Penn State Environmental Law Review

Volume 19 | Number 2 Article 7

5-1-2011

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I. INTRODUCTION

Vineyards traditionally keep meticulous records regarding the viability of their environmentally sensitive grape crops, making temperature-dependent variations in wine grapes an excellent vehicle for studying global climate change.[1] While the onslaught of global warming has at least minimally affected the daily life of the typical global citizen, average wine drinkers remain unaware of the stressors affecting their favorite libation.[2] However, wine connoisseurs, viticulturists, and oenologists[3] have started voicing their growing concern that in the near future climate change may not allow the production of fine wines in the regions from which they have traditionally or legally come.[4]

Because the regulations surrounding viticultural developments and controls vary from country to country, some wine regions may be more readily adaptable to climate change than others.[5] This comment focuses on comparing the laws shaping the ability to adapt to climate change of the new world wine producers of the United States (U.S.) with the laws surrounding the old world wine producers of the European Union (E.U.).

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1. Clifford Louime et al., *Future Prospects of the Grape*, 93 CURRENT SCI. 1210, 1210 (2007).

2. *See* Sid Perkins, *Global Vineyard: Can Technology Take on a Warming Climate?*, 165 SCI. NEWS 347, 347 (2004) ("So far, the news has been good—wine quality for recent vintages is better than it was 50 years ago, according to connoisseurs.").

3. Oenology is a variant of the word enology and is defined as the science of wine and wine making. *See* WEBSTER'S NEW WORLD DICTIONARY 940 (3d ed. 1988) [hereinafter WEBSTER'S].

4. *See, e.g.*, Molly Moore, *In Northern France, Warming Presses Fall Grape Harvest into Summertime*, WASH. POST FOREIGN SERVICE, Sept. 2, 2007, http://www.washingtonpost.com/wp-dyn/content/article/2007/09/01/AR2007090101360.html.

5. *See* Leanne Webb et al., Conference Report, Global Warming, Which Potential Impacts on the Vineyards?, Future Climate Change Impacts on Australian Viticulture 9 (Mar. 28-30, 2007) http://www.u-bourgogne.fr/chaireunesco-vinetculture/Actes%20clima/Actes/Article_Pdf/Webb.pdf.

Specifically, this comment will analyze regulations regarding appellations,[6] genetically modified organisms, and wine production techniques in the U.S. and E.U. This comment will then discuss the implications of these regulations on the success or failure of wine production in a warmer world. The question of whether the relatively casual regulations of the U.S. should trump the strict traditions of E.U. Member States will ultimately be answered.

This comment will begin with a background discussion of the connection between climate and viticulture, and the various effects of global warming on grapevines and wine production. It will discuss three proposed solutions for the wine industry to consider implementing in an effort to reduce the impact of climate change on wine production. The proposed solutions include: shifting viticultural areas, genetic modification of grapevines, and altering wine production techniques. This comment will then discuss and compare the U.S. and E.U. regulatory schemes behind these proposed solutions. Each comparison of the regulations dealing with an individual solution will be followed by an analysis of the feasibility of implementing the solution in the differing regulatory schemes of the U.S. and E.U. This comment will conclude with a brief discussion regarding why the laws regulating and affecting wine production in the U.S. are so divergent from those in the E.U. and what this means for wine production in the face of global warming.

II. BACKGROUND

A. The Connection Between Climate and Viticulture

The intense regionalization of grape and wine varieties to specific and distinct locations demonstrates that the history and development of wine has been closely interconnected with landscape and climate.[7] The largely climate-dependent factors of wine making, such as soil type, are known in France as "terroir." Winemakers in the U.S. more commonly refer to them as "microclimates."[8] The limited terroir-based geographical regions used for wine grape production put the industry at greater danger of crop failure from climate change when compared to

6. An appellation is the "geographical name under which a winegrower is authorized to use to identify and market wine." *Appellation Definition*, MERRIAM-WEBSTER ONLINE DICTIONARY, http://www.merriam-webster.com/dictionary/appellation (last visited Feb. 3, 2011).

7. *See* Gregory Jones, *Making Wine in a Changing Climate*, 49 GEOTIMES 24, 24 (2004) [hereinafter *Making Wine*].

8. *See id.*; CAROL ROBERTSON, THE LITTLE RED BOOK OF WINE LAW: A CASE OF LEGAL ISSUES 102-03 (ABA 2009).

agricultural industries that distribute their crops over wider areas, such as the corn or wheat industries.[9]

Of the many integrated factors that create a specific, unique geographical area, "[t]emperature has the most influence on grapevines."[10] This is because temperature affects both the growth and reproductive cycles of wine grapes, as well as the biochemical processes that allow the production of a certain variety of wine.[11] Because wine making is so temperature-dependent, climate ultimately dictates whether any specific region worldwide will be able to "adequately ripen the fruit to produce high quality wines."[12]

B. The Impact of Global Warming on Wine Making

Global warming is not likely to affect worldwide wine production in a uniform or consistent manner.[13] Some viticultural areas are currently seeing a benefit from global warming, as the rise in temperature pushes them into more optimal temperature ranges for wine production.[14] However, the burdens of climate change could potentially outweigh the benefits, as traditional wine making areas reach temperatures above those suitable for production.[15] In climates that are even slightly warmer than their grape varieties' optimum growing temperature, biological processes such as growth and reproduction are accelerated.[16] Early ripening of wine grapes leads to higher sugar content, which translates directly into an undesirable increase in the alcohol content of the wine, as well as a subsequent loss of acidity resulting in a lack of freshness.[17] The risk of wine grape desiccation increases when a decrease in water supply is not compensated for with some type of irrigation technique.[18] Overall, the

9. *See* Gregory Jones, *Climate Change and the Global Wine Industry*, PROCEEDINGS OF THE THIRTEENTH AUSTRALIAN WINE INDUSTRY TECHNICAL CONFERENCE 1 (2008) [hereinafter *Climate Change*], http://www.sou.edu/envirostudies/gjones_docs/AWITC%20GJones.pdf; Louime, *supra* note 1, at 1210.

10. Kym Anderson et al., *Viticulture, Wine and Climate Change*, GARNAUT CLIMATE CHANGE REV. 1, 5 (June 2008) [hereinafter *Viticulture*], http://www.garnautreview.org.au/CA25734E0016A131/WebObj/01-HViticulture/$File/01-H%20Viticulture.pdf.

