total Capital Expense</b>	<b>\$ 12,000</b>	<b>\$ 5,000</b>	<b>\$ 5,000</b>	<b>\$ -</b>
<b>Less DEBT SERVICE</b>				
List Loan Principal Payments				
<b>Plus STARTING CASH</b>	<b>\$ -</b>	<b>\$ (25,260)</b>	<b>\$ (38,717)</b>	<b>\$ (44,674)</b>
<b>NET RETAINED CASH EARNINGS (DEFICIT)</b>	<b>\$ (25,260)</b>	<b>\$ (38,420)</b>	<b>\$ (44,377)</b>	<b>\$ (43,834)</b>
- Income Taxes (estimate at 33%)		\$ 297	\$ 297	\$ 297
Less Family Living	\$ -	\$ -	\$ -	\$ -
- Capital Reserve				
<b>NET AFTER CAPITAL RESERVE, FAMILY LIVING AND INCOME TAX ALLOCATION</b>	<b>\$ (25,260)</b>	<b>\$ (38,717)</b>	<b>\$ (44,674)</b>	<b>\$ (44,131)</b>

CASH FLOW PROJECTION

Scenario: Selling Direct To Brewer, Whole Hops

Optimized Manual Harvesting, Harvesting Only Top 1/3 of Bine, Mechanized Stripping, Picking, & Sorting

Production Information	Projection		Projection	Projection
	Year 1	Year 2	Year 3	Year 4
Number of acres	1	1	1	1
Production Level	0%	40%	90%	100%
Quantity of dried hops sold (lbs/year)	0	600	1350	1500
Pounds of dried hops per acre per year	0	600	1350	1500
Average price per dried pound needed to break even	6.01	6.61	6.61	6.61
Projected Sale Price to Brewers	10.00	10.00	10.00	10.00
Return on Investment in Years	5			
Annual Net Income at 100% Production	\$ 5,090			
<b>Cash Receipts</b>				
Hops Sold	\$ -	\$ 6,000	\$ 13,500	\$ 15,000
<b>TOTAL CASH RECEIPTS</b>	\$ -	\$ 6,000	\$ 13,500	\$ 15,000
<b>Cash Expenses</b>				
<b>Variable Expenses:</b>				
Chemicals	\$ -	\$ -	\$ -	\$ -
Conservation expense	\$ -	\$ -	\$ -	\$ -
Custom hire	\$ -	\$ -	\$ -	\$ -
Trellising supplies- twine, w clips, etc.	\$ -	\$ -	\$ -	\$ -
Fertilizer	\$ -	\$ -	\$ -	\$ -
Fuel and oil	\$ -	\$ -	\$ -	\$ -
Labor hired (incl. FICA, workers comp, etc.)	\$ -	\$ -	\$ -	\$ -
Repairs, maintenance	\$ -	\$ -	\$ -	\$ -
Electricity for drying	\$ -	\$ -	\$ -	\$ -
Supplies	\$ -	\$ -	\$ -	\$ -
Sub total Variable Expenses	\$ 2,500	\$ 2,500	\$ 2,500	\$ 2,500
Labor	\$ -	\$ -	\$ -	\$ -
Spring/Summer Labor 500 hrs/acre @ \$10/hr	\$ 5,000	\$ 5,000	\$ 5,000	\$ 5,000
Harvest Labor harvesting only top 1/3 of the bine 3 min/lb- 1 min to pick, 2 min to sort 1,500lbs/acre (75 hrs) @ \$10/hr	\$ 750	\$ 750	\$ 750	\$ 750
Sub total Labor	\$ 5,750	\$ 5,750	\$ 5,750	\$ 5,750
Other Variable Expenses				
Freight/Shipping estimating 2,000lbs NMFC classification 100	\$ 610	\$ 610	\$ 610	\$ 610
Chemical Analysis	\$ 150	\$ 150	\$ 150	\$ 150
Processing (pelletizing and packaging)	\$ -	\$ 100	\$ 100	\$ 100
Climate Controlled Storage- rented climate controlled space	\$ -	\$ 700	\$ 700	\$ 700
Sales & Marketing	\$ -	\$ 100	\$ 100	\$ 100
Other:	\$ -	\$ -	\$ -	\$ -
Sub total Other Variable Expenses	\$ 760	\$ 1,660	\$ 1,660	\$ 1,660
<b>Total Variable Expenses:</b>	\$ 9,010	\$ 9,910	\$ 9,910	\$ 9,910
<b>Fixed Expenses:</b>				
Auto & truck	\$ -	\$ -	\$ -	\$ -
Interest, farm share	\$ -	\$ -	\$ -	\$ -
Insurance, farm share	\$ -	\$ -	\$ -	\$ -
Property tax, farm share	\$ -	\$ -	\$ -	\$ -
Rents paid—land, buildings	\$ -	\$ -	\$ -	\$ -
Rents paid—equipment, livestock	\$ -	\$ -	\$ -	\$ -
Utilities, farm share	\$ -	\$ -	\$ -	\$ -
Other:	\$ -	\$ -	\$ -	\$ -
Other:	\$ -	\$ -	\$ -	\$ -
Other:	\$ -	\$ -	\$ -	\$ -
Other:	\$ -	\$ -	\$ -	\$ -
<b>Total Fixed Expenses</b>	\$ -	\$ -	\$ -	\$ -
<b>TOTAL CASH EXPENSES</b>	\$ 9,010	\$ 9,910	\$ 9,910	\$ 9,910
<b>RECEIPTS MINUS EXPENSES</b>	\$ (9,010)	\$ (3,910)	\$ 3,590	\$ 5,090
<b>Plus CAPITAL CONTRIBUTIONS</b>				
grants	\$ -	\$ -	\$ -	\$ -
loans	\$ -	\$ -	\$ -	\$ -
off-farm income	\$ -	\$ -	\$ -	\$ -
other	\$ -	\$ -	\$ -	\$ -
<b>Plus CAPITAL SALES</b>				
equipment	\$ -	\$ -	\$ -	\$ -
<b>Less CAPITAL EXPENSE</b>				
mechanical harvester	\$ -	\$ -	\$ 5,000	\$ -
sorter	\$ -	\$ -	\$ 5,000	\$ -
oast	\$ -	\$ 5,000	\$ -	\$ -
one acre hop yard	\$ 12,000	\$ -	\$ -	\$ -
<b>Total Capital Expense</b>	\$ 12,000	\$ 5,000	\$ 10,000	\$ -
<b>Less DEBT SERVICE</b>				
List Loan Principal Payments				
<b>Plus STARTING CASH</b>	\$ -	\$ (21,010)	\$ (30,217)	\$ (36,924)
<b>NET RETAINED CASH EARNINGS (DEFICIT)</b>	\$ (21,010)	\$ (29,920)	\$ (36,627)	\$ (31,834)
- Income Taxes (estimate at 33%)		\$ 297	\$ 297	\$ 297
Less Family Living	\$ -	\$ -	\$ -	\$ -
- Capital Reserve				
<b>NET AFTER CAPITAL RESERVE, FAMILY LIVING AND INCOME TAX ALLOCATION</b>	\$ (21,010)	\$ (30,217)	\$ (36,924)	\$ (32,131)

### **Scenario 3: Grower sending hops to Atlantic Hops for processing**

Cash flow 1: demonstrating cash flow if no efficiencies in production are utilized

Cash flow 2: demonstrating cash flow if grower harvests only top 1/3 of the bine

Cash flow 3: demonstrating cash flow if grower harvests only top 1/3 of the bine, and manually strips and sorts

Cash flow 4: demonstrating cash flow if grower harvests only top 1/3 of the bine, and mechanically strips and sorts

Courtesy: Vermont Farm Viability Enhancement Program

CASH FLOW PROJECTION

Scenario: Selling Pelletized Direct To Brewer Using Atlantic Hops Processing Services

