Oenologist's words Joël ROCHARD

Interview by Jacques Bertin

Joël Rochard:

"It is absolutely necessary to limit the impact on greenhouse gases and, more generally, to implement sustainable development whenever possible within the wine industry".

An agricultural engineer and oenologist who graduated from Dijon in 1979, Joël Rochard began his career at the Comité Interprofessionnel du Vin de Champagne on a project relating to effluent treatment. From there, he broadened his knowledge to become one of the experts in sustainable viticulture, notably through the creation of the National Environment Pole of the French Institute of Vine and Wine. He also teaches in various schools and universities, publishes various works, in particular the "Traité de viticulture et d'oenologie durables", and participates in numerous conferences as well as national and international missions, as an expert of the International Organisation of Vine and Wine. His involvement in

numerous international thematic networks, as well as the animation of European projects, has enabled him to acquire a worldwide knowledge of the wine sector, in particular in relation to the elaboration and tasting of sparkling wines, sustainable development, treatment of wine effluents and sprayers, biodiversity, landscapes, climate change and the eco-design of cellars, subjects for which, since his retirement from the institute, he has taught in various courses and has accompanied projects for cellars or international wine structures. His visits to most of the world's wine-producing countries have also enabled him to appreciate the beauty and diversity of wine-growing landscapes, a theme that he enhances through numerous photographs presented in particular in a book: "Vignes et Terroirs, Splendour des paysages du monde" (Vines and Landscapes, Splendour of the World's Landscapes). His action for the preservation and enhancement of wine-growing landscapes as well as biodiversity has also enabled him to develop the concept of eco-oenotourism.

La Revue Française d'œnologie: The vine is perhaps the crop where climate change is most likely to occur. How do you apprehend this phenomenon?

Joël Rochard: The vine is a very good biological indicator of the climate, like the Huglin index, which allows us to determine the optimum climate for grape varieties and terroirs. Historical harvest dates have in fact been used to reconstruct the climate over the last few centuries. The studies carried out initially by Emmanuel Leroy-Ladurie, and then by other researchers, highlight a trend towards earliness since the 1990s, which has emerged from the variability observed over five centuries, which seems to support the hypothesis of a warming that is not simply natural but at least partly due to human action. Collaboration with historians has also made it possible to identify the correlation between temperature and harvest dates. Thus when the temperature rises by 1 degree, the harvest is brought forward by an average of 10 days. Concerning the end of our century, the question today is rather whether the temperature increase will be + 2°, as hoped, or rather, without a significant reduction in the greenhouse effect, + 4 or 5°C. Compared to the IPCC's hypotheses, it seems that we are moving more towards high hypotheses. Indeed, almost every year we beat the average temperature records. Moreover, within the northern hemisphere, which is more continental compared to the southern hemisphere, global warming is globally greater than the global average.in the 20th century, the average global temperature increased by approximately 0.6°C and that of metropolitan France by more than 1°C. Many conferences are organised on adaptation to change, but relatively few on mitigation and more generally on sustainable development. This approach is essential for wineries, for which it is important to reduce energy consumption, particularly in relation to air conditioning, through eco-design. The principles of ecodesign, from an energy perspective, were published in a previous Journal (No. 295, November and December 2019), with examples from different regions. I address this theme in the training of future oenologists in particular, as well as in various Masters courses. Indeed, I think that young professionals in the sector must integrate these concepts now, especially since a cellar is built for a very long time, which means anticipating the constraints for the future. Since retiring from the Institute, I have been working with wineries and professional organisations in France and abroad to develop these new concepts. It is imperative that the sector is mobilized. Climate plans have been set up in winegrowing companies and through inter-professional organisations in the three regions of Champagne, Burgundy and Bordeaux. Thus, it is absolutely necessary to limit the impact on greenhouse gases, whenever possible within the sector. Everyone can take action. Beyond

ecodesign, efforts must be made, with a vision of a circular economy, on all production routes: reducing the weight of bottles, modes of transport for wine or personnel, renewable energies, etc.... Interesting avenues may also concern by-products, which are fairly well valorised in France by the distillation sector, but which may, depending on the case, be extended to composting and methanisation. Soils are also important carbon sinks to be developed through the storage of organic matter from grassing and all the developments with the planting of hedges and trees that contribute to carbon storage and biodiversity. At the same time, nitrogen, by volatilizing, also contributes to the greenhouse effect, which requires optimal management of organic and mineral fertilisers. In this context, agro-ecological approaches developed in particular by the IFV and the INAO can be envisaged, associating them with environmental specifications and Appellations of Origin. Beyond the technical adaptations, but we must imagine that tomorrow the social and societal consequences, geostrategic with migrations, cultural or cultural conflicts, which, if we look at the history of civilizations, will not be neutral for the future of our sector. Mention must also be made of the rise in sea levels, droughts and extreme climatic events which will become more pronounced. They will inevitably lead to difficulties for the population, which will impact the wine market. We must also take a step back and understand that wine production is not a basic food production. It is a cultural production and, consequently, it is not certain, in a future context of food challenge, that it will be taken as a priority both in terms of the occupation of space, and in relation to the use of inputs, water in particular.