11. *See id.*

12. *Making Wine*, *supra* note 7, at 24.

13. *E.g.*, *Climate Change*, *supra* note 9, at 1.

14. *See Making Wine*, *supra* note 7, at 28; Perkins, *supra* note 2, at 347.

15. *See Making Wine*, *supra* note 7, at 28; Perkins, *supra* note 2, at 347.

16. *See Climate Change*, *supra* note 9, at 2; Anderson, *Viticulture*, *supra* note 10, at 5-6.

17. *See Making Wine*, *supra* note 7, at 28; *Climate Change*, *supra* note 9, at 2; *Viticulture*, *supra* note 10, at 10.

18. *E.g.*, *Climate Change*, *supra* note 9, at 2.

direct effects of global warming will cause the quality of grapes to suffer and the logistics of harvesting and winery intake to be strained.[19]

A host of the indirect effects of global warming are also predicted to affect viticulture.[20] *Vitis vinifera* is by far the dominant species of grapevine cultivated for wine production, composing ninety-eight percent of the planted acreage worldwide.[21] This species does not possess any significant natural genetic resistance[22] to defend against the diseases and pests that will become more prominent viticultural stressors as temperatures rise.[23] A warmer climate will allow both pests and diseases common to grapevines to spread to areas where they were previously unviable.[24] For example, the presence of the fungal disease Downey mildew is predicted to increase in Italy and in the United States.[25] Also, the deadly bacterial infection known as Pierce's disease is likely to move north into Oregon and Washington where it is currently not able to survive.[26] Examples of pests that are likely to spread to new viticultural areas include *Hyalestes obsoletus,* a type of aphid, and the nematode *Xiphinema index*, both of which carry diseases that are seriously detrimental to grapes.[27]

C. *What's a Grape to Do?*

There are several proposed solutions for the wine industry to consider implementing in an effort to reduce the impact of climate change on wine production. The most straightforward solution to the problem of preserving current wine styles and traditional production techniques is to move vineyards to cooler regions.[28] However, this may also be the most complicated and disfavored proposition because viticultural shifts would be in conflict with localized regulatory systems largely based on the notion of terroir and microclimate,[29] as well as

19. *See Viticulture*, *supra* note 10, at 8.
20. *See id.* at 8-9.
21. Louime, *supra* note 1, at 1210. *See also* Linda F. Bisson et al., *The Present and Future of the International Wine Industry*, 418 NATURE 696, 698 (2002).
22. *See* Louime, *supra* note 1, at 1210; Bisson, *supra* note 21, at 698.
23. *See* Louime, *supra* note 1, at 1210.
24. *See id.*; *Viticulture*, *supra* note 10, at 9.
25. *See* Louime, *supra* note 1, at 1210.
26. *See Viticulture*, *supra* note 10, at 9.
27. *See* Louime, *supra* note 1, at 1210.
28. *See* Webb, *supra* note 5, at 6.
29. *See* Bernard Seguin & Inaki Garcia de Cortazar, *Climate Warming: Consequences for Viticulture and the Notion of 'Terroirs' in Europe, in* VII INTERNATIONAL SYMPOSIUM ON GRAPEVINE PHYSIOLOGY AND BIOTECHNOLOGY 3 (L.E. Williams ed., 2005).

steadfast tradition.[30] Other solutions are largely technology-based and would allow the grapevines to remain in their traditional viticultural areas while adapting to their warmer surroundings.[31] One such technology is the genetic modification of the grapevine itself to produce heartier, more resilient vines.[32] However, the potential for a genetic solution is dependent on individual countries' regulations pertaining to genetically modified crops.[33] These regulations vary from lax and indifferent to strict bans on genetically modified crops.[34] A third solution is to alter the production techniques, such as alcohol adjustment and acidification.[35] However, these techniques also face legal regulations that vary from country to country.[36]

Legal implications affect the practicality of implementing any solution.[37] Regulations unique to individual countries will therefore play an important role in determining which wine producing areas will be able to adapt to climate change.[38] Differences in country specific regulatory schemes are made evident by comparing pertinent regulations in the U.S. to those that govern wineries in the E.U. Member States. In the face of global climate change, the question becomes whether regulation steeped in the tradition of old world European wineries is preferable to the less stringent regulations governing wineries in the U.S.[39]

30. *See* Henry Samuel, *Best Wines Will Come From Scotland if Climate Change is not Stopped, French Chefs Say*, TELEGRAPH, Aug. 17, 2009, http://www.telegraph.co.uk/foodanddrink/wine/6040419/Best-wines-will-come-from-Scotland-if-climate-change-is-not-stopped-French-chefs-say.html?FORM=ZZNR (discussing how global warming may cause "generations of viticulture" to "slowly die out" and emphasizing the importance of wine to the cultural heritage of traditional wine producing regions).

31. *See* Webb, *supra* note 5, at 6.

32. *See generally* Louime, *supra* note 1, at 1210-11. *See also* Bisson, *supra* note 21, at 698.

33. *See Viticulture*, *supra* note 10, at 11.

34. *See* Kym Anderson & Lee Ann Jackson, *Why Are US and EU Policies Toward GMOs So Different?*, 6 AGBIOFORUM 95, 95 (2003) [hereinafter *Policies*].

35. *See* Monika Christman, President, OIV Expert Group Tech., Keynote Address at the 34th Auction of Rare Cape Wines: Winemaking in the 21st Century—How will consumer demands shape the future of wine? (2008).

36. *See id.*

37. *See* Webb, *supra* note 5, at 9.

38. *See id.*

39. *See id.* ("Global climate change will challenge wine production in all wine regions of the world in both a viticultural and regulatory sense.").

