October 2011

LaHave Forests' Haskap Day

Introduction

While Blueberries have long been Nova Scotia's leading agricultural berry crop, local farmers may want to investigate the attributes of the Haskap berry, which is now being commercially grown for the first time in the province. The berry, which is considered a delicacy in northern Japan, has garnered increasing attention in North America in recent years in conjunction with the rising consumer demand for healthy foods. Haskap berries contain at least three times the antioxidant levels of Wild Blueberries, which are purported to be North America's "healthiest berry," and twice the vitamin C content of oranges. The Haskap plant also appears to be perfectly suited to Nova Scotia's climate, growing zone, and much of its soil, all of which should contribute to an especially healthy and robust crop.

Lunenburg County's LaHave Forests formally introduced the Haskap berry to an enthusiastic audience of potential growers on October 11, 2011, during its first annual "Haskap Information Day" seminar at its Honeyberry Hurst Farm. LaHave Forests has planted the first commercial Haskap berry orchard in Nova Scotia, and now has about 20,000 Haskap plants growing on 20 acres. The operation plans to have 80,000 plants under cultivation by 2014.

Although the 150-plus seminar attendees were certainly interested in learning about the Haskap berry, they were equally intrigued by LaHave Forests' innovative "biodynamic" farming practices, which focus on generating and maintaining soil health as the primary means of ensuring bountiful and healthy crop yields. As noted by LaHave Forests General Manager Logie Cassells in his welcoming remarks, "When you get the soil right, everything else naturally flows."

Along with touting the benefits of biodynamics in his opening remarks, Logie stressed that the Haskap berry is a perfect fit for Nova Scotia agriculture. Not only is the province's microclimate fantastic for berry cultivation, but in many areas the soil is also perfect, he said, adding that these attributes should make Lunenburg County the "berry capital of the world."

These sentiments were echoed by Curtis Braaten and Carl Barber of Saskatchewan-based Haskap Central, the first licensed propagators of Canadian grown Haskap varieties. Not only does Nova Scotia have a suitable climate, proper soil types, and sufficient precipitation, said Curtis, but the province, unlike the prairies, "already has a berry infrastructure in place."

Saskatchewan growers "deal with extremes," added Carl, citing the extremes of "heat, cold, dry and wet," and noted that, "we must be crazy to be growing fruit out there." Carl clarified that the Haskap is hardy enough to thrive and bear fruit despite such extremes, and both he and Curtis emphasized throughout the seminar that the Haskap should grow especially well in Nova Scotia.

The seminar's opening remarks were followed by breakout sessions designed to educate the participants about the Haskap berry and its cultivation, as well as about LaHave Forests' innovative biodynamic farming practices. These sessions included:

Haskap berry varieties and Saskatchewan growers

- The general history of the Haskap berry and the University of Saskatchewan's Haskap breeding program, along with an overview of Haskap berry varieties;
- Haskap berry growing conditions and planting and growing techniques;
- Pollination, irrigation, and bird netting strategies; and,
- Haskap berry pruning techniques and harvesting methodologies.

Haskap planting and growing techniques at Honeyberry Hurst Farm

- Why biodynamic farming works with Haskap or any berry;
- The importance of biological soil analysis;
- An introduction to making and applying compost tea, biochar compost and other "fairy dust" on LaHave Forests' farms;
- LaHave's bird netting strategy and other pest control; and,
- General costings of building a Haskap orchard and a Haskap co-op model.

Haskap Orchard Preparation—New soil care system for farming

- Honeyberry Hurst Farm's secret soil care weapon—"Agrowplow";
- How conventional soil cultivation techniques cause significant damage to the soil;
- How Agrowplow's non-inversion soil tillage technique provides similar results as conventional tillage, but without damaging the biological makeup of the soil; and
- Demonstration of Agrowplow's non-inversion tillage.

Harvesting and value added in consumer markets

- Mechanical harvesting versus hand picking;
- The Japanese opportunity and (lack of) the Chinese threat;
- Haskap berry consumer market overview in Saskatchewan; and,
- Haskap berry consumer market overview in Nova Scotia and beyond.

