

New aesthetic regimes: the shifting global political ecology of aroma hops

Abstract: This paper argues that the switch from bittering to aroma qualities as a way to value hops has shaped new political ecologies and economies of hops production and marketing globally. The value of aroma hops has grown significantly over the last decade. The aesthetic and chemical properties of new aroma varieties are central to the new cultural and political milieu of the rapidly expanding craft beer brewing sector. In response, some hop-growing regions are expanding their production, while others are re-orienting to new market dynamics while attempting to maintain their existing production traditions. This paper draws on qualitative fieldwork in the USA, Aotearoa (New Zealand), the UK, and Germany to explore the political, social and economic effects of the massive and rapid growth of aroma hops production. We consider how the botany of the hop plant has influenced the development of new power dynamics around distinction and control of aroma hop varieties, what we identify as a new aesthetic regime. The new aesthetic regime we describe reshapes regional infrastructures in breeding, cooperative marketing, and trade, while bringing regions into new relations with each other.

Introduction: the growth of aroma hops

Beer brewing and consumption has undergone a significant transformation over the last three decades. In the early 1990's, microbreweries proliferated in the United States, beginning a craft beer 'revolution' that has spread globally (Elzinga et al. 2015; Elzinga et al. 2018; Gatrell et al. 2018). Throughout most of the 20th century the global brewing sector was characterized by the mass production of standardized low-hopped lagers designed to be consumed in large quantities. Mainstream beer production is increasingly highly concentrated among mega-players like MillerCoors (now Molson Coors), Anheuser-Busch (the brewer of Budweiser) and Heineken. The craft brewing resurgence, in comparison, is premised on flavor-heavy styles of beer, such as IPA (India Pale Ale) beers, and associated styles like APAs (American Pale Ales), Double IPAs (IPAs with extra hops and malt), and hazy IPAs (IPAs with large hop additions following fermentation).

At the center of this social and economic revolution in beer are new varieties of the hop plant, known as aroma hops. Previously used as a standardized bittering and preservation component, hops are now the single most valued and consequential ingredient of craft beer (Moir 2000). Instead of using hops to simply bitter the beer, new styles of craft beer are distinct in using hops to flavor the beer. In this paper, we argue that the increased use of hops as flavor and aroma agents reshapes the role that the hop plant plays in the beer economy. The parts of the hop associated with aroma contain a variety of compounds, as opposed to the single chemical compound associated with bittering. Defining hops by their aroma makes these parts of the hop plant more active in hop economies, changing how hop growers interact with breeders, brewers, markets and each other. The mobilization of unique flavors by brewers to signal the independence and distinctive qualities of craft beer production reifies and responds to the new political-economic and cultural role occupied by hops in a global marketplace.

The new values constructed around flavor and aroma have rapidly reshaped hops production globally. To develop analytic insights into the meaning of changes to hops production, we draw from frameworks in political ecology to better understand how the features of hops plants become economically and politically vibrant or active. In doing so, we build on Scott's (2017) work on the political effects of grain crops, which have been

understood through the lens of legibility and their utility for state-making. We argue that the political effects of hops are better understood as the consequence of a new aesthetic regime, displacing dynamics associated with bittering hops which constitute another, older aesthetic regime. The previous regime primarily valued hops based on their bittering qualities. These are qualities that can be easily standardized and measured. When bittering hops are used, the resulting bitterness of a beer, expressed as International Bitterness Units or IBUs, can be calculated and standardized based on the alpha acid content in the hops. The ability to quantify bittering makes hops, when valued in this way, commensurable and substitutable in the global marketplace, and allows for predictability in brewing recipes. In recent decades, however, the dominance of bittering qualities has been increasingly displaced by the desire for the different aromatic and flavor qualities hops can impart in beer. The new focus on aroma represents a fundamentally different way of understanding and using hops, with considerable social and economic effects on their production.

We borrow the term aesthetic regime from Ranciere (2013) who used it to reflect on historical shifts in the symbolic lexicon being circulated in art and to recognize the social politics implicated in those shifts. For example, Ranciere describes how the 18th century frenzy over the Belvedere Torso—a headless, limbless sculpture of a human—can be seen as a revolt against the limited politics that were available to art when its purpose was viewed as simply capturing and circulating beauty and expression. No limbs and no face in the Torso meant no expression and no beauty could be evaluated according to the standards of the time, and the celebration of the Torso ushered in new political capacities in art where it was no longer confined to the role of pure pleasurable consumption. The concept, adapted, can help to clarify the relational power represented by new food aesthetics—here, we define aesthetics as the smells, appearances, textures and tastes that are produced, recognized, and consumed. In turn, aesthetics are also defined by those smells, appearances, textures, and tastes that are made invisible. What Ranciere's concept draws our attention to is the ways in which aesthetics are always co-produced by materials and humans, as we intentionally create objects to be consumed in relation to their natural qualities. Aesthetics are also always cultural and political, as they either support and maintain the logics of existing or dominant production regimes or challenge them.

Aesthetic regimes also relate to work in new materialisms which focus the ways that the materials in our lives affect us and shape our capacities for actions (see, for example, Bennett 2009, Barry 2001; Tsing 2015). Aesthetics is about the effects (and affects) of objects on humans through embodied sensation. The concept of aesthetic regimes is intended to denote the ways that aesthetics, and the ways they are produced and experienced, are part of a historically situated social and political environment. The aesthetics of things become crafted to allow for specific ideas and cultural readings to be advanced; to allow for a particular kind of communication in market relations. While there has been considerable work looking at materials, and particularly technologies, as having a type of agency within the creation, stabilization, and transformation of market relations and the politics therein (for example Cetina 1997; Cetina and Bruegger 2002; Callon 2008; Barry 2001; Barry and Slater 2002; Preda 2006; Marres 2009), this paper extends this body of work by looking particularly at aesthetics. In the case of food, aesthetics are produced by and part of a larger social and political context, but within a very specific medium: plants.

In developing the concept aesthetic regimes, we also add to a long line of work that has considered plants as affective—having an influence on other human and non-humans in their orbit beyond their utilitarian input via the delivery of food calories. The interest in affect is part of a broader concern with the agency of non-humans, to get away from under-theorising and overlooking the role various materials play in shaping social life (see Bennett 2009, Coole and Frost 2010), economic life (Pinch and Swedberg 2008; Swedberg 2011;

Beunza and Stark 2004), and food systems in particular (Goodman 2001; Legun and Henry 2017). Work on non-humans generally has been elaborated to think more considerably about the role of plants as a particular kind of materiality.

