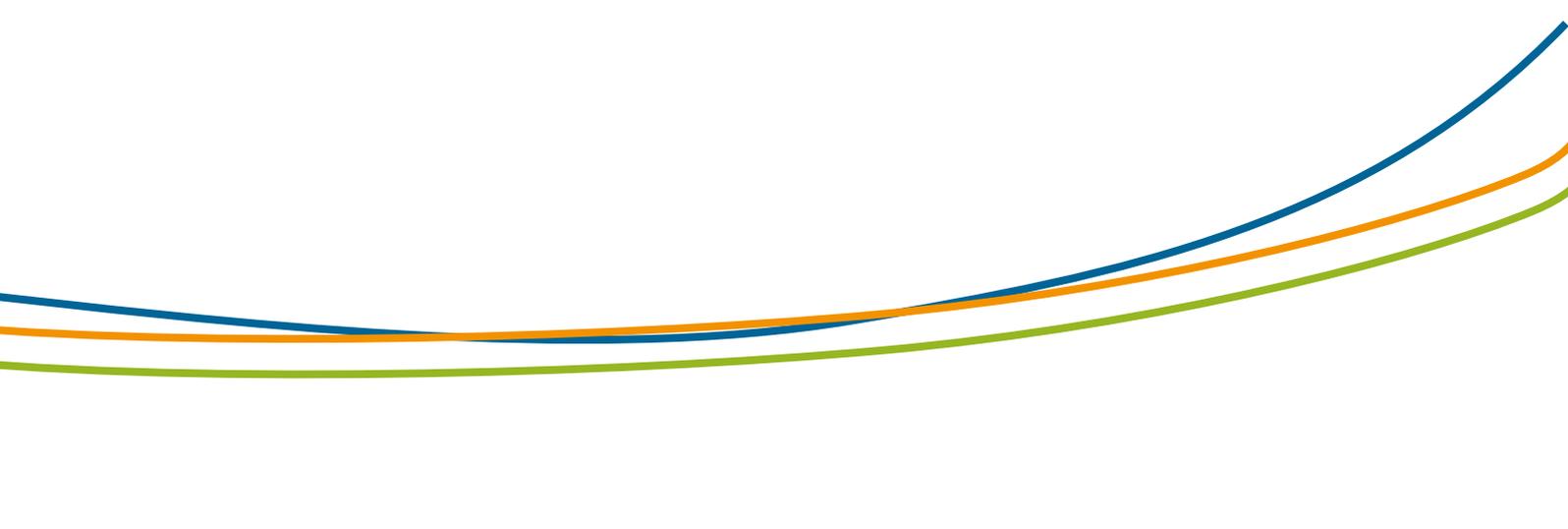

SYMPOSIUM

Fruit productions facing climate changes: anticipating and shaping for tomorrow

**Tuesday 14 January 2020 (during the SIVAL)
from 14:00 to 16:00.**

Summary:

Fruit productions are actually vulnerable in these times of climate changes. This is a major concern for the sector and represents a challenge for the professionals, technical institutes and scientists. Even if we are still doubtful regarding the climate predictions, some impacts and differences in behaviours can already be noticed in the productions, especially in phenology, fruit quality criteria, or even in the emergence of diseases.



1. Overview of the French and international projects about adapting to climate change: the case of apricots, vines and Corsican clementines.

1.1. Main Impacts of Climate Change on Fruit Trees

Inaki Garcia de Cortazar Atauri - INRA Avignon – Agroclim platform

Iñaki Garcia de Cortazar-Atauri is a research engineer and has been working at INRA since 2011. His work in the Agroclim Service unit covers several research areas: 1.) assessment and development mechanistic models that simulate the phenology of annual and perennial crops.; 2) modelling of agri-systems with the STICS crop model; 3) development of climate-related biophysical data bases; 4) design of agronomic indicators to define climate change adaptation strategies of agri-ecosystems. He is currently the coordinator of the French Phenology of the Living National Network, TEMPO (Réseau National de la Phénologie du Vivant en France). He co-authored more than 50 articles in international magazines with reading committee. He also participated in the drafting of 5 chapters and 4 reports, and he published 2 conference proceedings. He attended more than 100 conferences and seminars, 32 as guest speaker. Finally, he is a member of a development team for several IT tools (programmes, data bases and web sites) such as GETARI, STICS, PMP or the TEMPO phenological data portal.



