

REVIEW OF HOP MARKET CHARACTERISTICS

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Pregledni članek / Review article

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Abstract

The paper provides a review on basic hop market characteristics. While illustrating sources, collation and management of hop supply statistics - a market concentration within the four issues are debated: (i) breweries as a primary customer group ten of which controlled 72% of global beer production, (ii) strong merchants' companies, (iii) main production countries, where in 2020 the United States and Germany embraced 73% of the hop acreage and (iv) a growing concentration of ownership of hop varieties.

Keywords: hop industry, hop market, proprietary varieties, price of hops

PREGLED ZNAČILNOSTI TRGA HMELJA

Izveleček

Prispevek ponuja pregled osnovnih značilnosti trga hmelja. Poleg ponazoritve virov tržnih informacij ter zbiranja in uporabe statistik ponudbe hmelja ilustrira štiri segmente koncentracije trga s hmeljem: (i) pivovarne, kot edino gospodarsko pomembno skupino kupcev, od katerih jih deset nadzoruje 72 % svetovne proizvodnje piva, (ii) dominantna trgovska podjetja, (iii) glavne države pridelovalke, kjer so leta 2020 v ZDA in Nemčiji pridelovali na 73 % vseh površin hmelja in (iv) naraščajočo koncentracijo lastništva sort hmelja.

Ključne besede: hmeljarstvo, hmeljski trg, lastniške sorte, cena hmelja

1 MARKET STATISTICS COLLATION

The brewing industry receives information regarding the international hop supply situation primarily from the several published sources: The BarthHaas® Report (BarthHaas, 2020), Hop Guidelines (Hopsteiner, 2020), USDA NASS data and the International Hop Growers' Convention (IHGC) Economic Commission reports

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(IHGC, 2021a). Within the hop industry, these information sources are valued but are bolstered by an informal network through which news regarding current events and pricing spreads rapidly. The two large hop merchant companies mentioned above offer the industry a comprehensive look at the global industry at least once each year via their reports. This offers their readers a comprehensive look at market statistics in hindsight enabling the calculation of the balance present in the market for those who know how to interpret the data. In addition, the IHGC as a nonprofit global hop industry network acts also as an important source of collecting the world's commercial hop supply data in the form of acreage, production of hops and alpha-acids, variety structure, and demand data in the form of contracted/spot hops percentage and average price information. As of October 2021, there were 21 country members - hop producers' organizations and 14 corporate members - hop trading companies (IHGC, 2021a). There are several other hop producing countries around the globe such as Serbia, Bulgaria, Turkey, Japan and India whose data were not contained within the IHGC reports. Their lack of participation did not affect the report as their production was insignificant and not export oriented.

The IHGC organization tracks global hop production data. It is the only non-merchant organization to do so on a regular basis. As such, it provides an invaluable service to the industry. The organization holds meetings three times each year, in April, July-August and November. The timing of these meetings is strategic to allow updates on planting activity in the spring, progress of the crop prior to harvest and a recap of yields and production in November. In 2020, North American and European Union countries produced 91.2 percent of total IHGC-tracked production with the United States (U.S.) and Germany combined responsible for 77 percent (IHGC, 2021a). Attendance by interested members from the (U.S.), Germany and the Czech Republic often outnumbered the delegates from the rest of the participating countries.

Despite the name of the organization implying that it is a grower organization, members of the IHGC in 2021 are mostly involved with the sales of hops (i.e., merchants and growers who sell direct to brewers). For decades, market prices had been openly reported and discussed between merchants in this forum. That could have been misinterpreted as collusion or price fixing, but little attention was ever paid to the workings of the tiny organization. In 2019, to eliminate the possibility for any such misinterpretation to occur, the organization amended its bylaws to address potential antitrust concerns. From then on, no specific price information could be discussed in that forum.

