

'Hops into Bass' – The viability of hop production in Bass Coast

Bass Coast 2018



The Story: 'Hops into Bass' – The viability of hop production in Bass Coast

Name: Bass Coast Landcare Network

Property: Bass River Garden

SUMMARY

This trial started in 2015 and was completed in March 2018. Over the three growing seasons 45 hop plants were planted at the River Garden, a 1Ha area of Bass River flat in Bass. Six varieties were trialed, the difference in growth and crop yield was recorded between improved soil and non-improved soil (control) in three varieties. A 4-metre trellis was constructed to support the bines, and irrigation was supplied through drip lines on top of the furrows.

Crop yields were recorded in seasons two and three, to give the first season plants time to establish. Soil tests were undertaken prior to planting and repeated after two years at both the improved and non-improved sites. Plant health and vigour were noted through the growing season.

This trial forms part of a larger agricultural demonstration at the River Garden that is coordinated by the Bass Coast Landcare Network with the aim of becoming a hub that sells local produce.

BACKGROUND: MOTIVATION BEHIND THE TRIAL

There is an increasing demand for hops of a more traditional variety, as this article highlights;

“A RISE in popularity in craft beer has Victoria’s hops growing industry poised to cash-in on worldwide demand” (Weekly times, July 11, 2014).

The 70-year old Australian industry, based predominantly in North East Victoria and Tasmania’s Derwent Valley, is enjoying unprecedented success as demand from Asia has driven exports to record levels. More than 270,000kg of fresh or dried hop cones were exported in May (2014) alone — almost double the previous best month in 2009, according to the Australian Bureau of Statistics. May’s figure of \$4.6 million, in exports was more than double the financial return than of any other month in the past five years.

The demand from Asia, particularly China and India, for Australian hop varieties follows the popularity of craft beer among consumers and major breweries’ decisions to expand their range of flavours”.

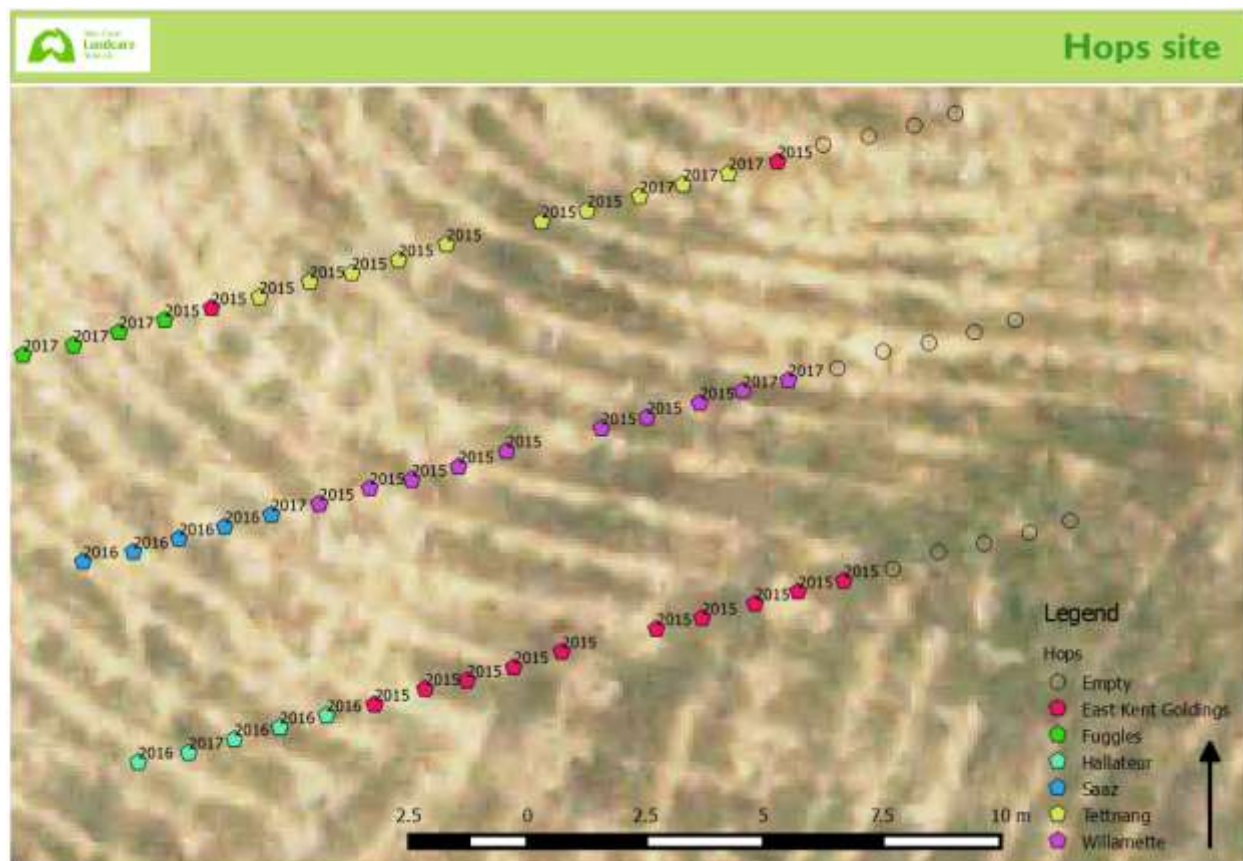
There are only two commercial hop farms in Australia that directly supply to brewing companies and, until recently, they grew only a handful of varieties. With an increase in microbrewery and ‘craft beers’, demand is increasing for heritage varieties. Mid to southern Victoria and Tasmania are by far the best locations nation-wide suitable for growing hops. Bass Coast is in the right geographic and climatic region to grow hops and, since the start of the trial, a further three microbreweries have opened in the South Gippsland region, which will increase the demand for local hops.