III. ANALYSIS

A. Shifting Viticultural Areas

1. The Notion of Terroir in the United States

The French word "terroir" cannot be directly translated into English.[40] However, similar regionalization loosely modeled after the old world system is found in the U.S. in the form of microclimate appellations and viticultural areas.[41] An American Viticultural Area ("AVA") is defined as "a delimited grape growing region distinguishable by geographical features[.]"[42] An AVA designation does not incorporate any specific wine production restrictions or controls.[43] In order to label a bottle of wine as being from a certain AVA, at least eighty-five percent of its contents must be derived from grapes grown within the boundaries of the geographical area.[44] AVAs are recognized and defined by the Bureau of Alcohol, Tobacco Products and Firearms[45] and include such well-known wine producing regions as Napa Valley[46] and Sonoma Valley.[47]

A viticultural area is a subcategory of an appellation of origin which, unlike an AVA, is a political subdivision rather than a geographical location.[48] An appellation can be as large as the United States itself, or as specific as a particular county or viticultural area.[49] The restrictions on labeling wine as from a specific appellation are more lenient, requiring that only seventy-five percent of the wine is derived from agricultural products grown in the specific appellation.[50]

Appellations and AVAs are not just used for the promotion of a specific wine through labeling, but also serve as a method of "preservation and defense" of a quality product.[51] For example, in *Bronco Wine Co. v. Jolly*,[52] a winemaker that owned the identities of three "Napa" named wineries used those names to label wine produced

40. *E.g.*, *Making Wine*, *supra* note 7, at 24.
41. *See* RICHARD MENDELSON, FROM DEMON TO DARLING: A LEGAL HISTORY OF WINE IN AMERICA 144-45 (2009).
42. 27 C.F.R. § 9.11 (2011).
43. *E.g.*, MENDELSON, *supra* note 41, at 145.
44. *See id.*; 27 C.F.R. § 4.25.
45. *See* 27 C.F.R. § 4.25.
46. *See id.* § 9.23.
47. *See id.* § 9.29.
48. *Id.* § 4.25; ROBERTSON, *supra* note 8, at 140.
49. *See* 27 C.F.R. § 4.25.
50. *See id.*; MENDELSON, *supra* note 41, at 145.
51. MENDELSON, *supra* note 41, at 152.
52. Bronco Wine Co. v. Jolly, 29 Cal. Rptr. 3d 462 (Cal. App. 2005).

completely outside of the Napa Valley viticultural area.[53] This would normally not be permitted under Federal law.[54] However, the brand names were in use prior to the enactment of the federal law and fell under a grandfathering exception.[55] Winemakers concerned with reputation of the Napa name challenged the company's labeling practices under a California regulation that was designed to counter the federal grandfathering exception.[56] The court held in favor of the intervening winemakers, finding that the California regulation was an attempt to curb the use of inherently misleading commercial speech and that the company's use of the Napa name was indeed inherently misleading.[57] The court also held that the state's interests in protecting both wine consumers and industry reputation outweighed any effect caused by the company having to rebrand the three wines in controversy.[58] The company's owner felt that the regulations were simply a sign of snobbery, but Napa Valley wineries, along with many other American wine producers, understand geographical and political designations to be a necessity in protecting both quality and consumers.[59]

2. Appellation Systems in the European Union and its Member States

The geographical notion of appellation reflected in American wine law has its roots in the time-honored traditions of terroir,[60] which European winemakers have revered for centuries.[61] The E.U. at large has specifically recognized that "[t]he concept of quality wines in the Community is based, *inter alia*, on the specific characteristics attributable to the wine's geographical origin."[62] The principles of terroir can be seen in E.U. legislation within the precepts of Council Regulation 479/2008, which amends prior regulations on the common organization of the wine market.[63] With regard to brand recognition and the insurance of wine quality and honest labeling practices, E.U. Regulation 479/2008 sets forth a definition of "designation of origin" as requiring the grapes

53. *See id.* at 467.
54. *See* 27 C.F.R. § 4.25.
55. *See* 27 C.F.R. § 4.39; ROBERTSON, *supra* note 8, at 133.
56. *See Bronco Wine Co.*, 29 Cal. Rptr. 3d at 470; Cal. Bus. & Prof. Code § 25241 (2001).
57. *See Bronco Wine Co.*, 29 Cal. Rptr. 3d at 480-81.
58. *See id.* at 492.
59. *See* ROBERTSON, *supra* note 8, at 137.
60. *See id.* at 140.
61. *See Terroir and Technology*, ECONOMIST (Dec. 16, 1999) [hereinafter *Technology*], http://www.economist.com/node/268112.
62. Council Regulation 479/2008, pmbl. (27), 2008 O.J. (L 148) 1 (EC).
63. *See id.* at pmbl. (5).

from which a wine is produced to come *completely* and *exclusively* from the specific geographical area in which production occurs.[64] A designation of origin may only refer to one particular type of wine, rather than a larger geographical area.[65]

A second, inferior labeling standard within the regulations is referred to as a "geographical indication."[66] Geographical indications can be considered the functional equivalent of AVAs because they require at least eighty-five percent of grapes in a wine product to come from the specified production area.[67] When assessing the larger E.U. wine regulatory framework, it is important to understand the individual regulatory systems of the E.U. Member States[68] because they are allowed to apply more stringent rules than those set forth in Regulation 479/2008.[69]

The desire to protect geographical identity[70] has produced volumes of wine regulations in E.U. Member States such as Spain, Germany, and Italy.[71] However, these laws are typified by France's Appellation d'origine contrôlée ("AOC") legislation.[72] Most French wine styles evolved in unique geographic locations, which make the protection of regional names for specific wine varieties the central focus of the AOC.[73] The AOC framework is based on the assumption that wines originating "from smaller regions will be more consistent and distinct" and will therefore be of a higher quality than wines produced in more expansive regions.[74] Consequently, viticultural designations are granted to relatively small geographical regions, possibly as small as an individual vineyard.[75] A viticultural area that is granted an AOC designation is considered to be a long established producer of fine wines.[76] Designations are not freely granted and a wine must meet several criteria,

64. *Id.* at art. 34.
65. *See id.*
66. *Id.*
67. *Compare* 27 C.F.R. § 4.25, *with* Council Regulation 479/2008, *supra* note 62, at art. 34.
68. *See* Jeffery A. Munsie, *A Brief History of the International Regulation of Wine*, HARVARD LAW SCHOOL, 2002, at 1, 28, http://leda.law.harvard.edu/leda/data/310/Munsie.pdf.
69. *See* 479/2008, *supra* note 62, at pmbl. (28).
70. *See* MENDELSON, *supra* note 41, at 142 (explaining that the French system is designed to honor traditional practices and capture essential grape character).
71. *See, e.g.*, *Technology*, *supra* note 61.
72. *See id.*
73. *See* RON S. JACKSON, WINE SCIENCE: PRINCIPLES, PRACTICE, PERCEPTION 485 (Steve L. Taylor ed., 1994).
74. *Id.*
75. *See id.*
76. *See id.*

ranging from land evaluations to taste assessments, in order to qualify as a high quality AOC wine.[77]