2 CONCENTRATION IN THE HOP INDUSTRY

Since the documented origins of hopped beer thousands of years ago (DeLyser and Kasper, 1994), hops remain a key component in the production of beer. The global hop industry is concentrated structurally in several different ways. It has only one primary customer group (i.e., breweries), ten of which controlled 71.6% of global production in 2019 (BarthHaas, 2020). Non-beer demand for hops, a figure not often reported in the hop industry, represented approximately 200 metric tons of alpha-acids, or 1.4% of production, in 2012 (Cooberg and Hintermeier, 2012), the most recent figures publicly available. This type of concentration among buyers creates a concentrated oligopsony with leadership (Galal, 1968). Large entities with disproportional influence over the market can effectively use their size to negotiate favorable terms to which smaller brewers would not have access (OECD, 2012). Macro breweries, and, in 2020, the largest craft breweries, comprised a significant portion of demand and were an important part of any seller's portfolio. The threat of the potential loss of business with one of these entities in the ultra-competitive hop market, where competitors will gladly undermine their competitor's business for personal gain, cannot be allowed thereby strengthening their oligopsony powers.

The second point of concentration in the industry is trade. There are four primary merchant groups through which the world's hop trade flows directly or is influenced. These four firms are Barthhaas®, HopSteiner, Yakima Chief Hops™ and Hopfenverwertungsgenossenschaft Hallertau e.G. (more commonly referred to as HVG). Insiders estimate the market share of these four entities between 70-80% of the total annual hop trade (IHGC, 2021a).

The third point of concentration in the industry is production (Figure 1). The U.S. and Germany produced 39.49 and 33.04 percent of the world's hop acreage respectively in 2020. The balance of global acreage (i.e. 27 percent of total global acreage) was divided by 19 producing countries (IHGC, 2021a). Some American growers have a distinct competitive advantage. In the U.S. states of Washington and Idaho, growers can plant hops in the spring and harvest them in the fall of the same year. In some other hop producing regions, they are harvested for the first time only in the second or third year after planting. Farm size in the U.S. is an order of magnitude larger than competing hop producing countries offering American hop growers an economy of scale not available to their competitors enabling unique cultural and business practices.

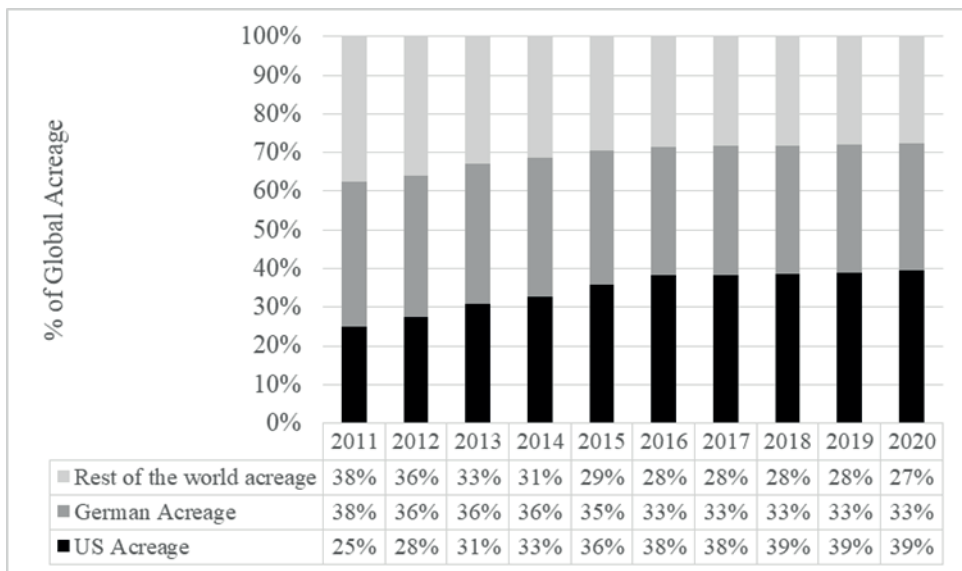


Figure 1: Global Hop Acreage (%) by Production Region (IHGC, 2021a).