There is a growing body of work taking the unique agency of plants in more-than-human accounts seriously. Drawing from the philosophy of Michael Marder (2013), Legun (2015a, 2015b, 2017) has described how the particular liveliness of apple trees has had far reaching effects on the evolution of the apple industry, while Robbins (2012) brilliantly described how the botany of grass has participated in the political ecology of Lawn People. Similarly, Head and Atchison (2009) consider how plants are meaningful actors in human geographies through a number of affective roles, from their role in food, to gardens, to migratory histories. Head et al (2014) elaborate on the distinct, affective “plantiness” of plants, and describe how taking it seriously decenters humans in agricultural and aesthetic regimes (See also Head and Atchison, 2016; Krzywoszynska, 2017). A similar line of work has been developed in the theorizing of cropscares (Bray et al 2019) as a grounded and geographically situated way of understanding particular kinds of moving histories of human and non-human assemblages. Our approach borrows from Head et al’s geography of triticales, which reconsiders the concept of wheat as co-produced by the ‘plantiness’ of grass and the goals of human actors, and the work of Legun (2015a, 2015b, 2017) that centers on apple trees in horticulture. Similarly, “aroma hops” are constituted by human growers and the ‘plantiness’ of the hop vines grown in specific locales. The agency of plants in the development of US hop growing has received attention, showing how hop plants impact the direction of breeding and the contours of the industry within the US (Comi 2020; 2021). Our work builds on this by considering specifically how plants and humans co-create aesthetics in food, or the ways that food is sensed and experienced, and we place this within the context of industrial dynamics and change.

Our terminology of an aesthetic regime, denotes the ways that mobilizing aesthetic features of the hop—aroma—influences the distribution of power among different industry actors. The focus on aesthetics, as the cultural and material foundation for sensing, builds on a growing body of work in visceral geography, as elaborated by Hayes-Conroy (2017, see also Hayes-Conroy and Hayes-Conroy 2008, 2010). The approach of visceral geography approach suggests that bodily experience is central to understanding intersections of ecology and politics (see also Mol’s 2008 work, *I Eat and Apple*). Watson and Cooper (2021) elaborate on Hayes-Conroy, calling for a ‘source to senses’ approach to account for the role of flavour in organising food geographies. They too draw attention to beer and aroma as an important illustration of far-reaching effects of the growth of craft beer and aroma. The argument in this paper extends work in visceral geography by linking sense and plants in agricultural production. Sensory features are inherently bound up with the botany of the plant itself, and its more-than-human agency. Aromatics shift the hop plant from one with a more functional purpose—bittering—to one unmoored from utility and relocated to the realm of taste, making it both expansive in the ability for hops to be differentiated in a market according to seemingly limitless quality claims, and also highly subjective in its evaluation. The result is a proliferation of new varieties all valued based on their brand and uniqueness, and a changing social and economic landscape in hops production. That landscape involves a new role for breeding, challenges for production cooperatives, and new market relations between brewers and growers.

To advance this argument, we draw on qualitative data from interviews conducted by the authors in the UK, USA, Germany and Aotearoa (New Zealand)¹ – four globally

¹ Aotearoa is the Māori word for New Zealand, and we have adopted the common and respectful convention of referring to the country as Aotearoa (New Zealand) or Aotearoa (NZ) here.

significant regions of hops production and varietal breeding that are deeply implicated in the new aesthetic regime we describe. These regions are diverse, but meaningful to the central role they play in historical and contemporary hop production: Germany has the oldest hop industry globally, and until very recently, also produced and exported the most hops. The USA is now the largest producer of hops globally, and it also the largest consumer of aroma hops as home to the largest craft beer industry. It has been the largest producer of beer since the 1980s, but hop production in the USA remained below that of Germany until the growth of craft beer and its focus on aroma (see Knudsen et al 2020). This shifting dynamic between Germany and the USA is a valuable comparison for understanding the significance of aroma hops. Aotearoa (NZ) is a relatively small producer of hops in terms of quantity, but it has recently witnessed a massive expansion of hops and plays a significant role in the new aesthetic regime, as the producer of the highest valued hops in the world. It is an example of a production region that was previously quite marginal, but has culturally and symbolically become a powerhouse in the new aesthetic regime. The UK, our last case region, is also culturally significant, as a major historical player laying the foundations for aroma hops and the craft revolution in beer, as we describe, but exemplifies a highly divided hops production environment due to its institutional organization and ecological conditions. Researching across these regions allows us to better understand how changes in the aesthetics of hops for beer constitutes a broad change in the dynamics of production globally and in ways with varying effects on regions depending on their ecologies, resources, and histories. The comparison of regions elaborates the regime aspect of the aesthetic regime, that it repositions producers in the global marketplace.

We begin the paper by placing the idea of an aesthetic regime within a discussion of the politics of crops, and the history of the hop plant itself in preservation and bittering. We describe these historical processes through the lens of legibility. We then describe the emergence of craft beer and aroma hops, describing the role of the plant the co-creation of a new aesthetic regime. We then elaborate on this new aesthetic regime using our cases, emphasizing how those regions are being reorganized in different ways based on their ecological and social conditions. In particular, we detail three areas in which these shifts are underway: in the importance of breeding programs that can develop aroma hops, creating challenges for regions with pest and disease pressures that shape breeding agendas; in the new forms of varietal marketing and influx of private capital, that is incompatible with production cooperatives so central to hops production and marketing historically; and, new kinds of exchange relations with the owners of proprietary varieties and brewers, who want increasingly bespoke services from growers. This leads to our concluding argument-that the new hop aesthetic regime, co-constituted by the botany of the plant, makes it an emblematic “neoliberal crop” within the set of production relations it has supported.

A botanical history of bittering hops

While there is a long history of small scale and regional beer production characterizing what we would call “craft beer,” there is no doubt that craft or specialty beer has rapidly expanded in terms of global markets and consumption (see Reid et al 2014; Garavaglia and Swinnen 2017; Gatrell et al 2018). One feature of this craft beer expansion is new forms of product-end differentiation. Gatrell et al. (2018) suggest that this differentiation is tied to the branding of localized human-nature interactions, operating at the intersection of nature, place and identity. Clemons et al (2006) in a relatively early study of craft beer characterized the industry as a site of “hyper-differentiation.” Part of this differentiation is supported by diverse brewers using different recipes, but it is mostly fueled by the expansion in variability in ingredients (Gatrell et al 2018). While wild and unique yeasts also play a role

in this differentiation, it is the distinct chemical, aromatic and botanical qualities of new varieties of hops that are fueling the craft beer revolution, rapidly escalating the value of the hop plant. As we come back to later, these forms of variation are co-produced by the hop plant whose botany was redefined by new production processes, but in a way that is directly confronting conventional brewing processes by large corporate brewers that commodified the hops according to global standards.

