A need for planned adaptation to climate change in the wine industry

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PERSPECTIVE

A need for planned adaptation to climate change in the wine industry

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The diversity of wine production depends on subtle differences in microclimate and is therefore especially sensitive to climate change. A warmer climate will impact directly on wine-grapes through over-ripening, drying out, rising acidity levels, and greater vulnerability to pests and disease, resulting in changes in wine quality (e.g. complexity, balance and structure) or potentially the style of wine that can be produced. The growing scientific evidence for significant climate change in the coming decades means that adaptation will be of critical importance to the multi-billion dollar global wine-industry in general, and to quality wine producers in particular (White *et al* 2006, 2009; Hertsgaard 2011).

Adaptation is understood as an adjustment in natural or human systems in response to actual or expected environmental change, which moderates harm or exploits beneficial opportunities (IPCC 2007). Autonomous adaptation has been an integral part of the 20th century wine industry. Technological advances, changes in consumer demand, and global competition have meant that growers and producers have had to adapt to stay in business. The gradual temperature rise in the 20th Century (0.7 °C globally) has been accommodated successfully by gradual changes in vine management, technological measures, production control, and marketing (White *et al* 2009), although this has in many cases resulted in the production of bolder, more alcoholic wines (Hertsgaard 2011). In spite of this success, the wine industry is surprisingly conservative when it comes to considering longer term planned adaptation for substantial climate change impacts. A few producers are expanding to new locations at higher altitudes or cooler climates (e.g. Torres is developing new vineyards high in the Pyrenees, and Mouton Rothschild is setting up new vineyards in South America), and the legal and cultural restrictions of Appelation d'Origine Côntrollée (AOC) systems are being discussed (White *et al* 2009). Changes in the AOC regulations would, for example, be imperative if different grape varieties were to be cultivated in response to climate change. Thus far, however, there has been little coordinated action to plan ahead. The third *Climate Change and Wine* conference organised by the wine industry (April 2011 in Marbella, Spain; www.climatechangeandwine.com), exemplifies this situation since it focused on observed impacts and sustainable production (mitigation), rather than on adaptation to cope with projected change.

Awareness and understanding of potential change is crucial in raising adaptive capacity (Metzger *et al* 2008). Diffenbaugh *et al* (2011) have recently developed a novel method for communicating potential climate change impacts for the wine industry using climate adaptation wedges. These diagrams summarise projected climate change impacts over time and distinguish the net gain or loss in wine production under a range of adaptation strategies. The climate adaptation wedges form a strong synthesis, illustrating how some losses can be negated with continued autonomous adaptation, but that even with effective planned adaptation the quality of premium wine-grapes is likely to alter. Although the study focused on the western US, the adaptation wedges can be compiled fairly easily for other wine regions, or even individual producers. As such, they can form an important communication tool, but can also help guide longer term strategic planning.

Adaptation wedges require careful interpretation and it is probably this interpretation process that will provide the most valuable insights. The climate change impacts in the diagrams are based on observed relationships between climate and wine production, which is assumed to stay unchanged in the future. However, rapid climate change will be a great stimulus for a complex and unprecedented transformation of the industry. Similarly, the potential contributions of the alternative adaptation strategies to cope with climate change are best-estimates given current knowledge, but are open to discussion among experts. As such, the adaptation wedges can form an important component of strategic conversations (cf Van der Heijden 2000) as part of wider foresight analysis regarding the future directions for a region or a producer.

However, changes in the wine sector will not be mediated by physical changes in the climate alone. Changes in consumer preferences and the geography of global wine demand will have a strong effect on what wine is produced where. Moreover the method of changing grape varieties as an adaptation to climate change has potential pitfalls since consumers associate wine produced in a region with certain grape varieties. Changing this will change dramatically the content of the wine bottle, and how consumers will react to this is unknown. Regions such as Burgundy are likely to be strongly adversely affected by this issue since the pinot noir grape used to produce most Burgundian red wines is especially sensitive to climate conditions (White *et al* 2009). Would Burgundy wines continue to command such high prices if they were produced from Syrah rather than Pinot noir?

There are clearly challenging times ahead for the wine industry. Greater awareness of the likely changes ahead will benefit the industry at large, while strategic planning will provide individual producers with a comparative advantage over competitors. To cope with projected change, long term planned adaptation strategies deserve greater attention. These include possible geographic shifts in production, adjustments to AOC systems, and marketing strategies to influence consumer demand. Foresight methods, including scenario analysis (Rounsevell & Metzger 2010) and the exploration of climate adaptation wedges (Diffenbaugh *et al* 2011) are important tools that can help the wine industry in planning for an uncertain future.

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