

Growing Hazelnuts in New Zealand



Are you thinking about growing hazelnuts but need more information before you decide? This information has been prepared by the Hazelnut Growers Association of New Zealand (HGANZ) to help prospective growers understand what is involved in growing hazels. This introductory pack includes basic information and covers most of the important decision factors about hazelnut operations. A more comprehensive Growers' Manual is scheduled for release in June 2009 – for more information, or for assistance with other questions, please contact HGANZ.

This information is provided in good faith and is as accurate as possible at the time of publication (September 2008), but individual growers will need to apply any information to their particular situation and HGANZ cannot accept any responsibility for the success or failure of individual plantings.

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1. Basic information on hazelnuts

The modern commercial hazel is based on selections of *Corylus avellana*, from temperate areas in Europe and Asia Minor. The trees grow best in sheltered areas with good soil moisture. Trees typically grow up to 5~10 metres tall (depending on the cultivar and local conditions) and are very long lived.

Hazelnuts are used in confectionary, particularly chocolate, and for baking. There is also a growing market for the nuts as a healthy snack food in their own right.

There are many different hazel cultivars, with different growing and fruiting characteristics. Hazels are not self-fertile, so you will need to grow at least two different cultivars - in addition to your main crop selection, you will need one or more pollinisers. Most orchards use two or more pollinisers to ensure a good overlap of flowering times.

2. Establishing a new orchard

2.1. What is involved in setting up a new orchard?

Purchase land – if you don't already own a property, then an important factor to consider when selecting a site is the soil's drainage profile and nutrient levels. Also consider the climate (particularly wind and extreme heat) and the availability of water for irrigation.

Soil tests – you should have a soil nutrient test done to confirm its suitability for any intended crop. This will also help you plan any fertiliser. The results should be analysed by a specialist with experience in hazelnut nutrient requirements.

Plan irrigation – your trees will need enough water to replace the moisture they lose through evapotranspiration. If you will be taking groundwater, you will first need to apply for a resource consent for the bore, then drill the bore and install the pump and finally apply for a resource consent for water extraction. This may take several months.

Install irrigation – talk to an irrigation specialist about irrigation options. Most hazel orchards use drippers or micro-sprayers to deliver water to each tree. You need to know how much water is available before you can plan the irrigation system.

Rip, cultivate and level – ripping is required if you need to break up a clay pan in order to improve drainage and root penetration. Cultivation and levelling may not be required if the property already has a healthy green cover and is level.

Plant shelter – shelter trees are commonly planted 1 m apart, so a 4 hectare (10 acre) property with 66 m x 66 m blocks (nine blocks in a grid pattern) requires around 1600 shelter trees. Contractors may be able to mechanically plant the shelter for you. Depending on the wind at your location, you should consider letting the shelter grow for two or three years before planting crop trees.

Plant crop trees – hazels are usually planted in rows about 5 m apart and with the trees about 3 m apart within each row (depending on the growth habit of the cultivar and local conditions – for more vigorous trees, it may be necessary to reduce planting density later). This translates to around 600 trees per hectare, so the same 10 acre property would require around 2000 trees (if one block was left unplanted for a house block).

Weed control – weeds compete for moisture and nutrients so control is important while the crop and shelter trees are becoming established. Glyphosate (such as RoundUp®) is commonly used for weed control, although a variety of non-chemical alternatives are also available (such as mulch).

2.2. Climate

Hazels are generally frost-hardy to around -14°C (and may require some winter chilling), although the flowers and catkins are vulnerable to frosts of -8°C or lower for a short period in early winter. The trees can suffer from overheating and sunburn in hot summer weather. Dry autumn weather makes harvesting easier.

Different cultivars flower at different times in different locations, so your choice of crop trees and particularly pollinisers will depend on your location.

2.3. Soil

Hazels tolerate a wide range of soils, but for optimal production you need a relatively fertile soil which holds moisture but does not become waterlogged. You should have at least 30 cm of topsoil (and ideally 60 cm) which is rich in organic matter. Hazels are more tolerant of too much water than too little, so stony or sandy soils present a real challenge in maintaining an adequate soil moisture level.

Extremely heavy clay soils also present a challenge, and if there is a clay pan (or a ploughing pan from previous use) you should rip to allow moisture to drain properly. You should consider the nature of the soil in relation to the local climate and rainfall levels – hazels can thrive on both clay soils and light soils, provided their water needs are met (via rainfall and/or irrigation).