When hops are used for bittering mass-produced beers, they are added early on in the brewing process. The most important component of the hop for bittering is its alpha acid content. Alpha acids are found in lupulin, the resin-like component of the hop cone. Importantly, alpha acids are easily measurable and hop varieties bred for bittering are largely interchangeable. In other words, bittering hops can be translated into a single chemical compound and made commensurate regardless of their outlying chemistries. One can easily situate a hop on an alpha acid scale which will tell the brewer its bittering capacities. These hops follow a market pattern that is typical of an agricultural commodity, where price is determined by supply and demand, production patterns are focused on improving efficiency and yield, and market competition is premised on producing hops with the highest alpha acid content for the lowest price. Historically, there were social mechanisms to ensure the quality of bittering hops were maintained and prices remained sustainable. In traditional bittering hop producing regions such as Bavaria (Germany), Czech Republic, the USA and the UK, hop growing was historically based on forms of regulated cooperative production, often with the significant support of the state in research and marketing (e.g. Torrens 1967). Due to its functional role in beer and the ease with which its value could be established through its bittering capacities, the hop plant historically aligns with the kinds of social relations we would associate with staple crops.

The social relations emerging from grain crops is well elaborated in James Scott's *Against the Grain* (2017). His work describes the emergence of the earliest states in Mesopotamia, and how cereal crops and the grains they produced were key players in state formation. Efforts to make cereal crops and livestock more productive, in the face of abundant food provisions that could be accessed through foraging, set the foundation for new types of more laborious relationships between humans and their environment. States were needed to coerce populations forcefully to become sedentary and take up agriculture as a primary source of sustenance, and to generate the material means for taxation: grains. The material properties of grains made them particularly useful for taxation: they were easy to quantify, store, and transport. In this sense, Scott suggests that in their legibility, "grains make states." Legibility in this sense refers to the ability for tax collectors to easily calculate a tax on a given parcel of land given a basic understanding of soil type and assumed yield, and to increase taxes by introducing yield-increasing practices. The formation of the state structure can be seen to reflect the botany of grain crops.

Staple crops can be seen to clearly play a role in the kinds of largescale political exercises that comprise state-making. Their foundational role in the provision of calories and support of populations means that they can be used to extend state power, or they become a focal point of resistance. We see some of these tensions most clearly in colonial contexts and in ways that reflect particular plant botanies, as Fischer (this issue) describes in the context of maize in South Africa. Soy is a focal point for state-making in Argentina, and like Fischer's work, both a site of state control and farmers resistance (Raucheker this issue). Staple crops can also be seen as provoking and underpinning the development of new kind of digital agriculture, as Duncan and Marquis (this issue) describe. They show how cereals have the features that enable them to more easily inspire particular kinds of highly digitalized imaginaries and practical projects. We too are considering the shape of an emergent style of

agriculture, but one reflecting the unique characteristics and affordances in the botany of specialty crops.

Specialty crops include fruits, vegetables, nuts, herbs, and flowers. They are considered to be more labour intensive in part because they are often perennial, meaning that the same plant may be used for production year after year, and in part because the thing that they produce is often more delicate. The result is a plant that often needs a bit more attention and care than cereal crops. Hops are considered a kind of specialty crop. Every year, hops send up bines, that are vinelike shoots that climb, but unlike vines, do not use tendrils to attach and climb up a surface, but twist around a support structure with their stem. However, unlike specialty crops like apples or tomatoes, the bines are harvested by being cut at the bottom of the bine, but the roots remain and will produce a plant again the following year. Hops are dioecious, having a male and female plant, and the female plant produces the cones used for brewing beer. They aren't grown from seed, but traditionally from the propagation of cuttings from a plant creating essentially a clone of the plant it was taken from. In high-earning markets like Yakima, tissue culture propagation is increasingly common, which lowers the disease burden of new plants. Unlike other perennial crops like apples or citrus, hops are more materially amenable to industrial methods because the entire plant can be removed each season, and the cones that are used for beer are largely dried and processed. In some ways, hops are an intermediate between grains and fruits in their agricultural botany, influencing the ease at which they can at once emulate grains in their regulatory history, detailed below, and depart from it, as we detail later in the paper. Notably, this is unique to the family—few other true bines are cultivated commercially, the results from our study have socio-material relevance to the expanding market of hops' botanical cousin, Cannabis.

Hops have historically played a similar role as a site of regulation, negotiation, and resistance. Hops became a focal point for regulation partly because of a unique capacity of the hop plant: it is a highly effective preservative for beer. The preservation capacities of hops were key to their introduction to beer in the Middle Ages to displace a mixture of herbs called grut or gruit that was taxed by local authorities (see Poelmans and Swinnen; 2011). Fearing the loss of the tax revenues, the use of hops was banned at varying points across Europe, with lasting influence on brewing processes (Poelmans and Swinnen 2011). In breweries in Belgium, sour beer is still brewed in regions where hops were banned (Degrande 2010). Grut did not prevent acidification, while hops did, such that their regulation altered future trajectories of beer production. On the other hand, in the 16th century what is now Bavaria in modern Germany carefully stipulated that hops would be one of three ingredients that could be included in beer: barley, hops, and water. Known as the Reinheitsgebot, this standard is still in use today and has a powerful cultural impact on beer marketing. The Reinheitsgebot has supported the continued iconic power of German beer in international brewing, and can be seen as a participant in processes of standardization in beer recipes, so much so that some have argued that it has impeded the participation of German beers in these new beer market, grounded in diversity (Eble and De Vries 2018), a topic we also elaborate in our own research findings. Indeed, many of the styles of beer we see on the market, from Pilsners to Porters to Ales, have been heavily regulated, so that local brewhouses would sell a version of a beer that would not differ substantially from those produced in other brewhouses.

While standardization was initially part of a localized production system, this set the foundations for the expansion of largescale production of beer, primarily Lager, for global export, and the result has been the consolidation of breweries into large multi-nationals. Here, the standardization of hops into alpha acids has played a large role, as breweries have sought the most efficient and cheap alpha acid delivery systems. Bittering varieties dominated 20th century hops production as producers attempted to increase yields of alpha acids, and

advances in plant breeding now produce hop varieties with over 15% alpha content.² Within the brewing process itself, bittering hops are used in a way that components other than the alpha acid are boiled off, so the hop plant is truly transformed into a basic additive. The variety of hop (in other words the plantiness of the hop) used is virtually irrelevant, and bittering hops growers are all competing with each other to supply breweries the same highly commodified product.

