

# A Guide to Analysing Your Site for Hops



**H Ā P I**  
HOP RESEARCH CENTRE

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# Preface

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**E ngā iwi, e ngā reo, e ngā kārangarangatanga maha tēnā koutou katoa.**

*To the peoples, to the many voices, we greet you all.*

**Tēnei mātou te mihi atu ki a koutou i roto i ngā tini āhuatanga o te wā. He kairangahau hāpi (hops) mātou nō te pūtahitanga o Hāpi, e kimi nei, e hāhau nei i ngā momo hōu, i ngā huarahi hōu e tupu ai te ahumahi hāpi o Aotearoa ki tōna teitei.**

*We acknowledge you and your ancestors, and all of the things happening in our various worlds.*

*We are researchers into hops, from the research collective known as Hāpi, who are seeking out new varieties and methods of hop farming, to ensure the hops industry of New Zealand grows to its full potential.*

**E ū ana mātou ki ngā upoko o te Tiriti o Waitangi i roto i ā mātou mahi, ā, ka anga te titiro ki ngā iwi o te Tauihu o Te Waka, o te Upoko o Te Ika, otira ngā iwi katoa, e kui mā, e koro mā tēnā koutou katoa. Ko te hiahia kia haere ngātahi tonu ā tātou mahi kia puta he oranga mō ngā uri whakatupu.**

*We affirm our commitment to the pledges of the Treaty of Waitangi in our work, and in so doing acknowledge the people of the top part of the South Island and the lower North Island where we have a presence, to all the elders, sincere greetings. Our wish is to work in tandem with you in developing the industry for the benefit of coming generations.*

**E mahi tahi ana mātou me ngā kaipupuru pānga o Moutere, o Pōneke, me ētahi atu takiwā, me te Manatū Ahu Matua, i runga anō i te hiahia kia puta he he hāpi, he pia ahurei, nō Aotearoa anake, ka paingia e ngā iwi o te motu, o te ao, e tupu ai he huanga ā-ōhanga mō te katoa.**

*We work closely with our shareholders in Moutere, Wellington, and elsewhere, and with the Ministry for Primary Industries, with the common aim of producing uniquely New Zealand hops and beer which people nationally and internationally will enjoy, producing an economic benefit for the whole country.*

**Te mahi a te kotahitanga o Hāpi he whakahiato i te tangata, he whakawhiti mōhiotanga, he tūhura huarahi hou, ā, i te mutunga, he whakatupu i ngā hāpi pai rawa o te ao katoa.**

*Hāpi collective is about gathering people together, exchanging information, exploring new ways of working and in the end, producing excellent hops for the whole world.*

New Zealand hop production encompasses only a small fraction of the global market; however, hops from New Zealand are highly sought after by domestic and international craft brewers. At the end of 2018 we launched Hāpi Research Ltd, with the vision to transform New Zealand's hop industry into a significant direct supplier of super-premium hops to the best craft breweries in the world. Our goal is to grow the value and volume of New Zealand premium craft beer and hop sales domestically and internationally, and to help New Zealand craft brewers create sustainable points of difference and access attractive new markets.

Hāpi Research Ltd. is a new collaborative industry-led hop breeding and market development company that seeks to support the growth of New Zealand craft beer and hop farming. We are doing this through the Hāpi - Brewing Success programme between Hāpi Research Ltd and the Ministry for Primary Industries. This programme is driving benefits for New Zealand's premium hops and craft beer industries through an advanced market-led hop breeding programme, precision farming and processing techniques, and international market collaboration with leading craft brewers.

Hāpi Research hosts an annual symposium, a gathering of craft beer and hop industry participants from across the globe, for a day of talks covering the latest research from the hop world, brewing techniques, and experiences from breweries and other industries. The event creates opportunities to build stronger, direct relationships, share best practices, and hear about the latest in hop research, brewing techniques, and market tastes and trends. The Hāpi Symposium provides a forum for domestic and international craft brewers, scientists, hop breeders and growers to engage in collaborative discussions, information sharing, and networking.

Hāpi Research is striving to create a platform for facilitating industry excellence and to become a resource centre for industry best practices in hops and craft beer. We aim to become a resource for new innovations, the latest research, and sustainability best practices. We strive to be a source of quality information on the hops and craft beer industries and to create opportunities to connect New Zealand craft beer and hop industry participants to markets.

This guide is intended to provide general information about analysing your site for suitability for growing hops. The Hāpi Research website is also a valuable source of information and has useful and relevant resources. We continuously add to this material and strive to provide up-to-date and relevant information. Please visit the Hāpi Research website at [Hapi.co.nz](http://Hapi.co.nz) for more information and to access additional resources.