1. Haskap berry varieties and Saskatchewan growers

Haskap Central's Curtis and Carl explained that Haskap, which is native to the northern Japanese island of Hokkaido and Siberia, belongs to the Lonicera caerulea L. plant species more commonly known as Blue Honeysuckle. While a variety of Blue Honeysuckle species grows naturally in northern regions of Eurasia and North America, the fruit of these varieties never proved especially flavourful, and thus they were not historically cultivated to any extent until the former Soviet Union undertook a cultivation program in the 1950s to breed a Blue Honeysuckle that would produce a more palatable fruit. These efforts led to a smattering of commercial production in Russia, but the berries never achieved the high quality taste of the Japanese "Haskap."

Meanwhile, the Japanese began domestication and commercial growing of the wild Haskap in the 1960s. The fruit had been eaten by the natives of Hokkaido for centuries due in large part to its health benefits, and is

now considered a delicacy in Japan. However, the country is unable to keep up with demand due to a lack of cultivable land and declining number of farmers.

While a couple of universities and independent growers in the United States initiated a few small research projects and test cultivations over the years, the University of Saskatchewan began its Haskap program in 1997, and has emerged as the biggest cultivator in North America. The university holds the largest genetic base of the Haskap plant, and has produced about 20,000 seedlings of improved crossbreeds. As of this year, said Curtis and Carl, approximately a half million University of Saskatchewan bred plants are in the ground in North America. And for every plant sold, the University receives 50 cents in royalties to fund future research.

Currently, Haskap Central and the University of Saskatchewan believe that the "Tundra" and "Indigo Gem" breeds, with a relatively thicker skin and firmer fruit, have the most potential for commercial growers, while the "borealis" breed, with a thinner skin and softer fruit, is most suitable for home gardeners and U-pick operations. The flavours of all three are considered among the best of all the university's many breeds, and received high praise from the usually fickle Japanese taste testers. Meanwhile, the university is continuing its efforts to improve its Haskap breeds to find the most appealing taste, texture, size, colour and shape of the berry for the consumer, along with the best overall plant to meet the production and harvesting considerations of the growers.

"The plant is especially hardy," said Carl, "and it's pretty amazing what the plants can put up with." Many plants tend to recover from extreme incidents, such as fire and ice storms, as the plant will regrow from its crown. They withstand the region's temperature extremes, which have experienced cold snaps into the -40° Celsius range to heat spells into the 30°s. And the plant's flower, which bloom in late April and early May, can survive temperatures as low as -7° Celsius. Strong wind, however, can be a problem. Strong winds right after planting the seedlings tends to weaken them, and strong winds prior to the fruit ripening can cause fruit drops.

As for pests and disease, the Haskap does not seem to have many enemies. The only disease that's proved to be a nuisance to the plant in Saskatchewan is powder mildew in the fall, which severely affects the leaves of some varieties, but does not affect other varieties. The Tundra and Indigo Gem breeds tend to be immune.

Deer and other mammals have not proven to be problematic with crops grown by either the university or Haskap Central. And though mammals do not appear to have a taste for the berries, Curtis and Carl admitted that it was certainly possible that the animals could acquire a taste. Carl noted that if bears or racoons were to take a liking to the berry they could wipe out a crop in no time and significantly damage the plants as well.

Birds have emerged as the biggest potential threat to the emergent North American Haskap berry crop. While Japanese commercial operations have not experienced any significant "bird problems," some Saskatchewan orchards have been hit hard, apparently after the birds—especially the Cedar Waxwings—gain a taste for them. Thus, Haskap Central recommends that orchards be covered with bird netting. Carl suggested that the netting should be one-half inch, as the larger one-inch size tends to trap and sometimes kill the birds. Curtis said that farmers should budget about $2,000 per acre for bird netting.

According to Curtis and Carl, the minimum size of a "cost effective" Haskap orchard in the Canadian prairies is 10 acres. Greenhouse grown seedlings are usually transplanted to the field when they are six- to nine-months-old. Carl noted that there are numerous options for preparing the rows for the plants, and said that he found that a "potato digger" made a nice trench for receiving the transplants.

