Tools of extraction or means of speculation? Making sense of patents in the bioeconomy

Veit Braun

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Maria Backhouse · Rosa Lehmann · Kristina Lorenzen · Malte Lühmann · Janina Puder · Fabricio Rodríguez · Anne Tittor
Editors

Bioeconomy and Global Inequalities

Socio-Ecological Perspectives on Biomass Sourcing and Production

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October 2020

Maria Backhouse
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4

Tools of Extraction or Means of Speculation? Making Sense of Patents in the Bioeconomy

Veit Braun

4.1 Introduction

What is the source of value in the bioeconomy? The conclusion that might be drawn from the various national and international bioeconomy strategies (Birch and Tyfield 2012; Backhouse et al. 2017)—that organisms, ecosystems and biological processes are infinite sources of energy, industrial raw materials and foodstuffs—is one that is challenged by the contributions to this volume. As many of the pieces in this volume show, the goods associated with the bioeconomy do not come from the green land of plenty: more often than not, they are produced under dire working conditions, at the expense of existing social and economic structures and with ecological consequences that complicate the idea of the bioeconomy as a sustainable, non-extractive way of life. But what about the fruits of the mind? After all, the bioeconomy is not just a

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vision of agro-industrial production. In the "knowledge-based bioeconomy" (Birch and Tyfield 2012), the basis for growth and value is not so much life's ability to produce surplus (Cooper 2008) but the value added by technological innovation. This does not simply mean that science and technology are what makes nature or life productive in the first place. As a continuation of the older idea of the "knowledge economy", it might even suggest that knowledge about biological objects and processes can itself be turned into a good (Slaughter and Rhoades 2004). In Birch's and Tyfield's (Birch and Tyfield 2012, p. 308) words,

> What this would imply is that it is the knowledge and knowledge labour required to transform these fragments into commodities that are valuable, implying that the prefix 'bio-' is rather irrelevant in this case. We may as well term it 'knowledge-'value instead since it is knowledge (or, more accurately, knowledge labour) which creates value and not the latent qualities of the biological material itself.

What, then, does value consist of and where does it flow from in the bioeconomy? In this chapter, I want to tackle this question by looking at the empirical case of European patents on plants.[1] Since the conception of the knowledge-based economy, especially in the life sciences, patents have provided a crucial link between science and industry, providing the legal basis for managing innovations as a private rather than a public good (Slaughter and Rhoades 2004). The "enclosure" of knowledge in patents, the economic argument goes, helps to turn elusive intangible knowledge into something resembling classical tangible goods (Landes and Posner 2003). While from a business point of view this is necessary to fend off competitors and to recover R&D investments, the established critical argument against patents is that they deprive the public of an otherwise accessible good—unnecessarily so, it is pointed out, because knowledge, unlike tangible goods, is neither scarce nor exhaustible. The counterargument consists in pointing to positive externalities generated

[1]This chapter is based on my PhD thesis *Seed at the End of Property: Propertization in Plant Breeding and its Crises* (LMU Munich, 2018). Methods included participant observation, interviews with breeders, lobbyists, patent lawyers and managers as well as document analysis and patent statistics.

through the disclosure of knowledge and the public availability of new technologies after the expiration of patents. The debate is thus about the tension between the positive value of patents to firms and their negative value to the public (cf. Parthasarathy 2017), and whether the latter is justified or compensated for by public benefits further down the line (Bently and Sherman 2014, pp. 379–381).

Does this long-standing controversy adequately capture the functions and effects of patents in the bioeconomy? Both the affirmative and the critical economic theory of patents assume a transsubstantiation of knowledge into tangible products, with the latter constituting the "real" value of the knowledge enclosed, as they can be turned into money on commodity markets. This idea has been challenged by patent research. Only about 5 to 10% of all granted patents result in a commercial product, with the number of commercially *successful* patents being even lower (Schankerman and Pakes 1986). Birch (2017) even argues that there are virtually no commercial products in the bioeconomy that would explain the level of market capitalisation. Does this mean that there is no value to patents in the bioeconomy at all? If so, then both the classical arguments for and against patents would be moot. If not, then how are we to understand the value of patents and the nature of what is protected by them?