Particularly important to the notion of shifting viticultural areas under the AOC scheme are the regulations that fix the amount and type of wine that a specific viticultural region may produce.[78] AOC laws preclude the production of differing varieties of wine in a viticultural area by limiting the grape varieties that can be grown there.[79] These regulations prevent producers from branching out when demand for a particular AOC wine is low.[80] However, a high demand for a particular AOC wine may not be any more profitable to its designated producers because only specific viticultural areas may produce the wine variety that is in demand and only up to the amount fixed, regardless of whether demand is met.[81]

Less significant regulations within the French wine system delimit "less-distinguished viticultural regions" than those of the AOC. These regulations deal largely with areas that produce common table and country wines.[82] The prestige and deep-rooted interests that make AOC regulations so influential on the regulatory systems of other countries also make the AOC regulations themselves intensely resistant to change.[83] Modifications to ensure compliance with E.U. legislation have not significantly affected the framework of the AOC laws.[84] On the contrary, the E.U. system is largely based on the French AOC,[85] as are the regulatory schemes of other European countries to varying degrees.[86]

3. The Feasibility of Shifting Viticultural Areas in Differing Regulatory Schemes

The amount of grape product needed to maintain a quality designation and appellation size are two interrelated aspects of wine production that may affect the ability of a wine producer to adapt to

77. *See* ROBERTSON, *supra* note 8, at 140.
78. *See Technology*, *supra* note 61.
79. *Id.*
80. *Id.*
81. *Id.*
82. JACKSON, *supra* note 73, at 485.
83. *See Technology*, *supra* note 61.
84. JACKSON, *supra* note 73, at 484.
85. *See id.* at 485.
86. *See Technology*, *supra* note 61. *Compare* JACKSON, *supra* note 73, at 488 (stating that the Italian regulatory system bears resemblance to that of the French), *with* JACKSON, *supra* note 73, at 487 ("The German Appellation Control system is conceptually different from its French counterpart.").

global warming.[87] From a regulatory standpoint, when assessing the amount of necessary grape product in the U.S., eighty-five percent is the minimum amount of grapes originating from a specific viticultural area needed to qualify a wine for a more prestigious quality label (AVA), with the appellation of origin designation requiring only seventy-five percent.[88] However, in the E.U., the eighty-five percent threshold is for the less prestigious designation of geographical indication.[89] The more prestigious designation of origin requires one hundred percent of the product to originate in the same area.[90] Additionally, Member States may require the complete grape product for designation, and may refuse to apply an eighty-five percent rule because they are allowed to enact stricter regulations.[91] With regard to appellation size, the U.S. lawmakers did not intend that the actual size of the appellation itself will imply anything about wine quality and they therefore allow larger areas to qualify for designation.[92] Conversely, in the E.U. and its Member States, where smaller size is understood to mean higher quality,[93] appellations are more often designated as an individual wine or vineyard.[94]

Although the U.S. appellation system is loosely modeled after that of France and other European countries,[95] the U.S. is simply not as protective of geographical names.[96] A U.S. wine producer is comparatively more free to supplement his wine with grapes from outside of a viticultural area without losing prestige if climate affects crop production,[97] or plant farther north in a slightly cooler region without leaving the wine's designated viticultural area.[98] A U.S. winemaker may also produce different types of wine from the same viticultural area to supplement sales and mitigate the stress of supply and

87. *See generally Viticulture*, *supra* note 10, at 10-11 (discussing yield increases and viticultural area shifts as modes of adaptation).

88. *See* 27 CFR 4.25 (2011).

89. *See* Council Regulation 479/2008, *supra* note 62, at art. 34.

90. *See id.*

91. *See id.* at pmbl. (28).

92. *See* 27 CFR 4.25; JACKSON, *supra* note 71, at 489 (explaining there is a presumption that perceptible regional character will still exist in U.S. wines).

93. *See* JACKSON, *supra* note 73, at 485.

94. *See id.* at 485-86 (noting that the distinctness of wines from excessively small terroirs is a taste illusion due to limited human sensory perceptions).

95. *E.g.*, ROBERTSON, *supra* note 8, at 140.

96. *See id.*

97. *Compare* 27 CFR 4.25 (2011), *with* Council Regulation 479/2008, *supra* note 62, at art. 34.

98. *See generally* JACKSON, *supra* note 73, at 488 (stating that the Texas Hill Country viticultural area encompasses nearly four million hectares).

demand.[99] A wine producer in the E.U. may not be allowed to supplement a quality wine product with outside grapes at all.[100] The E.U. wine producer is generally more restricted in movement,[101] and in some countries may not attempt to produce more favored wine varieties within the designated area.[102] Therefore, the U.S. producer is more likely to be able to maintain a wine quality designation by shifting the source of his grapes, changing the location of their planting, or altering the wine he produces within the viticultural area itself. Meanwhile the E.U. producer may lose their quality designation as the terroir that once allowed production of a specific wine product shifts, but tighter regulations require that the wine producer remain in a small, fixed geographic location.

B. Genetic Modification of Grapevines

1. Regulation of Genetically Modified Agricultural Products in the United States

Federal policy concerning the safety of genetically modified agricultural products reflects the position that existing regulations currently used for assessing the safety of more traditionally produced foods are also appropriate for those produced by new DNA technologies.[103] In 1986, the White House Office of Science and Technology issued a policy statement to this effect,[104] which is considered to be the "cornerstone of U.S. biotechnology policy."[105] The 1986 policy statement sets forth a coordinated framework for various agencies and appoints a lead agency when more than one has jurisdiction over a certain genetically modified product.[106] Generally, the policy established that the federal government does not consider these

99. *See id.* at 489 ("The designation of a viticultural area does not impose any specific regulations on cultivar use, viticultural practices, or wine making procedures.").

100. *See* Council Regulation 479/2008, *supra* note 62, at art. 34.