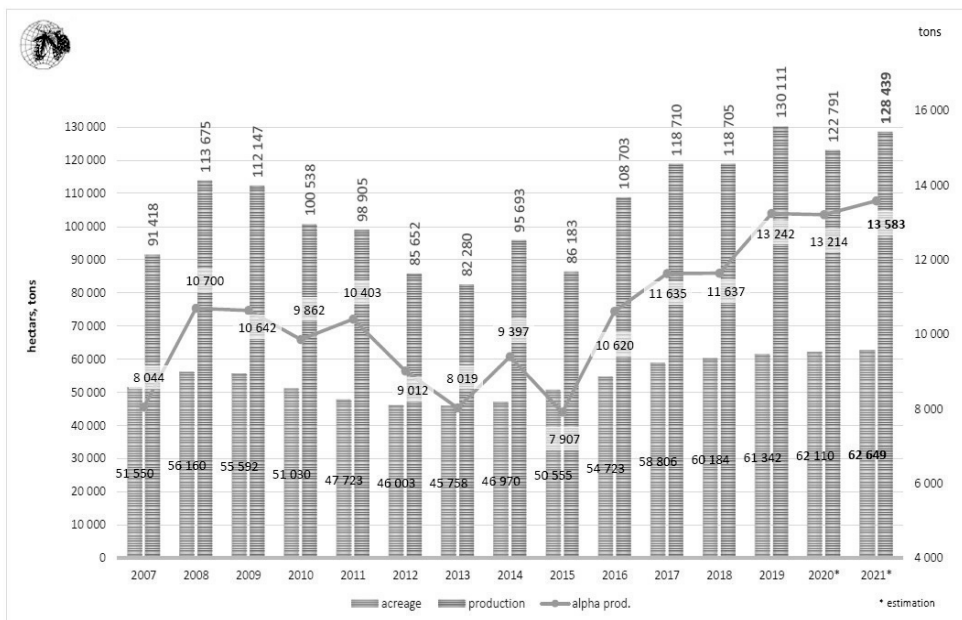


Figure 2: IHGC hop supply statistics 2007-2021 (IHGC, 2021a).

Until 1998, varieties reported by the USDA and the IHGC were public. The proportion of proprietary and public hop varieties changed after 1997, when the USDA NASS reported no proprietary varieties. A fourth point of concentration within the industry has evolved in the years since. The growth in popularity of proprietary varieties has led to a concentration of ownership of the varieties produced in the U.S. By 2021, proprietary varieties accounted for over two-thirds of the U.S. industry. The rapid reorientation toward varieties registered with IPR after 2010 represented efforts by hop growers, merchants and craft brewers to differentiate themselves from their competitors (MacKinnon and Pavlovič, 2019).

The time frame does however include the period during which we may witness the meteoric rise in popularity of proprietary varieties between 2012-2021(IHGC, 2021a; IHGC, 2021b). This gave the grower community, in particular a small group of growers, enormous power to influence the narrative regarding pricing. Premium prices for proprietary varieties influence prices for public varieties, which must produce a competitive return per acre, or they will no longer be produced (Mahoney, 2021).

3 HOP MARKET CYCLES

Until 2010, the market demonstrated its inelasticity through extreme price swings as it cycled between surpluses and shortages approximately once every 10-12 years (Figure 3). A similar cycle existed in Europe, in the U.S. and other producing countries as the market is global. Under shortage conditions, the common oils nearly all hop varieties share makes the market highly elastic as brewers seek to satisfy their demand regardless of variety. Shortages in supply of hops occurred in 1980, 1991 and 2007.

The supply-demand situation will likely always be in a constant state of flux and in need of management. The hop market, when left to the free market, has tended to oscillate on either side of mean prices over time. In other words, the market tends to move toward some form of balance. Given the number of endogenous and exogenous variables affecting hop supply and demand, relative stability of the market without the influence of external forces is highly unlikely.