No Optimization in Harvesting

	Year 1	Projection Year 2	Projection Year 3	Projection Year 4
<b>Production Information</b>				
Number of acres	1	1	1	1
Production Level	0%	40%	90%	100%
Quantity of dried hops sold (lbs/year)	0	600	1350	1500
Pounds of dried hops per acre per year	0	600	1350	1500
<b>Average price per dried pound needed to break even</b>	<b>15.00</b>	<b>17.81</b>	<b>20.56</b>	<b>21.11</b>
<b>Projected Sale Price</b>	<b>15.00</b>	<b>15.00</b>	<b>15.00</b>	<b>15.00</b>
<b>Return on Investment in Years</b>	<b>(2)</b>			
<b>Annual Net Income at 100% Production</b>	<b>\$ (9,160)</b>			
<b>Cash Receipts</b>				
Hops Sold	\$ -	\$ 9,000	\$ 20,250	\$ 22,500
<b>TOTAL CASH RECEIPTS</b>	<b>\$ -</b>	<b>\$ 9,000</b>	<b>\$ 20,250</b>	<b>\$ 22,500</b>
<b>Cash Expenses</b>				
<b>Variable Expenses:</b>				
Chemicals	\$ -	\$ -	\$ -	\$ -
Conservation expense	\$ -	\$ -	\$ -	\$ -
Custom hire	\$ -	\$ -	\$ -	\$ -
Trellising supplies- twine, w clips, etc.	\$ -	\$ -	\$ -	\$ -
Fertilizer	\$ -	\$ -	\$ -	\$ -
Fuel and oil	\$ -	\$ -	\$ -	\$ -
Labor hired (incl. FICA, workers comp, etc.)	\$ -	\$ -	\$ -	\$ -
Repairs, maintenance	\$ -	\$ -	\$ -	\$ -
Electricity for drying	\$ -	\$ -	\$ -	\$ -
Supplies	\$ -	\$ -	\$ -	\$ -
Sub total Variable Expenses	\$ 2,500	\$ 2,500	\$ 2,500	\$ 2,500
Labor	\$ -	\$ -	\$ -	\$ -
Spring/Summer Labor 500 hrs/acre @ \$10/hr	\$ 5,000	\$ 5,000	\$ 5,000	\$ 5,000
Harvest Labor 1 hr/dried lb 1,500hrs @ \$10/hr	\$ 15,000	\$ 15,000	\$ 15,000	\$ 15,000
Sub total Labor	\$ 20,000	\$ 20,000	\$ 20,000	\$ 20,000
Other Variable Expenses				
Freight/Shipping estimating 2,000lbs NMFC classification 100	\$ -	\$ 610	\$ 610	\$ 610
Chemical Analysis	\$ -	\$ 150	\$ 150	\$ 150
Processing (pelletizing)	\$ -	\$ 3,300	\$ 7,425	\$ 8,250
Packaging				
Climate Controlled Storage		\$ 50	\$ 50	\$ 50
Sales & Marketing		\$ 100	\$ 100	\$ 100
Other:	\$ -	\$ -	\$ -	\$ -
Sub total Other Variable Expenses	\$ -	\$ 4,210	\$ 8,335	\$ 9,160
<b>Total Variable Expenses:</b>	<b>\$ 22,500</b>	<b>\$ 26,710</b>	<b>\$ 30,835</b>	<b>\$ 31,660</b>
<b>Fixed Expenses:</b>				
Auto & truck	\$ -	\$ -	\$ -	\$ -
Interest, farm share	\$ -	\$ -	\$ -	\$ -
Insurance, farm share	\$ -	\$ -	\$ -	\$ -
Property tax, farm share	\$ -	\$ -	\$ -	\$ -
Rents paid—land, buildings	\$ -	\$ -	\$ -	\$ -
Rents paid—equipment, livestock	\$ -	\$ -	\$ -	\$ -
Utilities, farm share	\$ -	\$ -	\$ -	\$ -
Other:	\$ -	\$ -	\$ -	\$ -
Other:	\$ -	\$ -	\$ -	\$ -
Other:	\$ -	\$ -	\$ -	\$ -
Other:	\$ -	\$ -	\$ -	\$ -
<b>Total Fixed Expenses</b>	<b>\$ -</b>	<b>\$ -</b>	<b>\$ -</b>	<b>\$ -</b>
<b>TOTAL CASH EXPENSES</b>	<b>\$ 22,500</b>	<b>\$ 26,710</b>	<b>\$ 30,835</b>	<b>\$ 31,660</b>
<b>RECEIPTS MINUS EXPENSES</b>	<b>\$ (22,500)</b>	<b>\$ (17,710)</b>	<b>\$ (10,585)</b>	<b>\$ (9,160)</b>
<b>Plus CAPITAL CONTRIBUTIONS</b>				
grants	\$ -	\$ -	\$ -	\$ -
loans	\$ -	\$ -	\$ -	\$ -
off-farm income	\$ -	\$ -	\$ -	\$ -
other	\$ -	\$ -	\$ -	\$ -
<b>Plus CAPITAL SALES</b>				
equipment	\$ -	\$ -	\$ -	\$ -
<b>Less CAPITAL EXPENSE</b>				
2 chest freezers		\$ 2,000	\$ -	\$ -
mechanical harvester	\$ -	\$ -	\$ -	\$ -
sorter	\$ -	\$ -	\$ -	\$ -
oast	\$ -	\$ 5,000	\$ -	\$ -
one acre hop yard	\$ 12,000	\$ -	\$ -	\$ -
<b>Total Capital Expense</b>	<b>\$ 12,000</b>	<b>\$ 7,000</b>	<b>\$ -</b>	<b>\$ -</b>
<b>Less DEBT SERVICE</b>				
List Loan Principal Payments				
<b>Plus STARTING CASH</b>	<b>\$ -</b>	<b>\$ (34,500)</b>	<b>\$ (59,210)</b>	<b>\$ (69,795)</b>
<b>NET RETAINED CASH EARNINGS (DEFICIT)</b>	<b>\$ (34,500)</b>	<b>\$ (59,210)</b>	<b>\$ (69,795)</b>	<b>\$ (78,955)</b>
- Income Taxes				
Less Family Living	\$ -	\$ -	\$ -	\$ -
- Capital Reserve				
<b>NET AFTER CAPITAL RESERVE, FAMILY LIVING AND INCOME TAX ALLOCATION</b>	<b>\$ (34,500)</b>	<b>\$ (59,210)</b>	<b>\$ (69,795)</b>	<b>\$ (78,955)</b>

Courtesy: Vermont Farm Viability Enhancement Program

CASH FLOW PROJECTION

Scenario: Selling Pelletized Direct To Brewer Using Atlantic Hops Processing Services

Optimized Manual Harvesting, Harvesting Only Top 1/3 of Bine

Production Information	Projection			
	Year 1	Year 2	Year 3	Year 4
Number of acres	1	1	1	1
Production Level	0%	40%	90%	100%
Quantity of dried hops sold (lbs/year)	0	600	1350	1500
Pounds of dried hops per acre per year	0	600	1350	1500
Average price per dried pound needed to break even	12.51	14.81	17.56	18.11
Projected Sale Price	15.00	15.00	15.00	15.00
Return on Investment in Years	(4)			
Annual Net Income at 100% Production	\$ (4,660)			
<b>Cash Receipts</b>				
Hops Sold	\$ -	\$ 9,000	\$ 20,250	\$ 22,500
<b>TOTAL CASH RECEIPTS</b>	<b>\$ -</b>	<b>\$ 9,000</b>	<b>\$ 20,250</b>	<b>\$ 22,500</b>
<b>Cash Expenses</b>				
<b>Variable Expenses:</b>				
Chemicals	\$ -	\$ -	\$ -	\$ -
Conservation expense	\$ -	\$ -	\$ -	\$ -
Custom hire	\$ -	\$ -	\$ -	\$ -
Trellising supplies- twine, w clips, etc.	\$ -	\$ -	\$ -	\$ -
Fertilizer	\$ -	\$ -	\$ -	\$ -
Fuel and oil	\$ -	\$ -	\$ -	\$ -
Labor hired (incl. FICA, workers comp, etc.)	\$ -	\$ -	\$ -	\$ -
Repairs, maintenance	\$ -	\$ -	\$ -	\$ -
Electricity for drying	\$ -	\$ -	\$ -	\$ -
Supplies	\$ -	\$ -	\$ -	\$ -
Sub total Variable Expenses	\$ 2,500	\$ 2,500	\$ 2,500	\$ 2,500
Labor	\$ -	\$ -	\$ -	\$ -
Spring/Summer Labor 500 hrs/acre @ \$10/hr	\$ 5,000	\$ 5,000	\$ 5,000	\$ 5,000
Harvest Labor harvesting only top 1/3 of the bine 35 min/lb1,500lbs/acre @ \$10/hr	\$ 10,500	\$ 10,500	\$ 10,500	\$ 10,500
Sub total Labor	\$ 15,500	\$ 15,500	\$ 15,500	\$ 15,500
Other Variable Expenses	\$ -	\$ -	\$ -	\$ -
Freight/Shipping estimating 2,000lbs NMFC classification 100	\$ 610	\$ 610	\$ 610	\$ 610
Chemical Analysis	\$ 150	\$ 150	\$ 150	\$ 150
Processing (pelletizing)	\$ -	\$ 3,300	\$ 7,425	\$ 8,250
Packaging	\$ -	\$ -	\$ -	\$ -
Climate Controlled Storage	\$ -	\$ 50	\$ 50	\$ 50
Sales & Marketing	\$ -	\$ 100	\$ 100	\$ 100
Other:	\$ -	\$ -	\$ -	\$ -
Sub total Other Variable Expenses	\$ 760	\$ 4,210	\$ 8,335	\$ 9,160
<b>Total Variable Expenses:</b>	<b>\$ 18,760</b>	<b>\$ 22,210</b>	<b>\$ 26,335</b>	<b>\$ 27,160</b>
<b>Fixed Expenses:</b>				
Auto & truck	\$ -	\$ -	\$ -	\$ -
Interest, farm share	\$ -	\$ -	\$ -	\$ -
Insurance, farm share	\$ -	\$ -	\$ -	\$ -
Property tax, farm share	\$ -	\$ -	\$ -	\$ -
Rents paid—land, buildings	\$ -	\$ -	\$ -	\$ -
Rents paid—equipment, livestock	\$ -	\$ -	\$ -	\$ -
Utilities, farm share	\$ -	\$ -	\$ -	\$ -
Other:	\$ -	\$ -	\$ -	\$ -
Other:	\$ -	\$ -	\$ -	\$ -
Other:	\$ -	\$ -	\$ -	\$ -
Other:	\$ -	\$ -	\$ -	\$ -
<b>Total Fixed Expenses</b>	<b>\$ -</b>	<b>\$ -</b>	<b>\$ -</b>	<b>\$ -</b>
<b>TOTAL CASH EXPENSES</b>	<b>\$ 18,760</b>	<b>\$ 22,210</b>	<b>\$ 26,335</b>	<b>\$ 27,160</b>
<b>RECEIPTS MINUS EXPENSES</b>	<b>\$ (18,760)</b>	<b>\$ (13,210)</b>	<b>\$ (6,085)</b>	<b>\$ (4,660)</b>
<b>Plus CAPITAL CONTRIBUTIONS</b>				
grants	\$ -	\$ -	\$ -	\$ -
loans	\$ -	\$ -	\$ -	\$ -
off-farm income	\$ -	\$ -	\$ -	\$ -
other	\$ -	\$ -	\$ -	\$ -
<b>Plus CAPITAL SALES</b>				
equipment	\$ -	\$ -	\$ -	\$ -
<b>Less CAPITAL EXPENSE</b>				
2 chest freezers	\$ -	\$ 2,000	\$ -	\$ -
mechanical harvester	\$ -	\$ -	\$ -	\$ -
sorter	\$ -	\$ -	\$ -	\$ -
oast	\$ -	\$ 5,000	\$ -	\$ -
one acre hop yard	\$ 12,000	\$ -	\$ -	\$ -
<b>Total Capital Expense</b>	<b>\$ 12,000</b>	<b>\$ 7,000</b>	<b>\$ -</b>	<b>\$ -</b>
<b>Less DEBT SERVICE</b>				
List Loan Principal Payments	\$ -	\$ -	\$ -	\$ -
<b>Plus STARTING CASH</b>	<b>\$ -</b>	<b>\$ (30,760)</b>	<b>\$ (52,109)</b>	<b>\$ (60,693)</b>
<b>NET RETAINED CASH EARNINGS (DEFICIT)</b>	<b>\$ (30,760)</b>	<b>\$ (50,970)</b>	<b>\$ (58,194)</b>	<b>\$ (65,353)</b>
- Income Taxes (estimate at 33%)	\$ -	\$ 1,139	\$ 2,500	\$ 2,772
Less Family Living	\$ -	\$ -	\$ -	\$ -
- Capital Reserve	\$ -	\$ -	\$ -	\$ -
<b>NET AFTER CAPITAL RESERVE, FAMILY LIVING AND INCOME TAX ALLOCATION</b>	<b>\$ (30,760)</b>	<b>\$ (52,109)</b>	<b>\$ (60,693)</b>	<b>\$ (68,125)</b>