You should have a soil nutrient test done for any property you are considering. An excess or deficiency of particular elements can harm the trees, and although you can use fertiliser it is difficult to fight the underlying nature of the soil. Soil should be neutral to slightly acid (pH 6).

2.4. Shelter

Hazels are easily damaged by strong winds, so good shelter is essential (especially in windy areas such as Canterbury or the Wairarapa).

If you purchase land with shelterbelts already established, you need to consider whether they are appropriate to your requirements. Shelterbelts for stock protection are often dense and evergreen, and this may not be suitable for an orchard. However, the shelterbelt could provide initial protection as your orchard becomes established (including your new shelter) and could be removed at a later stage.

If you are starting with bare land, it is a good idea to plant the shelter first and allow it to become well established – in most cases, the hazels can be planted two or three years later. If you choose not to wait, your trees may suffer – regular strong winds may slow their growth; because they are struggling to survive in the elements, they may be weaker overall and more vulnerable to pests and diseases; branches may break, which may make pruning more difficult later. However, planting the hazels at the same time as the shelter may allow cropping one or two years earlier than waiting.

Shelterbelt design is an important part of planning a new orchard – the maximum block size will depend in a large part on what shelter species you choose. Most shelterbelts use fast-growing deciduous species that will grow to 15–30 metres, such as poplars and alders. Be aware that some shelter species (such as poplars and willows) have vigorous root systems and will compete with your crop plants for water. Different varieties of each species have different growing habits and requirements, and some varieties may be susceptible to diseases under certain conditions. Talk to a local tree nursery that has experience in shelter design – they should be able to recommend appropriate shelter species for your conditions and help you determine the appropriate block size.

2.5. Orchard layout

Block sizes may vary from 50 m to 90 m and blocks do not need to be rectangular. You should consider the prevailing wind direction when designing your orchard as this will affect block size and polliniser layout.

You will need to allow enough space for maintenance equipment (such as mowers, sprayers, harvesters or fertiliser spreaders) to access and work in your blocks.

More information on orchard design, such as tree spacing and cultivar selection, will be included in the Hazelnut Growers' Manual (scheduled for release in June 2009).

2.6. Orchard floor management

There are several different options for orchard floor management. The most common approach is to use grass (often a slow growing variety such as fescue, which reduces the amount of time required for mowing, or else regular pasture grass), but you could also use a herbal ley to bring nutrients up from deeper in the soil and to improve your soil structure, or potentially plant a cash crop (such as lucerne). To a large extent this decision depends upon your philosophy and priorities.

For planning purposes, it costs around \$1500 per hectare to spray out and cultivate land (whether to re-sow grass or to establish some other crop). You should discuss your particular situation with a local farm supplies expert.

Even if you do not cultivate and re-sow, it is important for harvesting that the orchard floor is level. Detailed information about the pros and cons of the different orchard floor options is available in the Hazelnut Growers' Manual.

2.7. Irrigation

Hazels prefer a relatively moist environment and may die if stressed by lack of water (particularly if drying winds occur on warm, sunny days - a common occurrence in many locations in New Zealand). Even if the trees do not die, if they are stressed they will not grow as well or produce as good a crop.

Your irrigation system design will depend on the water you have available and the profile of your soil. You will need to be able to replace the moisture lost through evapotranspiration, which may be up to 5 mm per day in summer.

It can be expensive and time consuming to have a bore drilled and to gain the necessary resource consents to use the water. Allow up to 3 months for a water use consent; you may also need to seek advice from an environmental planning consultant. Consent to drill a bore does not guarantee you consent to take and use groundwater, so check whether there are any restrictions in your area.

Sprinklers are the most commonly used system, although drippers may also be suitable in heavier soils (bear in mind that the root zone will extend as the trees grow so you will need to broaden the dripper zone in later years).

3. How much time does it take?

The amount of time you will need to spend in your orchard depends on design decisions you make and also on how much work you do yourself and how much you use contractors.