As I will show in the following, the answer to the question of patents and value in the bioeconomy is not straightforward: plant patents are used in various ways, many of them in a manner that is counterintuitive to the established economic theory of patents. European plant patents on conventional seed complicate critical stances towards patents and their role in "knowledge-based" economies as well as the notions of invention and knowledge. Patents are pursued for very different, often contradictory reasons—protecting sales and firms, fending off competitors, facilitating cooperation or signalling value. Markedly different from biotech patents, patents on non-GM plants highlight the complexity of valuing nature while foreshadowing the conflicts to come over gene-edited plants. This also poses a challenge for a generalised critique of patenting in the bioeconomy.

4.2 From Biotech to Native Traits

The past 30 years have seen an increase in patent applications for conventionally bred plants at the European Patent Office (EPO), with a steep rise in applications from the late 1990s onward. This trend is a result of a coalescence of various scientific, economic and legal developments. Although breeding native traits has been possible for at least a century—if not during the millennia since the agricultural revolution—patents on such traits are a relative novelty. The simultaneous rise of conventional and biotech patents in the 1990s suggests that native trait patents follow the model of patents on genetically modified plants, which were first developed and patented in the mid-1980s (Charles 2001).

This technological breakthrough, together with understanding genes as chemical compounds (Calvert and Joly 2011), leads to a paradigm shift in plant breeding. Plants, long deemed unpatentable (Pottage and Sherman 2011), could now be treated as inventions. Patent law was reinterpreted and reformed across the globe in the 1980s and 1990s to facilitate the patenting of transgenic plants, which in 1998 resulted in the EU Biotechnology Directive (Parthasarathy 2017). However, GM food was widely opposed by European consumers, supermarkets and farmers, preventing a green biotech industry from emerging. Today, plants are almost exclusively bred by conventional techniques—crossing, selecting and back-breeding—occasionally supplemented by laboratory techniques like cell culture and double haploids. The firms in the European seed sector include large plant science multinationals, but also a considerable number of medium- or moderately large-sized seed producers that often specialise in a small number of crop species (Ragonnaud 2013; Brandl 2018).

Although not as costly as genetic transformation, which costs about USD 100 million (Phillips McDougall 2011), breeding new plant traits with conventional means still takes around 10 to 15 years and between 1 and 2 million euros (Goodman 2002). The plant variety protection (PVP) law provides an opportunity to protect intellectual property right related to plants in Europe, but it only applies to finished varieties, not to new individual plant traits (Sanderson 2017; Braun 2020). PVP gives breeders a temporary monopoly on their varieties, but allows third parties to use these varieties as sources of traits or to develop new varieties. Firms can therefore recoup investments in variety development, whereas trait breeding is economically less attractive. For this reason, trait development in Europe is usually delegated to public research institutes or organised collectively among private breeders with some public assistance. In the latter case, a number of companies will share the costs of developing a new trait while coordinating market introduction of their varieties (Becker 2011; Brandl 2018). Overall, European breeders support these public and collaborative models for trait development and consider them sufficient and effective.

4.3 Patenting Native Traits: Shifts in the Legal Landscape in Europe

The 1990s legal reforms opened a backdoor for patents not just on biotech but also on conventional plants. In March 2015, the EPO's Enlarged Board of Appeal set out its ruling in the "Tomato/Broccoli II" case. The ruling stated that while conventional varieties and breeding techniques themselves could not be patented due to their exemption under European patent law, the products of such techniques—conventionally bred traits—could. The reasoning behind the decision was that there was no explicit exclusion of traits; biotechnology traits had, in fact, explicitly been declared patentable. If the latter were compatible with PVP, there was no reason to assume that plant traits bred with conventional means were not. These are commonly called "native traits" because they originate in the crop species or genus itself rather than from a genetically very different organism (Girard 2015; Kock 2017). As such, they can be transferred with the established techniques of deliberate crossing, selecting and back-breeding, which have been at the heart of modern plant breeding since the nineteenth century. In the wake of green biotechnology, however, these native traits also attracted the interest of patent lawyers. Between 1981 and 2018, 438 patent applications were made for native traits, 117 of which were granted (Patstat 2019). While these figures may not appear to be very high, they are in about the same range as those for biotech plants.