Summary:

The increase in temperature, observed over the past decades, as well as the expected one if drastic GHG mitigation policies are not implemented within the next 20 years, will impact all agri-ecosystems and notably perennial crops, making the development of change adaptation strategies all the more necessary as from now. These species in France have already been affected by climate change: earlier harvest, greater water stress during some summers, modification in the quality of fruits and their produce (wine, juice), higher climate-related risks... These evolutions will continue, with positive or negative consequences according to regions and crops. Furthermore, these are major challenges for perennial crops: planting today means looking at a period between 2020 and 2050 and thus questioning the climate change adaptation strategies. What is the most reasonable planting location depending on possible innovations, from variety choice to agronomical practices and up to the processing technologies and evolution of the agricultural sectors?

The objective of this lecture is to describe the past, present and future climate situation, assess the consequences or impacts already observed, or to come, (as risks and/or opportunities) explore the main adaptation possibilities that can be envisaged.

1.2. Strategies to minimize the impact of climate change on stone fruit crops.

Spanish innovation project 'Adaptation of stone fruit sector to climate change'.

Dr. David Ruiz González - CEBAS -CSIC Murcia

Tenured Researcher in the Department of Plant Breeding at CEBAS-CSIC in Murcia (Spain). Breeder responsible for the apricot and Japanese plum breeding programs at CEBAS-CSIC, leading the national breeding projects in these Prunus species. He has released 14 new apricot cultivars broadly cultivated in Spain. He has participated in 23 research projects and published 49 SCI papers in high-impact journals, as well as a remarkable work of transfer to the productive sector. Dr. Ruiz participates in the Spanish operative group 'Adaptation of stone fruit sector to climate change'.



Summary:

The climate change is drastically affecting Mediterranean agricultural systems, especially stone fruit species located in warm areas, with very negative consequences on the adaptation and productivity. In this context, a Spanish innovation project, 'Adaptation of Stone Fruit Sector to Climate Change', is starting with the objective of design, development, evaluation and implementation of strategic actions to facilitate the adaptation of the stone fruit sector to climate change, and mitigation of its effects.

The specific objectives are:

- i) Identification of agroclimatic and homoclimatic areas and projection in future climate change scenarios;
- ii) Growing cultivars adapted to current and future climatic conditions in the different producing areas;
- iii) Design, validation and optimization of efficient and sustainable methods and cultivation systems to facilitate the adaptation to the conditions caused by climate change;
- iv) Agroeconomic evaluation;
- v) Development of an integrated decision support system (DSS).

1.3. Taking into Account the Impacts of Climate Change a strategies implemented

1.3.1. about vineyard - The experience of the Laccave Project

Isabelle La Jeunesse

With a PhD and an environmental geography research management certification, Isabelle La Jeunesse has been a Professor at the university of Tours and at the CNRS 7324 Citeres laboratory since 2010. From 2003 to 2010, she was a Professor at the university of Angers where she coordinated a study on pesticide transfers in the small wine growing catchment basin of Coteaux du Layon. This study was carried out within the framework of the catchment basin regional contracts.

The research works of Isabelle La Jeunesse were essentially on the integrated management and usages of water. Today, her research focuses on how companies consider climate change challenges when implementing adaptation and mitigation actions. The governance of the challenges raised by climate change in order to explain the stumbling blocks and the drivers is at the core of her works.

*In 2016, with Ph. Quevauviller, she published a book entitled *Changement climatique et cycle de l'eau. Impacts, adaptation, législation et avancées scientifiques*, at Tec&Doc Lavoisier.*

*In 2019, she coordinated the publishing of a collective work with C. Larrue about the governance of extreme hydrometeorological events: *Facing hydrometeorological extreme events: a governance issue*, Wiley, 536 p*

Summary:

The objective of the Laccave2.21 project, within the INRA Accaf metaprogramme, is to promote integrated and resilient wine growing and wine making systems so as to face climate change. It thus develops local and national mid-term operational strategies (crop systems, land planning, sectoral policies) based on eco-climate indicators, simulations and participatory methods at the various levels of the wine growing sectors.

In the Centre-Val de Loire region, in this Laccave 2.21 prospective project, the objective of an EAFRD (European Agricultural Fund for Rural Development) sponsored programme called PEI CLIMENVI and coordinated by the Loir-et-Cher Chamber of Agriculture, is to design climate change adaptation solutions together with the wine growers. After an analysis of climate change and its impacts on an 8km² area, using indicators and climate and agri-climate criteria, the discussions with the wine growers and the various stakeholders of the sector opened up short, mid and long-term operational possibilities.