3.1. Setting up an orchard

If you purchase bare land, the sequence of events is likely to run along the following lines:

Task	Sub-task	Duration	Season
Purchase land			Any
Irrigation	Apply for consent to drill	1 month	Any
	Drill and prove	1 month	Any
	Apply for consent to take and use groundwater	3 months	Any
	Design irrigation system	1 month	Any
	Install irrigation	1 month	Any
Orchard floor preparation (optional)	Spray out existing cover	1 month	Summer
	Cultivate and allow weeds to re-emerge	1 month	Late summer
	Re-cultivate and sow new cover, allow time to germinate	6 weeks	Autumn (or spring)
	Roll	-	Spring
Shelter	Plant shelter	-	Winter
	Allow to grow	3 years	Spring
Crop trees	Plant trees	-	Winter
	Allow to grow	5 years	All year
	Harvest	-	Late autumn

If you are starting from scratch, it may be several years before you have any harvest from your trees and up to 10 years before you achieve a saleable crop (and the orchard starts to meet its own costs).

3.2. Regular maintenance

The time required for major maintenance tasks is as follows (time per hectare).

Task	Comments	Time	Season
Mowing	Depends on the machinery you use	0.5 ~ 3 hours	Spring/summer
Weed control	Chemical control by backpack	3 hours	Spring/summer
	Chemical control by farmbike	1 hour	
Sucker control	Chemical control by backpack	2 hours	Spring/summer
Pruning	Manual, young trees (2 mins/tree)	3 days	Winter
	Manual, older trees (5 mins/tree)	7 days	
Disease control	Spray by backpack	1 hour	Spring, autumn
Harvesting	Manually		Late autumn
	Mechanically		

Mowing – mowing keeps the grass under control, which is important to prevent new weeds seeding, to allow air movement in the orchard (reducing pests and diseases), and to build up mulch around the trees (which retains moisture, suppresses weeds and builds up organic matter). Many contractors offer mowing services, or you can use a tractor, ride-on mower or farm bike plus mowing attachment. The width of the mowing equipment should efficiently cover the width of the area to be mowed.

Weed control – weeds compete for moisture and nutrients so control is important, especially while the crop and shelter trees are becoming established. Glyphosate (such as RoundUp®) is commonly used for weed control, although a variety of non-chemical alternatives are also available (such as mulch). With any systemic herbicide, care is required to avoid damaging the trees. Hazels are planted in rows, so you will need to be able to strip spray. It is possible to do this using a backpack sprayer, but it is slow, tiring work. Instead, you can tow a spray tank behind a tractor or other vehicle (ATV or even mower), or mount the tank on an ATV.

Pruning – pruning requirements in the first few years are very modest, and the main aim is to encourage the tree to develop a strong framework of scaffold branches. Pruning in the first 10 years should take only around 2 minutes per tree, using secateurs and pruning shears. Once the tree is mature you will need a pruning saw, but pruning should still take only around 10 minutes per tree every second year.

Sucker control – some cultivars sucker freely and you will need to control the suckers in order to optimise tree growth and production. You can use a desiccant spray such as Buster® or Hammer®, or suckers can be removed manually (but this is very labour intensive and can encourage the tree to produce even more suckers) or by allowing sheep to graze around larger trees. For young trees, spraying can be done effectively using a backpack sprayer, although larger equipment is necessary for larger areas or older trees.

Disease control – hazels are hardy and generally healthy, but some disease prevention or control is recommended. The most common activity is to spray the trees with copper just before bud burst and again before leaf fall. For young trees, this can be done effectively using a backpack sprayer.

4. How much does it cost?

As a general rule of thumb, it costs between \$22,000–\$25,000 per hectare to establish a hazel orchard (not including the cost of the property or the bore).

4.1. One-off setup costs

The following costs are based on a 4 hectare (10 acre) block of bare land. The costs will depend on the contractors you use and how much work you do yourself, but the figures give an overall idea of the commitment.

In many cases, larger or more expensive equipment offers greater efficiency, so can be a worthwhile investment if you can only spend limited time working on your property.

Task	Sub-task	Cost
Purchase land		200000
Irrigation	Resource consents and consultancy	3000
	Bore (depends on depth to water – example is 30 m depth)	10000
	Pump	5000
	Irrigation system (equipment and installation)	50000
Orchard floor preparation (optional)	Root rip	2500
	Spray out existing cover, cultivate twice, re-sow	12500
	Fertiliser	2500
Shelter	Plant shelter (1600 trees @ \$5)	8000
Crop trees	Spray out planting strips	1000
	Plant crop trees (1800 trees @ \$9)	16200
	Plant pollinisers (200 trees @ \$23)	4600
	Planting contractor (2000 trees @ \$5)	10000
Capital equipment	Mower (depends on the model)	10000~35000
	Backpack sprayer	200
	100 litre spray tank	1000