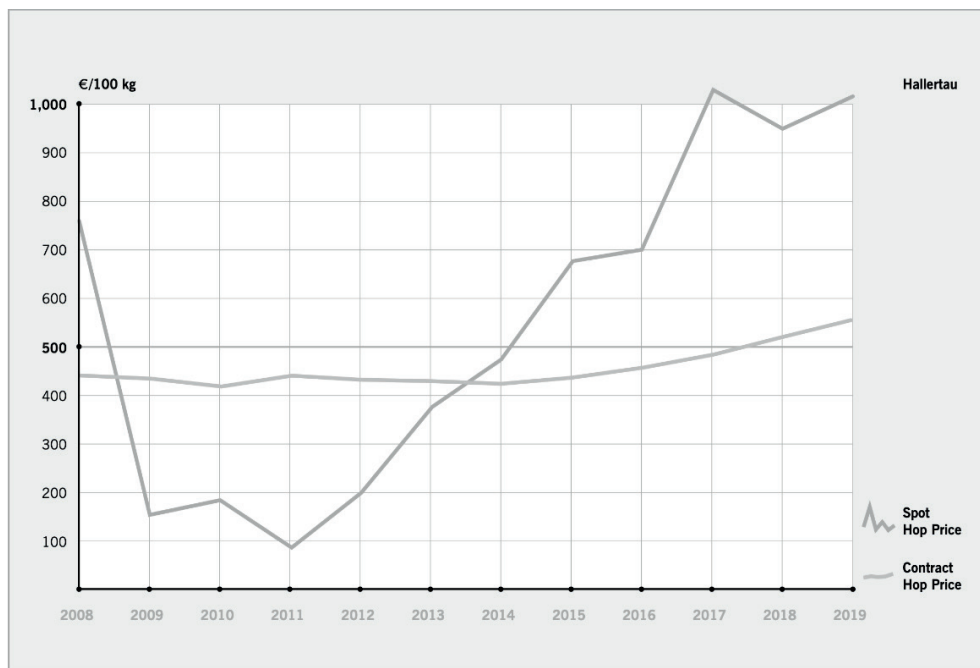


Figure 3: *The Hop Cycle 1994-2020 as manifested in Europe (Hopsteiner, 2020).*

The imperfect information under which the hop industry operates does not enable a precise reading of the equilibrium situation in real time. During a deficit, when stocks are low relative to demand (i.e., perceived shortage), growers demand five-year forward contracts to increase production. During times of surplus, the Delayed Surplus Response (DSR) introduced by the authors in Hoponomics (MacKinnon and Pavlovič, 2021), and inelastic demand creates backwardation removing brewer incentives to lock in forward prices through contracting. The perception among hop growers and merchants (who are also growers) is that contracts provide stability and opportunities for recapitalization and investment in their farm. Prices for long-term crisis contracts have traditionally been above long-term season average prices (MacKinnon and Pavlovič, 2020b).

Subsequent contract renegotiations, reduced acreage and decreasing season average price reductions followed every price spike following the shortages mentioned earlier. We may infer that during these times of perceived crisis brewers were forced into contracts they neither wanted or needed resulting in production that created market disequilibrium. Given the cost to change acreage and the loss of contracted revenue, forward contracts, may in fact lead to lower profits than spot market competition and prices would otherwise yield (Cabral and Villas-Boas, 2005).

Due to their similar quantity and quality of essential oils and hop resins, most varieties have substitutes. Largely homogeneous hop products created the need for differentiation among competitors. In the 1980's, hop merchants began creating processed products with Intellectual Property Rights (IPR). Originally, these were attractive to the customer as they increased brewing efficiency. These innovative products were very successful but ultimately decreased the size of the market providing a temporary advantage to the innovator while creating a Bertrand Supertrap (Cabral and Villas-Boas, 2005). As a commodity in a market with inelastic demand during times of oversupply, alpha acid sales often go to the lowest-cost producer. This can result in a Nash equilibrium of the Bertrand model (Hermalin, 2003).