The emergence and aesthetics of aroma hops

India Pale Ale, the heavily hopped beer that participated in British colonial relations with India, has a notably different historical trajectory. This style of beer (stylized as ‘IPA’ in the craft beer industry) popularly traces its roots to 18th century London, when George Hodson of Bow Brewery in the UK began exporting his ‘October Ale’ through the East India Company (Haugland 2014). October Ales were a style from the European mainland, where fresher hops were used quickly after the harvest, producing a hoppier flavoured beer. Located relatively close to the East India Company headquarters, Bow Brewery developed a relative monopoly on beer exports to India, with their October ale gaining them a majority of their profits. October Ale would be rebranded as India Pale Ale, produced largely in Burton-upon-Trent in the UK, and exported all over the world (Haugland 2014; Pryor 2013). The UK also became the site of some of the earliest aroma hops, the Fuggle variety, developed for their resistance to mildew in the UK and transported to the USA, where their the strong citrus flavour would become a foundation of the West Coast, and then global, craft beer scene (Haugland 2014).

With advancements in logistics, transportation, and sanitation, as well as the increasingly industrialized character of the global brewing industry in the 20th century, the IPA was displaced by more readily standardized lager styles. Yet, over the last 20 years, IPA styles have resurged as the cornerstone of a new wave of craft beer and brewing that appears as fundamentally incompatible with mass produced beer. Craft brewers brew beer with stronger flavours and higher alcohol content, meant to be consumed in smaller quantities. The IPA is central to these efforts, as this style of beer emphasizes the variable flavours of hops that are incorporated into the beer later in the brewing process. By simply adding the hop later, different parts of the plant make it into the beer, and these carry much greater flavour variability that is difficult to standardize. The hop plant produces terpenes stored in the cone that have varying levels of water solubility and volatility. Some of these terpenes can only be sensed in the final product when the hop flowers are added to beer at the very end of the boil (in a process called ‘aroma’ or ‘whirlpool’ hopping), or following primary fermentation (in a process called ‘dry’ hopping’). While the translation of the hop into bittering units is easy to predict when the hop is added early which causes terpenes to volatilize, the flavours that result from terpenes that remain in the solution after dry hopping can be difficult to predict and standardize.

Like the Belvedere Torso we described earlier in the paper that challenged the prevailing uses and evaluation of art through the absence of a head and limbs, so too does the use of these new hop terpenes in the brewing process change the social and political landscape of brewing. Not only do different varieties of hop have very different flavour profiles when added later in brewing, but the same variety of hop that is grown in different locations can taste quite different (see Barry et al 2018). The hop plant, in collaboration with brewers and growers, has created a new regime of beer where taste is no longer the product of

² In contrast, the Hallertau hop variety that has been grown in Europe as a bittering hop for centuries has an alpha content of about 5%. Today, the Hallertau variety has been revalorized for its aroma qualities.

a carefully followed recipe with stable ingredients, but instead the non-standardizable qualities of ingredients, and particularly hops. Changes in brewing are based on the new forms of differentiation created by those highly variable compounds in the hop plant, changing the dynamics of hop production, and representing what we call a new aesthetic regime.

The new aesthetic regime we see in hops is part of broader shifts in food production. The preoccupation with distinction and the maintenance of difference has been observed through efforts to use provenance labelling (Goodman 2004), alternative food networks and local food (Goodman et al 2012), relationship branding in coffee (Vicol et al 2018), and varietal differentiation in apples through forms of carefully managed licensing (Legun 2015a). These echo observations about a discursive shift in agriculture and food³ away from a state-centred productivist paradigm towards a regime that emphasizes quality (Murdoch et al 2000, Winter 2003), more direct relationships between producers and consumers (Vicol et al 2018) and symbolic attributes such as sustainability and social justice issues (Daviron & Ponte 2005). These shifts can be seen as a desire to develop producer-consumer relations that emphasize “food from somewhere” (Campbell 2009) or “food from here” (Schermer 2015) to counteract the alienating tendencies in what McMichael has called a “food from nowhere” food regime (2002, drawing from Bové and Dufour 2001). Others have identified a tension emerging in the politics of this new food landscape that reinforces a neoliberal market logic, so that efforts towards quality, transparency and ethical trade become incorporated into value propositions, captured by corporate actors and furthering a neoliberal approach to food system governance (see Friedmann 2005; Pechlaner and Otero 2010). The different ways in which aroma hops are acting upon our four production regions reveals a practical illustration of these new politics in action.

New hop aesthetic regimes and the politics of production

In the following sections, we describe changes being experienced through the new hop aesthetic regime in the USA, Aotearoa (New Zealand), the UK, and Germany, all sites that play an important role economically and culturally in hops production as previously described. These findings are based on primary data from detailed qualitative interviews primarily with hop growers, but also a hop breeder, five brewers of craft beer, and cooperative representatives in each of these regions. 16 interviews were conducted in the USA, mainly in the Yakima region of Washington. 14 interviews were conducted in the Nelson region of Aotearoa (New Zealand). 7 interviews were conducted in the Kent region of the UK. 8 interviews were conducted in the Hallertau region of Germany. In some cases, there were multiple people in a single interview. See details about these participants in Table 1. Across regions, we spoke to 35 hop growers, 7 breeders, 6 representatives of cooperatives or non-cooperative marketers, and 6 brewers. In some cases, these roles overlapped, as in some cases, a non-cooperative marketer would also run a hop breeding operation, or a grower would also be a cooperative representative. In these cases, we counted participants as participating in both roles where it seemed most accurate and appropriate. Our interviews took place from 2017 to 2019. We also draw on observational data collected by the authors in each location, pertaining to, for example, the extensiveness of hop production in a region, which differed significantly in the Hallertau region of Germany and the Nelson region of Aotearoa; or, the visibility of historic hop infrastructures, which were prevalent in the countryside in Kent in the UK, where oast houses frequently dot the landscape. These observations influenced our interpretation of interview data, as helping us to add context to

³ These trends are particularly well documented in ‘high value’ sectors such as wine, coffee, chocolate and horticultural crops.

things like descriptions of the cultural importance of hops in Kent and how exchange was historically organized, or discussions of disease sweeping through hop gardens in the Hallertau. The researchers used open-ended questions, and asked about processes and practices, changes in the industry, and expectations for the future, and often accompanied interviews with a walk around the hop garden.

