

Law and innovation in new resistant grapevine varieties [☆]

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Abstract

This article is a brief account of the main laws governing or impacting upon the breeding of new resistant grapevine varieties, complementing previous work in this Journal. It focusses on the emergence of the legal fields of *plant variety rights* and *sanitary and phytosanitary measures* to bring law into the foreground as an important set of institutional parameters which shapes the actions of economic operators involved in the development of new resistant grapevine varieties in both direct and contingent ways.

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1. Introduction

In their recent paper *Economic issues and perspectives on innovation in new resistant grapevine varieties in France*,¹ (the “Montaigne paper”) the authors present an analysis of the trajectory of grapevine breeding in France from the mid-20th century alongside the emergence of disease resistance as a new technological paradigm driven by social demand. Among other factors, the authors identify institutional settings as an important constraint on the emergent responses to this new paradigm. Law forms a large part of these institutional settings and the Montaigne paper clearly demonstrates the significant influence of law on the decision-making of breeders, nurseries, growers and wine businesses.

This paper presents a brief complementary account of the laws governing or impacting upon the breeding of new resistant grapevine varieties, seeking to sketch more broadly the dimensions of the legal framework for new resistant grapevine varieties across the global wine sector, including France. In this way, we can bring into the foreground this

important set of institutional parameters shaping the actions of economic operators and understand how the constraints they impose may vary across place to create comparative advantage or disadvantage in the adoption of new grapevine varieties.

A global perspective, using the examples of *plant variety rights* and *sanitary and phytosanitary measures*, has been taken to emphasise certain points. The Montaigne paper describes a shift in the objectives of grapevine breeding programmes away from localised, production-driven concerns towards a broader and more consumer-driven paradigm. In this paper it is shown how this has been matched by an ongoing (but still far from complete) evolution in key areas of the legal framework towards greater international harmonisation, as well as a general convergence around certain key objectives. As the law has evolved, so have the priorities and opportunities facing breeders of new resistant grapevine varieties.

2. A perspective on “law”

References to “law” in the context of this paper are not simply references to the “black letter” law found in the text of laws, regulations, statutory rules, court decisions and the like. They are intended also to cover law as it is played out in society through institutional practices, and the responses of people affected by the law.

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¹Montaigne et al. (2016), *Economic issues and perspectives on innovation in new resistant grapevine varieties in France* Wine Economics and Policy 5, 73–77.

Area of law	Purpose
Sanitary and phytosanitary measures	Protect human and plant health including rules on: biosecurity; GMOs; pesticides; novel foods / food safety.
Plant variety rights	Encourage innovation in plant breeding by granting exclusive rights to breeders of new plant varieties if certain criteria are met.
Environmental protection	Manage human impacts upon the environment including through use of harmful chemicals or plants.
Registration/approval of grapevine varieties	Ensure suitability of new grapevine varieties e.g. for winemaking.
Planting rights/authorisation	Mechanism for management of wine sector within the European Union.
Geographical indications and designations of origin	Protect producers and consumers by granting exclusive rights to producers within delimited area and/or following specified practices.
Consumer information	Ensure consumers have complete and accurate information, including regarding grapevine variety names.

Fig. 1. Key areas of law affecting breeding and dissemination of new grapevine varieties.

The law is not a closed or inflexible system removed from society, politics or the economy that acts only *upon* people. Rather it is a socially constructed system that is itself continually evolving and responding. Law is not only a set of formal rules; nor is it exclusively the domain of Parliament and the Courts. Law is also lived by people in their daily lives through practices, decisions, contests, knowledge, understanding and the like.

Therefore, in considering the law in the context of an evolving real-world scenario such as the case at hand, it should not be as sort of a stop/go “traffic light” that objectively directs operators; but as a provisionally fixed institutional setting that can over time be applied, used, responded to, opposed or changed according to the particular circumstances.

2.1. The legal framework for new resistant grapevine varieties

The development and use of new resistant grapevine varieties plays out across a number of different areas of the law at a national and/or community, as well as an international, level. The relationship between the decisions of actors in the filière (breeders, nurseries, viticulturists, oenologists and marketers) and the legal framework within which they operate may be direct or highly contingent.

The law permeates daily life to such an extent that it is impossible to identify every effect that it might have on a given set of interactions. However, it is possible to identify in broad terms certain key areas of the law impacting the decisions of those involved in the breeding of new innovative varieties. There are set out in Fig. 1 below.