Courtesy: Vermont Farm Viability Enhancement Program

CASH FLOW PROJECTION

Scenario: Selling Pelletized Direct To Brewer Using Atlantic Hops Processing Services

Optimized Manual Harvesting, Harvesting Only Top 1/3 of Bine, Manual Stripping & Sorting

Production Information	Projection		Projection	Projection	Projection
	Year 1	Year 2	Year 3	Year 4	Year 4
Number of acres	1	1	1	1	1
Production Level	0%	40%	90%	100%	100%
Quantity of dried hops sold (lbs/year)	0	600	1350	1500	1500
Pounds of dried hops per acre per year	0	600	1350	1500	1500
Average price per dried pound needed to break even	8.84	11.14	13.89	14.44	14.44
Projected Sale Price	15.00	15.00	15.00	15.00	15.00
Return on Investment in Years	29				
Annual Net Income at 100% Production	\$ 840				
<b>Cash Receipts</b>					
Hops Sold	\$ -	\$ 9,000	\$ 20,250	\$ 22,500	\$ 22,500
<b>TOTAL CASH RECEIPTS</b>	\$ -	\$ 9,000	\$ 20,250	\$ 22,500	\$ 22,500
<b>Cash Expenses</b>					
<b>Variable Expenses:</b>					
Chemicals	\$ -	\$ -	\$ -	\$ -	\$ -
Conservation expense	\$ -	\$ -	\$ -	\$ -	\$ -
Custom hire	\$ -	\$ -	\$ -	\$ -	\$ -
Trellising supplies- twine, w clips, etc.	\$ -	\$ -	\$ -	\$ -	\$ -
Fertilizer	\$ -	\$ -	\$ -	\$ -	\$ -
Fuel and oil	\$ -	\$ -	\$ -	\$ -	\$ -
Labor hired (incl. FICA, workers comp, etc.)	\$ -	\$ -	\$ -	\$ -	\$ -
Repairs, maintenance	\$ -	\$ -	\$ -	\$ -	\$ -
Electricity for drying	\$ -	\$ -	\$ -	\$ -	\$ -
Supplies	\$ -	\$ -	\$ -	\$ -	\$ -
Sub total Variable Expenses	\$ 2,500	\$ 2,500	\$ 2,500	\$ 2,500	\$ 2,500
Labor	\$ -	\$ -	\$ -	\$ -	\$ -
Spring/Summer Labor 500 hrs/acre @ \$10/hr	\$ 5,000	\$ 5,000	\$ 5,000	\$ 5,000	\$ 5,000
Harvest Labor harvesting top 1/3 of the bine, stripping and sorting 20 min/lb 1,500lbs/acre (500 hrs) @ \$10/hr	\$ 5,000	\$ 5,000	\$ 5,000	\$ 5,000	\$ 5,000
Sub total Labor	\$ 10,000	\$ 10,000	\$ 10,000	\$ 10,000	\$ 10,000
Other Variable Expenses	\$ -	\$ -	\$ -	\$ -	\$ -
Freight/Shipping estimating 2,000lbs NMFC classification 100	\$ 610	\$ 610	\$ 610	\$ 610	\$ 610
Chemical Analysis	\$ 150	\$ 150	\$ 150	\$ 150	\$ 150
Processing (pelletizing)	\$ -	\$ 3,300	\$ 7,425	\$ 8,250	\$ 8,250
Packaging	\$ -	\$ -	\$ -	\$ -	\$ -
Climate Controlled Storage	\$ -	\$ 50	\$ 50	\$ 50	\$ 50
Sales & Marketing	\$ -	\$ 100	\$ 100	\$ 100	\$ 100
Other:	\$ -	\$ -	\$ -	\$ -	\$ -
Sub total Other Variable Expenses	\$ 760	\$ 4,210	\$ 8,335	\$ 9,160	\$ 9,160
<b>Total Variable Expenses:</b>	\$ 13,260	\$ 16,710	\$ 20,835	\$ 21,660	\$ 21,660
<b>Fixed Expenses:</b>					
Auto & truck	\$ -	\$ -	\$ -	\$ -	\$ -
Interest, farm share	\$ -	\$ -	\$ -	\$ -	\$ -
Insurance, farm share	\$ -	\$ -	\$ -	\$ -	\$ -
Property tax, farm share	\$ -	\$ -	\$ -	\$ -	\$ -
Rents paid—land, buildings	\$ -	\$ -	\$ -	\$ -	\$ -
Rents paid—equipment, livestock	\$ -	\$ -	\$ -	\$ -	\$ -
Utilities, farm share	\$ -	\$ -	\$ -	\$ -	\$ -
Other:	\$ -	\$ -	\$ -	\$ -	\$ -
Other:	\$ -	\$ -	\$ -	\$ -	\$ -
Other:	\$ -	\$ -	\$ -	\$ -	\$ -
Other:	\$ -	\$ -	\$ -	\$ -	\$ -
<b>Total Fixed Expenses</b>	\$ -	\$ -	\$ -	\$ -	\$ -
<b>TOTAL CASH EXPENSES</b>	\$ 13,260	\$ 16,710	\$ 20,835	\$ 21,660	\$ 21,660
<b>RECEIPTS MINUS EXPENSES</b>	\$ (13,260)	\$ (7,710)	\$ (585)	\$ 840	\$ 840
<b>Plus CAPITAL CONTRIBUTIONS</b>					
grants	\$ -	\$ -	\$ -	\$ -	\$ -
loans	\$ -	\$ -	\$ -	\$ -	\$ -
off-farm income	\$ -	\$ -	\$ -	\$ -	\$ -
other	\$ -	\$ -	\$ -	\$ -	\$ -
<b>Plus CAPITAL SALES</b>					
equipment	\$ -	\$ -	\$ -	\$ -	\$ -
<b>Less CAPITAL EXPENSE</b>					
2 chest freezers	\$ -	\$ 2,000	\$ -	\$ -	\$ -
mechanical harvester	\$ -	\$ -	\$ -	\$ -	\$ -
sorter	\$ -	\$ -	\$ 5,000	\$ -	\$ -
oast	\$ -	\$ 5,000	\$ -	\$ -	\$ -
one acre hop yard	\$ 12,000	\$ -	\$ -	\$ -	\$ -
<b>Total Capital Expense</b>	\$ 12,000	\$ 7,000	\$ 5,000	\$ -	\$ -
<b>Less DEBT SERVICE</b>					
List Loan Principal Payments	\$ -	\$ -	\$ -	\$ -	\$ -
<b>Plus STARTING CASH</b>	\$ -	\$ (25,260)	\$ (41,109)	\$ (49,193)	\$ (49,193)
<b>NET RETAINED CASH EARNINGS (DEFICIT)</b>	\$ (25,260)	\$ (39,970)	\$ (46,694)	\$ (48,353)	\$ (48,353)
- Income Taxes (estimate at 33%)	\$ -	\$ 1,139	\$ 2,500	\$ 2,772	\$ 2,772
Less Family Living	\$ -	\$ -	\$ -	\$ -	\$ -
- Capital Reserve	\$ -	\$ -	\$ -	\$ -	\$ -
<b>NET AFTER CAPITAL RESERVE, FAMILY LIVING AND INCOME TAX ALLOCATION</b>	\$ (25,260)	\$ (41,109)	\$ (49,193)	\$ (51,125)	\$ (51,125)