4.2. Ongoing costs

Task	Comments	Annual cost
Mowing	Equipment maintenance	600
	Petrol/diesel	250
	or equipment hire (\$200 per day, every second week for 3 months)	1600
	or contractor (\$700 per time, every third week for 3 months)	3500
Weed control	Chemicals (Glyphosate 360, 15 litres)	200
	Petrol/diesel	250
	or contractor	2500
Sucker control	Chemicals	200
	or contractor	1250
Pest and disease control	Blight control: Kocide	50
Fertiliser	Leaf nutrient analysis	150
	Fertiliser	2000
	Spreading contractor	1000
Irrigation electricity cost		750

4.3. Time frames until first harvest

In most locations in New Zealand, with good conditions and appropriate management, hazels will start to provide a modest crop after around 5-8 years and should reach full production around 12-15 years of age. Trees will reach maximum production when the canopies touch between rows (known as 'canopy cover'). A sample financial analysis, including projected yield and rough operating costs, can be downloaded from <http://www.hazelnut-growers.org.nz>.

The following figures give a general indication but productivity depends on factors such as climate, soil, management regime and cultivar, and yields are likely to fluctuate between seasons.

Year	5	6	7	8	9	10	11	12
kg/tree	0.1	0.25	0.6	1.2	2.0	2.8	2.9	3.0
kg/ha	60	150	360	720	1200	1680	1740	1800
Return @ \$3.50/kg	210	525	1260	2520	4200	5880	6090	6300

5. Taking your crop to market

New Zealand currently imports 200 tonnes of hazelnuts annually, mostly from Turkey. These nuts are of variable quality and are certainly not as fresh as local produce, so there are good prospects for import replacement in the local market. Hazelnuts can also be processed into oil (used for salads and as a flavouring), ground meal (which can be used as a gluten-free flour substitute) or dukkah (a Middle Eastern condiment).

In order to process and sell your own crop, you need not only a sales and marketing channel, but also access to a registered commercial kitchen. This requires regular audits and strict compliance to food safety standards, so many growers choose to sell to another processor instead.

Processors currently operating in New Zealand include the following companies. These companies purchase in-shell nuts from growers and process then sell them through their own channels. Not all processors offer contract cracking or processing services.

Prices may vary depending on factors such as volumes provided, cultivar and nut quality. Each processor has its own quality requirements and growers should discuss these with the processor at the start of the harvest season.

Processor	Whiteheart	General	Organic premium?
The Hazelnut Company (Christchurch, www.hazelz.co.nz)	\$3.00~\$6.00/kg		Under consideration

Indicative retail prices for hazelnuts in mid-2008 were (per kg):

Imported bulk hazelnuts at supermarket: \$40.00

New Zealand hazelnuts through specialist outlet: \$30.00~\$60.00

6. Organic management

Hazelnuts are a relatively hardy and low maintenance crop, so are a reasonable candidate to consider for organic management. Most new orchards use conventional (chemical) management techniques until the trees are well established. The transition to certified organic status usually takes around three years.

Routine maintenance (such as sucker control) may be more time-consuming in an organic operation, and it is vital to address potential problems before they develop (eg good orchard health and good airflow for disease prevention; regular mulching to prevent weeds). One possibility is to run sheep or other livestock in the orchard once the trees are mature, to keep down the grass and eat the suckers. For food hygiene reasons, all stock need to be removed from the orchard well before harvest.

Not all processors offer a premium for organic nuts at this stage.

7. Cultivars

The main criteria for hazelnut cultivars are yield (not just the volume of nuts produced but more importantly the volume of quality nut meat), flavour and ease of processing (including cracking and blanching).

The main crop cultivar in New Zealand at present is Whiteheart, which gives a high quality kernel which is easy to process. The main pollinisers for Whiteheart are Alexandra (late flowering) and Merveille de Bolwiller (early flowering). HGANZ is currently researching whether these are the best pollinisers in all locations.

Other common cultivars are Barcelona, Tonda di Giffoni, Tonda Romano, Lansing and Ennis, which all produce good yields. Different cultivars perform better in different conditions (particularly soil, rainfall and temperature), and all cultivars require a compatible polliniser. The placement and ratio of

pollinisers required will depend on local conditions (including wind and rainfall during the flowering period).