The RFOE: How can we adapt to climate change?

J. A.: Certainly significant changes have already occurred. We have to adapt to high alcohol levels, and of course from 15 or 16 degrees, it becomes problematic. Acidity drops, which can penalise white wines and sparkling wines in particular. Nevertheless, overall and apart from the extreme southern conditions, the current climate change is rather positive from a qualitative point of view for the northern regions, Champagne, Burgundy and even the Loire Valley or Bordeaux. If we maintain the objective of one to two additional degrees C°, we will be able to adapt to it, even if this may become problematic in the southern regions, with repetitive water stress and very high degrees. On the other hand, with an increase in temperature to levels of 4 to 5 degrees at the end of the century or even more, it is no longer an evolution, but a revolution, which will profoundly modify our terroirs. I think that we must start anticipating quite quickly, knowing that the implantation of a vineyard is for several decades. It seems to me desirable that from now on the vineyards, by associating the appellations, should be able to combine changes both in terms of grape varieties and management methods, of course with safeguards to ensure a gradual evolution. The gradual introduction of new (or abandoned) grape varieties, without forgetting the role of the rootstock, is part of this strategy. Of course, when the appellation corresponds to a single grape variety, this will probably be more difficult, with nevertheless a certain "climatic elasticity" within the same variety. Nor should we forget the need to reduce the use of phytosanitary products, with probably the progressive development of resistant grape varieties and the debate on the association of traditional names in the names of new varieties.
In the northern regions, there may be a reflection on widening the rows and raising the vineyard. Until now the standard, in order to favour ripening, was low and narrow vines, difficult to work and manage for grassing. With wider vines around 2 m and higher, the driving will be easier, with less sugar and more acidity and robotization will be facilitated.

The problem of water justifies an adapted tillage, with in particular a root cover which occupies the space well, including in depth. The practices of organic producers have shown their interest in colonizing the soil compared to conventional practices, where the roots often remain on the surface.

The RFOE: What to expect?

J. R.: We are heading towards upheavals, that's for sure, with undoubtedly a rise in vine cultivation towards the North and East of Europe. If we look at France from a longitudinal point of view, at the same altitude, the climatic characteristics vary by about 1 degree C° for 150 km. Of course, the variability linked to altitude and winds must be taken into account, but we can clearly see the potential for cultivation in England, Belgium and even Poland. Brexit will no doubt encourage Great Britain to develop its vineyards. All this will certainly reshuffle the maps of world viticulture. The vineyard will also go up in altitude (1 degree less for an elevation of 150 meters) when it is possible, for example in Argentina, Chile, even China...
Extreme phenomena must also be taken into account. Of course we will have fewer days of frost in winter, but with earlier budburst, it is possible that sensitivity to spring frosts will increase until the end of the classic "ice saints" period. This results in a longer potential frost period, with significant impacts on harvest volumes. Similarly, hail is also to be feared, with more frequent and more intense phenomena. Among the extreme phenomena, there are also forest fires, which are probably more frequent, just like the seriousness of this phenomenon in Australia, California and South Africa, which for the moment affect French vineyards relatively little, but could intensify over the next few decades.
We still have to consider the disease and pest aspect. It is difficult to identify the positive or negative consequences of climate change. What is undeniable is that the vine grows within an ecosystem, the balance of which is largely influenced by climatic data. With a modification of this ecosystem, we could see the arrival of new parasites, either by migration effect, or the emergence of insects present today, not necessarily problematic today, but which could be tomorrow, in a context of reduced means of phytosanitary control. We will probably have more and more unknown, atypical phenomena, with forms of expression of diseases and pests that are detrimental to quality or food safety.
At the regional level and with the support of professional bodies, each winegrower must project himself and think about his exploitation of tomorrow, in warmer conditions. For new plantings, at least on a part of the vineyard in order to test their evolution over the long term, one can already move towards clones or massal selections better adapted, with lower sugar levels and more acidity. One can also act on the management of the foliage and there again test the effect of leaf protection to counter scalding. In any case, it is not possible to provide a universal adaptation guide, all of this is very contextual and it is up to each producer and each region to determine by projecting themselves towards scenarios, in my opinion, of at least 2 or 3 additional degrees by the end of the century.