Three times during the 20th century, using the authority of the United States Department of Agriculture (USDA), American hop farmers sought to control the quantity of hops available to the market via Federal Marketing Orders (FMOs). Between 1966-1986 Washington State hop prices remained volatile, fluctuating on average 7.71% per year with the median fluctuation of 6.25% (USDA 2013). Price and supply control experiments can lead to various forms of market failures and create market inefficiencies (Tothova, 2011). When a shortage occurred in the late 1970's and early 1980's due to crop failures, the Hop Administrative Committee (HAC) that regulated the third FMO abandoned its original guidelines (Folwell et al., 1985) in pursuit of increasing long-term global market share for American hops, an effort that failed. By 1986, farmers voted for the termination of the order (Associated Press, 1986).

4 PROPRIETARY HOP VARIETIES

As reported in November 2020 to the International Hop Growers' Convention (IHGC, 2021b), 67.2 percent of the world's commercial varieties had some form of IP (i.e. patents or trademarks). In 2006, of 155 unique varieties, forty (25.8%) had some form of IP associated with them. The trend is clear. What remains unclear are whether the effect of IP rights upon the landscape of the hop industry will be permanent. Production of proprietary varieties has thus far been limited to the region in which the variety was developed except for a brief time when Amarillo[®] VGXPO1 was produced in Germany.

The development of a new viable commercial hop variety can take over ten years (Perrault, 2016). The greater degree of specificity, control and profit incentivized private hop breeding companies to invest further in innovation because they could define it and thus seek to protect and enforce their rights (Bugos and Kevles, 1992). The presence of IP introduced constraints to the market that had not previously existed, which affected planting decisions (Stiglitz, 1977). In 1998, the first proprietary varieties met the reporting threshold of the USDA National

Agricultural Statistical Service (NASS) that state a variety must be produced by three or more entities to data may be aggregated thereby protecting the anonymity of the producer. The USDA NASS reported acreage and production for the first U.S. proprietary hop varieties with IPR in their annual National Hop Report (NHR). The reader may safely assume that varieties were in production prior to this however but simply did not meet the USDA reporting threshold. Indeed, according to their web site, Yakima Chief Ranches, one of the companies that would in 2003 become part of the Hop Breeding Company, was founded by "three hop-farming families, the Carpenters, the Smiths and the Perraults" who "came together to form a new hop production and research farm" with "a directive to develop new hop varieties" began working with variety development efforts in the 1980's (YCH Hops, 2021).

Table 1: Five largest U.S. hop variety development companies and their respective shares of the proprietary variety market in 2020 by acreage and production (MacKinnon and Pavlovič, 2021).

	Variety Development Company	Market Share of U.S. Proprietary Acreage in 2020	Market share of U.S. Proprietary Production in 2020
1	Hop Breeding Company (HBC)	72.02%	70.35%
2	HopSteiner	12.44%	16.19%
3	Association for the Development of Hop Agronomy (ADHA)	5.30%	3.83%
4	Virgil Gamache Farms (VGF)	5.22%	4.96%
5	CLS Farms	3.85%	3.31%

Proprietary hop varieties remained an insignificant share of global production until 2010, when the focus of the global hop industry shifted. The U.S. craft beer industry began growing at an unprecedented rate. In some cases, craft brewers used over 435g/hl of hops (at 12% alpha, this would equate to 52g/hl of alpha-acids) whereas macros on average used less than 3.5g/hl of alpha-acids, the global average hopping rate at the time. As they pursued their passion, small craft brewers were also willing to pay premium prices. Craft brewer money therefore represented a disproportionately large portion of the market relative to the volume of beer produced by their macro counterparts. The reader may infer on Figure 4 their effect on the industry was overwhelming based on the sudden change in hopping rates between 2010 and 2012 (BarthHaas, 2020).