If trait development is by and large economically unattractive in Europe, what is attractive about patents of the tomato/broccoli type? Why have these patents become controversial, especially for the seed industry? Unlike plant biotechnology, which is more or less restricted to four species of field crops (soy, maize, cotton and rapeseed), the range of species in native trait patents is more diverse and surprisingly vegetable-heavy. Out of 117 granted patents, between 33 and 37 (depending on the way in which "vegetable" is defined) fall into this category.[2] Furthermore, specialised vegetable breeders are well represented among applicants. Although largely absent during the 1990s (with just 8.4% of all applications up to 1999), they accounted for 21.4% of applications filed between 2000 and 2017. The major patent disputes in the field of native traits have so far been about vegetables. Meanwhile, Monsanto, Syngenta and Bayer have all strongly invested in vegetable breeding programmes and the vegetable sector has seen a strong market concentration (Ragonnaud 2013), which is reminiscent of the North American market in the wake of agricultural biotech (Schenkelaars et al. 2011).

There is a slight trend towards "output traits" in the analysed patents: while input traits, which dominate plant biotechnology, primarily benefit farmers, output traits like enhanced nutritional content (like the broccoli patent) or facilitated processing (as in the tomato patent) target processors and consumers in the first place. Vegetables have higher profit margins than field crops; both seed and fruit production in greenhouses are more labour-intensive than field agriculture (Becker 2011), meaning that R&D investments make up a smaller share of the total costs and are thus more easily recovered. There is, however, also a considerable number of pest resistance traits among the sample; native traits patents, thus, are not simply "output trait" patents.

[2]The classification of *Brassica* species in patents is not straightforward, as they often refer to the whole genus or to field (e.g. rapeseed) as well as greenhouse crops (e.g. broccoli).

4.4 Tools of Extraction?

There is some evidence that patented traits mirror the unequal, often extractive economic relations between the Global North and the Global South highlighted by other contributions to this volume. Many of these traits originate in so-called exotic materials or wild relatives of crop species (Acquaah 2012). While the discussion is mainly focused on innovations and inventions that occur in Europe, in other words, the seed companies' nurseries, the genetic foundation of pest resistance, self-drying and other plant abilities often comes from the centres of diversity, overwhelmingly located in the Global South (Kloppenburg 2004). The tomato patent, for example, makes claims on traits derived from a wild tomato relative found in Peru and Ecuador. The broccoli patent derives its glucosinolates from a threatened Sicilian species of cabbage, while a patent by Syngenta on bell pepper, also subject to extensive litigation at the EPO, is based on Jamaican wild pepper germplasm (Leberecht and Meienberg 2014).

The flow and subsequent valuation of genes, commonly labelled "biopiracy", from the developing south to the industrial north has been a long-standing topic in postcolonial discourse (Hayden 2003) and has a tradition reaching back to the beginnings of colonial ethnobotany (Schiebinger 2011; Brockway 2011). The process, however, is usually not as straightforward as a company venturing into the tropics to screen and collect plants and ship them back home for breeding. More often, seed banks serve as intermediaries by collecting, describing and storing plant germplasm. Seed companies then access this pre-collected material rather than original populations in the Global South. Syngenta's pepper is a well-documented example; the original material is from a publicly funded expedition in the 1970s, predating private bioprospecting (Leberecht and Meienberg 2014). Nevertheless, the contribution of countries of origin and their native communities remains a contested topic (Bertacchini 2008).

Another dominant narrative in the critical scholarship on agricultural biotechnology and the study of intellectual property has been the rise of "neofeudal" property relations engendered by patents and other intellectual property (IP) rights (Schubert et al. 2011; Perzanowski and

Schultz 2018; Braun 2020). In these asymmetrical relations, IP rights are not used as horizontal instruments to fend off competitors but as vertical tools to control property objects and, by extension, processors and farmers beyond the point of sale (Kloppenburg 2014). Lending legal existence to and conferring ownership of technologies, patents give companies a means to license rather than sell their seed. On top of creating new business models, which only work if seed companies retain control over the seed, licensing also enables companies to evade competition and force additional terms upon their licensees (Perzanowski and Schultz 2018), extracting additional profits from actors not upstream, but downstream in the value chain. In the case of biotech seed, this involves the restriction that licensed seed may only be used in combination with chemical products from the same company, forcing farmers to buy the whole package, even if they only want the seed (Schubert et al. 2011).

While patents permit the licensing of vegetable seeds and most vegetable breeders are vertically integrated (i.e. breeding, seed production and distribution take place in one company), it is unlikely that the rise in vegetable patents is driven by such business models. Licensing seed to farmers is already possible with PVP and, in fact, widespread in tomato production (tomato grower, Interview no. 1, August 2017). Thus, patents do not add an additional instrument with which to capture a higher share of the profits across the value chain. Few native traits have been a commercial success: even though patent disputes are generally regarded as indicative of high commercial value in the industry (former head of IP, Interview no. 2, June 2018), the tomato patent, for example, has never been used for breeding actual self-drying tomatoes (patent lawyer, Interview no. 3, November 2017). Indeed, only 25 patented traits were present in commercial varieties in 2016 (Kock and ten Have 2016). Overall, native trait patents in Europe, unlike their biotech counterparts in North America, have not led to new vertical property relations between breeders and farmers.