**CASH FLOW PROJECTION**

**Scenario: Selling Pelletized Direct To Brewer Using Atlantic Hops Processing Services**

**Optimized Manual Harvesting, Harvesting Only Top 1/3 of Bine, Mechanized Stripping, Picking, & Sorting**

	Projection		Projection	Projection	Projection
	Year 1	Year 2	Year 3	Year 4	
<b>Production Information</b>					
Number of acres	1	1	1	1	1
Production Level	0%	40%	90%	100%	
Quantity of dried hops sold (lbs/year)	0	600	1350	1500	
Pounds of dried hops per acre per year	0	600	1350	1500	
<b>Average price per dried pound needed to break even</b>	<b>6.01</b>	<b>8.31</b>	<b>11.06</b>	<b>11.61</b>	
<b>Projected Sale Price</b>	<b>15.00</b>	<b>15.00</b>	<b>15.00</b>	<b>15.00</b>	
<b>Return on Investment in Years</b>	<b>6</b>				
<b>Annual Net Income at 100% Production</b>	<b>\$ 5,090</b>				
<b>Cash Receipts</b>					
Hops Sold	\$ -	\$ 9,000	\$ 20,250	\$ 22,500	
<b>TOTAL CASH RECEIPTS</b>	<b>\$ -</b>	<b>\$ 9,000</b>	<b>\$ 20,250</b>	<b>\$ 22,500</b>	
<b>Cash Expenses</b>					
<b>Variable Expenses:</b>					
Chemicals	\$ -	\$ -	\$ -	\$ -	
Conservation expense	\$ -	\$ -	\$ -	\$ -	
Custom hire	\$ -	\$ -	\$ -	\$ -	
Trellising supplies- twine, w clips, etc.	\$ -	\$ -	\$ -	\$ -	
Fertilizer	\$ -	\$ -	\$ -	\$ -	
Fuel and oil	\$ -	\$ -	\$ -	\$ -	
Labor hired (incl. FICA, workers comp, etc.)	\$ -	\$ -	\$ -	\$ -	
Repairs, maintenance	\$ -	\$ -	\$ -	\$ -	
Electricity for drying	\$ -	\$ -	\$ -	\$ -	
Supplies	\$ -	\$ -	\$ -	\$ -	
Sub total Variable Expenses	\$ 2,500	\$ 2,500	\$ 2,500	\$ 2,500	
Labor	\$ -	\$ -	\$ -	\$ -	
Spring/Summer Labor 500 hrs/acre @ \$10/hr	\$ 5,000	\$ 5,000	\$ 5,000	\$ 5,000	
Harvest Labor harvesting only top 1/3 of the bine 3 min/lb- 1 min to pick, 2 min to sort 1,500lbs/acre (75 hrs) @ \$10/hr	\$ 750	\$ 750	\$ 750	\$ 750	
Sub total Labor	\$ 5,750	\$ 5,750	\$ 5,750	\$ 5,750	
Other Variable Expenses					
Freight/Shipping estimating 2,000lbs NMFC classification 100	\$ 610	\$ 610	\$ 610	\$ 610	
Chemical Analysis	\$ 150	\$ 150	\$ 150	\$ 150	
Processing (pelletizing)	\$ -	\$ 3,300	\$ 7,425	\$ 8,250	
Packaging	\$ -	\$ -	\$ -	\$ -	
Climate Controlled Storage	\$ -	\$ 50	\$ 50	\$ 50	
Sales & Marketing	\$ -	\$ 100	\$ 100	\$ 100	
Other:	\$ -	\$ -	\$ -	\$ -	
Sub total Other Variable Expenses	\$ 760	\$ 4,210	\$ 8,335	\$ 9,160	
<b>Total Variable Expenses:</b>	<b>\$ 9,010</b>	<b>\$ 12,460</b>	<b>\$ 16,585</b>	<b>\$ 17,410</b>	
<b>Fixed Expenses:</b>					
Auto & truck	\$ -	\$ -	\$ -	\$ -	
Interest, farm share	\$ -	\$ -	\$ -	\$ -	
Insurance, farm share	\$ -	\$ -	\$ -	\$ -	
Property tax, farm share	\$ -	\$ -	\$ -	\$ -	
Rents paid—land, buildings	\$ -	\$ -	\$ -	\$ -	
Rents paid—equipment, livestock	\$ -	\$ -	\$ -	\$ -	
Utilities, farm share	\$ -	\$ -	\$ -	\$ -	
Other:	\$ -	\$ -	\$ -	\$ -	
Other:	\$ -	\$ -	\$ -	\$ -	
Other:	\$ -	\$ -	\$ -	\$ -	
<b>Total Fixed Expenses</b>	<b>\$ -</b>	<b>\$ -</b>	<b>\$ -</b>	<b>\$ -</b>	
<b>TOTAL CASH EXPENSES</b>	<b>\$ 9,010</b>	<b>\$ 12,460</b>	<b>\$ 16,585</b>	<b>\$ 17,410</b>	
<b>RECEIPTS MINUS EXPENSES</b>	<b>\$ (9,010)</b>	<b>\$ (3,460)</b>	<b>\$ 3,665</b>	<b>\$ 5,090</b>	
<b>Plus CAPITAL CONTRIBUTIONS</b>					
grants	\$ -	\$ -	\$ -	\$ -	
loans	\$ -	\$ -	\$ -	\$ -	
off-farm income	\$ -	\$ -	\$ -	\$ -	
other	\$ -	\$ -	\$ -	\$ -	
<b>Plus CAPITAL SALES</b>					
equipment	\$ -	\$ -	\$ -	\$ -	
<b>Less CAPITAL EXPENSE</b>					
2 chest freezers	\$ -	\$ 2,000	\$ -	\$ -	
mechanical harvester	\$ -	\$ -	\$ 5,000	\$ -	
sorter	\$ -	\$ -	\$ 5,000	\$ -	
oast	\$ -	\$ 5,000	\$ -	\$ -	
one acre hop yard	\$ 12,000	\$ -	\$ -	\$ -	
<b>Total Capital Expense</b>	<b>\$ 12,000</b>	<b>\$ 7,000</b>	<b>\$ 10,000</b>	<b>\$ -</b>	
<b>Less DEBT SERVICE</b>					
List Loan Principal Payments	\$ -	\$ -	\$ -	\$ -	
<b>Plus STARTING CASH</b>	<b>\$ -</b>	<b>\$ (21,010)</b>	<b>\$ (32,609)</b>	<b>\$ (41,443)</b>	
<b>NET RETAINED CASH EARNINGS (DEFICIT)</b>	<b>\$ (21,010)</b>	<b>\$ (31,470)</b>	<b>\$ (38,944)</b>	<b>\$ (36,353)</b>	
- Income Taxes (estimate at 33%)	\$ -	\$ 1,139	\$ 2,500	\$ 2,772	
Less Family Living	\$ -	\$ -	\$ -	\$ -	
- Capital Reserve	\$ -	\$ -	\$ -	\$ -	
<b>NET AFTER CAPITAL RESERVE, FAMILY LIVING AND INCOME TAX ALLOCATION</b>	<b>\$ (21,010)</b>	<b>\$ (32,609)</b>	<b>\$ (41,443)</b>	<b>\$ (39,125)</b>	

**Scenario 4: Grower sells pelletized hops direct to brewer, using Do-It-Yourself pelletizing**

Cash flow 1: demonstrating cash flow if no efficiencies in production are utilized

Cash flow 2: demonstrating cash flow if grower harvests only top 1/3 of the bine

Cash flow 3: demonstrating cash flow if grower harvests only top 1/3 of the bine, and manually strips and sorts

Cash flow 4: demonstrating cash flow if grower harvests only top 1/3 of the bine, and mechanically strips and sorts

Courtesy: Vermont Farm Viability Enhancement Program

**CASH FLOW PROJECTION**

Scenario: Selling Direct to Brewer D-I-Y Pelletized

**No Optimization in Harvesting**

Production Information	Projection			
	Year 1	Year 2	Year 3	Year 4
Number of acres	1	1	1	1
Production Level	0%	40%	90%	100%
Quantity of dried hops sold (lbs/year)	0	600	1350	1500
Pounds of dried hops per acre per year	0	600	1350	1500
<b>Average price per dried pound needed to break even</b>	<b>15.51</b>	<b>15.89</b>	<b>15.89</b>	<b>15.89</b>
<b>Projected Sale Price to Brewers</b>	<b>15.00</b>	<b>15.00</b>	<b>15.00</b>	<b>15.00</b>
<b>Return on Investment in Years</b>		<b>(35.15)</b>		
<b>Annual Net Income at 100% Production</b>	<b>\$ (1,340)</b>			
<b>Cash Receipts</b>				
Hops Sold	\$ -	\$ 9,000	\$ 20,250	\$ 22,500
<b>TOTAL CASH RECEIPTS</b>	<b>\$ -</b>	<b>\$ 9,000</b>	<b>\$ 20,250</b>	<b>\$ 22,500</b>
<b>Cash Expenses</b>				
<b>Variable Expenses:</b>				
Chemicals	\$ -	\$ -	\$ -	\$ -
Conservation expense	\$ -	\$ -	\$ -	\$ -
Custom hire	\$ -	\$ -	\$ -	\$ -
Trellising supplies- twine, w clips, etc.	\$ -	\$ -	\$ -	\$ -
Fertilizer	\$ -	\$ -	\$ -	\$ -
Fuel and oil	\$ -	\$ -	\$ -	\$ -
Labor hired (incl. FICA, workers comp, etc.)	\$ -	\$ -	\$ -	\$ -
Repairs, maintenance	\$ -	\$ -	\$ -	\$ -
Electricity for drying	\$ -	\$ -	\$ -	\$ -
Supplies	\$ -	\$ -	\$ -	\$ -
Sub total Variable Expenses	<b>2,500</b>	<b>2,500</b>	<b>2,500</b>	<b>2,500</b>
Labor	\$ -	\$ -	\$ -	\$ -
Spring/Summer Labor 500 hrs/acre @ \$10/hr	\$ 5,000	\$ 5,000	\$ 5,000	\$ 5,000
Harvest Labor 1 hr/dried lb 1,500hrs @ \$10/hr	\$ 15,000	\$ 15,000	\$ 15,000	\$ 15,000
Sub total Labor	<b>20,000</b>	<b>20,000</b>	<b>20,000</b>	<b>20,000</b>
Other Variable Expenses				
Freight/Shipping estimating 2,000lbs NMFC classification 100	\$ 610	\$ 610	\$ 610	\$ 610
Chemical Analysis	\$ 150	\$ 150	\$ 150	\$ 150
Processing (pelletizing)	\$ -	\$ 100	\$ 100	\$ 100
Packaging	\$ -	\$ 330	\$ 330	\$ 330
Climate Controlled Storage	\$ -	\$ 50	\$ 50	\$ 50
Sales & Marketing	\$ -	\$ 100	\$ 100	\$ 100
Other:	\$ -	\$ -	\$ -	\$ -
Sub total Other Variable Expenses	<b>760</b>	<b>1,340</b>	<b>1,340</b>	<b>1,340</b>
<b>Total Variable Expenses:</b>	<b>\$ 23,260</b>	<b>\$ 23,840</b>	<b>\$ 23,840</b>	<b>\$ 23,840</b>
<b>Fixed Expenses:</b>				
Auto & truck	\$ -	\$ -	\$ -	\$ -
Interest, farm share	\$ -	\$ -	\$ -	\$ -
Insurance, farm share	\$ -	\$ -	\$ -	\$ -
Property tax, farm share	\$ -	\$ -	\$ -	\$ -
Rents paid—land, buildings	\$ -	\$ -	\$ -	\$ -
Rents paid—equipment, livestock	\$ -	\$ -	\$ -	\$ -
Utilities, farm share	\$ -	\$ -	\$ -	\$ -
Other:	\$ -	\$ -	\$ -	\$ -
Other:	\$ -	\$ -	\$ -	\$ -
Other:	\$ -	\$ -	\$ -	\$ -
Other:	\$ -	\$ -	\$ -	\$ -
<b>Total Fixed Expenses</b>	<b>\$ -</b>	<b>\$ -</b>	<b>\$ -</b>	<b>\$ -</b>
<b>TOTAL CASH EXPENSES</b>	<b>\$ 23,260</b>	<b>\$ 23,840</b>	<b>\$ 23,840</b>	<b>\$ 23,840</b>
<b>RECEIPTS MINUS EXPENSES</b>	<b>\$ (23,260)</b>	<b>\$ (14,840)</b>	<b>\$ (3,590)</b>	<b>\$ (1,340)</b>
<b>Plus CAPITAL CONTRIBUTIONS</b>				
grants	\$ -	\$ -	\$ -	\$ -
loans	\$ -	\$ -	\$ -	\$ -
off-farm income	\$ -	\$ -	\$ -	\$ -
other	\$ -	\$ -	\$ -	\$ -
<b>Plus CAPITAL SALES</b>				
equipment	\$ -	\$ -	\$ -	\$ -
<b>Less CAPITAL EXPENSE</b>				
2 chest freezers	\$ -	\$ 2,000	\$ -	\$ -
vacuum, nitrogen flush sealer	\$ -	\$ 24,000	\$ -	\$ -
pellet mill	\$ -	\$ 2,400	\$ -	\$ -
hammer mill	\$ -	\$ 1,700	\$ -	\$ -
mechanical harvester	\$ -	\$ -	\$ -	\$ -
sorter	\$ -	\$ -	\$ -	\$ -
oast	\$ -	\$ 5,000	\$ -	\$ -
one acre hop yard	\$ 12,000	\$ -	\$ -	\$ -
<b>Total Capital Expense</b>	<b>\$ 12,000</b>	<b>\$ 35,100</b>	<b>\$ -</b>	<b>\$ -</b>
<b>Less DEBT SERVICE</b>				
List Loan Principal Payments				
<b>Plus STARTING CASH</b>	<b>\$ -</b>	<b>\$ (35,260)</b>	<b>\$ (85,391)</b>	<b>\$ (89,173)</b>
<b>NET RETAINED CASH EARNINGS (DEFICIT)</b>	<b>\$ (35,260)</b>	<b>\$ (85,200)</b>	<b>\$ (88,981)</b>	<b>\$ (90,513)</b>
- Income Taxes (estimate at 33%)		\$ 191	\$ 191	\$ 191
Less Family Living	\$ -	\$ -	\$ -	\$ -
- Capital Reserve				
<b>NET AFTER CAPITAL RESERVE, FAMILY LIVING AND INCOME TAX ALLOCATION</b>	<b>\$ (35,260)</b>	<b>\$ (85,391)</b>	<b>\$ (89,173)</b>	<b>\$ (90,704)</b>