THE TRIAL METHODOLOGY

Three varieties of hops were purchased from Hopco in Tasmania at the start of Spring 2015 (10 each of Willamette, Tettnang, and Goldings), and were planted along with one Fuggles and two East Kent Goldings that were given to the project. Varieties were chosen following consultation with two local breweries and took into account the availability of hops at the time of purchase.

Prior to site disturbance a soil sample was taken to provide a baseline analysis (see results section). The soil was tilled by hand to a depth of 300mm and mounded into three rows approximately 0.7 metres wide, 20 metres long and 5 metres apart. Compost (see analysis of compost in results section) was added to the western half of each mound and turned in.

The rhizomes were planted at the original ground level within the mound with a one metre spacing between each one.



Where rhizomes died they were re-planted with rhizomes from the surviving variety the following winter. There was a problem with slugs and snails eating the emerging shoots and leaves which resulted in some rhizome death, but once hop plants were established these pests were not a problem. The year of planting is shown above. Two other varieties were sourced locally (Saaz and Hallateur) and planted in the improved soil section, and space was provided for another three varieties.

A trellis was installed using galvanized poles (treated pine was avoided, and hardwood poles were very expensive), put 1-metre into the ground and extended to 4-metres for ease of harvesting (commercial farms use 6-metre trellis). Two strands of fencing wire twisted together was used for the trellis (tensioned and adjusted with turn buckles), and a looped strand of wire for the strainers that were attached to a steel reinforced bar which was concreted in the ground and tensioned with a gripper gun.



Hop trellis



Shoots damaged by slugs

Jute string was used at the start of the second growing season. This was not strong enough and the weight of the bines snapped the string. Coir rope, the same that commercial hop farms use, was then purchased and bines were trained clockwise onto the rope.



Jute string



Coir rope

A drip line was installed, and irrigation was controlled via a timer. Prior to the start of each growing season a dressing of compost was added to the 'improved soil' half of the plot, and mulch to the entire plot to conserve water.

Due to labour constraints, all hops were harvested at the same time. During regular hop cone checks from mid-February to mid-March, the overall ripeness across all varieties was checked so the best harvest time could be gauged. Hops were cut down, and cones were hand-picked and weighed for each variety.

RESULTS

SOIL TESTING

Beneficial changes in soil chemistry after soil remedial treatment with compost

The soil analysis indicated that the compost had a very favourable effect on the pH and nutrient levels of the soils in the improved section of the site. Most noticeable was the increase in Olsen phosphorus, available nitrogen and organic matter. Importantly the Base Exchange elements calcium, magnesium and potassium had also increased, and hydrogen (a measure of acidity) had decreased. The slight increase in exchangeable magnesium and sodium were not seen as beneficial as they can have a negative influence on soil structure.