101. *See Gardiose Origins of the Côtes Du Rhône*, VINTAGE DIRECT (2011), http://www.nicks.com.au/Index.aspx?link_id=76.823 (explaining that 15 to 20 hectares is the average size of a French appellation).

102. *See Technology*, *supra* note 61.

103. *See, e.g.*, *Guide to U.S. Regulation of Genetically Modified Food and Agricultural Biotechnology Products*, PEW INITIATIVE ON FOOD AND BIOTECHNOLOGY 1, 2 (Sep. 03, 2001) [hereinafter PEW], http://www.pewtrusts.org/our_work_report_detail.aspx?id=33388; Coordinated Framework for Regulation of Biotechnology, 51 Fed. Reg. 23,302, 23,303 (June 26, 1986).

104. *See generally* Coordinated Framework for Regulation of Biotechnology, 51 Fed. Reg. at 23,302 (announcing the policy of the agencies involved with biotechnology research and product review).

105. PEW, *supra* note 103, at 6.

106. *See id.*

technologies to be inherently risky and that products will continue to be regulated on a case-by-case basis, evaluating the product itself and not the process that creates it.[107] The Office of Science and Technology has also made its policy on the introduction of genetically modified organisms into the environment very clear.[108] Planned introductions of these organisms, including genetically modified crops, are not subject to oversight, unless introduction creates a risk that would make such oversight necessary.[109] Because regulation lies within an existing framework, further policy statements from individual agencies, rather than new legislation, elucidate how the federal government regards foods derived from genetically modified plants.[110]

The U.S. Food and Drug Administration ("FDA") issued a policy statement that is particularly helpful in understanding how the Government treats food products derived from new plant varieties,[111] such as a wine derived from a genetically modified vine. In this statement, the FDA reiterated the idea that food byproducts of genetically modified plant varieties will be regulated in the same manner as foods developed by traditional plant breeding within the existing regulatory framework.[112] The statement confirms the understanding that genetically modified food byproducts are no more dangerous than those that are produced from more traditional plant varieties.[113]

Almost a decade after the FDA announced its policy, several plaintiffs challenged its position. These plaintiffs feared that genetically modified foods may contain toxins or allergens, and some believed that their religion forbade the consumption of genetically altered foods.[114] However, the claims brought against the FDA were dismissed on summary judgment largely because the FDA did nothing but articulate

107. *See id.*

108. *See generally* Principles for Federal Oversight of Biotechnology, 55 Fed. Reg. 31,118 (July 31, 1990) (announcing federal policy on the planned introduction of genetically modified organisms into the environment).

109. *See id.* at 31,120.

110. *See* PEW, *supra* note 103, at 1-2, 6.

111. *See generally* Statement of Policy: Foods Derived From New Plant Varieties, 57 Fed. Reg. 22,984 (May 29, 1992) (announcing a policy statement on non traditionally derived foods, including those derived from genetically modified plants).

112. *See id.* at 22,984.

113. *See id.* at 22,985 ("In most cases, the substances expected to become components of food as a result of genetic modification of a plant will be the same as or substantially similar to substances commonly found in food, such as proteins, fats and oils, and carbohydrates.").

114. *See* Alliance for Bio-Integrity v. Shalala, 116 F. Supp. 2d 166, 169 (D.C. Cir. 2000).

policy and did not promulgate any new rules regarding genetically modified foods.[115]

Activism against biotechnology, such as that demonstrated by the plaintiffs in *Alliance for Bio-Integrity v. Shalala*, is widespread in the U.S.[116] Despite the federal government's relaxed policies regarding biotechnology, those concerned about its use in agriculture can localize control.[117] For example, in March 2004, the northern California county of Mendocino passed a ban making it unlawful to cultivate organisms whose "native intrinsic DNA has been intentionally altered or amended with non species specific DNA," but still allowed conventional methods of species modification.[118] This was the first and only ban of its kind in the U.S.[119] Similar localized bans will likely be rare because the typical American citizen does not remain apprised of the actual science behind food biotechnology and remains apathetic despite activist efforts.[120]

2. Regulation of Genetically Modified Agricultural Products in the European Union[121]

The regulatory systems that govern the production and consumption of genetically modified crops in the U.S. have progressed along a path that deviates greatly from their E.U. counterparts.[122] The differing regulatory treatments are unusual in the face of the many economic similarities between the U.S. and E.U.[123] and the existence of a competitive European biotechnology industry.[124] One possible explanation for the divergence may be found in the differing attitudes and expectations held by consumers in the U.S. and the E.U.[125] Whatever the reason may be, the biotechnology industry in the E.U. is

115. *See id.* at 181.

116. *See* Marygold Walsh-Dilley, *Localizing Control: Mendocino County and the Ban on GMOs*, 26 AGRIC. & HUM. VALUES 95, 96 (2009).

117. *See id.*

118. *Id.* at 97.

119. *E.g.*, *id.* at 95.

120. *See id.* at 98-99.

121. At the time of publication of this article, the European Commission is still in a long-running deadlock over a proposal that would allow Member States to individually regulate domestic farming of genetically altered agricultural products. *See, e.g.*, *EU Commissioner Call for Greater transparency of GMO Approval Process*, SEED TODAY (Jan. 14, 2011), http://www.seedtoday.com/articles/EU_Commissioner_Call_for_Greater_transparency_of_GMO_Approval_Process-103742.html.

122. *See Policies*, *supra* note 34, at 95.

123. *See id.*

124. *See, e.g.*, *id.* at 100.