Spacing between the plants is generally between three to three-and-a-half feet, with this difference in spacing dependent on whether harvesting methods are more applicable to a hedge or individual bushes within each row. Standard spacing of about 10 feet between the rows is generally dictated by the harvesting method to be used and by bird netting and irrigation considerations. The allowance of grass and weeds between rows should

be dictated in large part by precipitation, as growth between the rows can compete for the Haskap's water intake. Regions with drier climates should restrict such growth, while wetter regions can utilize between-rows-growth to reduce moisture so as to induce plants to go dormant as winter approaches.

While the Haskap plant does not "sucker," it does send new shoots up from the root collar, which is where any pruning should take place, according to Curtis and Carl. While they recommend planting the Haskap two inches below the root collar to inhibit too much shoot growth, they acknowledged that this may depend on whether the grower requires a tall or short plant. Determining the desired height and girth may be dependent on several factors, such as harvesting, as a bushy plant's berries will be low to the ground, while a tall plant's berries will be higher up. One difference between the two said Curtis, is that a mechanical harvester will not be able to get all the crop on a low bush. Thus, it will be an individual farmer's choice, and will likely be driven by market considerations and whether the grower is utilizing handpicking or mechanical harvesting.

The Haskap plant, all of which have both male and female parts, needs two unrelated varieties for successful pollination—preferably two that pollinate at the same time to ensure proper fruit set. Haskap Central recommends a one-to-five ratio for successful pollination, and along with the University of Saskatchewan, promotes the "Berry Smart Blue" as being the best pollinizer.

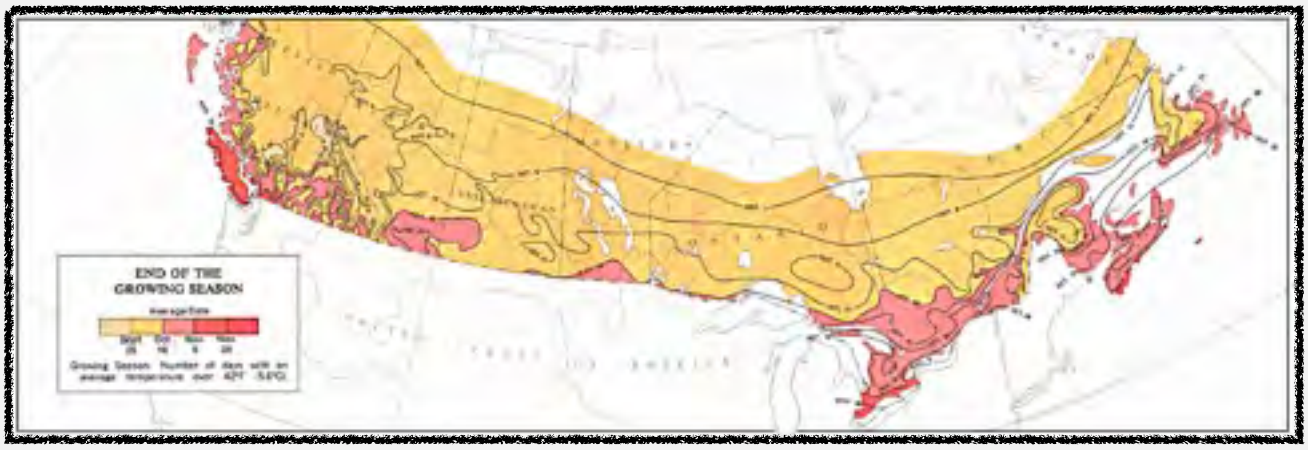
The Haskap plants usually produce fruit the first year after planting, but farmers should not expect to see mature plant yields of up to 15 pounds per bush until the third or fourth year. The berry should be the first of the season, which makes it "a value added crop" for any farmer growing other berries, said Curtis. The fruit should begin to ripen the first week of June, turning from green to a dark blue or purple, but the fruit is not ripe until its inside flesh has begun to turn purple or blue as well. And while the fruit can be picked when ripe, said Carl, it can stay fresh for weeks, with the fruit retaining its good taste until mid- to late-August. "If the fruit drops, it does not rot, it does not mildew, and you can pick it up off the ground six weeks later and still eat it."