Cheers,

The Hāpi Team



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## Purpose of this Guide

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The purpose of this guide is to provide general information on analyzing your site for growing hops. This guide offers considerations when determining the suitability of growing hops on a site, pointing out things that you should be looking for and thinking about. This guide is only intended to provide general information, and it critical that an agriculture expert is consulted to provide an in depth analysis of the suitability of your site for hops.

# Table of Contents

Preface.....	3
Purpose of this Guide .....	5
Evaluating a Site for Hops.....	7
Seasonal Daylength .....	8
Chilling Requirements and Seasonal Temperatures.....	10
Water Availability and Quality .....	11
Shelter from Wind and Hail .....	13
Topography of the Site .....	14
Adequate Power Supply and Reasonable Site Access .....	14
Soil .....	16
References .....	19

## Evaluating a Site for Hops

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When considering a site for hops it is important to talk with an agriculture expert who can do an evaluation of the suitability of the site to help determine its suitability for hops. It is also important to check any zoning restrictions that might present challenges to your operation or prevent you from growing hops on a given site. Hops have a variety of basic requirements; therefore, when evaluating the suitability of a site for hops, it is important to consider whether the site can satisfy those needs.

Does your chosen site offer:

- High sunshine hours and long days during the growing season
- Appropriately low winter temperatures
- An adequate number of frost free days
- Growing season temperatures that aren't too high
- Adequate water supply during critical growth periods of the season
- High quality water
- Shelter from wind and hail
- Mildly undulating or flat terrain
- Well drained, deep, sandy loam soil
- Adequate power supply to power picking equipment and kilns
- Reasonable access for trucks to both bring in supplies and to transport hops off site after processing

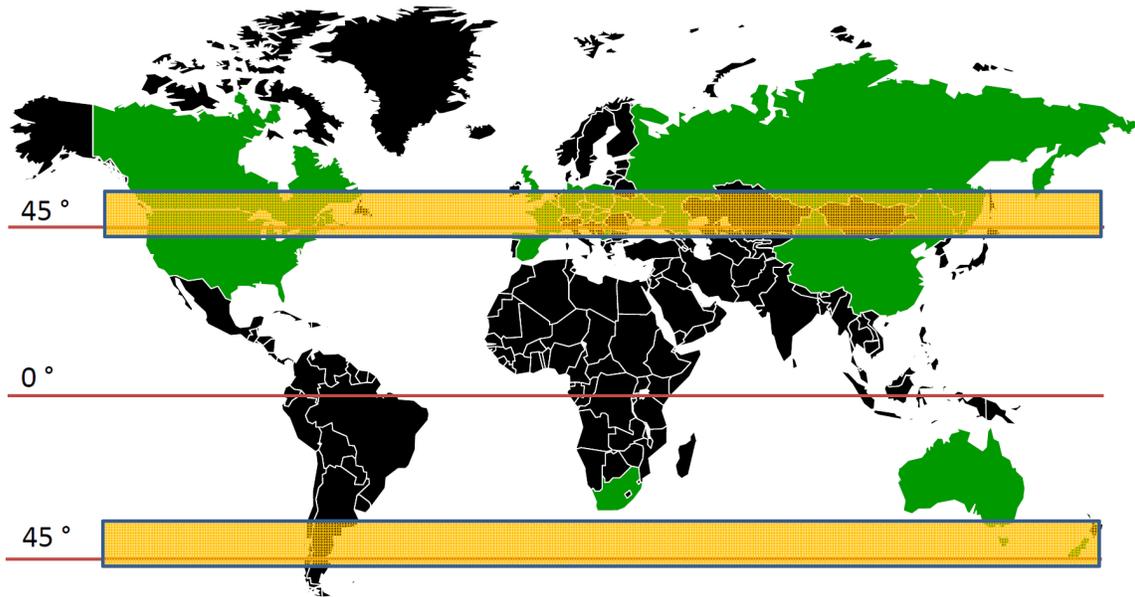
## Seasonal Daylength

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When selecting a site it is important to consider whether the location provides adequate sunlight hours during the growing season. Daylength is important to hops production because daylength plays a large role in the growth patterns of hops and the timing of flowering. Hops grow and yield the best results in areas with long daylight hours. Hops are photoperiod sensitive, which means that daylength drives their production. During the period when the days are getting longer, the hop plant is putting all its effort into growing taller (vegetative growth). As the days get shorter, the plants switch from vegetative growth to reproductive growth. The amount of vegetative growth on the plant ultimately determines the yield.<sup>i</sup> In this way, daylength has a direct impact on plant growth and yield.