125. *Id.* at 95.

faced with exceedingly strict regulations and a generally unwelcoming attitude.[126]

Diametrically opposed to the U.S. system, the E.U. system that regulates genetically modified crops is process-based rather than product-based.[127] This means that the way in which specific genetic modifications are carried out determines which regulatory framework the crop or product being modified will fall under.[128] Directive 2001/18/EC is more stringent than its predecessors.[129] Under this directive a precautionary principle is adopted, instructing the European community to act preventatively to protect human health and the environment from the deliberate release and market availability of genetically modified organisms.[130] The precautionary principle focuses on both indirect or delayed effects of changes in agricultural practices, as well as the immediate repercussions associated with the introduction of a genetically modified crop.[131] Directive 2001/18/EC treats environmental releases of genetically modified products for research and development differently from releases for the purpose of putting a product on the market.[132] Consent procedures for the market introduction of a genetically modified product are considerably extensive and possibly even indefinite.[133] Directive 1829/2003 further provides a "high level of protection" through safety standards designed to protect the lives and health of both humans and animals with regard to exposure to genetically modified foods and feed.[134]

A *de facto* moratorium on the approval of new genetically modified products in the E.U. started in June 1998.[135] However, prior to the moratorium the approval process was prolonged at the Member State level, with final approval only obtainable by evaluation of the product by the E.U. Council of Ministers.[136] The *de facto* moratorium was theoretically lifted in 2004 with the allowance of both the cultivation and production of a transgenic[137] corn crop, genetically modified for purposes

126. *See* G. Kristin Rosendal, *Governing GMOs in the EU: A Deviant Case of Environmental Policy-Making?*, 26 GLOBAL ENVTL. POL. 82, 100 (2005).

127. *See generally* Council Directive 2001/18/EC, 2002 O.J. (L 106) 1 (EC).

128. *See* Jan-Peter Nap, *The Release of Genetically Modified Crops into the Environment*, 33 PLANT J. 1, 11 (2003).

129. *See* Rosendal, *supra* note 126, at 82.

130. *See* Council Directive 2001/18, *supra* note 127, at pmbl. (4-8).

131. *E.g.*, Nap, *supra* note 128, at 11.

132. *See id.*

133. *See id.*

134. Commission Regulation 1829/2003, art. 1, 2003 O.J. (L 268) 1 (EC).

135. *E.g.*, Rosendal, *supra* note 126, at 82.

136. *Policies, supra* note 34, at 96.

137. Transgenic in this sense means that the genes of one or more species have been incorporated into an organism of another species. *See Transgenic Definition*, MERRIAM-

of pest control.[138] The E.U has since authorized, for import only, many genetically modified varieties, but due to consumer pressure in Member States, the moratorium has continued throughout most of the community.[139]

3. The Feasibility of Introducing Genetically Modified Grapevines for Wine Production in Differing Regulatory Schemes

Vitis vinifera is the dominant species of grape used in wine making because of its high production quality.[140] Production of wine is based almost exclusively on varieties of this species.[141] However, unlike other species of *Vitis* grapes, *Vitis vinifera* does not naturally possess the genetic characteristics needed to defend against the stressors of climate change, including temperature, disease, and pests.[142]

The complete genome of the grape variety Pinot Noir has already been sequenced, demonstrating the expertise of the biotechnology industry in dealing with genetic modification of grape crops.[143] This prowess opens the door for the sequencing of the resistance and defense genes useful in the protection and continuation of *Vitis vinifera* in the face of global warming.[144] The introduction of these genes into weaker grape vine varieties through genetic modification would allow the grapes to adapt to the stressors of global warming without obstructing localized regulation or further altering traditional wine production.[145] However, the feasibility of introducing a transgenic grapevine is highly dependent on the regulatory scheme controlling the growth and marketability of genetically modified crops.[146]

It is abundantly clear, when comparing the regulatory schemes governing the introduction of genetically modified crops in U.S. with those of the E.U., that a genetic solution[147] to the effects of global

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WEBSTER ONLINE DICTIONARY, http://www.merriam-webster.com/dictionary/transgenic (last visited Feb. 3, 2011).

138. *See Genetically Engineered Crops and Foods: Worldwide Regulation and Prohibition*, CENTER FOR FOOD SAFETY, (June 2006) [hereinafter THE CENTER FOR FOOD SAFETY], http:// www.centerforfoodsafety.org/pubs/World_Regs_Chart%20_6-2006.pdf.

139. *See id.*

140. *See* Louime, *supra* note 1, at 1210.

141. *See* Bisson, *supra* note 21, at 698.

142. *See* Louime, *supra* note 1, at 1210.

143. *See id.*

144. *See id.* at 1210-11.

145. *See id.* at 1210.

146. *See Policies*, *supra* note 34, at 95.

147. The genetic solution discussed in this comment is that of altering the grapevine to have a greater resistance to the stressors of global warming. *See* Louime, *supra* note 1, at 1210-11. A larger understanding of the genetic solution not discussed involves the

warming on wine is far more practical in the U.S. than in the E.U.[148] Although the E.U. does have regulatory system that allows for the introduction of genetically modified crops,[149] allowances are rarely made and are always made under an attitude of protectionism and precaution.[150] The U.S. regulatory scheme is far less stringent and permits an open market for most genetically modified agricultural products and processes.[151] In comparison to the handful of genetically modified crops released in the E.U., about seventy-five percent of soybeans and one-third of corn crops in the U.S. are the spawn of genetically modified seeds.[152] If wine producers seek to introduce a variety of *Vitis vinifera* genetically bolstered to withstand the onslaught of global warming in the future, those in the U.S. would be freer to take this step.

C. *Changing Production Techniques*

1. Regulation of Oenological Practices in the United States

Wine producers often look to new oenological technologies to help solve problems that they confront in trying to produce the perfect wine.[153] Oenological practices include both regulating the external environment of grape production through techniques like irrigation and regulating the biochemical and chemical processes of the grape itself by controlling factors such as alcohol and acidity levels.[154] Implementing new production techniques and technologies that affect these factors of grape production is one way to combat the environmental changes impacting the way grapes are processed into wine.[155]

The continually developing oenological practice of irrigation is a necessity in a number of the major wine producing areas of the U.S.[156] In dryer regions, such as Texas, wine production would be impossible

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genetic modification of both grapevines and yeast to help control alcohol and acidity levels that may become unbalanced in higher temperatures. *See Viticulture*, *supra* note 10, at 10.

148. *See Policies*, *supra* note 34, at 95; Rosendal, *supra* note 126, at 82.

149. *See* 1829/2003, *supra* note 134, at art. 1; 2001/18, *supra* note 130, at pmbl. (4-8).

150. *See* Nap, *surpa* note 128, at 11.

151. *See* Rosendal, *supra* note 126, at 82.

152. *Id.*

153. *See* Christman, *supra* note 34.

154. *See generally Viticulture*, *supra* note 10, at 9-10 (discussing the winery level impacts of global warming affecting use of aridity and environment as well as acidity and similar wine characteristics dependant on the biochemistry of the grape itself).

155. *See, e.g.*, Christman, *supra* note 35.