Each of these areas of the law is implicated in the Montaigne paper: sanitary and phytosanitary measures and environmental protection laws were behind the ban on sodium arsenite; plant variety rights protect the INRA varieties discussed in the paper;

new varieties are shown to be subject to approval of grapevine varieties for use first, for winemaking, and then under AOC rules; finally, the challenges of consumer information laws are addressed in the discussion of variety names.

At the level of national/Community laws and their local application, it would no doubt be rewarding to explore in greater depth the specific legal factors at play in the particular case study presented in the Montaigne paper. (For example, the long term legal and policy shift within France away from *vin de table* towards varietal / PGI / PDO wines will certainly have had an impact on the objectives of plant breeding programmes.)

However, for the purposes of this paper, rather than examining local legal frameworks, this paper views the case study in the Montaigne paper through a more generalized and global lens so as to help place these local developments into a broader context. In particular, it focuses on two areas of the law that have undergone important processes of international harmonisation over the period of the case study in question: sanitary and phytosanitary measures and plant variety rights.

3. Sanitary and phytosanitary rules

Breeding new grapevine varieties for disease resistance has the potential to impact upon the health of both plants and human beings, and therefore such breeding programmes fall to be regulated by rules in place to protect the health of humans, animals and plants. Collectively known as sanitary and phytosanitary (SPS) measures, they include measures relating to GMOs, plant protection and quarantine, and the use of agricultural chemicals such as pesticides.

SPS measures can have a direct impact on decisions around grapevine breeding programs. To take a fairly obvious example, rules on GMOs will affect what can be done in terms

of breeding techniques as well as the commercial viability of varieties developed using such techniques.

Additionally, SPS measures can have an indirect influence, often with unintended consequences. One anecdotal example from New Zealand relates to the fact that privatisation of quarantine facilities combined strict biosecurity rules in the early 1990s meant that new planting material for Sauvignon blanc variety was unavailable during the early boom in planting of this variety. This in turn led to the widespread propagation through mass selection of the main locally available clone of Sauvignon blanc (UCD1); making it an integral element of the typical New Zealand Sauvignon blanc style.

The Montaigne paper gives another example of indirect influence; the 2001 EU ban on the use of sodium arsenite. This ban catalysed the breeding of disease resistant varieties due to the absence of viable pesticide options, but also attracted negative public attention to the use of pesticides in viticulture.²

Taking this example as a point of embarkation, it is useful to examine in a little more depth the broader evolution of regulation of pesticides as this is a key influence on the breeding of new resistant grapevine varieties.³ The timeframe of the plant breeding projects discussed in the Montaigne paper roughly coincides with a period of transformation in the way in which pesticides have been regulated both internationally and at the Community or national level.

At the risk of oversimplifying an extremely complex subject, this period has seen most modern economies adopt systems for regulating pesticides that have in common certain features such as:

- elimination or limitation of the most harmful or eco-toxic pesticides (including arsenic compounds);
- approval of active substances and registration of pesticides based on rigorous science-based risk assessment and risk management;
- setting of maximum residue limits for the presence of pesticides in foods;
- imposition of safety requirements for those storing, handling and using pesticides;
- introduction of increasingly strict measures for ensuring transparency and compliance.

This evolution has been fostered by international intergovernmental organisations – principally Codex Alimentarius through the Codex Committee on Pesticide Residues, but also the World Health Organisation⁴ and the International Plant Protection Convention.

²By 2001 the use of arsenic compounds as pesticides in the EU wine sector was already something of an anomaly since arsenic compounds were then well known for their harmful properties.

³Technically this section addresses a subset of pesticides called plant protection products. However the more common parlance is used for ease of reference.

⁴The publication of the WHO's 2001 paper *Environmental Health Criteria 224 Arsenic and Arsenic Compounds*, coincides with the ban on sodium arsenite.

Undoubtedly the development of pesticide regulation has ensured that their use has become progressively safer. At the same time, it has resulted in a reduction of the pesticides available to producers as well as a substantial increase in the cost and time required to bring new pesticides to the market.

Between 1995 and 2005, the discovery and development costs associated with bringing a new pesticide to the market increased from €115 million to €215 million. The time from first synthesis of a product to first sale on the market is approximately 11.3 years.⁵ Although approximately 12% of the overall cost is directly attributable to the legal registration process, much of the other cost will be related to ensuring that the product developed can conform to basic criteria around human and environmental safety as well as effectiveness without which there would be no point in proceeding to registration.