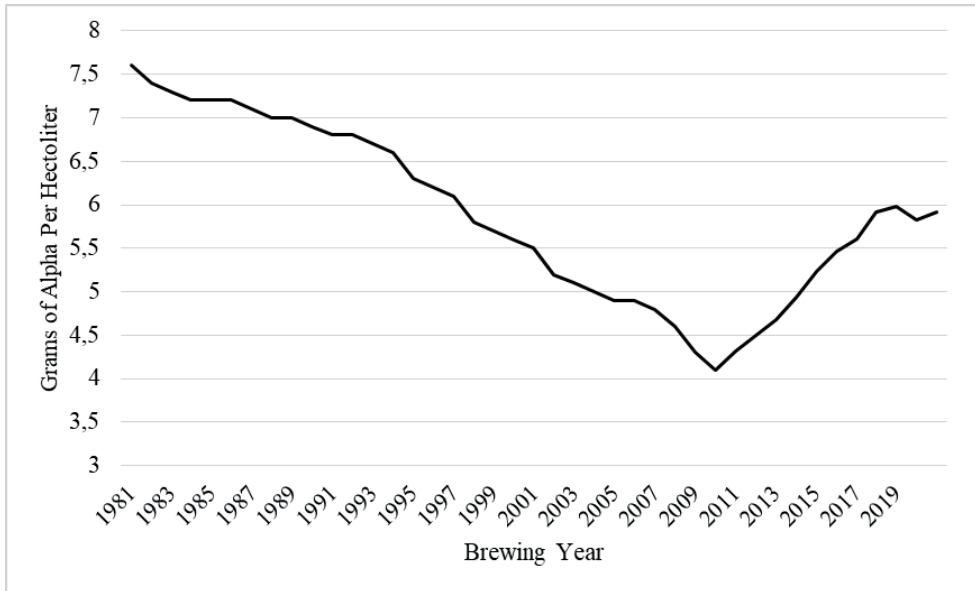


Figure 4: *Hopping Rates 1991-2019 (MacKinnon and Pavlovič, 2021).*

As the U.S. craft beer industry continued to grow, it consumed ever larger quantities of the U.S. proprietary hop varieties. In response, between 2011 and 2019, American hop acreage increased 97.8% (George, 2019), a change that consisted largely of proprietary varieties. Constrained Pareto optimality led to the counterintuitive expansion of varieties with greater inelasticity while more elastic varieties were restricted (Stiglitz, 1977). Premium prices for proprietary varieties influenced prices for public varieties, had to produce a competitive return per acre, or they would no longer be produced (Mahoney, 2021).

The popularity of proprietary varieties reported by the USDA NASS rose from zero in 1997 to 70.19 percent of U.S. acreage and 73.44 percent of U.S. production in 2020 according to the 2020 NHR. Until the existence of varieties with IP, it was not possible to calculate market share for any hop merchant companies using public data. Sales to breweries is the metric most thought of with regards to market share. Acreage and picking capacity are the scarcest resources in the hop industry. The market share of hop acres devoted to a proprietary variety, or a group of proprietary varieties owned by a company, enables the calculation of influence over hop acreage market share possible. Without first winning the battle for acreage market share, a proprietary variety or its owners cannot succeed in the battle for market share of sales to breweries as the product will not exist.

A company with patented plant material that wanted the growth of its IP to spread would, in theory, benefit greatly from marketing its products through every merchant or interested party in the industry so long as the sales were in response to demand and not speculative in nature. Some of the companies that have developed proprietary hop varieties appear to restrict sales of their IP by not making them available to all merchants equally. This would be curious behavior for an independent variety development company. Perhaps not coincidentally, some of the companies developing proprietary hop varieties share ownership with the large merchant companies or farms through which they primarily market and distribute their IP. One might infer from this that proprietary varieties are a means by which individuals who own shares in both merchant firms and variety development companies consider using the proprietary varieties to create a competitive advantage over their competitors.