Courtesy: Vermont Farm Viability Enhancement Program

**CASH FLOW PROJECTION**

Scenario: Selling Direct to Brewer D-I-Y Pelletized

Optimized Manual Harvesting, Harvesting Only Top 1/3 of Bine

Production Information	Projection			
	Year 1	Year 2	Year 3	Year 4
Number of acres	1	1	1	1
Production Level	0%	40%	90%	100%
Quantity of dried hops sold (lbs/year)	0	600	1350	1500
Pounds of dried hops per acre per year	0	600	1350	1500
<b>Average price per dried pound needed to break even</b>	<b>12.51</b>	<b>12.89</b>	<b>12.89</b>	<b>12.89</b>
<b>Projected Sale Price to Brewers</b>	<b>15.00</b>	<b>15.00</b>	<b>15.00</b>	<b>15.00</b>
<b>Return on Investment in Years</b>	<b>14.91</b>			
<b>Annual Net Income at 100% Production</b>	<b>\$ 3,160</b>			
<b>Cash Receipts</b>				
Hops Sold	\$ -	\$ 9,000	\$ 20,250	\$ 22,500
<b>TOTAL CASH RECEIPTS</b>	<b>\$ -</b>	<b>\$ 9,000</b>	<b>\$ 20,250</b>	<b>\$ 22,500</b>
<b>Cash Expenses</b>				
<b>Variable Expenses:</b>				
Chemicals	\$ -	\$ -	\$ -	\$ -
Conservation expense	\$ -	\$ -	\$ -	\$ -
Custom hire	\$ -	\$ -	\$ -	\$ -
Trellising supplies- twine, w clips, etc.	\$ -	\$ -	\$ -	\$ -
Fertilizer	\$ -	\$ -	\$ -	\$ -
Fuel and oil	\$ -	\$ -	\$ -	\$ -
Labor hired (incl. FICA, workers comp, etc.)	\$ -	\$ -	\$ -	\$ -
Repairs, maintenance	\$ -	\$ -	\$ -	\$ -
Electricity for drying	\$ -	\$ -	\$ -	\$ -
Supplies	\$ -	\$ -	\$ -	\$ -
Sub total Variable Expenses	<b>2,500</b>	<b>2,500</b>	<b>2,500</b>	<b>2,500</b>
Labor	\$ -	\$ -	\$ -	\$ -
Spring/Summer Labor 500 hrs/acre @ \$10/hr	\$ 5,000	\$ 5,000	\$ 5,000	\$ 5,000
Harvest Labor harvesting only top 1/3 of the bine 35 min/lb1,500lbs/acre @ \$10/hr	\$ 10,500	\$ 10,500	\$ 10,500	\$ 10,500
Sub total Labor	<b>15,500</b>	<b>15,500</b>	<b>15,500</b>	<b>15,500</b>
Other Variable Expenses				
Freight/Shipping estimating 2,000lbs NMFC classification 100	\$ 610	\$ 610	\$ 610	\$ 610
Chemical Analysis	\$ 150	\$ 150	\$ 150	\$ 150
Processing (pelletizing)	\$ -	\$ 100	\$ 100	\$ 100
Packaging	\$ -	\$ 330	\$ 330	\$ 330
Climate Controlled Storage	\$ -	\$ 50	\$ 50	\$ 50
Sales & Marketing	\$ -	\$ 100	\$ 100	\$ 100
Other:	\$ -	\$ -	\$ -	\$ -
Sub total Other Variable Expenses	<b>760</b>	<b>1,340</b>	<b>1,340</b>	<b>1,340</b>
<b>Total Variable Expenses:</b>	<b>\$ 18,760</b>	<b>\$ 19,340</b>	<b>\$ 19,340</b>	<b>\$ 19,340</b>
<b>Fixed Expenses:</b>				
Auto & truck	\$ -	\$ -	\$ -	\$ -
Interest, farm share	\$ -	\$ -	\$ -	\$ -
Insurance, farm share	\$ -	\$ -	\$ -	\$ -
Property tax, farm share	\$ -	\$ -	\$ -	\$ -
Rents paid—land, buildings	\$ -	\$ -	\$ -	\$ -
Rents paid—equipment, livestock	\$ -	\$ -	\$ -	\$ -
Utilities, farm share	\$ -	\$ -	\$ -	\$ -
Other:	\$ -	\$ -	\$ -	\$ -
Other:	\$ -	\$ -	\$ -	\$ -
Other:	\$ -	\$ -	\$ -	\$ -
Other:	\$ -	\$ -	\$ -	\$ -
<b>Total Fixed Expenses</b>	<b>\$ -</b>	<b>\$ -</b>	<b>\$ -</b>	<b>\$ -</b>
<b>TOTAL CASH EXPENSES</b>	<b>\$ 18,760</b>	<b>\$ 19,340</b>	<b>\$ 19,340</b>	<b>\$ 19,340</b>
<b>RECEIPTS MINUS EXPENSES</b>	<b>\$ (18,760)</b>	<b>\$ (10,340)</b>	<b>\$ 910</b>	<b>\$ 3,160</b>
<b>Plus CAPITAL CONTRIBUTIONS</b>				
grants	\$ -	\$ -	\$ -	\$ -
loans	\$ -	\$ -	\$ -	\$ -
off-farm income	\$ -	\$ -	\$ -	\$ -
other	\$ -	\$ -	\$ -	\$ -
<b>Plus CAPITAL SALES</b>				
equipment	\$ -	\$ -	\$ -	\$ -
<b>Less CAPITAL EXPENSE</b>				
2 chest freezers	\$ -	\$ 2,000	\$ -	\$ -
vacuum, nitrogen flush sealer	\$ -	\$ 24,000	\$ -	\$ -
pellet mill	\$ -	\$ 2,400	\$ -	\$ -
hammer mill	\$ -	\$ 1,700	\$ -	\$ -
mechanical harvester	\$ -	\$ -	\$ -	\$ -
sorter	\$ -	\$ -	\$ -	\$ -
oast	\$ -	\$ 5,000	\$ -	\$ -
one acre hop yard	\$ 12,000	\$ -	\$ -	\$ -
<b>Total Capital Expense</b>	<b>\$ 12,000</b>	<b>\$ 35,100</b>	<b>\$ -</b>	<b>\$ -</b>
<b>Less DEBT SERVICE</b>				
List Loan Principal Payments				
<b>Plus STARTING CASH</b>	<b>\$ -</b>	<b>\$ (30,760)</b>	<b>\$ (76,391)</b>	<b>\$ (75,673)</b>
<b>NET RETAINED CASH EARNINGS (DEFICIT)</b>	<b>\$ (30,760)</b>	<b>\$ (76,200)</b>	<b>\$ (75,481)</b>	<b>\$ (72,513)</b>
- Income Taxes (estimate at 33%)		\$ 191	\$ 191	\$ 191
Less Family Living	\$ -	\$ -	\$ -	\$ -
- Capital Reserve				
<b>NET AFTER CAPITAL RESERVE, FAMILY LIVING AND INCOME TAX ALLOCATION</b>	<b>\$ (30,760)</b>	<b>\$ (76,391)</b>	<b>\$ (75,673)</b>	<b>\$ (72,704)</b>

Courtesy: Vermont Farm Viability Enhancement Program

**CASH FLOW PROJECTION**

Scenario: Selling Direct to Brewer D-I-Y Pelletized

Optimized Manual Harvesting, Harvesting Only Top 1/3 of Bine, Manual Stripping & Sorting