	Soil analysis unimproved 2015	Soil analysis improved 2018
pH (1:5 water)	5.2	6.6
Available Calcium ppm	730	3440
Available Magnesium ppm	450	985
Available Potassium ppm	306	869
Available Nitrogen ppm	2.4	37.1
Available Phosphorus ppm	1.73	120
Available Sulphur ppm	6.9	36
Total Organic Matter %	4.1	14.4
Adjusted Cation Exchange Capacity	15.4	27.35
Exchangeable Calcium %	23	57
Exchangeable Magnesium %	23.6	27.2
Exchangeable Potassium %	4.9	7.4
Exchangeable Sodium %	1.5	3.3
Base Saturation Percentage (BSP) %	48	77

Compost analysis

An important indicator of the quality of the compost is the carbon nitrogen (C:N) ratio, which in well-made compost should be less than 15:1. As the ratio becomes wider, the availability of nitrogen (N) reduces significantly.

Analysis of key components in the supplied compost is tabulated below. The batch supplied with the C:N ratio of 11.98 would release up to 20% of its nitrogen in the first year.

Total Nitrogen %	1.31
Total Phosphorus %	0.428
Total Potassium %	0.72
Total calcium %	2.05
Total Magnesium %	0.436
Total Sulphur %	0.192
pH	7.4
Carbon/nitrogen ratio	11.98

At the conclusion of the trial, the following positive results in soil chemistry on the hops demonstration site were noted:

- A rise in pH from 5.2 to 6.6
- A rise in available calcium from 730ppm to 3440ppm
- A rise in magnesium from 450ppm to 985ppm
- A rise in potassium from 306ppm to 869ppm
- An increase in Olsen phosphorus from 1.73ppm to 120ppm
- An increase in nitrate nitrogen from 2.4ppm to 37.1ppm
- An increase in organic matter from 4.1% to 14.4%
- An increase in adjusted cation exchange (ACEC) from 15.4 to 27.35
- An increase in the Base Saturation Percentage from 48% to 77%
- A rise in exchangeable calcium from 23% to 57%
- An increase in exchangeable magnesium from 23.6% to 27.2
- A rise in exchangeable potassium from 4.9% to 7.4%
- A rise in ESP sodium from 1.5% to 3.3%



Goldings in unimproved soil- 2016

Goldings in improved soil- 2016

HOP HARVEST

Comparison of hops harvest yields

There was an increase in the overall yield from the second to third seasons in three of the five varieties. This was expected, as hops reach yield capacity around the third season onwards. Improved soil fertility increased the yields in the Tettang and Willamette varieties. Surprisingly, the 2018 yield of the Goldings in the unimproved soil was almost double that of in the improved soil yield.

Variety	Year			
	23/3/2017 harvest (grams)	8/3/2018 harvest (grams)		
		Total	Improved soil	Unimproved
Fuggles	0	55	55	-
East Kent Goldings	0	0	0	0
Tettnang	1093	980	610	370
Saaz	1059	1430	1430	-
Willamette	980	1025	565	460
Hallertau	55	200	200	-
Goldings	438	390	135	255

1st season harvest
 2nd season harvest
 3rd season harvest

Harvest yields were lower than the expected average, which can be attributed to the younger age of the plants, lower than normal trellis height, as well as reduced plant health and vigour (wind burn and inconsistent watering regime). With better care and shelter from the wind, much higher yields could be achieved.



2017 harvest

RESULTS OF THE TRIAL: THE BEST VARIETIES

Up until January 2018 all hop plants were growing vigorously and looked very healthy. From that point on, the lower leaves started to yellow, and plant health decreased. Some varieties were affected more than others. Saaz was the stand out variety, maintaining a high level of health and crop yields, even though one plant was in its first year and the other four in the second year.

	Yield per plant			
	8/3/2018 harvest			Comments
Variety	Combined	Improved soil	Unimproved	
Fuggles	55	55	-	Over ripe, burnt cones, 70% health
East Kent Goldings	0	0	0	No cones, 25% health
Tettnang	122.5	152.5	92.5	Slightly over ripe, burnt tips, 60% health
Saaz	286	286	-	Slightly under ripe, 80% health
Willamette	102.5	113	92	Slightly under ripe, burnt tips, 60% health
Hallertau	50	50	-	Over ripe, burnt cones, 70% health
Goldings	78	27	51	Ripe, burnt tips, 70% health



Saaz cones from the 2018 harvest

ANALYSING THE METHODOLOGY

Site selection. Hops are a riparian plant, liking deep, fertile and well drained soils in sheltered locations. We placed the hops trial plot on a slight rise near the Bass River, focusing on the need to get it above the recent flood line.