Hops need plenty of direct sunlight and long day lengths, thriving in conditions of 13 or more daily hours of full sun, but ideally 15 hours or more. Latitude determines seasonal day length, which is why most global production of hops occurs between 35° and 55° latitude, north or south. Hops rarely do well below 35°. Hops can be grown outside these latitudes but it is unlikely that they will produce commercial yields. The following chart shows the major hop growing regions of the world.<sup>ii</sup>

# Latitude and Daylength



In the southern hemisphere, New Zealand hop production is centered around Nelson, at 41.5°S. In Australia, hop production is primarily located in the Derwent Valley, Tasmania, at 42.7°S. Most of the world's hops are grown in the northern hemisphere, with Hallertau, Germany and Yakima, USA the two largest hop producing regions in the world.

# Chilling Requirements and Seasonal Temperatures

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## Winter Chilling Requirements

Accepted scientific thought has been that hops have specific chilling requirements; therefore, ensuring that your location has adequate winter cold is an important consideration for site selection. Hop plants have been thought to need winter low temperatures below 4°C for at least six weeks in order to enter dormancy and prepare for growth and flowering in spring.

Inadequate chilling has been thought to result in weak and erratic spring growth. It has been thought that hops, like many other flowering plants, require sufficient winter cold in order to go through vernalisation, and therefore flower properly the following year. This has been a commonly accepted requirement for hops; however, it should be noted that a recent study completed by Colorado State University Extension, over a 3 year period, called this requirement into question, finding no connection between vernalisation and hop plant growth and yields.<sup>iii</sup>

Plant response to chilling and day length is partly determined by genetics and therefore varies by plant varietal. Some northern hemisphere plants have been known to be particularly sensitive to day length, while others show less sensitivity in this area. In addition to chilling requirements, hop plants require a minimum of 120 frost free days for flowering.

## Seasonal Temperatures

Prolonged exposure to high soil and air temperature can be damaging to hop plants, as it affects their ability to conduct photosynthesis. A study conducted at Great Lakes Hops found that exposure to high temperatures caused plants in the study to completely shut down photosynthesis when the temperatures were too high, resulting in chlorosis and reduced leaf size. High soil temperatures (above 35°C) damaged the plants and reduced yield.<sup>iv</sup>

## Water Availability and Quality

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A readily available water supply, with adequate water throughout the growing season is an important requirement for growing hops. When selecting a site, it is important to make sure there is access to the required amount of water, and that this water is available at the crucial times during the growing season.

Access to a reliable and plentiful water supply is crucial. Although hops have deep roots, the majority of the feeder system is located in the upper portion of the top soil, and keeping this system moist during critical growth periods is essential to ensure optimal cone quality and yield. Spring and summer rainfall can be unpredictable, particularly in New Zealand, so a supplementary water system is an important factor when choosing a site location. Satisfying the water needs of the hops is critical for the full development of the chemical compounds in the cones, which result in desirable flavours and aromas in beer.

Below is an image of a supplementary water source supplying water to a hop farm in New Zealand.



The typical water requirement for optimal hop plant growth is frequently cited as 30mm of water consumption per week during the period of vegetative growth. This can however vary significantly based on other factors such as the evapotranspiration at each location.

In addition to securing an adequate water supply, it is important to ensure the quality of the water you have available. Have the water tested to determine ensure that it is not contaminated or that it doesn't contain excessive levels of sodium, chloride or other elements.

## Shelter from Wind and Hail

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Hops are sensitive to wind and exposure to strong wind, particularly at certain stages of the growth cycle can cause significant damage and impact quality and yield. Leaf damage and the loss of cone bearing laterals can occur, having an impact on overall plant health and yield. After flowering has occurred, exposure to hot wind, can cause damage and impact cone quality. Sites that are naturally protected from the wind are ideal; however, shelterbelts or windbreak fencing systems can be used to reduce the impact of wind. The major northern and southern hemisphere hop growing areas are in locations with low wind during the growing season. In addition to wind damage, hail can significantly damage hops at any point after they have been trained onto strings. When hail damage occurs it often has a large impact on yield for the affected areas. Below are some images showing damage to a crop after a severe storm.



v

## Topography of the Site

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The majority of global hop production is on flat to mildly undulating terrain. Level sites are less complex to set up and simplify management of the crop, thus reducing operational costs. Building canopy on undulating or sloping sites can be challenging and stringing can be difficult to accomplish efficiently and safely on those sites. Harvesting can be done more effectively and efficiently on flatter sites. In addition, it is easier to maneuver equipment in the fields and the bines can be cut more efficiently on flatter sites. Site that have less variability in terrain and slope also tend to have more uniform soil, which is easier to manage.