156. *See* Cary Blake, *Texas High Plains Wine Grape Industry Taking Root*, SOUTHWEST FARM PRESS, May 27, 2009, at para. 22, http://southwestfarmpress.com/news_archive/ texas-wine-grapes-0527/.

without irrigation,[157] a lack of which would likely result in desiccated and unviable grape products.[158] The Texas High Plains AVA, which contains five wineries, was established in 1993 and stretches over nine million acres, making it the third largest AVA nationally.[159] In this expansive AVA, irrigation allows producers to properly manage grapevine heartiness.[160]

A second oenological technique that is important to adjusting wine production to meet the effects of global warming is tartaric acid[161] addition.[162] Tartaric acid is used to correct acid deficiencies in wine by reducing pH.[163] Wine producers often add tartaric acid to their product in order "to address the imbalance of acidity caused by warm/hot climates that decrease the acidity in grape berries."[164]

In the U.S., the management of chemical and biochemical processes of wine by addition of chemicals, such as tartaric acid, is subject to a level of regulation specific to wine and juice.[165] In the example of tartaric acid, the addition of the acid may not be used to reduce the pH of the wine product below 3.0.[166] The acid may be added any time before, after, or during fermentation in order to correct deficiencies, but the level of tartaric acid in the finished wine may not be greater than nine grams per liter.[167]

2. Regulation of Oenological Practices in the European Union

Within the larger E.U. regulatory framework, Member States are instructed to set forth provisions regarding growing methods that ensure that only the finest quality wines are produced.[168] Therefore, oenological practices, such as irrigation, are carried out only to the extent that

157. *See id.*
158. *See Making Wine*, *supra* note 7, at 27.
159. *See* Blake, *supra* note 156.
160. *See id.*
161. Tartaric acid is clear colorless acid of plant origin used in food and medicines, photography, and wine making. *See* WEBSTER'S, *supra* note 3, at 1370.
162. *See* Jeffrey T. Iverson, *How Global Warming Could Change the Winemaking Map*, TIME (Dec. 3, 2009), http://www.time.com/time/specials/packages/article/0,28804,1929071_1929070_1945282,00.html.
163. *See* 27 C.F.R. § 24.246 (2011). pH is the measure of acidity or alkalinity of a solution that is represented by a number scale on which a value of seven represents neutrality, lower numbers indicate increasing acidity, and higher numbers are increasingly basic. *See* WEBSTER'S, *supra* note 3, at 1011.
164. *Viticulture*, *supra* note 10, at 9.
165. *See, e.g.*, 27 C.F.R. § 24.246.
166. *See id.* § 24.182 (2009).
167. *See id.*
168. *See* Council Regulation 1493/1999, Annex VI, 1999 O.J. (L 179) 1 (EC).

individual Member States have authorized such practices.[169] E.U. Member States have generally favored the traditional techniques of wine production over new technologies because of a belief that the traditional methods are better simply because they are traditional.[170] Based on this understanding, irrigation has been fundamentally outlawed in European countries causing grape yields as well as wine flavor to be subpar in seasons with warmer than normal temperatures.[171] The prohibition of irrigation throughout most appellations has created a myth that irrigation is detrimental to grape quality.[172] Although there is some truth behind this myth based on the fact that excessive irrigation can have undesirable effects on crop maturity and quality, proper irrigation can "facilitate the production of premium quality grapes."[173] High temperatures and a lack of rainfall have forced some French wine producers to start irrigating their vineyards. This means that they no longer produce a wine with a superior quality designation, despite the fact that irrigation is generally allowed in the larger agricultural regulatory framework enveloping several appellations.[174]

The favoring of traditional methods to new technologies also extends to production techniques that deal with the chemical and biochemical process of wine making.[175] E.U. regulations of wine production divide the community into various regulatory zones and may treat them differently.[176] However, no matter which zone a wine producer is located in, the acidification of wines may only be carried out up to a limit of two and one half grams per liter expressed as tartaric acid in the finished wine product.[177] This amount is only a third of that allowed in wines in the U.S.[178] Furthermore, individual Member States are allowed to apply more stringent rules with respect to oenological practices.[179] For example, in the normally cool French wine making regions of Champagne and Alsace, many winemakers having problems naturally maintaining acidity levels have begun to use tartaric acid.[180] In France this is a rare practice that must be specifically authorized.[181] The

169. *See id.*
170. *See* Christman, *supra* note 35.
171. *See Making Wine*, *supra* note 7, at 28.
172. *See* JACKSON, *supra* note 73, at 133.
173. *Id.*
174. Iverson, *supra* note 162, at para. 5.
175. *See* Christman, *supra* note 35.
176. *See generally* Council Regulation 1493/1999, *supra* note 163, at Annex III (designating geographical wine growing zones).
177. *See* Council Regulation 479/2008, *supra* note 62, at Annex V.
178. *See* 27 C.F.R. § 24.182 (2011).
179. *See* Council Regulation 479/2008, *supra* note 62, at pmbl. (28).
180. *See* Iverson, *supra* note 162.
181. *See id.*

use of tartaric acid has only been permitted twice in the Alsace region and is considered an exceptional measure; however, it could "become common practice in five or [ten] years."[182]

3. The Feasibility of Changing Production Techniques and Oenological Practices in Differing Regulatory Schemes

Global warming is predicted to increase temperatures in a way that will cause wine grape harvests to occur in the warmer parts of the growing season, resulting in "hot and potentially desiccated fruit without greater irrigation inputs."[183] In comparing the regulatory attitudes of the U.S. with those of the E.U. and its Member States towards irrigation, it is clear that the U.S. is in a better position to utilize irrigation techniques to mitigate the effects of global warming on wine production.[184] U.S. wine producers have already adopted a variety of irrigation techniques[185] and indeed rely on irrigation as a way of maintaining viable, healthy grapevines.[186] While the E.U. does technically allow for irrigation practices,[187] the idea of using a nontraditional technique to modify an aspect of a wine producing terroir is largely frowned upon by Member States.[188] As temperatures rise, more European wine producers will be inclined to implement irrigation practices, but their wines are likely to lose their quality designations under the current regulatory system,[189] a significant deterrent for any European producer. Conversely, quality designations in the U.S. are based solely on geography, not geography and production techniques as in European countries, which allows U.S. winemakers to implement techniques without causing their good names to suffer.[190]