RFOE: Which instruments are the most relevant to limit the effects?

J. A.: Energy is undoubtedly the first point to work on to limit the greenhouse effect. To do this, an eco-designed building, i.e. one that uses the thermal inertia of the basement, is essential. We can either bury the building or use geothermal energy, for which we drill a 100 m borehole in which we lay a pipe with water circulation to recover coolness in summer and heat in winter. The Canadian well system is based on the same principle. It makes it

possible to introduce air into a pipe which has benefited from the thermal inertia of the subsoil. The plant by effect of screen and evapotranspiration can be used at the level of the roof or the walls, to naturally control the temperature of the building. Sustainable development must at all costs be introduced into architecture and more generally into the design of a cellar, considering of course the envelope but also the functioning of the cellar. Eco-design also concerns the treatment of effluents, which has been my scientific and technical speciality since the beginning of my career. For a long time I worked on conventional systems, mainly aeration systems, which consume a lot of energy and can lead to problems of odour and noise pollution when the treatment takes place in open basins. These devices produce sludge that is increasingly difficult to manage by spreading. Now we can use the purifying properties of aquatic plants with phyto-purification techniques. These reproduce wetland ecosystems near rivers. In a confined environment, a basin is created with a geomembrane and various local species or reeds are planted to favour a natural purification process that uses little energy and limits technological intervention. Nevertheless, cellar effluents are generally 5 to 10 times more loaded than domestic effluents, which justifies the creation of an aerated basin upstream, with the ecological device as a finishing touch. This approach is now widespread, most often with a bed planted with reeds as a finishing touch. An original system has been developed at the Buzet Cooperative with native plants after an aerated basin closed at the surface. A new technique has been developed in Italy over the last ten years or so with now about a hundred installations in different wineries using zeolite sand, a microporous rock, as an alternative to zeolite sand, as a pond substrate. This microporous volcanic rock, which accentuates the retention and biodegradation mechanisms, makes it possible to significantly reduce or even eliminate the aeration basin. For example, the GAJA winery, which is very well known in Piedmont, has had two 120 m2 zeolite basins planted with reeds for 15 years, preceded by a simple screen, for an annual production of around 700,000 bottles. Ecodesign, beyond the architecture and its internal functioning, must also involve its environment. Classically, with an open basin and potential for nuisance, the devices were far from the cellar and houses, but with these systems of "ecological gardens" it is a change of paradigm. It is possible to arrange them in the tour circuit without noise or smell, with an ecological image and biodiversity . These systems can also be integrated in addition to existing stations, in order to optimise their performance and facilitate the reuse of water for irrigation or to supply ornamental basins or cooling towers, an ecological approach already implemented in some cellars.

Of course, an ecological system also requires a rigorous approach within the winery, in particular with regard to water savings, the recovery of by-products and above all the filtering earth that could saturate the basins. It is possible to integrate filtration to avoid "parasitic" discharges, but the ideal is to associate a rigorous environmental management approach upstream of the treatment system.

The RFOE: HVE, Bio, biodynamics, which path should be adopted as a priority for sustainable production?

J. A. With a historical look, we can say that organic farming has helped us to understand the importance of the wine ecosystem, both on the ground and underground. In fact, I use the notion of the "Wine Cultural Ecosystem" to underline this symbiosis between man and the natural environment. This is a theme that I am developing with the terroir in a training course

for wine journalists, led by the Chappaz Institute in Champagne, with, moreover, this year an exercise for students on the articulation of sustainability between organic and conventional. Until the 1970s, hyper-modernity saw the soil as a simple physical support. From this point of view, organic has made a positive contribution to traditional viticulture. On the other hand, organic does not include all the elements of sustainability in its specifications. One can develop organic, but without taking an interest in water, waste or energy, even though organic producers are generally sensitive to these subjects. The use of copper and its accumulation over time (and perhaps sulphur in the future) also represents an environmental impact that needs to be taken into account. The High Environmental Value, is more directly a formalization of the concept of sustainability applied to farms, but which does not include the winery, unlike other international standards. HVE encourages professionals to carry out an audit, which is always the initial step, sweeping globally what is positive and what is negative, with a programme of continuous improvement. Asking questions and trying to put in place answers leads to a certain hindsight in relation to practices and a putting into perspective.

In any case, the use of synthetic herbicides and pesticides is going to be more and more complicated, and alternative solutions will have to be found in order to continue to produce quality wine. But here again, history, and in particular the phylloxera crisis, teaches us that men and winegrowers have a strong capacity to adapt, provided that all the impacts, especially climatic, allow us to have time to overcome the challenges of the coming decades.