The New Zealand Hop Industry: An Overview

An essential ingredient

Hops are an essential ingredient in beer. The oldest recorded food standard in history – the ‘Reinheitsgebot’ or German beer purity law – states that beer can only be made using the three ingredients of malt, hops and water. In more recent times, yeast is generally accepted as the fourth essential ingredient, but back in 1516 when the law was enacted no-one knew what yeast was or actually did. In many parts of the world since, changes have made their way into certain parts of food legislation to permit other adjuncts and additions. However, hops have remained firmly in place. Quite simply, if it doesn’t have hops, it isn’t beer.

So, what are hops anyway? Hops, as grown for brewing, are the flowers of the female hop plant *humulus lupus*. Technically they are strobiles, or cone-like structures that form as an *inflorescence* beneath a bract at the terminal ends of the plant’s laterals. Hops are diecious, meaning that there are male and female plants which are a perennial rhizome. They emerge as shoots in the spring where a small number, say two or three, are selected and trained to grow as a bine up a string to reach maturity in autumn.

Cultivation and kilning

Wide-scale cultivation is made possible through a structure of poles and wires to create a framework over hectares of land to support the bines as they grow to a height of approximately five metres. When mature and laden with flowers, the whole bine is cut down and transported to a picking machine. The picking process is one of feeding the bines into a machine that initially removes the cones feeding the remaining laterals into a secondary picking operation. Here further cones are removed and conveyed through a series of cleaning belts until only the cones remain, and they are then conveyed to the kilning operation.

Kilning is carried out at 60°C with process time varying by variety. However, six to eight hours would be considered an average time to reduce the moisture content to between eight and ten per cent. The dried hops are pressed into bales after a period known as ‘conditioning’ in heaps on the kiln floor to allow cooling while moisture equilibrates.

At the time of writing, the 2013 hop harvest had commenced and this coincides with the shortening day length and the approach of autumn. The flowers move into maturity, with early varieties ripening toward the end of February and other varieties being either mid or late season and all coming into maturity before the end of March. Picking windows can be quite short for some types, and growers need to plan their gardens accordingly to have a mix of varieties to ensure they can take full advantage of a relatively brief harvest period.

Hops chemistry

The bales, with an average weight of around 120 kilograms, are transferred from the farm to a central storage and processing facility in Appleby near Richmond in the Nelson region. Here they are weighed, graded and sampled for quality checks and analysed for their alpha acid content. This content is an international measure of importance to brewers, as it is the conversion of these acids to a soluble form during boiling in the brewing process that determines the bitterness of the resulting beer.

Hops chemistry is an extremely complex study with a focus on the major component of the hop known as lupulin, a resin stored in glands within the hop cone. The lupulin contains the bittering acids, but also a vast array of other components including the all important essential oils that contribute to a beer’s flavour and aroma profile. There are over 100 different hops varieties grown internationally, with no two being the same, albeit that some with higher alpha acid content may bear similarities.

It is the variation of hops and how they are applied to the brewing process that gives rise to the myriad of beer styles, categories and sub-categories produced internationally. New Zealand grows 20 different varieties of hops, with 15 of those unique to this country having been developed through our own hop research and breeding programme partnered by New Zealand Plant and Food Research.
Selling and distribution

After the hops are received into store and assessed they are put into cold storage and held until processing commences once harvest is complete, generally in late March. All the analysis is collated and the bales are batched for processing into pellets or for re-packing of whole hops for sale to brewers or distributors. In some instances, brewers will visit the hop store to ‘select’ the hops they have contracted through a process of sensory evaluation and scoring.

Different brewers may have variations in selection criteria, but most are agreed that it is the intensity of aroma that makes one sample stand out from another. The process of hop selection is a tradition still upheld by many brewers, with some brewing companies having a policy that they will not brew with hops that they have not selected. This time-honoured process drives overall quality performance measures across the industry, as growers strive to have their hops selected for inclusion into contracts while serving to benchmark the industry’s own selection and grading processes.

Original varieties

Hops are not a native to New Zealand so early settlers from England and Germany circa 1840 had brought hops from their homelands, which they grew to brew beer for the table as part of household duties. During this time the local brewers retained their preference for imported varieties, which one could only speculate was based on their indifference to the quality of the domestic offering.

