

VIVEXPO 2010

International Symposium: « Cork oak and climate change »

by Renaud PIAZZETTA

The Vivexpo Symposium, held in June 2010, was devoted to "Cork Oak and Climate Change". Included in this special issue is an account of the proceedings that we feel throws a clear light on the preoccupations of cork oak producers faced with climate change. But we learn, too, that in the final analysis this is not the most worrying factor for them.

Last June 17 and 18, experts of the cork world gathered together at Vivès in France's Mediterranean Pyrenees (Pyrénées-Orientales) for the 10th biannual VIVEXPO symposium entitled "Cork oak and climate change". An occasion for representatives from the various cork-producing countries to exchange their experiences on this current issue whose impact is already making itself felt around the Mediterranean Rim. Cork oak stands are indeed in the front line.

Climate change, whatever the controversies about its origins, has become a recognised phenomenon generating numerous questions and very little certitude for forestry professionals. Because forests are by definition "static", they are witnesses (some would say prey) to the random hazards of climate about which they have no other choice than to make adjustments... if they can. As to the Mediterranean forester, he needs tools suited to his long-term perspective that will enable him to anticipate these changes as best he can, for example when choosing a species for replanting. Pathology, cork quality, cultivating cork stands, forest fires... these are just some of the topics considered during the two days of debate and exchange, both by specialists during Thursday's round-table discussions and with the general public attending the lecture on Friday morning.

What kind of forest are we moving towards?

Climate change is a worldwide phenomenon but varying in its impact depending on the region. What is the situation around the Mediterranean? Bernard Boutte, an engineer with the Forest Health

Service in Avignon, gave us an answer in his presentation, basing his remarks on the conclusion of the IPCC¹: *"It will be hotter in summer, with rainfall stable but concentrated in the winter and spring. Hotter in summer will mean greater evapotranspiration, lack of water and drought stress, particularly in our region."* Backing up his remarks with meteorological data, he demonstrated that the area around Perpignan, in the heart of the Roussillon region, has displayed a lack of water over the last ten years in comparison to the previous three decades.

The effects of such changes on various forest species are already observable. Eric Rigolot, assistant director of the Avignon – based INRA (French national agricultural research institute) research unit on the ecology of Mediterranean forests, cited the case of the beech (*Fagus sylvatica*) which has moved 50 m higher up in the Montseny mountains of Spanish Catalonia. This upset has occurred over such a short lapse of time that it seems very unlikely that the vegetation will be able to adapt naturally.

Concerning the evolution of rainfall and temperature, Enrique Torres, a research scientist and teacher on the staff of the University of Huelva (Spain), pointed out that climate change can manifest itself through a change in averages but, also, by a change in variability (standard variations). In relation to cork oak, climate change may reveal itself through problems linked to relocalisation of the species due to the difficulty it has in spreading naturally via acorns: *"There will be a displacement of potential areas for planting cork oak towards the north and to higher altitudes."* This statement has been confirmed by computer modelling carried out at the University of Estramadura

(Spain) by Angel María Felísimo and presented at Vivexpo by Ramón Santiago, engineer with the Renewable Natural Resources Service of the Spanish institute IPROCOR: *"Several scenarios are possible depending on the model used, the worst case forecasting the almost complete disappearance of areas favourable for cork oak in South-West Spain"*, a region where it is currently the major species, while in contrast *"new cork oak territory will emerge in the north of the country."* Logically, therefore, if the cork oaks disappear from areas whose climate is the least favourable, the species may nevertheless spread northwards in the future. Yet this is not the case in North Africa, as shown by the modelling done by Gazi Gader, a Tunisian expert involved in a joint Tunisian-German project on climate change: *"There is no possibility for the evolution and extension of cork oak forests in Tunisia."* In fact, if climate change goes on as now: *"There will be a drastic decline in areas in Tunisia offering favourable conditions for the cork oak, with an overall fragmentation of habitats."* Even so, he emphasised that it is important to understand that *"a reduction in the areas providing favourable conditions"* does not necessarily mean that the cork oak is bound to disappear completely from such areas. In fact, though climate models in current use forecast changes in temperature and rainfall, they cannot take into account the capacity of forest ecosystems to adapt. Ramón Santiago also stressed that *"cork oak forests are very well adapted to heat, and even to enormous variations in temperature and periods of drought"* and, in contrast, can also resist cold very well, as in the region around Salamanca where *"every winter the cork oak has no trouble surviving temperatures that drop to as low as -12°C."*