Production Information	Projection		Projection		Projection	
	Year 1	Year 2	Year 3	Year 4	Year 1	Year 2
Number of acres	1	1	1	1	1	1
Production Level	0%	40%	90%	100%		
Quantity of dried hops sold (lbs/year)	0	600	1350	1500		
Pounds of dried hops per acre per year	0	600	1350	1500		
<b>Average price per dried pound needed to break even</b>	<b>8.84</b>	<b>9.23</b>	<b>9.23</b>	<b>9.23</b>		
<b>Projected Sale Price to Brewers</b>	<b>15.00</b>	<b>15.00</b>	<b>15.00</b>	<b>15.00</b>		
<b>Return on Investment in Years</b>	<b>5.44</b>					
<b>Annual Net Income at 100% Production</b>	<b>\$ 8,660</b>					
<b>Cash Receipts</b>						
Hops Sold	\$ -	\$ 9,000	\$ 20,250	\$ 22,500		
<b>TOTAL CASH RECEIPTS</b>	<b>\$ -</b>	<b>\$ 9,000</b>	<b>\$ 20,250</b>	<b>\$ 22,500</b>		
<b>Cash Expenses</b>						
<b>Variable Expenses:</b>						
Chemicals	\$ -	\$ -	\$ -	\$ -		
Conservation expense	\$ -	\$ -	\$ -	\$ -		
Custom hire	\$ -	\$ -	\$ -	\$ -		
Trellising supplies- twine, w clips, etc.	\$ -	\$ -	\$ -	\$ -		
Fertilizer	\$ -	\$ -	\$ -	\$ -		
Fuel and oil	\$ -	\$ -	\$ -	\$ -		
Labor hired (incl. FICA, workers comp, etc.)	\$ -	\$ -	\$ -	\$ -		
Repairs, maintenance	\$ -	\$ -	\$ -	\$ -		
Electricity for drying	\$ -	\$ -	\$ -	\$ -		
Supplies	\$ -	\$ -	\$ -	\$ -		
Sub total Variable Expenses	\$ 2,500	\$ 2,500	\$ 2,500	\$ 2,500		
Labor	\$ -	\$ -	\$ -	\$ -		
Spring/Summer Labor 500 hrs/acre @ \$10/hr	\$ 5,000	\$ 5,000	\$ 5,000	\$ 5,000		
Harvest Labor harvesting top 1/3 of the bine, stripping and sorting 20 min/lb 1,500lbs/acre (500 hrs) @ \$10/hr	\$ 5,000	\$ 5,000	\$ 5,000	\$ 5,000		
Sub total Labor	\$ 10,000	\$ 10,000	\$ 10,000	\$ 10,000		
Other Variable Expenses						
Freight/Shipping estimating 2,000lbs NMFC classification 100	\$ 610	\$ 610	\$ 610	\$ 610		
Chemical Analysis	\$ 150	\$ 150	\$ 150	\$ 150		
Processing (pelletizing)	\$ -	\$ 100	\$ 100	\$ 100		
Packaging	\$ -	\$ 330	\$ 330	\$ 330		
Climate Controlled Storage	\$ -	\$ 50	\$ 50	\$ 50		
Sales & Marketing	\$ -	\$ 100	\$ 100	\$ 100		
Other:	\$ -	\$ -	\$ -	\$ -		
Sub total Other Variable Expenses	\$ 760	\$ 1,340	\$ 1,340	\$ 1,340		
<b>Total Variable Expenses:</b>	<b>\$ 13,260</b>	<b>\$ 13,840</b>	<b>\$ 13,840</b>	<b>\$ 13,840</b>		
<b>Fixed Expenses:</b>						
Auto & truck	\$ -	\$ -	\$ -	\$ -		
Interest, farm share	\$ -	\$ -	\$ -	\$ -		
Insurance, farm share	\$ -	\$ -	\$ -	\$ -		
Property tax, farm share	\$ -	\$ -	\$ -	\$ -		
Rents paid—land, buildings	\$ -	\$ -	\$ -	\$ -		
Rents paid—equipment, livestock	\$ -	\$ -	\$ -	\$ -		
Utilities, farm share	\$ -	\$ -	\$ -	\$ -		
Other:	\$ -	\$ -	\$ -	\$ -		
Other:	\$ -	\$ -	\$ -	\$ -		
Other:	\$ -	\$ -	\$ -	\$ -		
<b>Total Fixed Expenses</b>	<b>\$ -</b>	<b>\$ -</b>	<b>\$ -</b>	<b>\$ -</b>		
<b>TOTAL CASH EXPENSES</b>	<b>\$ 13,260</b>	<b>\$ 13,840</b>	<b>\$ 13,840</b>	<b>\$ 13,840</b>		
<b>RECEIPTS MINUS EXPENSES</b>	<b>\$ (13,260)</b>	<b>\$ (4,840)</b>	<b>\$ 6,410</b>	<b>\$ 8,660</b>		
<b>Plus CAPITAL CONTRIBUTIONS</b>						
grants	\$ -	\$ -	\$ -	\$ -		
loans	\$ -	\$ -	\$ -	\$ -		
off-farm income	\$ -	\$ -	\$ -	\$ -		
other	\$ -	\$ -	\$ -	\$ -		
<b>Plus CAPITAL SALES</b>						
equipment	\$ -	\$ -	\$ -	\$ -		
<b>Less CAPITAL EXPENSE</b>						
2 chest freezers	\$ -	\$ 2,000	\$ -	\$ -		
vacuum, nitrogen flush sealer	\$ -	\$ 24,000	\$ -	\$ -		
pellet mill	\$ -	\$ 2,400	\$ -	\$ -		
hammer mill	\$ -	\$ 1,700	\$ -	\$ -		
mechanical harvester	\$ -	\$ -	\$ -	\$ -		
sorter	\$ -	\$ -	\$ -	\$ -		
oast	\$ -	\$ 5,000	\$ -	\$ -		
one acre hop yard	\$ 12,000	\$ -	\$ -	\$ -		
<b>Total Capital Expense</b>	<b>\$ 12,000</b>	<b>\$ 35,100</b>	<b>\$ -</b>	<b>\$ -</b>		
<b>Less DEBT SERVICE</b>						
List Loan Principal Payments						
<b>Plus STARTING CASH</b>	<b>\$ -</b>	<b>\$ (25,260)</b>	<b>\$ (65,391)</b>	<b>\$ (59,173)</b>		
<b>NET RETAINED CASH EARNINGS (DEFICIT)</b>	<b>\$ (25,260)</b>	<b>\$ (65,200)</b>	<b>\$ (58,981)</b>	<b>\$ (50,513)</b>		
- Income Taxes (estimate at 33%)		\$ 191	\$ 191	\$ 191		
Less Family Living	\$ -	\$ -	\$ -	\$ -		
- Capital Reserve						
<b>NET AFTER CAPITAL RESERVE, FAMILY LIVING AND INCOME TAX ALLOCATION</b>	<b>\$ (25,260)</b>	<b>\$ (65,391)</b>	<b>\$ (59,173)</b>	<b>\$ (50,704)</b>		

**CASH FLOW PROJECTION**

Scenario: Selling Direct To Brewer D-I-Y Pelletized

Optimized Manual Harvesting, Harvesting Only Top 1/3 of Bine, Mechanized Stripping, Picking, & Sorting