More detailed information on the characteristics and compatibility of common cultivars is available from HGANZ.

8. Pests and diseases

Hazelnuts have very few pests and diseases in New Zealand. Pest and disease control is particularly important when the trees are young as any damage can kill them. You should expect to spray with copper two or three times in the first few years and should also check for big bud mite (if you have a low level of infestation, you may be able to pick off affected buds; for a higher level of infestation, you may need to spray twice). Use 60 cm sprayguards to protect the trees from hares and rabbits.

8.1. Pests

- Big bud mite

Big bud mite is a mite that reduces the amount of productive growth on the tree, and therefore reduces crop yields. Some cultivars are more susceptible than others and the effect may depend on the season or climate. Small infestations can be controlled by removing affected buds, or severe infestations can be controlled by spraying with sulphur.

- Hazel leaf miner

Causes premature defoliation of trees and no controls are known at present.

- Lemon tree borer

Lemon tree borer causes branches to break and weakens vegetative growth. The borer usually only affects trees that are already performing poorly, and can be controlled by pruning out affected growth.

- Grass shield beetle

Grass shield beetle feeds on the nuts, causing distortion of the kernel and a bitter taste. The beetle can be controlled by insecticides and good orchard hygiene.

- Hares and Rabbits

Hares can severely damage young trees by nipping the tops off them around knee height.

Rabbits can damage young trees by nipping off and eating the branches, and can damage older trees by gnawing at the bark (weakening the trunk and also leaving a wound where disease can enter).

- Possums and rats

Possums and rats do not generally affect the trees but may steal nuts for their own winter food. Prompt harvesting will reduce the opportunity, as will a secure storage location (a sealed shed with no access points, a steel tank, or onion bags suspended from the ceiling).

8.2. Diseases

- Bacterial blight (*Xanthomonas corylina*)

Bacterial blight mainly affects young trees while they are being established, and is especially problematic for trees that are already stressed (by wind, sun or lack of water). The blight causes dieback of leaves and shoots and can damage new growth buds so that they don't develop properly (so the next season's crop and growth are also affected). In extreme cases, the blight may weaken the tree so much that it dies.

Bacterial blight is controlled using copper sprays in spring and autumn. The bacterium appears to thrive in moist conditions, so control requirements will vary from season to season and from location to location.

- Phytophthora

Phytophthora is a soil-borne fungus that kills the tree's roots. Phytophthora is more of a problem in moist soils (heavy soils or locations with high rainfall). Phytophthora cannot be eradicated from the soil but can be controlled.

9. About HGANZ

9.1. History

HGANZ is the industry association for hazelnut growers in New Zealand. The group exists to help the industry grow and to help growers throughout NZ learn from each other's experiences. HGANZ began in the 1980s as an interest group within the Tree Crops Association of New Zealand and developed into an association in its own right in 2002.

9.2. Structure

HGANZ holds its AGM in May or June each year, and the location moves around the country depending on where there are members who are willing to organise the event. The committee is elected annually.

Details of committee members can be found on the website <http://www.hazelnut-growers.org.nz>.

9.3. Activities

HGANZ organises field days two or three times a year, and these are a good opportunity for growers to learn from each other and hear about the latest developments in the industry. We are also working on additional resources, such as a Growers' Manual which will provide a comprehensive reference guide to best practice in hazelnut management in New Zealand (scheduled for release in June 2009).

9.4. Membership

Membership costs \$50 per year (the membership year runs from July to June) and includes subscription to the quarterly HGANZ newsletter and Health in a Shell (the journal of NutNZ - Nut Industries of New Zealand, an umbrella group covering the hazelnut, walnut and chestnut industries).

To join HGANZ, fill out the online form at www.hazelnut-growers.org.nz/membership.htm or contact Alan Mathewson at membership@hazelnut-growers.org.nz or by phone on (01) 234 5678.

9.5. Current research projects

As at September 2008, HGANZ's major research projects are:

- Flowering and pollen times (and variation attributable to climate differences across the country)
- Preparation of a guide to identifying hazel cultivars in NZ (with funding from the MAF Sustainable Farming Fund). Also, acknowledge the SFF for the pollination research
- Factors affecting successful establishment of new orchards

The pollination and cultivar identification projects are supported by funding from the Ministry of Agriculture and Forestry, under the Sustainable Farming Fund (SFF).