Another example came to us from Algeria, specifically from the Oran region where Rachid Tarik Bouhraoua, research scientist and teacher in the Department of Forestry of the University of Tlemcen, has carried out studies for the past 11 years, recording that the cork oak forest at Nesmoth near Mascara has been faced during this time with several years when rainfall was less than 400 mm and for the whole of 2000 was as little as 136 mm (!). Yet despite this, according to Bouhraoua: *"One can see a certain resistance or adaptation to the drought."* Thus, in the event of an extremely hot or dry episode in the climate, trees may lose the totality of their leaves at the end of the summer then

Picture 1:

Jacques Arnaudès,
president of the
Mediterranean Cork
Oak Institute, gives the
opening speech at the
June 18 lecture
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renew them completely in the following spring, even though he has noted that “*high spring temperatures can cause damage on young plantations in semi-arid areas.*” On the other hand, in the same region an increase in rainfall is not necessarily synonymous with an immediate improvement in plant health.

This remarkable flexibility, particularly in a tree whose bark is removed at regular intervals, is grounds for remaining optimistic about the future of cork oak forests which continue to be one of the main ramparts against desertification in many places around the Mediterranean Rim as well as forming a habitat of an exceptional diversity at our latitudes.

Contrasting, but not alarming, states of health

Climatic changes will have an effect on the physiology of trees but, also, on the whole range of animal life in cork oak stands, notably on pathogens. So, in the opinion of Mohamed Lahbib Ben Jamâa, a research scientist with the INGREF in Tunisia: “*Insects are good indicators of climate change because their life cycles are short.*” But more than the impact of the rise in average temperatures, it is the increase in climatic extremes that affects insects even more. Thus, in Tunisia, the gypsy moth (*Lymantria dispar*), which is the most common primary pest, experiences disturbance to its life cycle in extremely high temperatures above 45°C while, in contrast, earlier-maturing species have emerged, for example the green leaf-roll moth (*Tortrix viridana*) or the great winter moth (*Erranis defoliaria*). In France, Bernard Boutte pointed out as evidence of climate warming the constant progression northwards of the pine processionary caterpillar (*Thaumetopoea pityocampa*). As to deterioration, he rather tempered his position: “*Deterioration can be observed after every climatic crisis; whether it be the cork oak or other Mediterranean species, all are affected to different degrees but for the moment always in very localised areas.*”

The state of health of the cork oaks in the Var region (S.-E. France) has been closely monitored by Louis Amandier, engineer with the Provence-Alpes-Côte d’Azur CRPF (private forest owners association) who, after first being alarmed by abnormal mortality at

the end of the 1990s, eventually set up a monitoring network in 2003. The observations on the plots have enabled a clear connection to be established between the presence of *Platypus cylindrus* and the health of the trees even though, as he remarks: “*The deterioration [is] always due to multiple causes.*”

The biological effects of climate warming are in theory normally beneficial to plants. They generally include a longer growing period (though attendant risks are of early and late frost) along with a rise in forest productivity due to the increase in atmospheric CO₂. This was confirmed, though with a rider, by Agostino Pintus, director of the department of research on cork and silviculture of AGRIS Sardegna (Italy): through the effect of climate change, pathogens which up to now have been marginal could become dangerous. This is notably the case with *Phytophthora cinammomi* (a root rot fungus) or with *Biscogniauxia mediterranea* (responsible for Charcoal Canker). In the Mohamed Ben Jamaâ’s view, there could well be an evolution in the pathogenic nature of fungi associated with *Platypus cylindrus*. Though not to forget that forest tree species, even when close cousins, are not all equal when confronted with the same pathogen. Thus, Ramón Santiago indicated that “*the cork oak resists Phytophthora cinammomi seven times better than the holm oak.*”

In Rachid Tarik Bouhraoua’s view, the cork oak stands displaying the poorest state of health are those infested with conifers: “*The deterioration observed in Algeria is not due to climate change but rather to the encroachment of the Aleppo pine and to wild-fire. [...] Climate change has a very negligible impact.*”

More heat = more fires

Eric Rigolot has been working for several years at INRA-Avignon on forest fire. His work shows a rise in the index for the risk of wildfire over the last fifty or so years, linked to an increase in heat waves (as seen in 2003) along with a drop in the number of depressions and their related winds: “*We have seen temperatures already rising in France: 0.3°C per decade over the last 50 years.*” As a consequence, where in 2010 33% of French forests were at risk from wildfire, in 2060 58% will be in this situation.