Returning to the example of sodium arsenite and Esca, the cost and time involved in developing new pesticides could be a key explanation for the absence of new substances to address the problem of that particular trunk wine disease. If grapevine breeding programs have a lower cost than the development of new pesticides and similar or shorter time frames for development, then they would appear to be an attractive alternative to pesticides on a purely economic basis.

4. Plant variety rights

Plant variety rights (PVRs) is a branch of intellectual property law concerned with the rights of plant breeders. In essence, it grants to the holder of a PVR exclusive rights to produce, sell and license reproductive material of a protected plant variety for a minimum of 25 years. The rationale of PVRs is to incentivise the development and commercial dissemination of new plant varieties. It is implicit that this incentive is greatly enhanced by the availability of reciprocal protection across countries, allowing new varieties to be traded internationally.

Most developed countries have a PVR system in place based upon the International Convention for the Protection of New Varieties of Plants (UPOV Convention). This convention is administered by an international intergovernmental organisation called the International Union for the Protection of New Varieties of Plants (UPOV). The UPOV Convention establishes the parameters of an internationally recognised form of protection for the rights of plant breeders as well as priority rights between Convention members.

Under the UPOV Convention, and national / Community laws following this convention, PVRs are granted in respect of a "variety" i.e. a plant grouping within a single botanical taxon of the lowest known rank, which can be defined by the

⁵Phillips McDougall (2016), *The Cost of New Agrochemical Product Discovery, Development and Registration in 1995, 2000, 2005-8 and 2010 to 2014. R&D expenditure in 2014 and expectations for 2019: A Consultancy Study for CropLife International, CropLife America and the European Crop Protection Association* March 2016, available at http://www.croplifeamerica.org/wp-content/uploads/2016/04/Phillips-McDougall-Final-Report_4.6.16.pdf accessed 4.9.17.

expression of the characteristics resulting from a given (for example a clone, line, F1 hybrid) or combination of genotypes (for example a complex hybrid or synthetic variety); distinguished from any other plant grouping by the expression of at least one of the said characteristics and considered as a unit with regard to its suitability for being propagated unchanged.⁶

A “breeder”, being the person who bred, or discovered and developed, a variety (or their employer or successor in title)⁷ may be granted a PVR if the variety meets four criteria⁸:

- it must be new, in that it must not have been sold or offered for sale within the country within which the PVR is sought within particular timeframes;
- it must be distinct from other varieties in existence at the time of application for a PVR, which is judged against characteristics such as morphology (e.g. shape, colour), physiology (e.g. disease resistance) or other characteristics (e.g. suitability for a particular commercial application);
- it must be uniform in its form and character across different generations; and
- it must be stable in its relevant characteristics after repeated propagation.

All varieties the subject of PVRs must have a suitable generic denomination, and that denomination must be used across all applications in UPOV Convention countries. The denomination itself must be sufficient to identify the variety and distinguish it from closely related varieties, and it should not be misleading or confusing. All persons dealing with a variety subject to a PVR are required to use the generic denomination.⁹

In general, PVRs are relevant at the stage where a new variety is considered for commercial production. The costs involved in achieving registration can be quite substantial, and therefore would generally need to be justified on the basis of a commercial return. However, since plant breeding in many countries will often receive funding from the public sector, PVRs may also be sought for reasons linked to economic or rural development.

Taking the existence of PVRs into account is important to understanding the evolutionary dynamic of plant breeding. The first iteration of the UPOV Convention did not come into force until 1968 and, up to the mid-1990s it had a membership of only 20 countries. Various revisions of the UPOV Convention, and important developments such as the creation of the European Community Plant Variety Protection System in 1995, have helped to significantly expand the reach of PVRs from the 1990s onwards.¹⁰ There are now 74 countries which have signed the UPOV Convention.

For the breeders, the global expansion of PVRs has meant a corresponding expansion in the ability for such institutions to

access markets in different countries without surrendering commercial profits or competitive advantage. In terms of new resistant grapevine varieties specifically, over and above the greater commercial opportunities, it can be posited that the international framework for regulation of PVRs influences research and development decisions in a number of ways:

- a. it establishes a recognised legal threshold as to what constitutes an “innovation”;
- b. it influences the potential market for innovations away from developing solutions for localized problems towards innovations with a broader market appeal;
- c. by increasing the commercial incentives for clonal improvements of existing varieties which may be selected for reasons other than disease resistance, it places competitive pressure on new resistant grapevine varieties;
- d. it establishes parameters for the naming of new resistant grapevine varieties.