## Adequate Power Supply and Reasonable Site Access

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Operating a hop farm requires running equipment and transporting materials on site and hops off site. It is therefore important to ensure that your chosen site can provide you with an adequate power supply as well as good site access for large vehicles. An adequate power supply is crucial to power your picking equipment as well as kilns. In addition, your location should have reasonable access for trucks to drive on site. This ensures that supplies can be brought to your

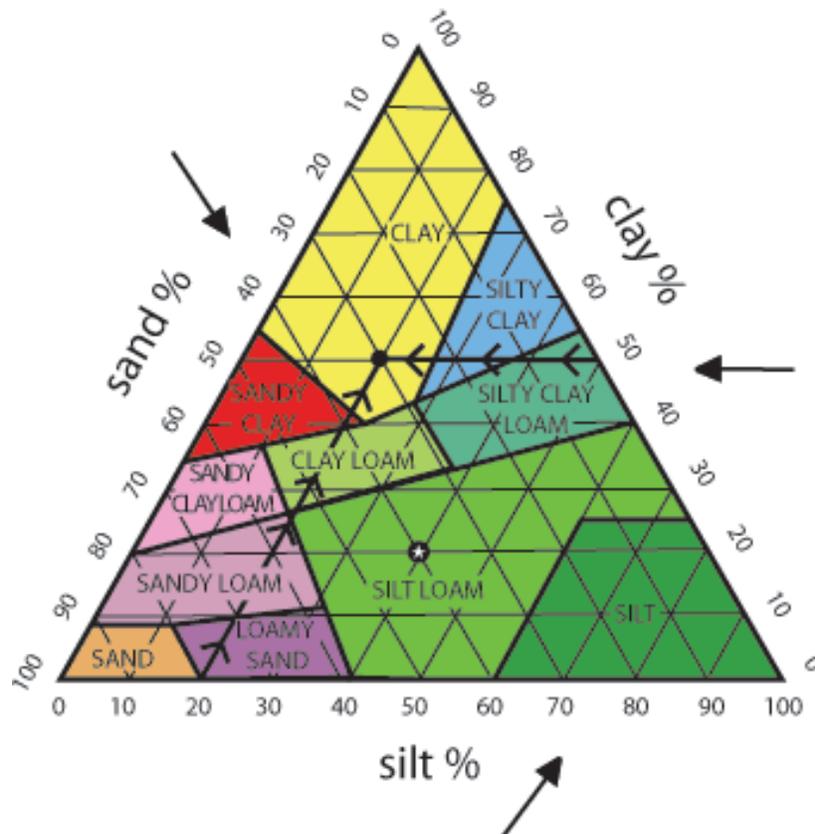
site when needed, but and also crucially ensures that your processed hops can be transported off site.

# Soil

It is important to determine whether the soil on your site is suitable for hops. An analysis of the type of soil present, as well as the soil fertility is necessary. Although hops will grow in a range of soils and conditions, the more that your chosen site varies from the ideal condition, the more difficult it will be to grow the hops and achieve the desired yields. Additionally, the cost to make improvements to the soil to the required results should be taken in to consideration.

## Soil Type

Hops will grow in a variety of soils, from clay to sand, but prefer rich alluvial soils or deep sandy or gravelly, well drained loam soil. Hop plants do not thrive in strongly alkaline or saline soils, and these soils should be avoided. The ideal soil conditions for hops is soil that is a well-drained, deep, sandy loam soil with a pH around 6.5.<sup>vi</sup> Below is a chart that illustrates the make-up of different types of soils.



## **Soil Texture**

Soil texture is important because it largely determines how much nutrients and water can be held in the soil. Soil texture also determines how fast water moves through the soil, what types of organisms can live in the soil, and what types of plants will grow well in the soil.

## **Internal Drainage**

Hops need well drained soil and do not like wet root systems. Heavy, poorly drained soils should also be avoided because they can interfere with ongoing farming operations, delaying your ability to get into the fields.

Shallow bedrock and shallow water tables should also be avoided. Hops are a fairly forgiving plant, and although they can live up to 50 years in great soil, they will grow and thrive for 15 plus years in moderate soil.

## **Contaminants and Fertility**

When evaluating a site, the soils should also be tested for contaminants, particularly if the land has been previously used for other crops.

Determining the makeup and fertility of your soil will help determine whether the site is suitable for hops, and whether amendments to the soil, and/or drainage needs to be installed. This is particularly important with the installation of drainage tile, as it should be installed prior to trellis installation and planting.

The Hāpi Brewing Success programme between Hāpi Research Ltd and the Ministry for Primary Industries is driving benefits for New Zealand's premium hops and craft beer industries through an advanced market-led hop breeding programme, precision farming and processing techniques, and international market collaboration with leading craft brewers.

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