Table 1: Participant characteristics				
Country	Number of interviews (distinct interviews)	Number of interviewees	Gender	Industry history of participant (intergenerational, extensive (over 20 years), or recent)
New Zealand	14 (12; 2 were conducted with the same people twice, two years apart)	14	12 male, 2 female	2 x Intergenerational 4 x Extensive 6 x recent
UK	7	9	7 male, 2 female	4 x intergenerational 1 x extensive 2 x recent
Germany	7	9	3 female 6 male	3 x intergenerational 2 x extensive 2 x recent
USA	16	21	3 Female 18 Male	14 x intergenerational 1 x extensive 6 x recent

In the following sections, we trace the interconnected effects of the growth of craft beer and aroma hops that make up the new hop aesthetic regime. We begin by describing how breeding programs, which operate at the intersection of industrial organization and plant botany, have shaped the new aesthetic regime. We then describe how the cooperative forms of organization in these hop producing regions less compatible with this new aesthetic regime, which has been increasingly driven by private capital and private enterprises. Lastly, we describe how the growth of aroma varieties shapes global production dynamics through the conditions of exchange. A common thread throughout the case studies highlights the ways that the new hop aesthetic regime emerges from, and in many cases in opposition to, a more productivist form of commodified hop production. Through our analysis, we are describing the social and political changes that result from making new hop terpenes salient and valued, but these are also differentiated in such a way that they create opportunities for forms of social control. These forms of control are based in intellectual property and market mechanisms, which support our claims that aroma hops have become an exemplary neoliberal crop.

Breeding Programs

Across all regional cases, growers noted that a major player in the construction of what we call the new hop aesthetic regime are the hop breeding programs that have long and distinct histories in each location.. These breeding programs operate at the nexus of historical institutional production relations in each region and the particular plantiness of hops.

Breeding new hop varieties involves the cross pollination of existing varieties. Each seed that is produced through cross pollination will produce a hop plant with slightly different characteristics—to cross breed successfully, hundreds of seeds from that cross pollination may be planted and tested with the overwhelming majority producing a plant that does not have desirable characteristics (for further details, see Comi 2020). As a result, when hop plants are bred, the outcome is highly unpredictable, and it is impossible to breed for a particular characteristic without having likely effects on other traits. Earlier, mid-20th century hop breeding programs in all four countries in this study were focused on increasing alpha acid content. Importantly, however, efforts to breed for higher levels of alpha acids also unintentionally generated hops varieties with interesting and diverse flavours. In the USA and Aotearoa (NZ), the incidental breeding of highly flavourful varieties initially valued for their alpha acids could be quickly channeled into an intentional program for flavour varieties. The development and strategic focus on breeding flavour varieties has been more difficult in the UK and Germany.

Take, for example, Harrison⁴, a large hop farmer in Washington who is also part owner of a breeding and merchant operations. Notably, as we describe in our next section on institutions, these are private breeding operations. Harrison describes how his father first became involved in breeding new hop varieties to increase their alpha-acid content and therefore their bittering value as a way to improve profitability for commodity contracts with large beer companies. Breeding efforts such as this produced new varieties with unique aroma qualities, meaning US growers were well placed to respond to the new desires of a nascent craft beer marketplace in the US:

Hops were sold by the pound in the 70s. In the 80s, it started to be sold by the pound of alpha, or the bittering substance that's used by the big brewers... We began to try to develop varieties that would have a higher alpha per acre than the other varieties, because you're trying to sell them by the alpha. That eventually led into this breeding program, ... There were some varieties that came out of that program that were very interesting, but the big brewers weren't really interested in it. It just didn't have what they were looking for. I don't know how familiar you are with beer in the hop industry, but one of those varieties that was very unique was Simcoe™. We almost took it all out, because there just wasn't interest from the big brewers. Once the craft industry started to delve into and find these unique, different varieties, [brewers]... really begin to utilize these varieties. (Harrison)

In this telling, new desirable flavours were identified in varieties previously developed as “high alpha varieties.” The small number of large farms which survived market contractions and lean alpha-based pricing in the 1980’s and early 2000’s rapidly inverted their growing portfolio to now produce primarily hops grown for aroma applications. (see Comi 2020, 2021). While this switch is partially a material shift in what varieties are being planted in Yakima, it is also the result of a contemporaneous ontological and aesthetic shift over the last thirty years in how hops, and the different properties of the plant, are being identified and valued.

Like the USA, the now most sought-after aroma variety produced in Aotearoa NZ, the Nelson Sauvignon Blanc, was an accidental byproduct of a breeding program focused on developing high alpha acid hops for large commercial breweries like Lion. Large brewers had little interest in the variety and it was initially only produced in very small quantities before being

⁴ Names used in this paper to refer to research participants are pseudonyms

revalued for its distinctive aroma aesthetics by craft brewers. The Aotearoa NZ breeding program was historically a joint venture between the government and the hop growers' cooperative that, until recently, included all hops producers in the country. It was the lack of pest pressures that allowed hop growers here to experiment with varieties like the Nelson Sauvin in the first place, and once craft brewing took off they were well poised to take advantage of the demand for new aroma hop varieties in part because of their small and highly coordinated industry. Aotearoa NZ growers quickly generated the most valued and unique varieties in the international hop market. As Chris, a grower whose family has moved in and out of hops production over generations, explained:

“because we don't have some of the pest and disease they have in Europe and America, their research programmes were often focused on disease resistance and things. We needed to have some disease resistance, but we weren't focused on disease resistance. We are focused on agronomics and flavour. And all of a sudden, the craft beer thing came along and out of the down turn of 2010/11, people started saying, “They've got some really good new hops down in New Zealand,” and some really good press and things just went a bit crazy.”

The breeding program in Aotearoa (NZ) has enabled the regional industry to be the most profitable in the world through the development of high value varieties. Growers cited prices for one of their most popular varieties, Riwaka, as being more than double other aroma varieties. As we describe in the following section, this peaked the interest of private investors who are now challenging the cooperative organization of the industry.

In contrast, the breeding programs in the UK and Germany had to focus heavily on breeding varieties that were disease resistant. In the UK, growers repeatedly referred to the plague of verticillium wilt they had to manage. This fungal disease has had a massive impact on the institutional landscape of the UK hops production, so much so that it has split the country into fundamentally different industries based on whether they are on the side of the highway that has verticillium wilt, or the side that does not. The Midlands area, where wilt has not been as much of a problem, has been heavily engaged with generating aroma hops, while Kent has had to contend more with disease challenges. The national breeding program, Wye hops, has similarly been split, whereby investment from Midlands companies have supported the development of aroma hops for craft beer, and disease resistance in classic iconic varieties like Fuggle, arguably the first aroma hop. Germany faces similar levels of disease pressure, most recently from powdery mildew which has a huge influence on breeding priorities, as well as the varieties that are marked as desirable for production.