2. Haskap Planting and Growing Techniques at Honeyberry Hurst Farm

LaHave Forests General Manager Logie Cassells said the company's search for a new healthy berry was sparked in large part by its belief that Lunenburg County should be "the berry capital of the world," because of its "fantastic microclimate." The county's climate, with a 210-day growing season and plenty of precipitation (almost 60 inches), precludes the need for irrigation. "We may grow rocks in Nova Scotia," said Logie, "but not here!"

Overall, explained Logie, land in Nova Scotia is perfectly suited for growing trees and agricultural produce due to its mild winters and ample amount of rainfall.

The province is situated between latitude 43° and 46° North, and is located within the U.S. Department of Agriculture's highly favorable zone 5B to 6A for "Plant Hardiness."

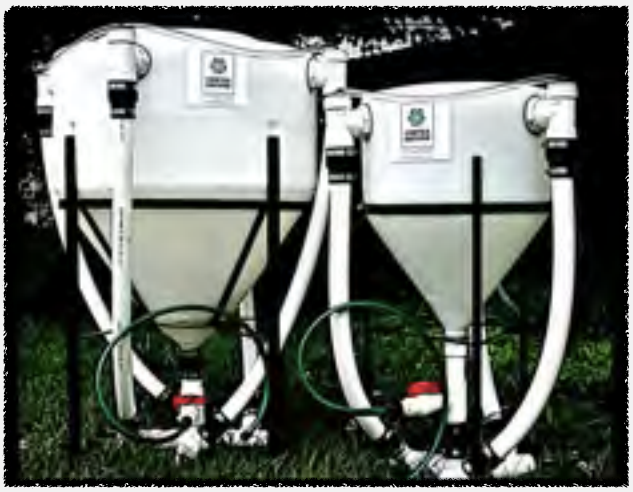


- **Precipitation:** Average 1,523 mm (rainfall 1,323 mm and snowfall 200 mm).
- **Growing Season:** 210 days (degree-days above 17 °C).
- **Humidity:** Relative humidity tends to be high, because of the surrounding sea and because of the Southern tropical winds.
- **Average annual temperatures are:**
  - Spring, from 1 °C (34 °F) to 17 °C (63 °F)
  - Summer, from 14 °C (57 °F) to 25 °C (77 °F)
  - Fall, about 5 °C (41 °F) to 20 °C (68 °F)
  - Winter, about −11 °C (12.2 °F) to 5 °C

Soil health is the linchpin of farming, said Logie, noting that modern agricultural methods, such as the use of synthetic fertilizer and soil inversion tillage, has resulted in significant erosion and a decline in soil health around the world. Modern farming methods "are broken," said Logie, "because they kill the soil." And dead soil grows poor crops, he added, pointing out that North American vegetable crops have generally lost more than 50 percent of their nutritional trace mineral content over the past 60 years, primarily due to depleted soils.

Today's new agricultural model is built on the premise that being well fed leads to health, and that living things that are well fed do not attract disease or parasites. Therefore, "healthy soil equals healthy crops equals healthy food equals healthy people, is our philosophy," said Logie, adding that LaHave Forests' farms were using biodynamics to improve the biological health of the soil. "Biodynamics makes logical sense and we believe it is more cost effective than modern farming methods and its reliance on fertilizers," he said. "As farmers and caretakers of the land we cannot control the variables of climate, but we can control the level and balance of essential nutrients in the soil."

Haskap needs three things to thrive: a correct soil structure, a healthy soil biology or food web (mix of one bacteria to five fungi) and a good balance of 85 to 92 for



natural minerals and trace elements. This last point is very important in ensuring the berry's Brix Factor (amount of natural sugars) is in the desired 20 to 25 range. Honeyberry Hurst Farm has experienced no problems with its Haskap crop to date—no outbreaks of fungi, and no problem with insects. "And I believe it's because we have achieved a balanced biodiversity on our farms," said Logie. He added that while he had seen black aphids on plants growing next to Haskap, they never migrated over to the Haskap.