The hops grown at that time were varieties called Fuggle and Golding from England and Spalt from Germany, all of which had adapted to the local conditions although they did not perform all that well. In the latter 19th and early 20th centuries the new colony was expanding rapidly and the brewing industry was keeping pace.

The outbreak of World War I impacted heavily on trade, which in turn meant that the hop supply was also restricted from imports. This situation forced an alliance between the brewers and the local hops growers, which was to change both the fledgling New Zealand industries forever. Then as now the brewers required greater efficiencies from the hop producers than what was on offer from the traditional varieties, so a hop variety was sought that could produce on a better economic return.

In California, a variety called Cluster was being grown and as it was on a similar latitude of 41 degrees – hop maturity is latitude specific. It was believed the Californian would be suitable and so it was introduced and rapidly expanded. The “Cali”, as it was affectionately known, thrived and soon made up most of plantings throughout the industry. Unfortunately, the strategy was fraught with peril as it was extremely risky with over-reliance on a single variety.

Black root rot

The Californian proved to be susceptible to black root rot, Phytophthora cactorum, which started to appear in the early 1930s. This insidious fungal disease was truly capable of destroying the entire crop, with the industry along with it. By the late 1940s, it was widespread and proving near impossible to control. An initiative to combat the disease was developed through the collaborative efforts of the growers, brewers and the government. So in 1947, the New Zealand Hop Research Committee was established comprising members from the government Department of Scientific and Industrial Research (DSIR), the Brewers Association and the hop growers.

Work commenced on the development of a variety that would be resistant to black root rot. The starting point for this, not surprisingly, was the old line varieties brought in by the early settlers as these hops had not succumbed to the disease. The ubiquitous Fuggle had still been grown, and even though it yielded poorly it had displayed resistance to the disease even in badly affected gardens. The crossing of the Californian with Fuggle and with subsequent selections and back-crossing produced three new root rot resistant varieties – First Choice, Smooth Cone and Calicross.

As well as their disease resistance, these varieties were developed through selection for several other characteristics such as yield, alpha potential, maturity and suitability to machine picking. The New Zealand Hop Breeding programme had been firmly established and the hop industry was set to embark on a major market-driven change.

Research organisations

The DSIR went on to be known as the Horticulture and Food Research Institute of New Zealand (Hort Research), which recently after a merger with Crop and Food has emerged as Plant and Food Research. It remains today the home of the New Zealand hop industry’s breeding and research efforts. The New Zealand Hop Research Committee celebrates its 66th anniversary this year. It also remains the research body for the New Zealand hops industry comprising growers, brewers and a Crown Research Institute (Plant and Food Research) in its representation.

Considerable advancement has been delivered technologically, both in quality and efficiencies to the brewing industry, through the
Research Committee. The contribution made to the success of both the New Zealand hop industry and brewers internationally cannot be overstated when speaking of the efforts of its members.

The growers rallied round their Research committee and put in place a programme of development that would increase the efforts in plant breeding and draw on the brewer representatives’ knowledge of quality expectation. New Zealand growers needed to produce hops that the market wanted and develop the capability to deliver on quality. The New Zealand hops strategy was to sell themselves as “from grower to brewer” and take their products to the world.

Having an active breeding programme and Research committee gave them an edge to develop new varieties and to meet with the brewers’ changing needs. How hops were being handled at picking, post-harvest storage temperatures and processing procedures all had parameters that needed to meet with the brewers’ expectations. The New Zealand grower became more quality focused with processing practices and procedures, as these were all seen as marketable points of difference.

Technology again was driving change, and both domestic and international brewers were demanding much more from their hops. Commodity alpha acid was still at the forefront, but it wasn’t just about bitterness contribution anymore. The New Zealand varieties that were emerging through the breeding programme could be tailored to specific needs. The distance from the northern markets, once viewed as a barrier, became seen as advantageous for off-season supply and risk mitigation.

**Hop marketing**

Hop marketing in New Zealand has transitioned through several models. Looking back to the early days, breweries bought directly from individual growers and this system developed into an organised pools system based on quotas through the Growers Association. Hop marketing was also regulated by the government in 1939, and this model saw a system of price-fixing and quotas. This was, quite ironically, with a view to ensuring that the domestic hop requirement was met prior to export sales.

Under this system it could be seen that any export hops would be below the standard of domestic, of which there were no real incentives for improvement. By the early 1960s, the absurd pricing controls were removed by the government and the growers were again allowed to offer hops both domestically and for export competitively. This shift brought about a greater quality focus and meant that the growers could once again actively market their hops. It also assisted in realigning the brewers and growers strategically with a flow-on to further quality improvement.