	Projection		Projection	Projection	Projection
	Year 1	Year 2	Year 3	Year 4	
<b>Production Information</b>					
Number of acres	1	1	1	1	1
Production Level	0%	40%	90%	100%	
Quantity of dried hops sold (lbs/year)	0	600	1350	1500	
Pounds of dried hops per acre per year	0	600	1350	1500	
<b>Average price per dried pound needed to break even</b>	<b>6.01</b>	<b>6.39</b>	<b>6.39</b>	<b>6.39</b>	
<b>Projected Sale Price to Brewers</b>	<b>15.00</b>	<b>15.00</b>	<b>15.00</b>	<b>15.00</b>	
<b>Return on Investment in Years</b>	<b>4</b>				
<b>Annual Net Income at 100% Production</b>	<b>\$ 12,910</b>				
<b>Cash Receipts</b>					
Hops Sold	\$ -	\$ 9,000	\$ 20,250	\$ 22,500	
<b>TOTAL CASH RECEIPTS</b>	<b>\$ -</b>	<b>\$ 9,000</b>	<b>\$ 20,250</b>	<b>\$ 22,500</b>	
<b>Cash Expenses</b>					
<b>Variable Expenses:</b>					
Chemicals	\$ -	\$ -	\$ -	\$ -	
Conservation expense	\$ -	\$ -	\$ -	\$ -	
Custom hire	\$ -	\$ -	\$ -	\$ -	
Trellising supplies- twine, w clips, etc.	\$ -	\$ -	\$ -	\$ -	
Fertilizer	\$ -	\$ -	\$ -	\$ -	
Fuel and oil	\$ -	\$ -	\$ -	\$ -	
Labor hired (incl. FICA, workers comp, etc.)	\$ -	\$ -	\$ -	\$ -	
Repairs, maintenance	\$ -	\$ -	\$ -	\$ -	
Electricity for drying	\$ -	\$ -	\$ -	\$ -	
Supplies	\$ -	\$ -	\$ -	\$ -	
Sub total Variable Expenses	\$ 2,500	\$ 2,500	\$ 2,500	\$ 2,500	
Labor	\$ -	\$ -	\$ -	\$ -	
Spring/Summer Labor 500 hrs/acre @ \$10/hr	\$ 5,000	\$ 5,000	\$ 5,000	\$ 5,000	
Harvest Labor harvesting only top 1/3 of the bine 3 min/lb- 1 min to pick, 2 min to sort 1,500lbs/acre (75 hrs) @ \$10/hr	\$ 750	\$ 750	\$ 750	\$ 750	
Sub total Labor	\$ 5,750	\$ 5,750	\$ 5,750	\$ 5,750	
Other Variable Expenses					
Freight/Shipping estimating 2,000lbs NMFC classification 100	\$ 610	\$ 610	\$ 610	\$ 610	
Chemical Analysis	\$ 150	\$ 150	\$ 150	\$ 150	
Processing (pelletizing)	\$ -	\$ 100	\$ 100	\$ 100	
Packaging	\$ -	\$ 330	\$ 330	\$ 330	
Climate Controlled Storage	\$ -	\$ 50	\$ 50	\$ 50	
Sales & Marketing	\$ -	\$ 100	\$ 100	\$ 100	
Other:	\$ -	\$ -	\$ -	\$ -	
Sub total Other Variable Expenses	\$ 760	\$ 1,340	\$ 1,340	\$ 1,340	
<b>Total Variable Expenses:</b>	<b>\$ 9,010</b>	<b>\$ 9,590</b>	<b>\$ 9,590</b>	<b>\$ 9,590</b>	
<b>Fixed Expenses:</b>					
Auto & truck	\$ -	\$ -	\$ -	\$ -	
Interest, farm share	\$ -	\$ -	\$ -	\$ -	
Insurance, farm share	\$ -	\$ -	\$ -	\$ -	
Property tax, farm share	\$ -	\$ -	\$ -	\$ -	
Rents paid—land, buildings	\$ -	\$ -	\$ -	\$ -	
Rents paid—equipment, livestock	\$ -	\$ -	\$ -	\$ -	
Utilities, farm share	\$ -	\$ -	\$ -	\$ -	
Other:	\$ -	\$ -	\$ -	\$ -	
Other:	\$ -	\$ -	\$ -	\$ -	
Other:	\$ -	\$ -	\$ -	\$ -	
Other:	\$ -	\$ -	\$ -	\$ -	
<b>Total Fixed Expenses</b>	<b>\$ -</b>	<b>\$ -</b>	<b>\$ -</b>	<b>\$ -</b>	
<b>TOTAL CASH EXPENSES</b>	<b>\$ 9,010</b>	<b>\$ 9,590</b>	<b>\$ 9,590</b>	<b>\$ 9,590</b>	
<b>RECEIPTS MINUS EXPENSES</b>	<b>\$ (9,010)</b>	<b>\$ (590)</b>	<b>\$ 10,660</b>	<b>\$ 12,910</b>	
<b>Plus CAPITAL CONTRIBUTIONS</b>					
grants	\$ -	\$ -	\$ -	\$ -	
loans	\$ -	\$ -	\$ -	\$ -	
off-farm income	\$ -	\$ -	\$ -	\$ -	
other	\$ -	\$ -	\$ -	\$ -	
<b>Plus CAPITAL SALES</b>					
equipment	\$ -	\$ -	\$ -	\$ -	
<b>Less CAPITAL EXPENSE</b>					
2 chest freezers	\$ -	\$ 2,000	\$ -	\$ -	
vacuum, nitrogen flush sealer	\$ -	\$ 24,000	\$ -	\$ -	
pellet mill	\$ -	\$ 2,400	\$ -	\$ -	
hammer mill	\$ -	\$ 1,700	\$ -	\$ -	
mechanical harvester	\$ -	\$ -	\$ 5,000	\$ -	
sorter	\$ -	\$ -	\$ 5,000	\$ -	
oast	\$ -	\$ 5,000	\$ -	\$ -	
one acre hop yard	\$ 12,000	\$ -	\$ -	\$ -	
<b>Total Capital Expense</b>	<b>\$ 12,000</b>	<b>\$ 35,100</b>	<b>\$ 10,000</b>	<b>\$ -</b>	
<b>Less DEBT SERVICE</b>					
List Loan Principal Payments					
<b>Plus STARTING CASH</b>	<b>\$ -</b>	<b>\$ (21,010)</b>	<b>\$ (56,891)</b>	<b>\$ (56,423)</b>	
<b>NET RETAINED CASH EARNINGS (DEFICIT)</b>	<b>\$ (21,010)</b>	<b>\$ (56,700)</b>	<b>\$ (56,231)</b>	<b>\$ (43,513)</b>	
- Income Taxes (estimate at 33%)		\$ 191	\$ 191	\$ 191	
Less Family Living	\$ -	\$ -	\$ -	\$ -	
- Capital Reserve					
<b>NET AFTER CAPITAL RESERVE, FAMILY LIVING AND INCOME TAX ALLOCATION</b>	<b>\$ (21,010)</b>	<b>\$ (56,891)</b>	<b>\$ (56,423)</b>	<b>\$ (43,704)</b>	

## Appendix E - Sample Hopyard Designs

1. **Hopyard Design** from Crannóg Ales, Left Fields  
Crannog Ales Hops Update, 2007  
Rebecca Kneen

Hopyard size: 1 acre, 209'/side

	<i><b>Plants</b></i>	<i><b>Poles</b></i>	<i><b>Beds</b></i>	<i><b>Cable main</b></i>	<i><b>Cable seconda ry</b></i>
spacing (foot)	3.5	25	15	25	3.5
per bed or row (#)	60	9			
Total ea	900	81		3,762	12,540

Obviously, considerable variation can be expected with clever use of scrounged materials or found materials.

### Annual Activities

- Crowning or digging rhizomes
- Irrigation maintenance
- Topdressing with compost
- Mulching plants
- Stringing plants
- Cover crop/green manure maintenance
- Inspections/cleanup and IPM
- Harvest & packaging

All of these activities take person hours and machinery of some description, whether it's your pocketknife or more complex tools. The major activities take place in early spring, as soon as the ground is open, and in the fall at harvest. We find that it takes 2-5 person days to dig rhizomes over 1/2 acre – but if you are only root pruning rather than digging rhizomes, this time would be cut by at least half if not 3/4. Stringing time depends on the efficiency of your system. By far the most cost effective method on larger holdings is to use a cherry-picker or some such device to run down the rows, tying strings to the trellising at each plant, followed by a ground person anchoring the strings and twining the vines. Summer work is relatively light,

depending on your weed-control methodology and Integrated Pest Management (IPM) use. Harvest and packaging vary widely, with considerations including use of machinery to harvest and to pull plants down, speed of hand pickers and dryer efficiency.

It should be clear from this that there is considerable potential in organic hops production. We strongly recommend small scale production for the new grower and direct liaison with your brewery customers. Capital costs can be amortized over the lifetime of the yard, with poles being replaced as needed during that time. A group of small hop growers can also take advantage of group dryers and vacuum sealers, as well as creating a trained and mobile workforce.

2. **Hopyard Design** from “*Hopyard Construction: Budgeting and Economics*”

Edward B. Page, Ph.D. CSU Extension

Ron Godin, Ph.D. CSU Ag Exp. Station

Hopyard

- 18' to 20' high
- Plant spacing 7'x7'
- Population: 889
- 21' posts
- 2' to 3' in ground
- Various spacings
- 14' x 42'
- 15'x 30'
- 30' x 30'
- Equilateral triangle at end posts
- 15' base
- Poles connected within rows only
- Top training wire is free floating
- High labor input
- High production

**Methodology**

- Steel Anchor Embedded in Concrete

    New auger type anchors (not for sandy soils)

Wire Clamp for Anchor Wire

Clamping Cable

Corner end with triple anchors

Hop Growth on High Trellis

- Coir twine is tied to clip placed in soil next to hill
- Twine is tied to top wire

- Trained hop vine winds its way to top
- Harvesting: cuts top and bottom and remove for picking & processing

3. **Hopyard Design** from UVM Extension  
Rosalie Madden, Heather Darby, Roger Rainville

Per Acre (60'x660')

1320 bines

33 60' Rows spaced 20' apart, 1 row every 10' on either side of a pole. Then within the row, 2 rhizomes per hill, maintain at least at least 3.5' between hills, and at least 7' (15' is better) between varieties, 40 rhizomes per row x 33 rows.

Typical spacing in the Pacific NW is between 42-50 sq ft per plant, with a spacing of either 3.5' x 14', or 7'x7', for approximately 900 bines/ac.<sup>1</sup>

110 20-24' poles

1 pole every 20 ft  
4-5 plants per pole

Note that general pole spacing recommendations are 30'x30', or 30'x15', or 14'x42'. UVM spaced theirs at 20'x35' because it made it easier to delineate between varieties and repetitions for trialing purposes.<sup>2</sup>

110 post protection plates- metal plates to protect the poles

Main cable to be strung between poles- 2,178' of 3/8 steel cable (~3 rows of 660')

Anchor, clamps and wire holding poles (2 anchors and 40' cable per pole)

Wire every 10' between the three rows (3,960')

Hop stringer "trailer" or some mechanism such as a fork lift, bucket loader, back of pick up truck, or ladders, to get people high enough off the ground to string the wire and the coir twine.

---

<sup>1</sup> Information provided by Rosalie Madden, UVM Extension, July 2010.

<sup>2</sup> Information provided by Rosalie Madden, UVM Extension, July 2010.

4. **High Density Hopyard Design** from Gorst Valley  
James Altwies

Per Acre

Trellis Materials

Structure	Qty	Units
<i>End Poles</i>	22	each
<i>Line Poles</i>	66	each
<i>Deadmen</i>	26	each

Supplies

	Qty	Units
<i>Droplines</i>	1283	each
<i>Clover</i>	20	lbs
<i>Rhizomes</i>	1283	each

Hardware

	Qty	Units
<i>Turnbuckles</i>	22	each
<i>eyebolts</i>	132	each
<i>3/16 GAC</i>	4235	lin. Ft
<i>1/4 GAC</i>	484	lin. Ft
<i>3/16 clips</i>	44	each
<i>1/4 clips</i>	88	each
<i>3/16 thimb</i>	22	each
<i>1/4 thimb</i>	44	each
<i>lowline</i>	4235	lin. Ft

Irrigation Materials

Irrigation Tube	Qty	Units
<i>Dripline</i>	4235	lin. Ft
<i>Valves</i>	2	each
<i>Main line</i>	200	lin. Ft
<i>Branch line</i>	500	lin. Ft

Tees

	Qty	Units
<i>1.25"x1.25"x1.25"</i>		
<i>"</i>	1	each
<i>1.25"x0.5"x1.25"</i>	11	each

Couplers

	Qty	Units
<i>0.5"x0.5"</i>	10	each

End Caps

	Qty	Units
<i>0.5"</i>	11	each

Hose Clamps

	Qty	Units
<i>0.5"-1.0"</i>	20	each

Distrb. & Control

	Qty	Units
<i>Pump</i>	1	each
<i>Filter</i>	1	each
<i>Controller</i>	1	each
<i>Sensors</i>	1	each
<i>Shut-off valve</i>	1	each
<i>Check valve</i>	1	each
<i>5 strand wire</i>	250	lin. Ft
<i>Valve box</i>	2	each

## **Appendix F - Hopyard Establishment Costs Per Acre**

Sample budgets from:

