



## Please Drink Responsibly

**T**he labels sustainable, biodynamic, organic, and natural are becoming almost as commonplace on wine bottles as the vintage. The addition of these descriptors only furthers wine's reputation for ambiguity and complexity, but they have a real meaning for product quality, environmental stewardship, the wine industry, and our wallets.

Although each label has its own distinct criteria, wines that are sustainable, biodynamic, organic, or natural are all produced in an effort to achieve a positive change in various aspects of business practices throughout the value/supply chain. This broad definition is in line with AIChE's Institute for Sustainability's (IfS's) definition of sustainability as "a path of continuous improvement, wherein the products and services required by society are delivered with progressively less negative impact upon the Earth."

The metrics to measure winemakers' sustainability have yet to be standardized, which makes it difficult to quantify and compare the impacts of wines with the same certification, and even more difficult to compare wines carrying different certifications. However, documentation and reporting is the first step in making wine production more sustainable. Programs that certify wines as responsibly produced provide tools to help wine growers and producers measure, track, and, ideally, improve the sustainability of the production process.

Each of the labels indicates compliance with a set of requirements — many of which are similar across certifications — that can be found easily on the various certifiers' webpages. Organic standards, such as those developed by the U.S. Dept. of Agriculture (USDA), preclude the use of most synthetic materials, such as pesticides, and focus on production methods that preserve the environment. The Demeter certified biodynamic seal indicates compliance with biodynamic principles, which emphasize minimal manipulation of the raw material as it is transformed into product. Wines that are labeled as natural are not certified as such, but are produced with minimal chemical and technological intervention. Organic, biodynamic, and natural are similar in their main focus, but differ in the specifics.

Many bodies around the world, including multiple organizations in the U.S., certify wine as sustainable. Sustainability certification goes beyond the product, and requires winemakers to optimize and balance environmentally sound, socially equitable, and economically beneficial practices. According to a recent sustainability report by the California Sustainable Winegrowing Alliance, a sustainable winegrower must produce high-quality grapes and wines, protect the environment, be a good neighbor and employer, and maintain a thriving long-term business. Certifying

organizations often accept third-party certifications such as organic, biodynamic, or the environmental management standard ISO 14001, as part of their compliance requirements, along with imposing their own additional guidelines.

Sustainability concerns in the winemaking industry are much the same as those in other industries familiar to chemical engineers. Some of the main tenets of sustainable winemaking practices sound familiar to engineers, including using energy and water efficiently; protecting wildlife and soil health; managing waste and recycling responsibly; minimizing pollution and emissions; optimizing packaging, transportation, and distribution; investing in and supporting the community; and being a good employer. Areas with the potential for improvement that are of particular interest to engineers are water use, packaging, and emissions.

Sensor technologies that determine and dispense precise amounts of water help to use water resources more efficiently. Water is delivered during irrigation via a micro-irrigation system that dispenses water based on humidity levels measured by the sensors. To eliminate excess water use during tank washing, which was traditionally done manually using a hose, a clean-in-place (CIP) system automatically dispenses the amount of water needed to reach the specified level of sanitation. Filtering and treating process water only to the degree required by the next process — such as reusing water used to clean tanks for irrigation — optimizes water use and reuse.

Innovative packaging solutions are also helping to improve efficiency and sustainability. One company was able to significantly reduce emissions and costs by forgoing traditional glass wine bottles without jeopardizing quality. By packaging 3 L of wine (equivalent to four standard bottles) in a bag within a box, Archer Roose reduced the carbon footprint, transportation costs, and quantity of landfill-bound refuse of its wine dramatically.

To control carbon emissions, the Univ. of California, Davis' Sustainable Winery practices a unique form of sequestration. The carbon produced during wine fermentation is captured and then turned into chalk.

The wine industry is proving that sustainability makes financial sense and is good for business. Efficiently using resources, investing in local communities, and protecting the environment help to ensure a thriving business. And while the wine industry may not be critical for humanity's livelihood (arguably), the industry's remarkable engagement in the movement and fervor to adopt and require high sustainability standards sets a good example for the entire agricultural and food production industries.

**CEP**