The first task on the road to a sustainable and healthier farm model is the "Soil Test." Without this, said Logie, farmers are "floundering in the dark or merely guessing what may be missing." The strongest, healthiest and most nutritious crops are grown in soils where its Cation Exchange Capacity is saturated to about 65% Calcium, 15% Magnesium, 4% Potassium and 1% to 5% Sodium. Calcium is very important as it tends to loosen soil, while Magnesium tightens it. Once these levels have been achieved, the pH of the soil will naturally stabilize around 6.4. This is the perfect soil pH, not only for organic agriculture, but is also the ideal pH of the sap in a healthy plant and the pH saliva in a healthy human.

The primary "Agri-Tech" tools LaHave Forests uses on its farms are compost tea, biochar and the Agrowplow. Logie explained that compost tea is an aerated brewed water extract of compost that is sprayed on the fields to restore beneficial microbes to the soil and crops, and is believed to induce improved plant growth and uptake of minerals, disease suppression, and a reduction of fungicide and fertilizer requirements. The tea includes

compost, molasses and kelp, with the mixture of the ingredients determined by what is needed to match the soil's biology to the chosen crop. It is produced over a 24-hour period in a vortex brewing vat that "folds" the mixture together rather than bubbling it.

On a price point, Logie said that compost tea application costs about $150 per acre if produced by the farmer, and that this cost is more than offset by the reduced need for pesticides and fungicides. The farm has been applying the tea to its Haskap fields about every 10 days. Lave Forests is offering the compost tea for sale, and will continuously provide updates on its research into the benefits of the compound.

Biochar is a charcoal created by burning wooden biomass waste in the absence of oxygen to produce a highly effective "carbon rich" soil enhancer. Biochar significantly improves soil fertility and crop growth, said Logie, who added that Biochar production originated 2,000 years ago among the people of the Amazon. Biochar's key advantages are that it stimulates the retention of nutrients and microbial life in the soil, reduces soil acidity, prevents nitrogen runoff and improves the soil's water holding capacity. BioChar also reduces the need for fertilizer, and research shows that it can increase crop yields by between 20 to 40 percent. LaHave Forests produces its own Biochar on site.

The last of LaHave Forests' biodynamic tools, the Agrowplow, is designed to plow the fields without inverting the soil, and thus minimizes soil disruption, reduces moisture loss, and alleviates root and soil compaction, all to the benefit of soil health and subsequent plant growth. Logie said that both earthworms and the Agrowplow serve as the engineers of LaHave Forests' farm soils.

3. Haskap Orchard Preparation—New Soil Care System for Farming

Agrowplow—North America Manager of Operations Graeme Finn said, "Soil is the lifeblood of a farm. If you treat it right, it'll treat you right, but if you abuse it, it will abuse you." Graeme explained that the Agrowplow was developed in Australia by farmers concerned about the deterioration of soil health. They determined that conventional tillage methods were leading to increased soil erosion, destroying the soil humus and causing a severe breakdown in soil structure.

"Anyone can see how soil in a conventionally tilled field is so loose that a bit of wind or rainfall will start eroding it away, but the conventional plough is also killing the soil as it breaks it up." He explained that different organisms reside in different layers of the soil, and that many of these organisms are killed when the soil is churned because they are only acclimated to living in their specific soil layers. The Agrowplow "opens the soil without disturbing the layers and killing their distinctive organisms," he said.

The Agrowplow also eliminates soil compaction, or hard panning, which can form an almost impenetrable soil layer that impedes water entry and further reduces the biological life of the soil. Compacted soils dry out quicker and become waterlogged easier, which hinders deep, healthy root growth and leads to restricted plant growth and reduced yields.

Graeme, who provided a live demonstration of the Agrowplow, said most farmers who have used the Agrowplow to break up their fields' hardpan are "amazed by the increase in yields" they subsequently achieve. The Agrowplow opens up new layers of nutrients for the plants' roots, said Graeme, adding that once those layers are exposed "the plants just thrive."