The work of the Citeres laboratory coordinated working group is to notably identify the stumbling blocks and the drivers to be used in order to face climate changes in the Centre-Val de Loire region.

1.3.2. Corsican Clementine

Olivier Pailly - INRA Corse

ground in agronomic engineering (Montpellier - 1983), PhD in Plant Physiology (University of Montpellier 1992). Manager of the INRA CITRUS Experimental Unit of San Giuliano and "Infrastructure" project manager for the INRA Environment and Agronomy Department. Since 2003, he has been working on citrus fruit ecophysiology and more specifically on the acidification of citrus fruit pulp. He participated in the drafting of the specifications for the "Clémentine de Corse" Protected Geographical Indication. He keeps on working, with his team, on the sustainability of this PGI within the context of climate change.



Summary:

The « Clémentine de Corse » Protected Geographical Indication relies on two criteria for the typicality of this fruit: an acidity level over the commercial standard, granting it its slightly acid taste, and a colour which is naturally acquired in the orchard and that can be easily identified as it does not cover the whole fruit (persistence of a green bottom). For the "Clémentine de Corse", colour is the major determining factor for the start of harvest. Acidity which decreases as the fruit matures, is generally acquired during the colouring phase. In Corsica, climate change mainly means warmer autumns leading to a quicker acidity drop on the one hand and to a delayed colouring on the other hand. The simultaneous development of the two criteria is thus taking place on a shorter and variable period of time, depending on years and orchards. The objective of the work carried out at the CITRUS experimental unit is to:

- Understand the acidity drop dynamics for the production area, the links with local climates and crop practices;
- Predict the acidity drop and give citrus growers a decision-making support tool so that they organise their crops according to the possible duration;

Act, by adapting the crop practices to the various local climate conditions and designing innovative crop systems.

2. Professionals and researchers will share their experience and observations and talk about envisaged strategies.

1.4. Vergers d'Anjou - Jacques Malagie

For more than ten years and with a background in agronomic engineering (Toulouse 1983), he has been managing the VERGERS D'ANJOU Cooperative which sells fruit species produced in the Loire Valley; apples, pears, blackcurrant, redcurrant and cherries. He also has several responsibilities in the sector. In particular, he chairs the blackcurrant interprofessional committee of AFIDEM. After co-chairing the Guidance and Scientific and Technological Monitoring Committee of Végépolys, he co-chaired the Labelling and Strategic Guidance for Innovation Committee (CLOSI) as a representative of companies.



Summary:

Pome fruits, grown in all temperate regions and adapted to a large scope of latitudes and altitudes, are not the first crops we can think of in terms of climate warming impact.

Yet, the list of impacts and consequences for these species is very long. It goes from the multiplicity of climate hazards (hail, frost during flowering or beginning of fruit development, summer drought, Cevenol events – intense and concentrated rainfalls lasting several days, at picking time) to the development of new diseases or to difficulties in meeting the needs in vernalisation which leads to lower yields.

The demands and selectiveness of markets impose very strict technical regimens to arboriculturists and this does not equate with the increase in the number of such hazards; size, fruit colouring, and yields are key commercial criteria.

Stakeholders must thus consider these changes when elaborating their strategies in order to design new technical, economic and commercial approaches and thus guide investments.

For many years, the nature of the soils at the heart of the production area and the regular rainfalls throughout the season enabled them to plant orchards and to produce without having recourse to irrigation.

This is why, even today, many orchards in the Limousin area, produce without any irrigation.

1.5. Fédération fruits et légumes d'Occitanie - Raphaël Martinez



As a trained agronomist (Montpellier - 1985), he has been managing the Fédération des Fruits et Légumes d'Occitanie for over 20 years, as well as the Association d'Organisations de Producteurs de pêches et abricots SAS since its inception. In this capacity and with the support of a team of seven, he facilitates a network of companies in the sector, helping them in their common strategic decisions and the implementation of coordinated actions in the fields of production techniques, marketing (environmentally responsible orchard initiative) or market monitoring.