Crannog Ales

Edward B. Page and Glenn Fuller, Colorado Extension

University of Vermont Extension

Gorst Valley Hops Value-Share Grower Program

**High Density Gorst Valley Hopyard Standard Trellis Establishment Cost per Acre**

Data Courtesy of James Altwies

<b>Trellis Materials</b>			
Structure	Qty	Units	
End Poles	22	each	
Line Poles	66	each	
Deadmen	26	each	
	<b>Sub Total Structure</b>		<b>\$ 2,942</b>
<b>Supplies</b>			
Drapelines	1283	each	
Clover	20	lbs	
Rhizomes	1283	each	
	<b>Sub Total Supplies</b>		<b>\$ 444</b>
<b>Hardware</b>			
Turnbuckles	22	each	
nyabots	132	each	
3/16 GAC	4235	lin. Ft	
1/4 GAC	484	lin. Ft	
3/16 clips	44	each	
1/4 clips	88	each	
3/16 thimb	22	each	
1/4 thimb	44	each	
lowline	4235	lin. Ft	
	<b>Sub Total Hardware</b>		<b>\$ 1,394</b>
<b>Irrigation Materials</b>			
Irrigation Tube			
Drapelines	4235	lin. Ft	
Valves	2	each	
Main line	200	lin. Ft	
Branch line	500	lin. Ft	
tees 1.25"x1.25"x1.25"	1	each	
tees 1.25"x0.5"x1.25"	11	each	
Couplers 0.5"x0.5"	10	each	
End caps 0.5"	11	each	
Hose clamps 0.5"-1.0"	20	each	
<b>Distr. &amp; Control</b>			
Pump	1	each	
Filter	1	each	
Controller	1	each	
Sensors	1	each	
Shut-off valve	1	each	
Check valve	1	each	
5 strand wire	250	lin. Ft	
Valve box	2	each	
	<b>Sub Total Irrigation</b>		<b>\$ 1,274</b>
Plants			<b>\$ 2,053</b>
Labor	150 hrs		<b>\$ 1,500</b>
Machine Hours	50 hrs		<b>\$ 500</b>
<b>Establishment Cost per Acre</b>			<b>\$ 10,107</b>
<b>Establishment Cost Not Including Labor per Acre</b>			<b>\$ 8,107</b>

**Hopyard Standard Trellis Establishment Cost per Acre**

Data Courtesy of Glen Fuller (Colorado)

Rhizomes (4" x 12")	1040	1.21	\$	1,260
Misc. Hardware & Supplies			\$	1,260
Poles (21' untreated, lodge pole pine)	52	20.57	\$	1,070
D5 Dozer Work			\$	600
Bob Cat & Auger (holes for poles)			\$	550
7-Strand Wire (carries floating wires)			\$	800
#9 Wire (floating - top wire)			\$	250
Hop Twine (coir: coconut husk fiber)			\$	140
48" Ground Anchors	48	8.33	\$	400
Drip Irrigation Materials			\$	1,500
30 hrs. Tilling			\$	300
40 hrs. Pole Setting			\$	400
Gallows (for work on top wires)			\$	140
Labor			\$	3,750
<b>Total Establishment Cost</b>			<b>\$</b>	<b>12,420</b>
<b>Establishment Cost Not Including Labor per Acre</b>			<b>\$</b>	<b>8,670</b>

**Left Fields Hopyard Standard Trellis Establishment Cost per Acre**

	Qty	S/Unit	\$ Total
Rebecca Kneen Cranford Ales, Left Fields	81	25	2,025
Poles	3762	0.4	1,505
Cabling - Primary	12540	0.26	3,260
String - 2/plant	1800	0.02	36
Anchors, cable	26	9	234
Cable clamps	194	0.29	56
pass-throughs (loops)	63	1.5	95
Cable eyes	26	0.32	8
Klein-Haven Grip	1	160	160
Rhizomes	900	3.5	3150
<b>Total</b>			<b>10,529</b>

**Standard Trellis Establishment on 4 Acres**

By Edward B. Page, Data Courtesy of Glen Fuller

Rhizomes	4160	1.21	\$	5,040
Potting Soil			\$	750
Pots (6" square)	5000	0.46	\$	2,300
Misc. Hardware & Supplies			\$	5,026
Poles (21' untreated, lodge pole pine)	210	20.38	\$	4,280
D5 Dozer Work			\$	2,400
Bob Cat & Auger (holes for poles)			\$	2,150
7-Strand Wire (carries hop wires)			\$	3,146
#9 Wire (floating-top wire)			\$	997
Hop Twine (coir: coconut husk fiber)			\$	556
48" Ground Anchors	188	8.4	\$	1,580
Drip Irrigation Materials			\$	5,980
30 hrs. Tilling			\$	1,200
40 hrs. Pole Setting			\$	1,600
Gallows (for work on top wires)			\$	556
Labor			\$	15,000
<b>Total Establishment Cost</b>			<b>\$</b>	<b>52,561</b>
<b>Establishment Cost per Acre</b>			<b>\$</b>	<b>13,140</b>
<b>Establishment Cost Not Including Labor per Acre</b>			<b>\$</b>	<b>9,390</b>

**UVM Extension Hopyard standardized to 1 acre**

Data Courtesy Rosalie Madden, Roger Rainville	#	Each	Sum
<b>Poles</b>			
22 ft locust poles	30		\$ 1,260
22 ft cedar poles	53		\$ 1,325
	<b>Sub total Poles</b>		<b>\$ 2,585</b>
<b>Wire</b>			
5/16" x 5000 ft			\$ 1,733
5/16" x 1000 ft			\$ 347
5/16" x 250 ft			\$ 107
3/8" x 500 ft			\$ 280
3/4"x12 eye/hook turnbuckle	34	15.92	\$ 721
cable cutters	1		\$ 66
5/16" x 10 pcs forged w/r clips	200	0.64	\$ 171
3/8" x 10 pcs forged w/r clips	50	0.94	\$ 63
3/8" x 10 pcs forged w/r clips	50	0.94	\$ 25
5"x46" anchor	40	9	\$ 360
Earth auger anchor, 5"x46"	40		\$ 267
Screws			\$ 159
2 Haven Grips cable pullers			\$ 166
	<b>Sub total Wire</b>		<b>\$ 4,465</b>
<b>Supplies</b>			
10 yards stone			\$ 460
Rhizomes fresh hops/hops union bulk price	1,778 rhizomes 2/hill		\$ 5,334
Drip Irrigation Supplies and Installation			\$ -
	<b>Sub total Supplies</b>		<b>\$ 5,794</b>
<b>Labor</b>			
Dig test holes	3		\$ 30
install poles, digging, stone, 2 tractors & loader	18	10	\$ 180
install poles, labor	25	10	\$ 250
set poles, labor	5	10	\$ 50
tractor and dump wagon	9.5	10	\$ 95
labor	65	10	\$ 650
tractor and auger to set anchors	4	10	\$ 40
labor to set anchors	2	10	\$ 20
tractor and lift	32	10	\$ 320
till	4	10	\$ 40
Plant rhizomes	16	10	\$ 160
tractor and loader to set poles	13	10	\$ 130
Tractor and auger to set anchors	3	10	\$ 30
	<b>Sub total Labor</b>		<b>\$ 1,995</b>
<b>Equipment Rent</b>			
transport digger			\$ 150
rent rototiller			\$ 88
rental for pole digger			\$ 339
	<b>Sub total Equipment Rent</b>		<b>\$ 577</b>
<b>Total Hop Yard Cost Per Acre</b>			<b>\$ 15,416</b>
<b>Total Hop Yard Cost Per Acre Not Including Labor</b>			<b>\$ 13,421</b>
<b>Total Hop Yard Cost Per Acre Estimating \$20/pole and Not Including Labor</b>			<b>\$ 12,496</b>

## **Appendix G - Laboratory Analysis Service Providers**

### **Brewing and Distilling Analytical Services, LLC (BDAS, LLC)**

128 Shady Lane

Lexington, KY 40503

Tel: 859-278-2533

<http://www.alcbevtesting.com/>

BDAS partners with Tom Shelhammer at Oregon State University to offer the following analyses

- Oils (Cohumulone and Humulone)  
HPLC high performance liquid chromatography test      \$100/sample
- Alpha and Beta Acids  
toluene extraction test      \$50/sample
- Reduced Alpha Acids for light struck prevention  
Light struck prevention test      \$100/sample  
(for clear bottled beer, to study hops that might react to light) Corona clear bottles have a skunky smell but Miller clear bottles do not and this is because Miller specially selects hops bred to be light struck reduced

### **BrewLaboratory**

J. Frizzell

18223 Crestview Circle

Holt, MO 64048

service@brewlaboratory.com

BrewLaboratory is offering a High Performance Liquid Chromatographic (HPLC) analysis of your whole leaf or pellet hops for:

- Alpha Acid % (cohumulone and adhumulone + humulone)
- Beta Acid % (colupulone and adlupulone + lupulone)
- Cohumulone % (% cohumulone contributes of the total Alpha Acid %)

We will analyze your hops for \$24.00 per sample.

### **Siebel Institute of Technology**

Laboratory Services

*Head Office:* 1777 N Clybourn Avenue Chicago, IL 60614

Phone: 312-255-0705 Fax: 312-255-1312

E-Mail: [laboratory@siebelinstitute.com](mailto:laboratory@siebelinstitute.com)

Web: [www.siebelinstitute.com](http://www.siebelinstitute.com)

Sample delivery only:

Siebel Laboratories

7564 Trade Street

San Diego, CA 92121, USA  
(888) 593-2785

#### HOP ANALYSES

Options	Price \$	Quantity
#3000 Moisture (International method)	22	200 g pellets
#3010 Alpha acids (spectrophotometric)	55	200 g pellets
#3020 Alpha acids (conductometric)	65	200 g pellets
#3030 Alpha and beta acids (HPLC)	131	200 g pellets
#3060 Hop Oil Profile (GC)	158	200 g pellets
#3070 Hop Tea Flavor Evaluation	89	200 g pellets
#3080 Humulene-2-ol	110	200 g pellets
#3090 Iso, tetra, dihydro, hexa- humulones	POR	200 g pellets
#3100 Nitrate (HPLC)	POR	200 g pellets
#3110 Total Essential Oils	23	200 g pellets
#3120 Variety Profile (trueness to type)	POR	200 g pellets
All individual analysis / other analysis	POR	

## **Appendix H – Expired Hop Harvester Patents**

High Trellis Patents

Mobile Patents

Low Trellis Patent