

Cultivation of Hazelnut (*Corylus sp.*) in a Sugarbush

Foreword

Through a program called “Improvement and Development of Sugarbush Resources”, professional foresters and researchers of the Faculty of forestry (*Université de Moncton, Campus d’Edmundston*) have tested seven hazelnut species (shrubby and arborescent), to determine which ones are best adapted to sugarbushes of Northwest New Brunswick. This technical guide aims to explain the method enabling the establishment of a hazelnut cultivation in the understory of a sugarbush.

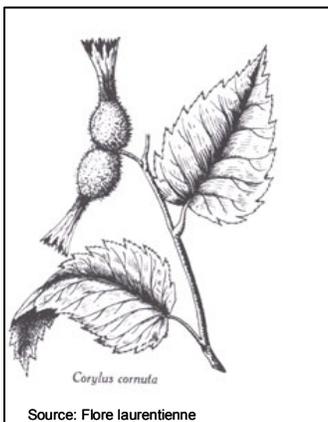
Why Cultivate Hazelnut?

Hazelnut:

- Excellent source of proteins (12.6%);
- Rich in Omega 9, vitamin B and E, fibers and trace elements;
- High energetic value;
- Highly recommended to athletes;
- There’s already a Canadian and world market for hazelnuts.



Contorted filbert is the common name given to the hazelnut tree named “*Corylus avellana*”. This species, native from Europe, is the most widespread in plantations



across the world. In North America, the indigenous species are the “*Corylus americana*” and the “*Corylus cornuta*”.

Did you know?

The three greatest producers of hazelnuts are (percentage of the world production):

- 1) Turkey (70%)
- 2) Italy (12%)
- 3) United States (6%)

How to setup a hazelnut tree plantation in the understory of a sugarbush

Step 1- Determine a favourable site to establish the plantation.

Hazelnut's particularities

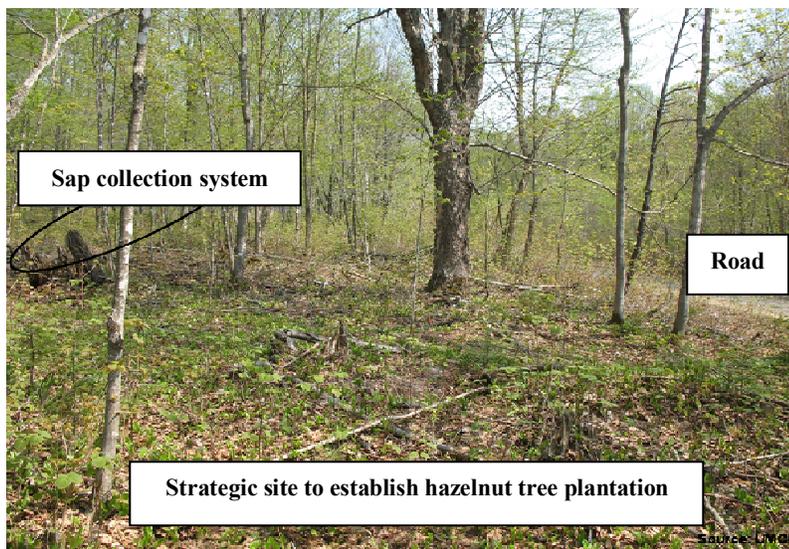
- A hazelnut tree plantation can be a hindrance in a sugarbush if it is established in proximity of a sap collection system.
- Hazelnut trees are often found in the understory, but direct sunlight improves growth and vigour.
- Hazelnut trees are naturally found in a large variety of sites and growing conditions.
- Hazelnut trees prefer sites with good drainage and humidity, but can also be found on dryer sites.

Strategic sites for a hazelnut tree plantation in a sugarbush

- In non-productive zones, such as between a road and a sap collection system.
- Favour a slope orientation that maximizes sunlight.

Advantages of these strategic sites

- The absence of crown canopy on roadsides increases the amount of direct sunlight available to the plantation, which improves growth and hazelnut production.
- The plantation will not hinder the maintenance of the tubing system nor will it obstruct access to parts of the sugarbush.