Today the industry model is one of a cooperatively grower-owned company, a vertically integrated business governed by a board of directors who appoint a chief executive officer to manage the off-farm interests of the industry. New Zealand Hops Limited was created in 2005 through the merger of New Zealand Hop Products Limited (the cooperative’s processing company) and The New Zealand Hop Marketing Board (the growers’ marketing arm which evolved out of the deregulated marketing committee).

Throughout the 1970s and 1980s the industry released several new varieties, both of the high alpha and aroma types, but it was the aroma hops that were pushing the boundaries and exciting the market. By the mid-1990s, the industry had a diverse variety portfolio to rival the traditional northern producers. However, the cyclical nature of the market and the pressures of a competitive global market required the industry to look for greater product differentiation.

Integrated pest management through the use of predators was soon to be adopted to create a marketing proposition of spray-free production, while organic hops were emerging with New Zealand at the forefront. The Research Committee was being called on again, and the ‘Hops With a Difference’ programme emerged with a view to capitalise on hop-breeding selections in search of unusual and unique flavours and aromas.

**Major industry change**

Entering the new millennium, the brewing industry was undergoing major change and top-end consolidation was driving the international hop markets into a mode of commodity trading. Traditional beer markets were under pressure, and hops it would appear were losing their fundamental synergy with brewing. Beer volumes were decreasing, or at best static, and rationalisation was pushing raw material pricing down.

Lower bitterness had been appearing as a consumer trend for several years, and increased brewing efficiencies for hopping was considered the universal ‘fix all’. This made alpha a keyword in the brewery war rooms and pricing was being driven to unsustainable levels. Buying patterns had changed and forward contracts were expiring without renewal in favour of the spot markets. Internationally, brewery inventories were reducing while the growers were forced into surplus. In more recent times, the hop market internationally has found itself in a structural deficit created for the most part by unsustainable purchasing behaviour.

With the brewing and hop industries being so inextricably linked, strategically it is hard to fathom how such a situation could exist. ‘Boom and bust’ scenarios continued to deliver uncertainty at the farm gate, and a major over-supply situation for alpha acid internationally called for a shift in the direction for the New Zealand hop industry’s marketing strategy.

In 2010, an industry growth strategy was adopted by the board of directors in response to successive years of international market supply and demand imbalances which were creating incremental seasonal surpluses.

An opportunity was seen to increase New Zealand’s hop presence in the burgeoning international craft beer markets, especially in the northern hemisphere. Re-branding and repositioning of the industry’s unique varieties was key to the success of the strategy, which has been focused on a higher value proposition for growers to improve farm gate returns. The result has seen a considerable shift in
what is planted and grown, as on-farm structure has diversified through increasing what and how many varieties are grown for a spread of customers across different markets. Behind it all, of course, is the underpinning by the research programme and an ability to breed unique hops varieties that the market wants.

**PSA a timely warning**

The hop industry certainly also has its share of risks outside of market forces and sees the major threat as the introduction of disease through lapses in biosecurity protocols. Several hop pests and diseases exist outside of New Zealand which, if introduced, would almost certainly have a catastrophic impact on the industry. The recent incursion, through alleged negligence, of the PSA bacteria and its extremely dire results on sections of the kiwifruit industry has served to remind us just how fragile and exposed rural industries are. This message needs to be brought home to the Ministry for Primary Industries at every opportunity.

**Succession planning**

Succession planning had also previously been identified as an area that could create risk for an industry with strategic growth plan. Presenting a sustainable future to the shareholders has resulted in some younger farmers stepping back into an active role on-farm, while company structured, leasing and joint venture farming operations have emerged to negate succession risk and shore up supply continuity into the future.

**Postive growth period**

The New Zealand hop industry is however in growth in what has been a challenging economic period for exporters and in spite of weak currencies in target international markets. The current harvest is looking to produce circa 780 metric tons from approximately 370 hectares, of which 95 per cent is forward sold on a contract basis and 85 percent is exported. Not all the current contracts are at the higher value levels. However, the strategy has a balanced mix of varieties across different market segments, which act to spread supply risk while increasing the average farm gate return and laying the ground work for the Nelson region’s future generation of hops growers.

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