Nevertheless, despite the overall increase in the threat from wildfire, in France the area burned out is decreasing. However, he adds: *"In other more highly exposed countries such as Spain or Greece, there is already a link between forest fires and climate change."* On the basis of this observation, it would be an illusion to think the public authorities will be able to invest in firefighting at the level required by the new areas involved: *"The wildfire season will get longer, while the means available will show signs of wear, and the fires will perhaps be more extensive. We have one of the best –performing fire prevention and firefighting systems in the world but which shows its limits in exceptional years such as 2003. We cannot unfailingly have more firemen, more trucks..."* We must therefore direct our efforts towards a type of silviculture that will enable the forests to become "self-protective" for, as Eric Rigolot reminded us: *"A forest that is exploited and maintained is protected."* And what is more, the presence of cork oak can be an advantage in forested areas adapted for fire prevention. As was remarked by Daniel Bourguin, head of the Forests Unit at the DDTM², the land use body of the government council of the Pyrénées-Orientales département: *"The cork oak constitutes one of the rare economically viable stakes to be found in forests in the Mediterranean region."* Well-designed intervention in areas given over to cork oaks can in fact combine several aims: protection against wildfire, production of cork, indeed silvopastoral grazing. But the cork oak's resistance to fire is at one and the same time both strength

and weakness because though the tree can survive a forest fire, it comes out weakened and deteriorating stands generate additional inflammable biomass.

In North Africa, the situation is considerably different on account of the sociological structure in this area, as outlined by Mohamed Ben Jamâa: *"There are few fires of any great size in Tunisia because the forests are densely populated and people can intervene very quickly; also, overgrazing prevents the development of inflammable undergrowth."* In other words, how overgrazing, damaging for soil conservation and natural self-seeding, becomes a positive element against forest fire. A difficult equation for a forester to resolve...

Changing the cultivation of cork oak stands

Let's return to Provence, in S.-E. France, where Louis Amandier does not beat about the bush: *"The cork oak stands in the Maures Mountains have been in a sad state since the 1950-60s as a result of the abandonment of cork harvesting and the related cork industry. [...] But the cork oak is a tree that really needs human intervention. [...] When a cork oak forest is abandoned, it goes downhill, it doesn't renew itself."* Inventories carried out above all when a typology was being established for the cork oak forests in the Var département show that the cork oaks in the Var display a demographic imbalance, with a lot of ageing trees and few young saplings with a future. There is thus an urgent necessity to undertake the work of renovation, so much more so in that there is a clear lack of genetic input due to the poor level of sexual reproduction and to the detriment of asexual reproduction via suckers and shoots. This has caused Maria Carolina Varela, a researcher at Portugal's National Institute for Biological Resources but also head of Silva Mediterranea's Cork Oak Work Group, to observe: *"We must study the genetic variability of the cork oak and genetically improve the quality of cork."* This desire met with the approval of the cork industry professionals attending the symposium, including Dominique Tournéix, president and managing director of Diam Bouchage (ex-Oeno Bouchage) who went so far as to say he was prepared to back initiatives in this direction.

Picture 2:
Round-table discussion
on Thursday June 17
at the Mediterranean
Cork Oak Institute
© IML



It is also necessary in forest management to take into account rainfall which, as Agostino Pintus so rightly said, is always the limiting factor for growth in Mediterranean regions: *"We must adopt silvicultural measures to regulate the water resource. [...] We must avoid the introduction of species requiring great quantities of water [...] and not carry out work that disturbs the soil or forest litter."* Maria Carolina Varela confirmed that the water requirement of the cork oak was very positive in comparison to that of other species such as the eucalyptus: *"Synergy exists between forest tree species and those of the undergrowth, and also with fungi, in their quest for nutrients and water."* She went further, saying: *"The management of water should be integrated into the funding systems of the European Union whereas at present European subsidies for livestock are aggravating the problems linked to overgrazing."* Rather than inventing new cultivation practices for cork oaks, it would appear more opportune to better employ the finances available at the European level insofar as, in the opinion of Gregorio Montero, research scientist in silviculture at Spain's National Agricultural Research Institute and president of the Spanish Association for Forestry Science: *"Forest management tools exist for adapting to climate change."* Which was confirmed by his compatriot Enrique Torres: *"Development for adapting to climate change involves diversifying the species involved, genetic diversification and diversification in the structure of stands."* Hence, in order to stand the best chance for the success of future plantations, it will be necessary to move towards using forest plant reproduction material of the highest quality, which entails sourcing seeds from selected quality stands.

Concerning carbon capture -an ecological argument in favour of silvicultural production- Agostino Pintus pointed out that the cork oak fixes relatively small amounts of carbon in comparison to other forest tree species: *"Around 1 tonne per hectare compared, for example, to 3 for the poplar."* On the other hand, it has a much longer life expectancy and will continue to fix carbon throughout its useful life which is nearly two centuries, as opposed to the few decades of faster-growing species whose water requirement is very much greater.