4.5 Using by not Using: Traditional Breeders and Native Trait Patents

If the value of native trait patents does not rest in superior products or the ability to squeeze additional profits from actors further down the value chain, where else could it lie? Studies in business and management have identified a number of "noncommercial" uses for patents, i.e. patents applied for and granted but never turned into products (Torrisi et al. 2016). These follow different logics: a firm might not "use" a patent, as its value rests in blocking a competitor from access to a specific technology. Such patents are often redundant to other patents the firm owns, preventing rival companies from "inventing around" them (Landes and Posner 2003, p. 295). Alternatively, patents can be used as "bargaining chips" (Noel and Schankerman 2013), giving companies leverage in merger and acquisition negotiations or licensing agreements. An even more profane reason for patenting technologies is not so much to prevent others from accessing them but the reverse, i.e. preventing a lock-out from central technologies (Torrisi et al. 2016).

In one form or another, these strategies can also be found among the holders of native trait patents. This group is notably diverse: it includes public research institutes such as INRA (France), CSIC (Spain) or CSIRO (Australia); plant science multinationals and their vegetable subsidiaries like Nunhems (formerly Bayer, now BASF), Seminis and De Ruiter (both formerly Monsanto, now Bayer); and independent, mostly Dutch seed producers such as Bejo, Enza or Rijk Zwaan. While the public applicants have pursued technology diffusion strategies with their patents as part of new public management (Jewell 2015), the motives of private applicants are more varied. Some of the latter have opposed native trait patents, either specific ones or in general. One example here is Syngenta (32 applications), which, otherwise pro-patent, contested the broccoli patent; the independent Dutch companies that take an explicit anti-patent stance yet engage in patenting, sometimes holding extensive trait portfolios, are further examples.

In an interview, representatives of one firm made it clear that patenting their traits was a defensive strategy:

> We do it. […] But the reason for that is that we saw this development by technology, more and more patents. And, also, the consolidation; bigger and bigger companies were created. Because in the 1990s we had Syngenta, there was SaatUnion still [an] independent company, and they are not completely independent anymore. We had Royal Sluis, which later, through a lot of takeovers, became part of Monsanto, Seminis-Monsanto. We thought, okay, we do not need a patent protection for the [plants], because we have plant breeders' right[s] for that. But we need the patents to protect ourselves. Because if all these big multinationals – and [our firm] is, compared to the multinationals, still small, but at that time it was really small. […] For example, […] if a competitor would have a patent on a very important characteristic in lettuce, and we couldn't get a license, then it would mean that we miss half of our turnover. And that is the end of the company. (head of IP, Interview no. 4, December 2017)

The company has not developed a business model around its patents and has no plans to do so. Patented traits are licensed to competitors for a small fee, which barely covers the costs of applying for and renewing the patents: due to economies of scale in R&D, assessment and litigation, it is more expensive for a small firm to engage in patenting than for a big one (Lanjouw and Schankerman 2001). For this company, the patent portfolio serves as insurance against hostile competitors who might use their own patents to squeeze it out of the market.

At the same time, the company's patent portfolio has forced bigger firms to take it seriously in negotiations and strike cross-licensing deals. While not all independent breeders with trait patents have made similar deals, their attitudes to patenting are likely similar. Traditional breeding companies argue that trait development can sufficiently be covered with revenues from variety development and sale; they do not see a need for patents on traits or a market for trait innovations. Instead, they stress the negative impact of patents on the freedom to breed under PVP, high transaction costs attached to patents and legal and economic insecurity tied to working with patented material.

4.6 Speculation, Not Innovation? Patents as Credit and Capital

But what about the plant science multinationals? Is their approach to trait patents really an exclusively aggressive one? As we have seen, most patents in the field never find commercial use. This does not necessarily mean that biotech companies would not resort to such strategies if they had a patent on a major native trait. In fact, the history of mergers and acquisitions in the 1990s and 2000s in the plant breeding industry should make conventional breeders wary. There are, however, other explanations for why plant science firms invest time, money and other resources in patenting in a comparatively small market without notable commercial success. The various non-commercial strategies pursued by smaller competitors obviously also apply to bigger firms: if the former need patent portfolios for defence and as bargaining chips, so do multinationals.

