Can biodynamic wines become even more sustainable? The eco-efficiency evaluation based on LCA and LCC analysis.

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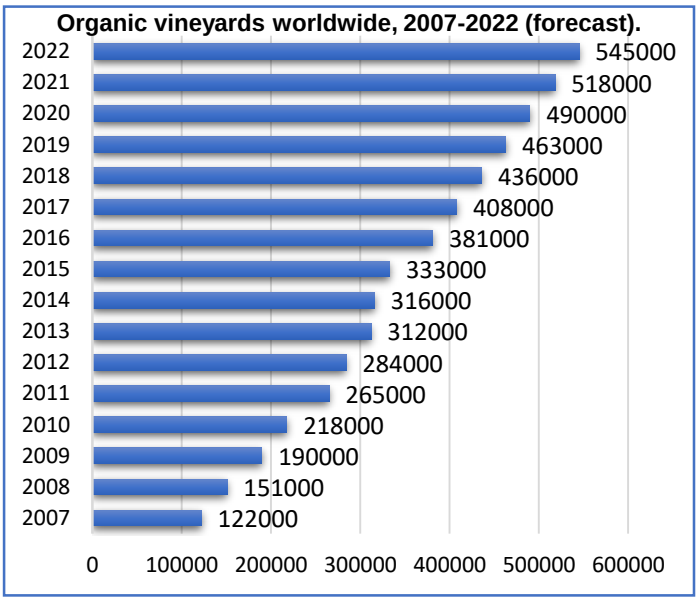
The challenge for global agriculture is to increase efficiency of production from the available land while reducing the negative effects of its use. This is one of the reasons why viticulture is now moving towards more sustainable production practices. Many winemakers have already introduced alternative production methods: in addition to organic production, for example biodynamic or integrated cultivation.

The sustainable wine market is dynamically developing. There is also an increasing number of agricultural producers, including winemakers, who choose biodynamic production. Therefore, it makes sense to use objective tools such as the LCA to determine its real environmental impact. A review of the current state of knowledge on LCA for biodynamic wine can be found, inter alia, in Petti et al. (2015). Most of the research covers the analysis of the life cycle, from viticulture to distribution.

Winemaker 1	Winemaker 2	Winemaker 3
		
Growing area: 4ha Other products: Preparations of fruit and vegetables, herbs, eggs Animals: poultry, sheep, pigs	Growing area: 12ha Other products: none Animals: none	Growing area (including orchards and fields): 2000ha Other products: apples, cereals Animals: cattle, horses, pigs, sheep and a few chickens



	Conventional wine	Organic wine	Biodynamic wine
Vineyard (gardening practices): Examples of used plant protection	Pesticides and artificial fertilizers authorized for trading	Insecticides of plant origin, vegetable oils, powders and insecticidal soaps that are selective, with a narrow range of effects and of lower toxicity copper-based solutions sulphur-based solutions bicarbonates, plant extracts and oils, natural products such: milk, whey, pheromones	Horn silica, horn manure, oak bark, yarrow, camomile nettles, dandelion, valerian
SO_2 content	My contain no more than 400 mg/l SO_2 (special wines)	May contain no more than 100–220 mg/l of SO_2	May contain no more than 70–90 mg/l of SO_2
Winehouse (vinification practices): chosen substances	Ammonium bisulphite/sulphate, Beta-glucanase enzymes, Calcium alginate/phytate, Carboxymethylcellulose, Chitin-glucan, Co-polymer PVI / PVP, L-malic acid, D, L-malic acid, Lysozyme, Polyvinylpolypyrrolidone, Potassium ferrocyanide, Sorbic acid and sorbates, Urease, Yeast mannoproteins. *The lists are not exhaustive!	Acacia gum (gum arabic) Active dry or fresh yeast Concentrated must Edible gelatine Egg white albumin Isinglass Plant proteins from wheat or peas Sucrose	Bentonite Egg albumin Oenological carbon Sucrose

The aim of the research will be to conduct a comparative assessment of the eco-efficiency using LCA and LCC analysis of wine-producing farms. This research focused mainly on the analysis of wine production, including the vinification process, bottling.

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