Disease pressures are a hurdle, but not a complete impasse, for breeders in the UK and Germany. For example, looking at a series of hop vines, Lottie said, “This is a new variety. It's really very tasty, but nobody likes to buy it. And we must take it away from our production.” “Why did you decide to plant that?” we asked. Lottie responded:

It was a new culture to grow special flavor hops, and we were interested... it's really a good to cultivate. It grows very easy, needs little plant protection...But this flavor is also noisy, so loud- Can you understand? So, extreme that the brewer doesn't like to brew it. They don't take it.”

Lottie described how new aroma varieties developed by German breeding programs were desirable because they aligned with the new culture, or aesthetic regime, of craft beer, while being disease resistant. However, the marketing of these varieties is a challenge in Germany, as we discuss in our following sections.

Organizational environments and proprietary varieties

New aroma varieties being grown for the craft beer market are carefully managed through licensing mechanisms associated with patents. These licenses can stipulate who can grow the variety, and how much can be grown, but most commonly they regulate how the hops can be sold and their price. These mechanisms allow for newly developed aroma hop varieties to remain bounded, controlled, and carefully branded, a feature not considered important for bulk produced, commodity bittering hops. These branding and licensing mechanisms are instead a new legal feature of the new aesthetic regime associated with aroma hops, signaling the importance of maintaining some kind of coherence in a context of such variable and distinct flavours. However, different regions have had different experiences with this proprietary style of production within their broader institutional contexts, particularly in ways that related to the structures of cooperatives. The tradition and infrastructure of collective marketing shapes the ways regional actors are able to privatize hop varieties, and how they can engage with the branded varieties of other international actors.

In the USA, branding new aroma varieties and managing them through licenses has become a dominant mode of industrial organization, whereby growers or breeders will maintain control over a variety. The controlled production and marketing of varieties has been an incredibly successful practice for the US hop industry. Harrison, one of the two brothers mentioned earlier, explains how new hop brands seek to decommoify hops by revaluing them based on aesthetic qualities resulting from volatile oils instead of commensurable alpha-acid content:

Alpha, I don't think it'll ever change. Alpha is alpha. That is going to be the commodity of the hop market, probably for the foreseeable future. But as we extend these aroma hops out in the international markets we want to see that same level of consistency go out into those markets as well. So that's where you start worrying about some of these political pressures and whether or not the added cost say of getting a US hop to those markets is going to be enough of a deterrent to us being successful in getting that effort of de-commoditization spread to those areas.

Harrison describes the “decommodified” or “craft” hops of Yakima are co-created with volatile oils. These are currently primarily sold in the US but described as having real global appeal, which is evidenced through expanding international sales. These company’s tight legal control over many popular, proprietary, craft hop brands has been enormously successful from a financial standpoint. The control exerted by a small number of vertically-integrated large growers with ownership stakes in breeding and merchant companies in Yakima and the US Northwest has had rebounding impacts on both US domestic production and on global hop demand trends. Particularly, Yakima growers have augmented the aroma hops market by introducing, branding, and managing a growing number of novel “decommodified” varieties as a method for producing desirable aesthetic qualities. However, as the quote illustrates, this vision of decommodification and its proprietary components can encounter challenges in the institutional contexts in other regions.

In Aotearoa (NZ), the patented and managed variety model has also been adopted, but in ways that illustrate the tensions between the kinds of branding and vertically integrated infrastructures associated with the new hop aesthetic regime, and cooperative breeding and marketing programs that have been so strong and instrumental in the past. Initially the grower cooperative, NZ Hops, was a wildly successful mechanism for developing and marketing new hop varieties. The cooperative included all hop producers in the country and they co-funded

the breeding program with the state, and marketed the hops they grew together primarily to large hops buyers/distributors in international markets. Disruptive change to the hops sector came from two new actors who brought large amounts of private capital to invest in the lucrative industry, but wanted to hops to brewers directly, branding the hops competitively through claims to higher quality production, and breaking with the collective marketing program in pursuit of a more American-style model. In 2015, excited by the popularity and high prices of NZ aroma hop varieties, an American venture capitalist purchased a large hop garden from a former cooperative member. The garden has now been established as a private operation, with production, processing and marketing operated in-house, marking a watershed change. Soon after, a managed investment fund specialising in agriculture, raised over 10 million dollars from individual and institutional investors (what they describe as a ‘hop garden syndicate’) to fund the establishment of a 116ha hop farm, the largest single hop farm in New Zealand.

These two private actors initially faced a significant challenge in developing their operation outside of the cooperative, which refused to licence their plant variety rights for the highly valued aroma hop varieties to external actors. The cooperative had that anyone who wanted to grow these varieties would be required to sell back through the cooperative. However, with government pressure and through a litigious process and eventual out of court settlement, the cooperative agreed to allow other commercial parties to grow its aroma hop cultivars under a licencing system. In 2018 vertical integration was further elaborated, with the US-owned operation established its own hop breeding and market development programme known as Hapi Research Ltd., with the support of the Ministry of Primary Industries (MPI), displacing the historical cooperative-led breeding program that had been wildly successful in the development of new aroma hop varieties. The new initiative is public-private partnership between the US-owned operation, MPI, two prominent Aotearoa (NZ) and United States craft breweries, and two Aotearoa (NZ) universities. The stated aim of the program is “to grow the value and volume of New Zealand premium craft beer and hop sales, domestically and internationally” (<https://hapi.co.nz/>). The program is remarkable as even though the cooperative still represents the vast majority of hop producers and production in Aotearoa NZ, its role in and control over variety breeding has been greatly diminished.⁵ This illustrates the new role of competitive branding and vertical integration in the new aesthetic regime, and the challenges it poses to cooperatives that collectively pursue strategies determined by the membership and market hops from all growers in a geographic region. This shift is emblematic of the new hop aesthetic regime, and is seemingly driven more by ideological reasons than an economic or scientific rationale.⁶

Hops production in the UK, like Aotearoa (NZ), had been historically organized around a cooperative and a planned market coordinated with the needs of brewers. One of our

⁵ The previous hop breeding program (considered by most of our interviewees to be effective and successful) was run by plant scientists at NZ Plant & Food, a New Zealand government-owned Crown Research Institute, and co-funded by the cooperative and the Ministry of Business, Innovation & Employment. As one key informant stated, “the existing industry...they were left out in the cold”. As he went on to say, this new breeding program appears to aim at least implicitly at breaking the hold of the cooperative on breeding, plant variety rights, and marketing: “the Americans feel like they have got a product which they can actually market into the States a lot better than the model that [the cooperative] are using. According to [the US-owned operation], it’s that they’ve got a more 21st-century approach to marketing it, whether that’s true or not”.