Step 2 - Order your seedlings.

Which species should you choose?

The hazelnut tree includes many species of the genus “*Corylus*”. In North America, there are two main species of shrubby hazelnut trees: *Corylus cornuta* and *Corylus Americana*. These indigenous species are better adapted to our climates than the exotic European or Asian species. The most popular species for the purpose of hazelnut production is the “*Corylus avella*”, imported from Europe. Hybrid hazelnut trees (*Corylus* sp.) have also been developed.

Before choosing a specific species, talk to nursery specialists. They will advise you on which is the right mix of hazelnut trees for your situation.



Corylus cornuta



Corylus americana

IMPORTANT!

When ordering your seedlings, keep in mind that you should buy at least two different varieties to ensure a higher yield of hazelnuts. This strategy improves pollination and formation of seeds and fruits. Having only one variety, especially if the seedlings are clones, will hamper the hazelnuts production. Gather the proper information from the nursery before buying the seedlings.

What type of plant material should you buy?

The hazelnut tree can be ordered in different forms such as seeds or cuttings. The bare root seedlings obtained through cuttings already have a certain age and height, which makes it easier to differentiate them from the competition. They also have a well established root system which can facilitate their transplantation. If you order bare root seedlings, make sure you receive your trees between mid-May and the end of May and plant them as soon as you can. Be aware that the growing season starts earlier in southern Quebec and southern Ontario than in north-western New Brunswick. It's also possible to successfully plant the seedlings in the fall.

Here are some suppliers of hazelnut trees:

Pépinière Lafeuillee

Bernard Contré, Owner
55, Chemin de la Feuillée
SCB/Joliette (Québec) J6E 7Y8
Tél.: (450) 759-5458
E-mail: lafeuillee@intermonde.net
Website: <http://www.lafeuillee.com/>

Rhora's Nut Farm and Nursery

Charles A. Rhora, Owner
32983 Wills Road
Wainfleet (Ontario) L0S 1V0
Tel/fax: 905-899-3508
E-mail: rhoras@nuttrees.com/
Website: <http://www.nuttrees.com/>

Step 3- Prepare the site.

When?

- In the fall preceding the plantation or in the spring of the plantation.

How?

- Remove herbaceous and woody vegetation by mechanical or chemical means.

Step 4- Install your hazelnut tree plantation.

When ?

- In spring (between mid-May and end of May) or in autumn

How?

- Plant the seedling at a given spacing. The spacing generally used are:
 - 4.5 m x 4.5 m
 - 6 m x 6 m
 - 7.5 m x 7.5 m

The recommended spacing, according to Snare (2004), should be of 4.5 m x 4.5 m since the productivity would be much higher. **Don't forget to plant different varieties.**

Step 5- Maintenance of your plantation.

Protection

During the first few years following the establishment of a hazelnut tree plantation, it is necessary to protect the seedlings against competition such as shrubby and herbaceous vegetation. Moreover, many animals such as hare, squirrel, varying field mice, deer, moose, bear, raccoon and certain birds can cause damage to the trees (bark and/or branches) or to the hazelnuts themselves during the production period. Such damage can cost a lot of money and have a negative impact on the productivity of hazelnuts.

The best way to prevent such damage and protect your plantation against these problems is to use tree protectors. They come in different forms:

- Plastic spirals;
- Rigid perforated or solid tubes;
- Metallic wire netting tubes.

These can be of 1 to 1.5 m height, which allows a physical barrier and individual protection for each tree.



Fertilization

The hazelnut tree generally grows very well in a variety of soils, thus the quality of the soil should not be a big concern for plant health. However, if you wish to optimize nut production, it's suggested to fertilize the soil. It is highly recommended to carry out a soil test or a foliage analysis to determine the soil's fertility before moving forward. The wrong fertilization prescription can have an undesired consequence on the soil's biological and chemical balance. Please consult the Technical Guide of this series on the organic fertilization in a sugarbush to learn more on the subject of fertilization. Professional foresters are also a good source of information.