Multinationals have additional motives for pursuing patents, though. As Kang (2020) shows, patents have become a value of their own in many publicly traded companies. Uncoupled from the total sum of the sales they protect, they primarily serve as a signal to investors and rating firms. In this logic, a patenting firm is a firm with an active and successful R&D department, a firm that produces value—in short, an *innovative* firm. At the same time, however, as patents are valued as such and not with reference to products or sales, they become empty signifiers proclaiming but not actually containing value. Kang's analysis echoes a wider criticism of the bioeconomy and life science research as "a passel of Ponzi schemes" (Mirowski 2012). Like in the late 1990's Dotcom economy, this critique points out that there are no "real" values to back up the capitalisation of companies on the stock markets (Birch 2017).

A patent on a native trait thus need not be commercially important as long as it adds to the company's patent portfolio, signalling to shareholders and investors that their money is well invested in an active company with a steady output of innovations. Patenting a trait black-boxes the question of its actual value (Kang 2020) in the legal-economic object of the patent. This is why life science start-ups put all their efforts into obtaining a patent (Haeussler et al. 2014): it is what constitutes their value in the eyes of a potential buyer. Indeed, actors in the seed business confirm that such a "post-commodity" mindset (cf. Birch and Muniesa 2020) is widespread among plant science multinationals, as in this statement from a breeder working for a subsidiary of a biotech company:

> Someone [at headquarters] has an idea for a project: 'We're making hybrid wheat now!' So the person goes to their superior and says: 'Boss, let's make hybrid wheat. With hybrid wheat, we'll […] get 30% of the global wheat market, which amounts to 20 billion euros. All I need is 20 million euros and 50 people.' And the boss […] tells this to the board of directors, who have even less of a clue about wheat breeding. But all they hear is 30% of the market for 20 million. So they approve it. Then the firm issues a press release […] The next thing that happens is that stocks go up because of that release. So [my firm] goes to its shareholders and says 'Look, you just made 25 euros profit on every single share you have thanks to our great business performance. Out of those 25 euros, could you maybe give us 5 and keep the other 20 so that we can reinvest it to make you even more money?' And then the whole thing starts all over again. (plant breeder, Interview no. 5, May 2017, paraphrased)

The fetishism of projects, innovations and patents is not just a scheme for tricking investors. It is mirrored in internal communications, decisions and rewards within the company. Patents serve as a currency between superiors and subordinates as well as between a firm's departments: there is a tendency for self-reinforcing feedback loops to develop in their interaction. R&D departments produce patentable innovations to justify hires and expenditures. IP departments turn these innovations into patents to legitimise their existence, controlling lists of patents among the company's performance indicators because they are easily quantified and labelled as valuable assets (Long 2002; Hsu and Ziedonis 2008; Gill et al. 2012).

Public companies' patent portfolios in native traits could thus be explained as aimed at the stock rather than the seed markets. The lack of commercial value would not contradict their function as internal and external signal of innovativeness and company value. And even if smaller firms use patents differently in their interactions with other market actors, this need not prevent similar logics from unfolding inside the firm: the self-referential nature of “patents as credit” (Kang 2015) largely emerges from complexity within companies of a certain size.

However, plant science multinationals do not necessarily agree with this theory. This is not necessarily because they need to uphold (both their own and others’) belief in patents as meaningful indicators of innovativeness, but because some of them have diagnosed the pitfalls of a self-referential patent economy themselves and taken countermeasures:

> My KPIs [key performance indicators] were cost management. So basically, we made sure that the patents we have are actually in active use. Either in relation to products or not [in use]. My KPI is efficiency-driven. Reducing costs, keeping only what is actually relevant […]. So in number of patents – yes, I know, [other firms have] KPIs like ‘We need to make at least 1000 patents a year,’ but that’s complete bullshit. And no educated investor will buy that anymore either. So it’s quality, not quantity. If I can protect my portfolio of products with a smaller number of patents, then that’s a considerable efficiency factor. The patent itself does not have any added value. The added value is only what’s protected by it. And if it doesn’t protect, if I enclose a piece of desert, then I’m wasting money! So [that’s] a very outdated vision; it’s done much more pragmatically nowadays. (former head of IP, Interview no. 2, June 2018)

This quote confirms the problem of self-referentiality but also situates it in the past: under his tenure, the interviewee points out, his company took a radically different approach to its patent portfolio. Unlike other companies, which simply counted their patents, he linked patents back to physical sales and only kept those that covered their costs. Recent publications in management literature argue for a similar turn away from portfolio size to quality and management of patents (Ernst 2017).