⁶ While we were writing this paper, NZ Hops (the cooperative) announced a new hop breeding partnership with NZ Plant & Food beginning in October 2020. The program is to be funded by the cooperative members without government support. The press release from the cooperative states “The programme will look at both breeding new cultivars using parents from the Plant & Food Research collection and assessing existing selections...For NZ Hops, the agreement ensures they hold ownership of intellectual property in relation to new varieties” (<https://nzhops.co.nz/>).

interviewees, Arthur, summed up the general sentiments of our interviewees in describing this industry as “cosy.” After the UK joined the EU, the hops marketing board in the UK was discontinued, and the industry has since become fragmented with some heavily involved with the development of new proprietary varieties and allying with American hop brands and international craft production, and others calling for a renewed focus on the subtle aromatic varieties aligned with the brewing styles distinct to the UK. These approaches align with different cooperatives in the UK, which are also located in regions with distinct pest pressures, as previously described. There are three cooperatives in the UK: one in East Kent, one in West Kent, and one in the Midlands.

The Midlands in particular, where there is less disease pressure from verticillium wilt, is largely involved with the development of strong aromatic proprietary varieties. One grower described how carefully managed these varieties are:

“they are really pushing those four varieties that they consider to be their varieties. ... they’re quite effective with their marketing and they are certainly very interesting aromated hops that they are producing. They won’t let everyone pile into it. They’ll literally say, you can have half a hectare there and you can have half a hectare there. And indeed, with their newer variety, I’ve heard they’re even asking for some of their other [proprietary] hops, the other of the four varieties to be taken out. They probably only went in two or three years ago.”

In Germany, the oldest and perhaps most regulated hops industries historically, is less equipped to engage with the new kind of branding and control associated with aroma hops. While “protected varieties are getting more and more popular,” as Thomas, a manager at a major German cooperative mentioned, they are a small fraction of production and are out-of-synch with the organisational style of hops production and breeding. He continued:

“we carefully watch what’s going on in the United States. In the United States I think they have already more than 50 percent of their hop volume, is already coming from private varieties. Their production is much more controlled... Today, here in Germany, everybody is free. So you can produce as much as you like, everybody can.”

When managed varieties in the USA reached Germany, they encountered problems and criticism from growers. As Caroline described,

“I think you had heard of Amarillo. Amarillo is was bred by Virgil Gamache in USA.... he said, okay, I cannot produce enough Amarillo in USA, please produce Amarillo in the Hallertau. So, they put in about three hundred hectares of Amarillo and in the last year they reduced this ...to one hundred acres... It's a problem if you put in the Amarillo about two years ago and now you have to put it out- It's no problem with the Amarillo deal with for Virgil Gamache, for him it's no problem. But it's a problem for the farmers.”

German growers we interviewed were the least engaged with producing aroma varieties for the craft beer market, but they were significantly interested. While growers were attracted to the prices, which could be more than double the prices they received for bittering hops, the institutional arrangements associated with the new aesthetic regime remained unappealing and challenging.

Global relations of exchange

One of the greatest shifts associated with the new hop aesthetic regime we describe is the shifting geographies of cultural power associated with hops and beer. Notably, our research is situated specifically within the context of European and North American beer

styles and international hop economies engaged with export, and does not account for the vast diversity of beer styles and forms of production that happen at a more national, regional, or local level. Nor did we interview producers in all key production regions within global hop markets, which includes places like Northwest China, Czech Republic, Slovenia, Australia, and Poland. When we refer to global relations of exchange here, we are not making claims about universal shifts in beer economies or hops production, but about changes we can observe at a global scale involving multiple production regions who occupy different, but highly relevant, market positions.

In the past, the global anchor of the industry was Germany, where the majority of hops were produced and brewing processes and styles were the international reference point. With the emergence of the new aesthetic regime, the balance of power in global hops production has radically shifted. The US hops sector has recently grown from a small share of global hops production mainly for domestic applications in beer to the largest single-country producer of hops. Centered in the US Northwest, particularly along the L-shaped, irrigated Yakima Valley in Washington state, US hop producers control some of the largest acreage hop gardens using high levels of automation, capital-intensive infrastructure, and novel hop varieties primarily intended for the craft beer market. Hop farmers in Yakima often self-identify as being at the vanguard of the industry. When asked to compare his operation to others and if he had visited hop farms in other regions or countries, Terry, a hop farmer on a multi-generational hop yard of over 1000 acres told us that hop farming in Yakima is like being on the “front lines” of the industry:

“Yes. I've done a lot of [hop yard] tours and visited a lot of farms around the world...but the reality is if you want to be on the cutting edge of developing what your industry is going to look like with globalism and all this sort of thing then being a [hop] farm in the United States is the way to do it. Because you are literally at the front lines of anything that's going to be happening.”

The centrality of the US to this new aesthetic regime was echoed across our cases. Not only did this apply to the expansion of the model of proprietary aroma varieties and their careful management, but also the types of relationships and conditions of exchange that existed between hops producers and brewers.

In Aotearoa (NZ), the new private players in the industry criticised the cooperative for having more rigid, collective approaches. Hops sold through the cooperative would normally be pelletized and distributed from their shared facilities, and in some circumstances, hops could be combined or blended to fill a contract when a garden was not able to produce its expected volume of hops. In comparison, the new private players celebrated direct and bespoke sales, where brewers could come to the farm and select the precise location in the garden from which they would like their hops. Ryan, a manager at one of these new ventures, explained:

“Our view is that we need to provide excellent customer service, direct engagement, transparency, basically do for that top tier of the craft beer market what a high quality vineyard does for a top tier wine maker... The other key pieces going down that path means potentially providing some sort of specific bespoke services to some of those breweries, giving them really exact transparency into what's going on, what we do, and how we process.” (Ryan, non-cooperative)

This style of production and direct marketing is challenging for cooperatives, and when implemented in regions with marketing cooperatives, must operate outside of them. In places like Germany, where the cooperative structure is highly formalized and functional with

regard to the production and sale of bittering hops, direct and bespoke forms of exchange are challenging. Thomas, a manager at a large cooperative, explained how the old aesthetic and the cooperative style of working in Germany effects their ability to participate in the new aesthetic regime:

“So we make contracts with our farmers, we sell it to the brewing industry... we are not a huge organisation in terms of number of people. So, we are of course not able to supply directly to ten thousands brewers in Europe, another seven [thousand] in the United States ... That’s not possible.”