Other biochemistry-related oenological practices have become more important; temperature increases speed up biological events within the grapevine, causing earlier sugar ripeness and loss of acidity.[191] Although there are a variety of technologies available to modify acidity levels,[192] the use of tartaric acid is common when dealing with loss of acidity

182. *Id.*
183. *Making Wine*, *supra* note 7, at 27.
184. *Compare* Blake, *supra* note 156, *with* Iverson, *supra* note 162.
185. *See generally* JACKSON, *supra* note 73, at 133-35 (discussing different methods of irrigation).
186. *See* Blake, *supra* note 156.
187. *See* Council Regulation 479/2008, *supra* note 62, at Annex VI.
188. *See* Iverson, *supra* note 162.
189. *See id.*
190. *See* JACKSON, *supra* note 73, at 489.
191. *See Making Wine*, *supra* note 7, at 28.
192. *See, e.g.*, Christman, *supra* note 34.

caused by warmer temperatures.[193] A rise in temperatures has caused many wine producers, even those in E.U. Member States, to begin to use tartaric acid in the effort to maintain acidity levels.[194] However, the use of tartaric acid in the E.U. is placed under stricter volume limitations than in the U.S.[195] Even if this technique does become common practice in E.U. Member States, based on the volume of tartaric acid allowed to be expressed in a finished wine product, U.S. wine producers can use tartaric acid to counter loss of acidity to a far greater extent than E.U. producers.[196] Therefore, U.S. wine producers are freer to implement a variety of different oenological practices to combat the effects of global warming than producers in the E.U.

IV. CONCLUSION

The above comparisons demonstrate that U.S. wine producers are more likely to be successful in implementing a variety of solutions to climate change, no matter whether they are geographical, genetic, or oenological. The E.U. regulatory scheme affecting wine production is inherently stricter than that in the U.S.[197] because there is a great reluctance within the European wine community to alter centuries-old traditions of wine making.[198] The idea of the tightly controlled terroirs losing their ability to produce wine may not be enough to entice regulatory change in many E.U. Member States.[199]

In exploring the reasoning behind the regulations, the renowned American winemaker Robert Mondavi has emphasized the importance of wine throughout history and its relation to the cultural image of a country.[200] In European countries like France, the strong correlation between cultural and geographical diversity explains the importance of locally identified agricultural products and foodstuffs to a significant degree.[201] However, unlike the closely land-tied histories that bolster the European cultural identity, American history demonstrates a culture based on abuse of land rather than using it as a preserve for agricultural

193. *See Viticulture*, *supra* note 10, at 9; Iverson, *supra* note 162.

194. *See* Iverson, *supra* note 162.

195. *Compare* 27 C.F.R. § 24.182 (2011), *with* Council Regulation 479/2008, *supra* note 62, at Annex V.

196. *See* 27 C.F.R. § 24.182; Council Regulation 479/2008, *supra* note 62, at Annex V.

197. *Making Wine*, *supra* note 7, at 28.

198. *See* Christman, *supra* note 35.

199. *See* Seguin & de Cortazar, *supra* note 29, at 3.

200. *See* Robert Mondavi, *Wine and History*, 16 PUB. HISTORIAN 66, 67 (1994).

201. *See* VALUING LOCAL KNOWLEDGE: INDIGENOUS PEOPLE AND INTELLECTUAL PROPERTY RIGHTS 232 (Stephen B. Brush & Doreen Stabinsky eds., 1996).

and culinary knowledge and tradition.[202] Because the importance of localized and traditional food production is not as culturally prevalent in America, strict regulation of localized agricultural production is not prevalent in American law.[203] American legal principles tend to maximize the proliferation of knowledge in ways distinct from European countries, especially in the area of agricultural techniques and practices, by promoting the spread of new technologies rather than emphasizing the importance of traditional practices.[204]

The question remains as to whether traditional techniques are better because they are traditional.[205] Many of those who enjoy quality European wines are chagrin to subject apparent viticultural perfection to the taint of modern technology, nontraditional production techniques,[206] or the hazards of genetic modification.[207] The usual understanding of quality wine has been based on the fortitude of the wine producer and aptness of the land, with minimal vineyard input or manipulation.[208] Unlike the variety of mass-produced agricultural products that inundate consumers worldwide, wine is marketed based on the unique and special geographical location of production.[209] Despite this understanding, the world wine market has become increasingly more competitive in recent years with new world winemakers "quick to respond to global perceptions of quality."[210] Thus, the desire to protect wine quality and heritage is not necessarily equivalent to a strict adherence to traditional methods, meaning that in the future traditional wines may not come from traditional production techniques.[211] In this sense, traditional techniques may no longer be important, but traditional wines will maintain their cultural importance and attractiveness to consumers.[212] With the grapes themselves demonstrating that climate change is a reality,[213] necessity may mandate the implementation of beneficial new technologies and a

202. *See* Jim Chen, *A Sober Second Look at Appellations of Origin: How the United States will Crash France's Wine and Cheese Party*, 5 MINN. J. GLOBAL TRADE 29, 59 (1996).

203. *See id.* at 58.

204. *See id.* at 58-59.

205. *See generally* Christman, *supra* note 35.

206. *See id.*

207. *See generally* Rosendal, *supra* note 126, at 100 (discussing public opinion of biotechnology and health as a factor preventing the biotechnology industry from successfully lobbying for deregulation).

208. Bisson, *supra* note 21, at 696.

209. *See id.*

210. *Id.* at 697.

211. *See generally id.* (discussing the challenge the perceived value of wine presents to scientists and wine producers in the new century).

212. *See generally id.* at 699 (emphasizing the market importance of creating wines attractive to consumers while concurrently developing new production techniques).

213. *See Viticulture*, *supra* note 10, at 9; Webb, *supra* note 5, at 1.

change in what defines traditional viticulture.[214] For traditional and culturally important wine varieties to survive, the European wine community may need to adopt regulatory schemes more like those of new world wine countries, such as the U.S., whose lax regulations allow for adaptation and change that may alter the perception of quality without necessarily harming actual wine quality.[215]

214. *See Making Wine*, *supra* note 7, at 28.
215. *See* Webb, *supra* note 5, at 9.