In addition, some firms in the business, notably Syngenta, have pushed for changes in European plant patent law while cutting their patent portfolios considerably. Syngenta spearheaded the International Licensing Platform for Vegetables (ILP Vegetable), a clearinghouse meant to drastically reduce the costs of licensing and breeding with patented traits (Kock and ten Have 2016; van Overwalle 2017). In exchange for access to patented traits, members have to make their patents available under the same conditions. Unlike in classical bilateral negotiations, licence fees cannot be set arbitrarily or prohibitively. If two parties cannot agree, they have to submit their bids to a committee, which then has to pick one over the other. The losing party will then have to cover the costs of the process.

ILP Vegetable's vision is to streamline patents into a useful tool for trait breeding. The platform is meant to reduce many of the transaction costs and uncertainties around patents, making them more accessible to smaller firms while at the same time preventing the use of patents as tools for aggressive monopolisation. However, this would also require conventional plant breeders to embrace patents as some form of market instrument, a commitment they are currently refusing to make. In addition, private solutions rely on voluntary participation, leaving open the possibility of aggressive patent use in the sector. Finally, there are also some legal uncertainties around the legal feasibility of an almost industry-wide pooling of patents (van Overwalle 2017; contra: Kock and ten Have 2016).

The platform nevertheless demonstrates that there are ideas and efforts directed at the proper use and actual value of patents in the industry that diverge from both the orthodox economic theory of patents and their various actual uses; these ideas and efforts should be taken seriously. Especially as the next wave of plant patents is just around the corner: with gene editing, many of the issues around native traits are about to return, albeit in a similar, yet different form. Gene-edited traits will be cheap and quick to produce, but also of a technical nature. With gene-edited traits proliferating in commercial varieties, breeders will face legal obstacles when trying to cross-breed with such plant material. Even if patent offices agree that native traits are "essentially biological" and, thus, unpatentable, this would not apply to gene-edited plants (Kock 2017). Once more, then, patent law would beat PVP law.

4.7 Conclusion: Patents in the Bioeconomy

If there is a lesson from the legal debate on native traits, it is first and foremost a negative one: we cannot definitely say what constitutes the value of patents in and for the bioeconomy. At least when it comes to patents, we cannot characterise the bioeconomy as predominantly based on extraction or speculation. Bio-patents are used in very different ways by different actors within the same industry. This defies any smooth policy narrative of patents as innovation incentives and vectors in the bioeconomy. However, it also complicates a critique of patents as instruments for extracting value or refeudalising economic relations. While refeudalisation captures an important and troubling element of the bioeconomy of GM seed, the case of native traits is different, despite shared genealogies and protagonists. The reason lies both in a specifically European situation (tensions between PVP and patent law, the makeup of the European plant breeding sector) and in the diverging biological nature of native traits (which are cheaper to produce than biotech traits and, thus, comprise different traits in different crop species). A similar difference will certainly manifest itself in gene-edited traits should there ever be considerable economic activity in that field in Europe.

However, there are also positive lessons to be drawn. While we have seen very different strategies and philosophies for patent use, they always referred and reacted to other strategies. Value is not “contained” in patents but unfolds in relation to sales, other patents, stock markets, competitors’ perceptions and their won visions for the future of trait breeding. It is not an inherent quality of life itself, nor a simple effect of investment bubbles. Instead, whether patents are of value and if that value is positive or negative depends on one’s situation in the complex landscape of European seed production. To determine the value of patents, we thus cannot simply look at them in isolation. Therefore, any policy that seeks to stimulate innovation in a bio-based economy needs to think beyond patents as a single-purpose instrument or the sole incentive for companies to innovate.

List of Interviews quoted

Interview no.	Profession/Function	Date and place
Interview no. 1	Tomato grower	08/2017, Germany
Interview no. 2	Former head of IP	06/2018, Switzerland
Interview no. 3	Patent lawyer	11/2017, Germany
Interview no. 4	Head of IP	12/2017, Netherlands
Interview no. 5	Plant breeder	05/2017, Germany

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