Discussion and Conclusion: Aesthetics and Politics in Food

Our research in the USA, Aotearoa (NZ), the UK and Germany demonstrates a historical shift in how hops are valued and produced. At the centre of this shift is the hop plant itself and its aesthetic and material properties. The relationships amongst different actors in the industry that result from a new kind of aesthetic regime emerge from the hop plant and its propensity to express itself in aesthetically different ways depending on brewing processes. These aesthetic shifts are co-created by the plant and the broader social and economic context. The unintentional unique aromas of varieties developed in the USA became highly captivating against a backdrop of highly monotonous and concentrated brewing industry. The chemistry of the hop plant lent itself historically to these processes of standardization, as we described in our discussion of the development of modern beer and the purity laws that shaped its development. The capacity of the hop plant to generate significantly different aesthetic properties, where flavour and variability are valued, plays a central role in catalyzing a series of changes. We detail those changes as relating to breeding program, industrial organization, and conditions of exchange. Together, we describe these as a new aesthetic regime.

Engagement with the new aesthetic regime of production differed in the UK and Germany, due, at least in part, to the pressures of disease and the institutional organization of their industry. In the UK, the industry is fragmented regionally, with some areas that experience lower disease pressure engaging more in the production of unique aroma hops. In other regions, growers have chosen to focus on more traditional UK varieties to supply traditional British brewers and beer styles, and they suggest that this can be their niche within this broad new landscape of diverse flavours. In Germany, growers have experimented with new aroma varieties, but found it difficult to engage with the style of marketing associated with craft beer. On the other hand, German growers and marketers noted that prices for their bittering hops were more stable with hops growers in other regions, especially the USA, switching to aroma hops. What these cases illustrate is that the effects of this new aesthetic regime have occurred at a global scale, and traditional production regions have had to grapple with it in ways that are rooted in their local ecologies and historical institutional structures. We suggest that this new aesthetic—aroma—is a regime, in that it has shifted how diverse regions think about hops, as well as their conditions of production.

It is this expansion of flavour afforded through the hop plant, emphasized through breeding, practiced through a celebration of unique consumption experiences, and capitalized on through control, branding, and proprietary mechanisms that makes it a particularly illustrative example of a crop whose botany affords and supports a neoliberal economic culture. It is simultaneously unregulatable at an industrial level, and extensively managed through market mechanisms like proprietary rights. The mechanisms and style with which management happens becomes the vehicle for political-economic power through exclusion and new forms of competition. The benefits to growers who are able to participate are huge.

The profits for a successful grower are considerable, and they illuminate many of the difficulties associated with standardized commodity production. In bittering hop production, growers were price takers, and many of our interviewees documented prices falling below the cost of production and squeezing growers out of production altogether. However, the new aesthetic regime ushers in a new set of challenges associated with providing bespoke services and romanticized forms of exchange that may accompany what is being called a quality turn in food.

The neoliberal aspects of this new aesthetic regime makes a contribution to broader discussions about trends in food production associated with a quality turn (Murdoch et al 2000, Winter 2003), foodie culture (Johnston and Baumann 2014), or interest in “food from somewhere” (Campbell 2009). These trends grow from a well-founded critique of industrial food production that generates “food from nowhere, produced by no one” (McMichael). This critique elaborates on the ways that industrial food system fails to provide stable and sustainable prices, or to support the cooperation necessary for successful environmental management. New trends in food production like the use of geographic indicators (GIs), the local food movement, or managed varietal clubs, remedy these problems of placeless, unfettered competition associated with commodity production through more control, containment and niche forms of production. These movements are sometimes considered post-productivist in the ways they attempt to challenge the forms of placelessness and facelessness and the foci on yield and efficiency that can be associated with more standardized products (See Ward et al 2008; Ilbery and Bowler 1998). The embrace of aroma hops and move away from bittering hops is illustrative of this broader trend, and the associated use of patents and licenses to manage the varieties, and bespoke services for brewers, makes sense as a contrast to open market commodification. However, we find that one consequence of wanting more transparency and closer relationships between growers and buyers may be a stronger interpolation of producers into a marketplace that is increasingly attempting to provide for highly divergent tastes and desires.

A central actor in this story is the hop plant, and the ways that the use of the hop for aroma allows for more variable components of the hop to be valued. Hops are a crop that are not consumed fresh but added to beer, meaning that changes in processing mediate what aspects of the plant become observable and economically valuable, multiplying the aesthetic shift in materially changes in the hop plant. Moreover, the growth of expensive craft beer alongside the continued production of more traditional and standard beer has likely influenced the culture of storytelling in brewing, which we might expect to transfer onto demands for a good story from hop growers, shaping their experiences. However, while hops are unique, we suspect that they are a particularly illustrative case of something we might expect to see in other crops in ways that reflect their own unique botany and production history. All crops have features that can be, and are, valued for features that can be quantified and standardized, often through things like size and colour. As consumers turn to quality, producers may challenge these standards that lead to low prices, high competition, and increasingly alienated forms of production, and like the case of hops, subverting these standards can be afforded by the botany of the crop itself (see also Legun 2015a). The botany, in a sense, opens a door, and it's a door that we as authors are happy to walk through.

However, our research also indicates how, in some cases, the quality focus in food systems can extend the reach of the market and we expect that this may placate efforts for meaningful change. The desire for smaller, controlled and transparent forms of production within a market economy makes control and transparency marketable, and while this may incentivize culturally celebrated forms of production through economic rewards and competition, it does not necessarily support the cooperative mechanisms we see as necessary for a more robust food system, or challenge forms of production seen as less desirable. In our

research, the aroma aesthetic regime challenged the operation of cooperatives, heightened the desire for differentiation, invited a surge in investment capital, and made the production of commodity hops actually a bit more profitable and viable. In short, a new aesthetic regime and a quality turn may feed our desires for a more culturally satisfying flavour in food, but the taste can be distracting. In the case of hops, and we suspect other products as well, the mechanisms through which flavour is provided carries a new set of challenges and power dynamics that also need our attention and may stifle meaningful change.

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