Pruning Hazelnut Trees

Naturally, the hazelnut tree grows in multiple stems. However, for hazelnut production, it is preferred to prune the tree so it develops only one main stem. The main objectives of hazelnut tree pruning are to:

- Optimize the productivity of the tree;
- Optimize the health of the tree by increasing the vigour, by developing a strong and solid structure and by minimizing the risk of structural failure;
- Facilitate the harvesting of nuts.

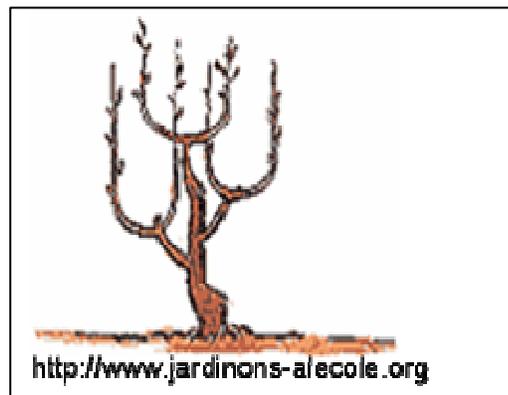
When should pruning be done?

- Pruning should be implemented during the period of dormancy, which occurs from late fall to early spring. Early spring correspond to the productivity period for sugarbush producers.
- Structural pruning for the first 4 to 5 years.
- Maintenance pruning from the 5th year on.

Structural Pruning

Objective: Obtain a single stem vase shaped tree, with three to five main branches.

- **1st year:** Cut down the stem to a height of 0.8 m, which will induce the growth of a well defined crown.
- **2nd to 4th year:** Select three to five primary branches by using the following criteria:
 - Choose primary branches pointing towards opposite directions;
 - Eliminate branches with an acute angle (inferior to 35°) relative to the trunk;
 - Leave a space of approximately 15 cm between each primary branch;
 - Make sure that there's only one central stem;
 - Cut the lower branches of the tree so that approximately the first 60 cm of the trunk has no branches.



Maintenance Pruning from Year 5

Objective: Ensure tree vigour and productivity.

- Prune the lower branches of the tree on the first 60 cm of the trunk.
- Prune the broken and diseased branches.

After the first pruning, it is not necessary to prune the trees each year. You can repeat this exercise about every five years.

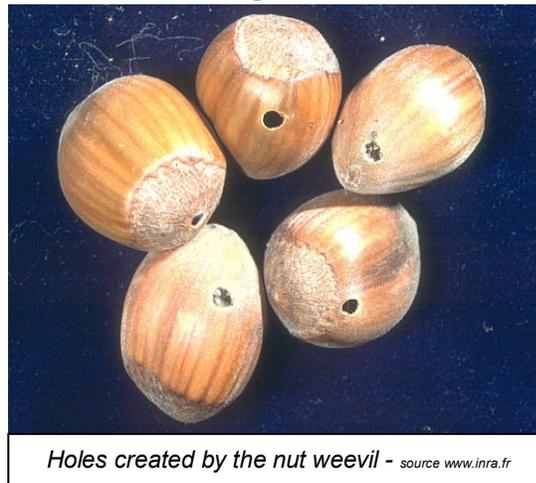
Disinfect your tools

Before and during the pruning, it is important that tools be disinfected with methanol or Javel water. Fill up a vaporizing bottle with your disinfectant and vaporize your tools between each tree. This important detail will help prevent the propagation of disease from one tree to another.

Insects and diseases

A number of different insects could affect the hazelnut tree. Some of the pests include:

- The nut weevil (*Balaninus nucum*) is an insect which bores the nut shell and lays its eggs inside. The larvae eat the kernel.
- The filbert weevil (*Curculio uniformis*) also attacks the nuts.
- The filbert bud mite (*Phytocoptella avellanae*) destroys the buds.
- The green stink bug (*Acrosternum hilare*) attacks the developing fruits.
- The large hazel aphid (*Corylobium avellanae*) colonizes the shoots and buds.