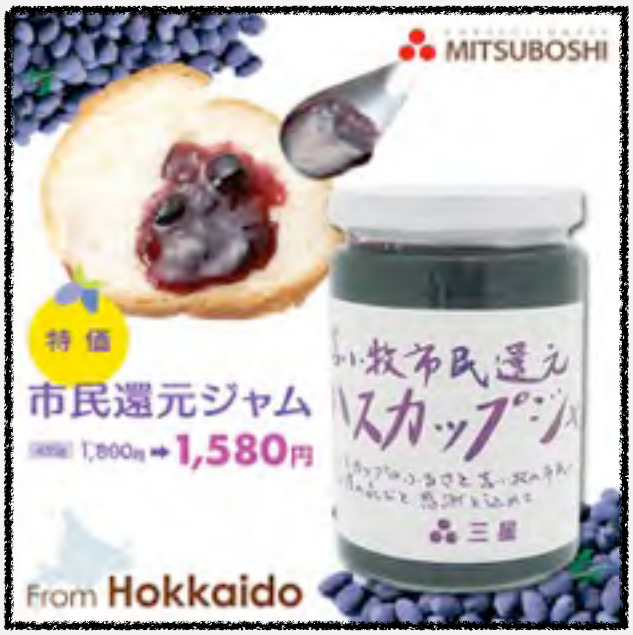
LaHave Forests owns the first two Agrowplows in use in the Maritimes. Graeme said interest in the

Agrowplow from farmers in the western provinces has increased significantly since the company opened its Canadian offices in 2005. When farmers hear about "increased yields" they want to know how, and the word spreads. LaHave Forests' future results will help spread the word about Agrowplow in the Maritimes.

Logie Cassells said soil compaction was a significant problem on much of LaHave Forests' farm acreage, and guessed that it is limiting yields on farms across the province and Maritimes. "We think the Agrowplow is one of the best farming tools there is to improve and maintain soil health."

4. Harvesting and Value Added in Consumer Markets

A key question that was undoubtedly on the minds of the farmers in attendance was, "how much can I make by growing this berry?" And with Haskap being a new commercial crop in North America, market research is limited. However, the speakers were able to provide some examples of prices earned by Saskatchewan and



Alberta farmers, and were able to posit on the berry's promise from both the nascent North American market and "a very eager" Japanese market. In the past year, Saskatchewan farmers realized about $13 per pound for fresh berries sold by U-pick operations, and about $7 for frozen berries, said Curtis and Carl.

"We know the buzz is there," said Curtis in reference to the potential North American market. Consumer interest in healthy foods has seen a significant increase in recent years, in large part spurred on by an aging Baby Boomer population interested in maintaining its health.

If these Boomers "are willing to pay a premium for California raspberries in February, then they will undoubtedly be willing to pay for a berry that tastes just as good and also has better health properties." He added that the "U.S. interest is huge," and noted that unique new food products tagged as being high in antioxidants tend to do well when introduced.

The berry's appeal as a fresh fruit lies in part by the fact that it is the "first fruit of the season" and that it stays ripe and edible in its fresh form for a long period of time. However, Curtis and Carl both said they believed that the Haskap berry's greatest commercial potential in the North American market is as a juice. The berry is 80 percent juice content by weight, and the berry's thin skin does not hinder the juicing process or detract from the taste. The juice has a dark, rich colour that appeals to consumers and the flavour has been described as a blend between a Blueberry and a Raspberry, with a hint of Elderberry. The berry has also proven popular as an ice cream flavour, in smoothies, as jam and cooked in baked goods such as pies, cakes and rolls.

The Japanese market potential is well-established, and a relative shortage of growers in the country helps drive a premium price for the berry. The Japanese demand evolved in large part due to the health properties —both those of historic lore and the more modern scientific findings—of the berry. The shortage in Japan is primarily caused by a lack of arable land, along with a dearth of farmers, due in part to aging demographics.

Fresh berries command especially high prices ($30 a pound) and the berries are sold in more than 10 different cakes and pastries, as well as in teas, wines, soft drinks, jellies, jams and juices. The Japanese have expressed interest in importing up to 1,200 tons of the berry, but they are exacting in their expectations of flavour, shape, texture and size and believe the berries should be hand picked.

Curtis and Carl believe that some varieties of the Canadian-grown berry now meet the exacting standards of the Japanese, and while they may not accept mechanically harvested berries for the "fresh" market, they will likely accept them for processed foods.