Certainly in the case of France's breeding programmes discussed in the Montaigne paper, PVRs have been taken into account by the institutions developing new resistant grape varieties. The INRA varieties Marselan, Caladoc, Chasan and Chenanson are among many which have been protected by PVRs.

It is not possible to determine without further research the extent to which the evolution of PVRs has specifically influenced France's breeding programmes. While PVRs would not have been a consideration for the initial breeding programs of the 1950s, they will have been an increasingly important consideration from the late 1960s and particularly after the mid-1990s. It can be observed that the turn towards disease resistance in these breeding programmes, reflecting a broadly global trend, coincides with the internationalisation of protection of the products of those breeding programmes through PVRs.

5. Conclusion

This paper has sought to complement the economic perspective on innovation in new resistant grapevine varieties provided in the Montaigne paper with an account that further emphasises the multi-factorial nature of evolution across a particular economic activity. Law is an important element that not only constrains or permits certain activities according to the letter of legal texts, but that also influences the decisions that people make and the context in which they make them in indirect, contingent and unintended ways.

Overall, it can be seen that it is not only the scientific and technological paradigm that has changed. In parallel, the legal paradigm has changed as well. From the examples given, this shift will favour the breeding of new varieties that result in less need for new pesticides and that are commercially viable in a globalised market.

It is pertinent to point out, however, that developments in law and technology are far from being coordinated or synchronised. The processes by which the fields of law and technology co-evolve are in reality far more haphazard, and it

⁶Article 1(vi) UPOV Convention.

⁷Article 1(vi) UPOV Convention.

⁸Articles 5-9 UPOV Convention.

⁹Article 20 UPOV Convention.

¹⁰UPOV (2005), UPOV Report on the Impact of Plant Variety Protection, http://www.upov.int/edocs/pubdocs/en/upov_pub_353.pdf accessed 4.9.17.

will often be the case that the law in particular lags behind or struggles to accommodate the leading edge of technological change.

This is illustrated by considering the identification and labelling of new resistant grapevine varieties, where there are many legal questions which remain unresolved. For example, it remains unsettled whether a variety developed by inter-specific crossing followed by introgression such that its genetic material is more than 99% of the original *Vitis vinifera* variety, could retain the name of that variety. Montaigne et al. also refer to the interesting legal issues that may arise where names for new varieties contain part of the name of a well-known parent e.g. cabernet jura. The answers to these questions could affect the commercial viability of new resistant grapevine varieties.

Ultimately, as with any paradigm shift, the responses of economic actors will be varied and favourable legal, technological and economic conditions for the breeding of new resistant grapevine varieties may not necessarily translate into acceptance by producers or consumer where there are other options or drivers.

At the same time as new efforts for grapevine breeding are ongoing, producers themselves are also putting more emphasis on reducing pesticide use through sustainability and integrated pest management practices - whether voluntarily,¹¹ to meet legal requirements,¹² and/or to conform to private standards imposed by large retailers.¹³

Additionally, it must be recalled that most consumers purchase wine based upon a number of properties, and not solely upon the presence or absence of pesticide residues. Therefore, new resistant grapevine varieties must do more than satisfy the demand for pesticide-free products; they must also be consistent with consumer perceptions and expectations for wine. Ensuring that consumers are sufficiently familiar and comfortable with wines made from new resistant grapevine varieties to generate demand will be at least as great a challenge and the development of the varieties themselves. As the authors of the Montaigne paper acknowledge, the future prospects for widespread uptake of the forthcoming revolution in resistant grapevine varieties should be viewed from a long-term perspective.

¹¹There are many countries or regions which have developed important sustainability programmes in which reduction of pesticide use has been a key objective, such as New Zealand's Sustainable Winegrowing New Zealand scheme: <https://www.nzwine.com/en/sustainability/sustainable-winegrowing-nz> accessed 4.9.17. In general, such programmes will conform to the OIV's *General Principles of Sustainable Vitiviniculture -Environmental -Social -Economic and Cultural Aspects* available at: <http://oiv.int/js/lib/pdfjs/web/viewer.html?file=/public/medias/4943/oiv-cst-518-2016-en.pdf> accessed 4.9.17.

¹²e.g. as required by *Directive 2009/128/EC of the European Parliament and of the Council of 21 October 2009 establishing a framework for Community action to achieve the sustainable use of pesticides.*

¹³See for example the Marks and Spencer (2015), Marks and Spencer Policy: Pesticide Policy Version 2, available at: <https://corporate.marksandspencer.com/file.axd?pointerID=de59665c59f541e9a05f30e701fe491c> accessed 4.9.17.