In the event that your plantation is attacked by pests, consult the following (or other) sites to help you appreciate the potential impact and educate yourself on methods of control :

Insects and diseases in Canadian forests (Natural Resources Canada)

<http://imfc.cfl.scf.rncan.gc.ca/accueil-home-fra.html>

Step 6 - Hazelnut Production.

The production depends on a number of factors such as: species, age of the tree at the time of plantation, environmental conditions, site characteristics, damage caused by animals, insects and diseases, height of the hazelnut trees, etc. Moreover, hazelnut production in a sugarbush understory will possibly be weaker than in direct sunlight, where the tree plantation should be established.

The following production numbers of hazelnuts is given as an example only. It should be noted that the hardiness zone in the Edmundston area is 3b, which represents a colder climate than zones 4 or 5 from which the numbers are provided.

- The hazelnut tree starts producing 3 to 5 years after plantation.
- Hazelnut production is rather weak during the first years.
- Production maximizes after about 8 to 10 years.
- Hazelnut production will last for 40 to 50 years.
- Annual production varies from 9 to 12 kg of hazelnuts/tree (note: these numbers have been collected from a full light plantation and in a zone with a warmer climate than 3b, which is inevitably more productive).

Step 7 - Nut Harvesting.

When?

- Every year.
- Depending on the species planted but generally in August.

How?

- Manual harvesting

How to get rid of the thorny envelope?

The hazelnuts are covered with a thorny envelope. The best way to get rid of it, is to lay out the nuts and let the thorny envelopes dry. Then, you can place the nuts in a jute bag and beat it against a hard surface.



http://www.ducketttruffieres.com/images/hazelnuts_2009.jpg



<http://www.sawbill.com/www/news/newsletter/images/Hazelnut.jpg>

Economic Potential and Marketing

The costs associated to hazelnut cultivation in the understory of a sugarbush are mostly due to the purchase of the trees during the year of establishment and labour for maintenance and harvesting. The following costs and revenues scenario (Table 1) are for information purposes only. Please note that the hourly rate of 25\$ for labour includes salary and travel. In the event that the maple producer decides to do the manual labour himself or herself, the cost benefit analysis changes. Furthermore, hazelnut cultivation enables the maple producer to benefit from a non productive area of the sugar maple producing operation which increases the overall profitability of the sugarbush operation.

Table 1 - Establishment of a hazelnut tree plantation for hazelnut production

5 plots of 9 cuttings = 45 cuttings (equivalent to approximately 0,1 ha)

	Rate per hour or per unit	Number of workers	Time required in hours	
Costs of establishment				
Labour	\$ 25.00	2	8	400.00 \$
Equipment				
Shovel, sledge hammer, axe, brush cutter ¹	\$ -			- \$
Material and trees:				
45 hazelnut trees ²	\$ 23.56			1 060.00 \$
45 protectors	\$ 3.00			135.00 \$
45 stakes	\$ 0.55			25.00 \$
				1 620.00
			Total	\$
Annual Costs				
Maintenance				
Weeding	\$ 25.00	1	4	100.00 \$
Pruning and inspection	\$ 25.00	1	8	200.00 \$
Harvest				
Manual harvesting	\$ 25.00	1	5 ³	125.00 \$
			TOTAL	425.00 \$

1 - Maple producers generally have this equipment. Depreciation of equipment and variable costs of usage are not accounted for.

2- This price includes shipping, handling and taxes.

3 - Harvest is estimated at one hour per plot.

Productivity of the Plantation

In full light: 9 to 12 kg/tree or 405 to 540 kg/year for above scenario.

Market Value

The market value of a crop of hazelnuts depends on many factors such as the export markets, location of production, Canadian dollar value, etc. Talking to market experts would be a good first step in identifying potential clients and determining the value of the crop.

Once the harvest completed and the thorny envelopes removed, there are different ways to make the hazelnuts available to market. First off, the nuts with shells must be washed and dried between 32°C and 38°C until their level of humidity is between 8% and 10%. It is possible to wash the shells in a chlorine solution for disinfection.

The nuts can either be sold for direct consumption or for processing (candies, desserts, sweets, flours, body care products, etc.).