Toward better quality cork?

The quality of the cork is the major preoccupation of the professionals in the bottle cork industry. For even if the cork oak and its stands can put up with a climatic evolution towards even drier conditions, how will cork growth be affected? The phenomenon has been under observation in Western Algeria by Rachid Tarik Bouhraoua for some twelve years. He has observed that the cork coming from a given tree maintained the same porosity whatever its state of decline but the cork itself grew less quickly: *"A tree in decline loses 30% of its growth in thickness [...], one can thus observe a close relationship between the health of a stand and its productivity characterised by the cork's speed of growth."*

Hence, a decline in the quality of a plot or stand can impact on the thickness of its cork. Observations by Enrique Torres tend to the same conclusion which will certainly imply modifying the harvesting rotations in the regions involved: *"It will perhaps be necessary to lengthen the periods between harvesting from 9 to 11 or 12 years."* As to porosity, the essential criterion for the quality of future cork stoppers: *"The number of cells will not decrease but their diameter may, which is positive for the quality of the cork."* The season for harvesting will also no doubt be affected: already, in particularly dry summers the cork will hardly come off from mid-July whereas harvesting usually goes on until a month later: *"The harvest will be brought forward, beginning earlier in the year but also finishing earlier, though this will require adapting legislation."*

Climate change leads us on to the wider question of taking into account environmental issues in the cork market. In Ramón Santiago's view, strong signs are already perceptible in the cork and related industries: *"The European Cork Confederation is in the process of influencing the International Code of Cork-making Practices by asking manufacturers to buy some part of their raw material from areas benefiting from guarantees of sustainable development such as forests certified by an independent body."* Agostino Pintus also considers that forest certification is the best way for owners to get the most out of their good forest management, not necessarily from the added value such management may bring to the cork as a product but above all because it requires of the manager a different perspective on

forests, more multifunctional, more global: *"Forest certification induces a different outlook on forests because it implies notably a pre-existing forest management plan."* The number of companies with a suitable monitoring scheme as well as the certified surface area under cork oak are both constantly increasing.

Revitalising Silva Mediterranea

Christophe Besacier works for the United Nations Organisation for Food and Agriculture – FAO – in Rome. He came to Vivès to introduce us to Silva Mediterranea, a forum for exchange that aims to encourage opportunities for cooperation between the different countries around the Mediterranean Rim: *"The FAO is responsible for fostering regional cooperation. [...] A committee on forests meets every two years while a committee on Mediterranean forests -Silva Mediterranea - has been in existence since 1948. Since 2009, there has been greater will to revitalise the committee's dynamic, and especially to reinforce regional cooperation, because it has become urgent in the Mediterranean area to adapt to climate change. The Mediterranean Rim will be one of the world's hotspots for climate change."* Grouping representatives from 26 countries, Silva Mediterranea is divided into five work groups, one of which, devoted to the cork oak, is headed by Maria Carolina Varela who has recently been joined by Ramón Santiago as her assistant. Delegates are appointed by each country involved, Daniel Bourgouin is France's delegate. As well as Christophe Besacier, the Silva Mediterranea secretariat includes in its ranks a person well-known in the world of cork, Nora Berrahmouni, who

took part in the 2008 edition of Vivexpo at a time when she was in charge of the WWF's cork oak conservation programme. This is sure evidence that the cork oak will not be overlooked by official authorities. Indeed, the tree was at the centre of an exhibition on Sardinian cork oak forests organised in Rome in October 2010 in conjunction with the meeting of the FAO's Committee on Forests.

In conclusion, can we say that the situation is cause for worry? Certainly more so in North African countries where they will be the earliest affected by any warming, whereas areas around the northern Rim offer a place for the cork oak to fall back on. This trend towards more favourable zones must be fostered by cork oak farmers, both by cultivation practices for the upkeep of present stands and by planting in new areas where the cork oak, presently still only a marginal species, should henceforth be seriously considered as a valid species for reforestation. In France it will definitely find areas for future implantation. If there are people claiming that in a hundred years' time there will be bordeaux-type wine made in South-West England, why shouldn't there be cork oak in the Médoc! Yet rather than speculate on the basis of what can only be hypothetical scenarios, let's not forget that at the present time the real cause for concern is the economic situation threatening the cork oak and related industries with crisis in the medium term. This is indeed the message from Maria Carolina Varela whose words offer a good summing: *"The flexibility of the cork oak gives us reason to hope; it's the economic decline that is really serious."*

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