Through producer licensing agreements, some IP owners in 2021 retained ownership of their plant material. They can control the pesticides allowed during production process. They can dictate harvest schedules on third-party farms. They can control and retain all rights to take delivery of and sell their product. This has resulted in a hierarchical structure within the hop industry. Those who do not own IP are reduced to contract growers working at the behest of those who do. Those who own hop varieties with IP did an amazing job at cultivating and curating a valuable public image for their proprietary varieties. Their brand image contributes significantly to their uniqueness. Brewers believed that new innovative hop flavors offered by proprietary varieties combined with their skills were responsible for their brewing success (MacKinnon and Pavlovič, 2020a).

5 HOP PRICES

Price is not the primary motivating factor with regards to purchasing (Chen and Lent, 1992). Without access to perfect information and with so many extrinsic variables, it is impossible to make exact predictions regarding the future of the market even as harvest is underway (Kruschke, 2013). Hop growers have long had a saying that can often be heard during harvest when yields are discussed: *"You don't know what you've got until it's in the bale"*.

Equilibrium in the hop market is a concept that passes under the veil of secrecy as surpluses turned to deficits under the free market. It was never achieved for any meaningful period and was never maintained prior to the dominance of proprietary varieties. Some participants in the industry are less informed. Creating an accurate image of brewer demand for hops has always been a challenging task. It is greatly simplified by the presence of proprietary varieties. Price is responsive to the quantity of hops perceived to be available to the market. If an entity can control that perception, they can control the price (MacKinnon and Pavlovič, 2021).

Ultimately, demand for hops manifests itself through the customer's willingness to contract hops, which can only be measured in hindsight.

During times of oversupply, demand for hops does not change in response to lower prices although it may appear so due to increases in sales volume. When hops are dumped onto the market in this fashion, it satisfies future demand rather than increasing demand for the product in that crop year. Acreage reductions corresponding to the volume of hops sold at discount seldom occurs even though evidence for a shift in demand is obvious. This is evidence of the DSR, a term created by the authors, mentioned above.

Reduced cross elasticity, regulation of supply and growing demand between 2010-2020 enabled a sustained period of premium hop prices and increased contracting rates among breweries due to the increasing prevalence of branded proprietary products (MacKinnon and Pavlovič, 2019). These significant changes could be harbingers of things to come. It may also represent a prolonged a swing in the market that will correct itself on a longer time scale than previous boom and bust cycles. By 2021, the lasting effect of proprietary varieties on the future of the market was not yet clear except as it pertained to the inflated value of forward contracting rates within the industry (Figures 5 and 6).