In the north-western part of New Brunswick, there is already a small local hazelnut market for direct consumption. Depending on your goals and ambitions for the cultivation, you can aim for a bigger or more diverse market. If this is the case, it would be important to verify if there are other potential markets and the market value of different hazelnut products. Many possibilities are available at a local level by networking and building links with local bakeries, pastry shops, restaurants, small grocery stores, farmers' markets, food manufacturing businesses or others.

In the case where markets are already developed and if you want to sell a part of your production, hazelnut cultivation in the undergrowth of a sugarbush represents few risks and is generally not too costly in time and money. Furthermore the sugarbush producer generally possesses the material and space necessary for such an initiative. Conversely, hazelnut trees need to be bought for the initial plantation and some maintenance tools might need to be purchased. These trees will produce hazelnuts for the next 40 to 50 years. After the installation of the first plantation, it's possible to use cuttings from your trees to expand the plantation.

Table 2 - Example of a hazelnut plantation installation, plantation maintenance and crop harvest calendar

	Fall	Winter	Spring	Summer	Fall	Winter	Spring	Summer
Planning								
Gather Documentation								
Market research and networking								
Order trees (1 year in advance)								
Gather material								
Plantation Installation								
Site preperation								
Plantation								
Maintenance								
Tree protection								
Fertilization								
Pruning								
Inspection								
Harvesting and Marketing								
Harvesting of hazelnuts								
Manufacturing of hazelnuts (if needed)								
Marketing								

Additional Information and Resources

This guide is presented by the Faculty of forestry of the “*Université de Moncton - Campus d’Edmundston*” through a program called “Improvement and Development of Sugarbush Resources”. The main objective of the program is to optimize the economic model of sugarbushes in New Brunswick by investing in development, research and technology transfer. The program aims to meet the following specific objectives:

- Diversify production and find new innovative products for commercialization;
- Technology and knowledge transfer;
- Training and professionalization of the workforce.

The goal of this technical guide is to transfer knowledge acquired from recent tests conducted within the context of this program. Additional information has been added from different sources which are cited in the bibliography.

The present guide is not exhaustive but is rather a summary of information that can be used as a starting point for hazelnut cultivation.

Conferences and workshops are available at the “Montagne Verte” Sugarbush. Moreover, other forestry extension materials regarding different aspects of the program are available for interested people. Other technical guides about cultivation of American ginseng, hazelnut, wild Indian cucumber, mushrooms and organic fertilization in maple stands are also available. For more information, contact Jeff Levesque or consult our website at www.umce.ca/foresterie/érablière.

Do not hesitate to communicate with experienced professionals and share your experiences and results. For more information, communicate with:

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Recipes

Hazelnut cookies

France Morissette

250 ml of butter
125 ml of white sugar
500 ml of flour
250 ml of finely chopped hazelnut
1 pinch of salt

- 1- Chop the hazelnuts in a grinder.
- 2- Beat the butter until it's creamy, then add the other ingredients and mix.
- 3- Mould the mixed ingredients into a cylinder of approximately 4 cm in diameter.
- 4- Roll up the cylinder in wax paper and put in the refrigerator for at least 2 hours or until the cookie doe becomes firm enough to slice easily.
- 5- Preheat the oven at 190°C (375°F).
- 6- Cut the doe into 3 mm thick slices and place them on a ungreased cookie sheet .
- 7- Cook for 8 to 10 minutes.

* source: Fleurbec 2005

Hazelnut muffins

Jean-Francois Travers

Preparation: 15 min
Cooking time: 25 min
Portions: 12

4 eggs
3/4 of a cup of sugar
1 1/4 cup of hazelnuts
2 tablespoon of flour
2 1/2 teaspoon of baking powder

- 1- Reduce hazelnuts to a fine powder in a blender.
- 2- Mix eggs with a mixer.
- 3- Add the flour, the baking powder and mix.
- 4- Pour mix in a greased muffin pan.
- 5- Cook at 350°F (180°C) for 20 to 25 minutes.

* source: www.recettes.qc.ca/recettes/



Enjoy!