Summary:

Adapting the Stone Fruit Sector to Climate Change

In France, the impacts of climate change on stone fruit production are manifold: potential drop in the number of cold hours required to break dormancy, recurrent heat waves, depletion of water resources, or changes in the behaviour of specific pests. French growers can adapt to such changes through at least three actions:

- Choose varieties with the lowest possible exposure to such hazards (lower cooling requirements, flowering period, hardiness, etc.); discussions on this matter are already at an advanced stage with researchers and plant breeders;
- Implement risk-informed approaches, such as soil conservation, functional biodiversity
- Ensure production equipment is suitable: watering systems, warning systems...

1.6. Gradilis Recherche - François Chevalier

M. Chevalier is the Director of Gradilis Recherche since 2017. Before he did studies to be engineer **Institut de Recherche pour le Développement**, Montpellier, UMR 204 (Nutrition, Food, Societies) and **INRA UMR NUM2** (Microbial Ecology of Insects and Host-Pathogen Interactions). He worked as Breeder at **PEPINIERES GRARD** during 5 years.



The long-term consequences of climate change are difficult to predict, but the effects of climate change are already perceptible today: warming of the atmosphere, the importance and frequency of "extreme" weather phenomena over the past several

years (drought, floods, storms, etc.)

Agriculture suffers from multiple impacts (lower yields, changes in crop or pest behavior, emergence of new pests, etc.)

The challenge in face of this evolution is to adapt agriculture to new parameters. Research, and more specifically varietal research, must respond to this new challenge. Hybrids that provide resistance to bio-aggressors or tolerances to harsher climatic conditions are multiplying and will certainly help to counter some of the effects of global warming.

(Example of chilling requirements for apple trees)

It is essential for agriculture to anticipate, through research, the consequences of climate change without rushing into applications that are not currently relevant.



Photos credit: « Vincent Mathieu, CTIFL Balandran »

1.7. Cooplim - Françoise Besse

Farmer, working with my husband on our tree-growing (Pommes du Limousin PDO) and cattle farming operation in Corrèze

Chairwoman of the Coopérative Fruitière du Limousin, COOPLIM.



Summary:

In the 1950's, the high altitude orchards (300-500m) of Limousin became home to an apple with unique flavours (the only one with a PDO) and an exceptional shelf-life, that makes it one of the most readily available apples all year round.

In order to capitalise on the natural constraints of the Limousin region (altitude and harsh climate which restrict yields), local tree growers have favoured quality over quantity.

The nature of soils in the production area and regular rainfall all season long have enabled them to plant orchards and produce for many years without systematically having to rely on irrigation.



As a result, many orchards in Limousin still operate without any water supply.

In the last five to ten years, however, it has become increasingly difficult to plant new orchards without irrigation, and it is now impossible for young tree growers to start their business without access to water.

Over the past two years, hillside catchment reservoirs, separate from all other surrounding water supply, have been established to collect runoff water during periods of heavy rainfall, so that it can be reused in the drier season - generally in June and July.

We have also observed new insect pests of great concern, such as the green shield bug (*Palomena prasi*), and, even more worrying, the brown marmorated stink bug (*Halyomorpha halys*) in the Alps. Any fruit bearing their bite is unfit for consumption.

Migrating down from the Massif Central in the North, European water voles have been making their homes in our orchards for the past ten years. Their reproductive capacity is staggering (114 offspring/year/pair). Many orchards have been severely damaged. We fear that such pests are on the rise.....

Finally, this year's cold and wet spring combined with a long summer period marked by drought and very high temperatures resulted in a significant drop in the average fruit size.



1.8. INRA – Jean-Michel LEGAVE

Jean-Michel Legave is a Research Manager and project leader at INRA (French National Agronomic Research Institute). He is now coordinating a summary book on how to adapt fruit production to climate change. He has a background in agronomy and is a teacher and researcher in fruit tree production at the Agronomic School of Montpellier. He headed the Corsican agronomic station and the fruit research station of Avignon before coming back to the INRA Centre of Montpellier as a researcher at the beginning of the years 2000. His knowledge of different species (apricot, almond, olive, apple trees, citrus fruit, kiwi, etc.), of various scientific topics (dormancy, flowering, plant variety improvement) and of different Mediterranean regional environments made him develop a research programme about the impacts of climate change on fruit production.



The research focused first on the impacts on phenology (apple tree model) and on flowering quality (flower bud abortion for apricot trees); it was then extended (European data bases) and enlarged (phenological modelling) thanks to the many (national and international) co-operations aiming at grouping knowledge and skills so as to adapt production to climate change.