Approximate location of hops trial plot in red. June 2012 flood following heavy rainfall, high tide and strong westerly wind.

Out of frame to the left in the image above there is a blue gum shelter belt and there was concern that shading would be an issue, so the plot was moved to the west.

Wind break. When locating the plot too much emphasis was placed on avoiding shading, and not enough on providing shelter. Hops prefer some shading rather than being exposed to wind. As a result, the site was open to hot north westerlies in mid to late summer and in both the 2016/17 and 2017/18 seasons, hop cones were burnt from these winds. A shelter belt is being established to protect the hops during summer.



Tettnang cones wind burnt



Willamette cones burnt



Burnt cones harvested

Sourcing hops. To avoid waiting another season to plant the first hops, rhizomes were sourced very late in the planting season from Tasmania. They were small and half price due to the time in season. Nearly all had commenced shooting and a few had rotted when they were received in the mail on the 5 August 2015. They were carefully potted up and grown in a sheltered environment.



Rotten rhizome



Rhizome with shoot being potted up

The rhizomes were placed at the bottom of the pot, forcing the small weak shoots to push through the potting mix to reach the surface. On the 22 August 2015 nine had not started to shoot and were re-potted, lifting the rhizomes closer to the surface. It was found that 7 had commenced shooting but were bent over.

Varieties planted too close. Planting too close risked an intermingling of rhizomes and uncertainty in varieties. In future plantings, either an entire row would be planted using a single variety, or a barrier would be buried between varieties to stop rhizome encroachment.

Rhizome harvesting. Initially dead rhizomes were replaced and varieties spread over the area. A mixture of rhizomes with and without obvious large growth buds were harvested. It was found that only the rhizome with the buds, produced shoots and grew.

Watering. During the 2016/17 growing season an automatic timer was used which worked well. However due to ongoing development at the site, which included irrigation, watering over the 2017/18 growing season was not automated. From January 2018 watering was inconsistent, fluctuating between over- and under- watering, and combined with a very dry summer produced unhealthy plants. Consistent watering and monitoring of soil moisture to ensure soil doesn't dry out is required for large hop yields.



Drip line irrigation installed, with one 4Lt/hr dripper placed over each plant

Jute string vs coir rope. The jute string was too thin and snapped when the hop bines reached half way up the trellis. Coir rope was used, which still provided a rough texture for the binds to grip to but with a much higher breaking strain (around 70kg).

Harvest timing. For expediency and due to lack of available labour, all the hops were harvested at the same time. Ideally the hop cones would be monitored and picked at their ideal ripeness. As varieties ripen at different times this would occur over a 2-3 week window.

THE FUTURE

IMPROVEMENTS FOR THE FUTURE AND KEY LEARNINGS

This project clearly demonstrated that hops can be successfully grown for commercial purposes in Southern Gippsland, particularly if the site is well suited to hop growing and a detailed management plan is developed and implemented.

In Bass Coast and Southern Gippsland there is an increasing number of microbreweries being established, many of which are interested in sourcing locally grown hops. The availability of locally grown hops is currently low, but there is opportunity for the microbreweries to source locally grown hops if they were available.

The project also funded a visit to the Yellingbo Brewery and Hop Garden in March 2018. With 25 people attending, the day proved to be an extremely valuable exercise as it connected local landowners with expertise available in other areas. As a result, there are some interested landowners who are currently researching the local market potential and setting up small hop plantations on their properties. The

recently announced proposal to cut tax on kegs will potentially provide further incentive for growth in the microbrewery sector.

Potential future works on the trial site should include the following:

- Appropriate soil amendment works to maximise hop growing to be undertaken;
- Installation of appropriate irrigation infrastructure to minimise water stress during drier summer months;
- Planting of a wind break to reduce exposure to hot summer winds.

If these measures were implemented prior to the hops being planted it is estimated that the trial harvest yields would have been much greater.

If other trial sites are to be established in the future, a more rigorous site identification should be undertaken to establish the optimum conditions to support the healthy growing of hops. Soil amendments, based on soil analysis, would also need to be undertaken to provide optimum hop-growing conditions.

References

<https://www.weeklytimesnow.com.au/agribusiness/horticulture/australian-growers-hop-to-it-as-craft-beer-craze-gives-local-industry-a-new-lease-of-life/news-story/99ff5e8286e595d4adf307ddedde827d>

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