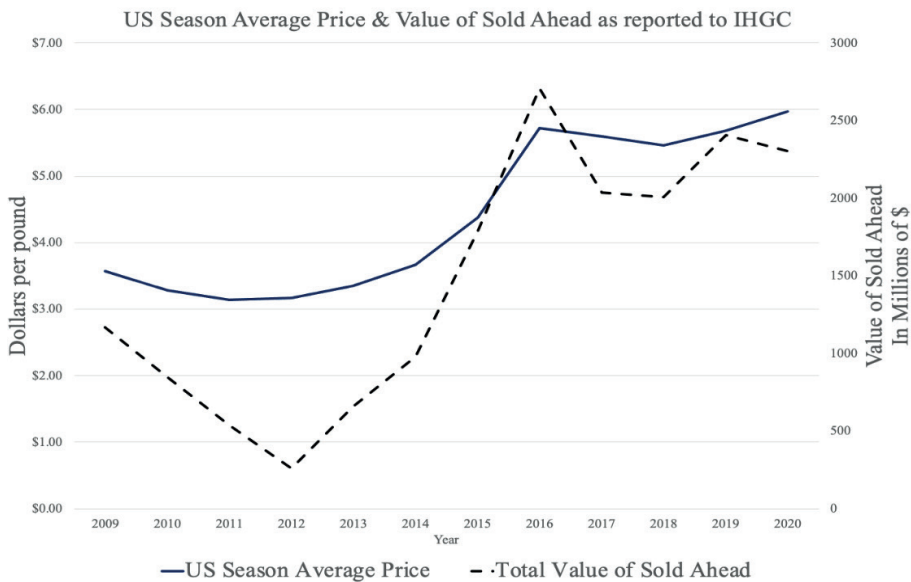


Figure 5: U.S. Season Average Price (SAP) and Value of Sold Ahead 2009-2020. Adapted from IHGC sold ahead data as reported by U.S. between 2000-2020 (IHGC, 2021a).

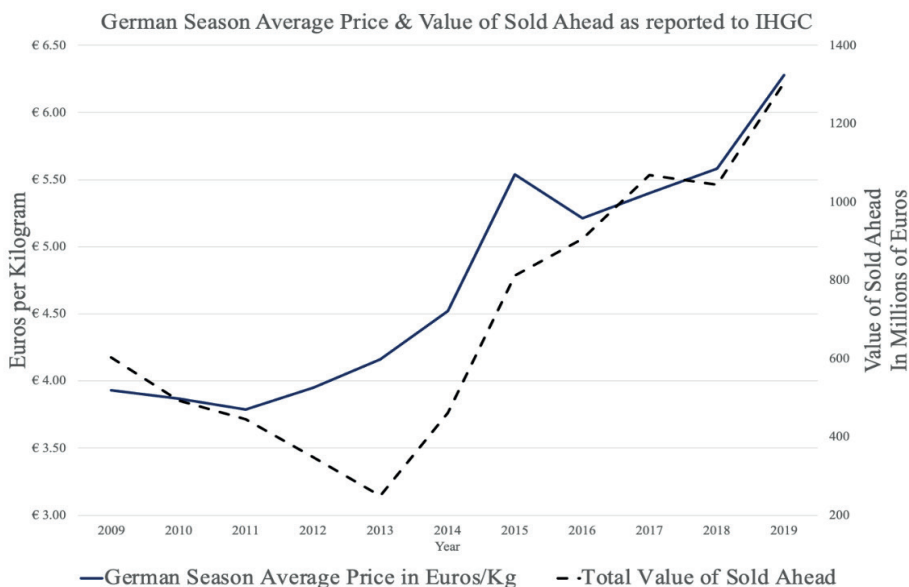


Figure 6: German SAP and Value of Sold Ahead 2009-2020. Adapted from IHGC sold ahead data as reported by Germany between 2000-2020 (IHGC, 2021a).

6 CONCLUSIONS

For the foreseeable future, the hop industry will remain a hyper competitive environment in which details regarding strategy and operations remain partial secrets. This is likely the primary reason for the dearth of published information on the workings of the hop market. For somebody involved in the hop trade, it would be financially risky to divulge such facts in an industry where so much power is wielded by so few. Those in power have no interest in exposing their tactics. Monopolies are inherently unstable and do not last forever. The future remains uncertain.

Demand for hops manifests itself through the customer's willingness to purchase hops which can only be measured in hindsight. Creating an accurate image of brewer demand for hops is a challenging task. Price is responsive to the quantity of hops perceived to be available to the market. Demand is slow to react to changes in price. Severe changes are necessary to increase sales.

The concept of hop supply represents an estimate. It is a perception by members of the brewing and hop industry regarding the quantity of hop products available to the market at any given time, which can change with circumstances in the market. So long as an event does not occur that changes that perception, it represents reality. Supply is reported by growers and merchants.

Growers and merchants alike, jostle for power in a unique industry. As they adapt to myriad changes, they attempt to preserve and grow their wealth and spheres of influence. For some, current trends will represent an existential crisis. There has long been a struggle for power between rivals. Vague images of a potential future in which a potential victor emerges are starting to emerge. Whether the brewing industry will continue to enable the concentration of power remains to be seen.

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