The Chinese have ramped up their production of Haskap as a potential export to Japan, but Curtis and Carl do not believe that they will be a significant competitive threat due to the high standards of the Japanese. "China has the capability to grow volume at a cheaper price," said Curtis, "but the quality of the Chinese product will be suspect." He added that to date, Chinese varieties of Haskap are especially bitter.

In discussing the Haskap berry market overview in Nova Scotia, Logie said that LaHave Forests' initial foray has been incredibly successful. Fresh and frozen berries were distributed to restaurants such as The Wooden Monkey in Halifax, Nicki's Inn in Chester and the Best Western Hotel in Bridgewater. Chefs at the three restaurants successfully used the berries in several recipes, such as a Haskap berry cheesecake, a Haskap fruit crisp, a Haskap berry ice cream, and as a seafood dipping sauce.

Fifty pounds of berries were given to Terra Beata Cranberry Farm to test the berries for juice processing and drying. The juice has been especially well received by tasters who describe it as "simply delicious." And the Ironworks Distillery brewed 100 bottles of Haskap Berry Liquor in a test run to sell alongside its already top-selling Blueberry liquor. The stock sold out in three days.

5. General Costings of Building a Haskap Orchard.

The general costings for a Haskap Orchard need to be separated into "establishment costs" for the first year preparation of the Orchard, and annual "maintenance costs" for its continued upkeep. All the costs included in the model are estimates based on the experiences of LaHave Forests and Haskap Central, and are subject to variation depending on market factors, technology and farming methods. Included in the following table are the key elements from the financial model for a 10 acre orchard. All costs are in Canadian Dollars.

Projected Revenue	
Pounds per acre	8000
Plants per acre	1,000
Pounds per plant	8
Price per pound	4.40
Break even per pound	1.28
Revenue per acre at year 5	35,200
Gross Margin per acre	24,992
Revenue per plant	35
Revenue per pound	4.4
Number of Acres	10
Orchard Revenue at Year 5	352,000
Establishment Cost	104,455
Annual Maintenance	11,905
Annual Harvest and processing	88,000

More detailed information and a breakdown of costings is available in our online document "Financial model of a 2 acre and 10 acre Haskap orchard." Click here.

6. Nova Scotia Haskap Association

The Haskap Growers' Association of Nova Scotia has been formed to maintain focus on grower issues. The goal of the Association is to "*Enhance the economic viability of the Nova Scotian Haskap grower.*" Their mission is to support and promote the Haskap growers of Nova Scotia.

The association is seeking to create a network of Haskap Growers to share knowledge and information, and to build a community behind this new crop.

More information on the association can be found at www.haskapnovascotia.com

7. What's Next?

The hosts of the Haskap Information Day believe that the interest shown by attendees bodes well for the future of the Haskap berry in Nova Scotia. LaHave Forests' President Simon Fineman was very pleased with the turnout and is excited to about introducing a new agricultural product to Nova Scotia. Simon, who lives in England, said that he finds it amazing that so much of the

land in Nova Scotia is not put to good use. "This project is partly about showing the local people that they can put their land to good use—to give them the confidence to believe that they can make their land productive."

8. Haskap Co-op

The Haskap Co-operative will be formed over the coming months with the goal of ensuring that sustainable and organic farming methods are promoted, that knowledge is shared between Co-op members, and that the farming of Haskap berries is economically viable.

Co-op members and associates will also benefit from a managed brand and marketing strategy, ensuring that the Haskap berry is promoted in the most effective way.

Members and associates will also be able to sell their berries through the Co-op, ensuring that the market's needs are met and that the most economically competitive price points are maintained.

Summary

LaHave Forests, in combination with the Haskap Growers' Association of Nova Scotia, intends to make the Haskap Information Day an annual event.

It is not often a new "Halo" or healthy berry comes along that is so well suited for northern climates.

The intention of LaHave Forests is to build the centre of the new emerging Haskap industry in Lunenburg County in terms of growing and processing. The added benefit is to show a new natural model that is sustainable in terms of soil and plant health, as well as economically viable for the farmer.