For several decades, the work on substrates has focused on their physical properties (air retention, water retention, stability). This research continues, for example via Ecol’eau Terreau project supported by several members of Afaïa Tools are available to producers on new parameters such as the diffusibility of air and water.

Other requests from horticulturists and consumers opened up new research fields. Among them:

- The demand for soil “usable in organic farming” has led manufacturers to incorporate organic fertilizers whose behaviour needs to be better known. This is the origin of the Optifaz project that has been supported by Afaïa since the beginning. More generally, the interest is on the living side of culture media: we are now talking about “biotised soils”. This is an important area of research, in order to develop more efficient growing media combining organic fertilizers and biostimulants.

- The reduction of the environmental impact of growing media is part of the actions of Afaïa and its members, with the commitments for Circular Agriculture. The reduction in the use of non-renewable materials has been going on for a long time, and continues to be clarified, for example thanks to new LCAs (life cycle analyses) on raw materials. We welcome innovative initiatives that put substrates at the heart of the pathways of progress for more sustainable horticulture.

Laurent Largant
General Delegate of Afaïa
(Professional Union of the actors of the sector of the supports of culture, mulches, organic amendments, organic fertilizers and organic-minerals and biostimulants).

Companies talk about it

Last updated: June 2018

This issue was produced with the contribution of an editorial board: JC Michel and P. Cannavo (Agrocampus Ouest); N. Maniez (Aria); F. Robert (ASTREDHOR); V. Truffault (CTIFL); E. Defossez (Végépolys); L. Lecerf et T. Redjala (RFI Objectif Végétal).
Aboveground and/or under-shelter production systems are growing rapidly, and must meet major challenges, both in terms of performance and in terms of reducing inputs and protecting natural resources. Nitrogen fertilization reduction in the use of peat root development, management of irrigation and the climatic environment of plants, energy savings are therefore all research topics of interest to professionals (market gardeners, producers of ornamental plants, greenhouse and substrate producers).

Angers is recognized for its academic skills in the field of (bio-) physical transfers in the plant environment in highly anthropised or artificialized constrained environment. The EPHor³ research unit is working to better understand and understand off-ground and/or under-ground production systems. Researchers are studying the interactions between organic culture media and roots as well as the consequences on the bioavailability of water, air and nutrients during culture. They are also interested in the transfer of water and energy in the substrate-plant-atmosphere continuum under irrigation restriction conditions. Their work sometimes uses the skills of the Arch-E team of the IRHS² research unit, that is specialist in plant eco-physiology.

These skills enable researchers to propose ways to meet the societal demand for the performance of these production systems while reducing the environmental impact:

- Improve the physical properties of substrates
- Favor organic fertilization despite its constraints
- Better control greenhouse climate by modeling
- Better manage water resources
- Valorise alternative materials

Improve your horticultural growing media

- Reduce the irrigation of your horticultural growing media


This project was performed by EPHor³ research unit in partnership with 11 culture media manufacturers, to evaluate the effect of root development and irrigation regime on transfer properties and on bioavailability in water and air in organic substrates.

- Results: This project has demonstrated the aerating properties of the substrate and its wettability as key physical parameters favoring root development. In extenso, this project contributes to optimise associations of substrates on the basis of these new criteria,
- the management of irrigation

OPTIFRAISE project (2015-2018) - funds from FEDER, Région N° Aquitaine, Fraises de France and private companies.

The project is driven by Invenio with a consortium of partners (Chambre d'agriculture 47. ValPrim INRA Bordeaux EPHor³ research unit and private companies). It aims to optimise irrigation management in soilless strawberries cultivation

- Results: This project highlights the effectiveness of irrigation management using tensiometers and water content probes, allowing significant reduction in water intake (around 20%) compared to the usual practices of producers.

REWET project (2018-2019) - private funds.

This project is performed by EPHor³ research unit, in partnership with private companies.

- Objective: Optimise the composition of the substrate by analysing the influence of the incorporation of coconut fibers and wetting agents on the ability to re-wet peat substrates according to irrigation techniques.
Manage your nitrogen fertilisation in soil-less conditions

**OPTiFaz project** (2017-2020) - funds from CASDAR and VAL'HOR

Driven by **ASTREDHOR²**, this project aims to **optimize organic nitrogen fertilization** in horticultural growing media, by developing a predictive tool based on the modeling of organic nitrogen mineralization under ground conditions.

- **Objective**: Field management **tools** to support the management of organic fertilization and determine nitrogen requirements in the crop cycle.

Microorganisms, a fertility factor in soil-less cultivation

Louise Paillat has been recruited by **Premier Tech** for a Cifre thesis (2018-2021), and is co-supervised by **EPHOr¹** and **IRHS²** (Arch-E team) research units. She studies the **role of the rhizosphere microorganisms** in a complex “organic fertilizer-substrate” medium on the **nutrients bioavailability** and on **plant growth**

- **Objective**: Improve the fertility of substrates by controlling microorganisms of the rhizosphere.

Optimize the climate around yours plants

Optimize the energy efficiency of your greenhouses

**Hortinergy project** (2017-2018) - ADEME funds

**EPHOr¹**, Agrithermic **CTIFL³** (Baldran et Carquefou) et **ASTREDHOR²** (RATHO).

- **Results**: A simulation software for the energy balance and GHG emissions of a greenhouse has been developed by integrating the contribution of plants.

Conciliate energy savings and yield optimisation

**Conser project** (2014-2017) - funds from Région Pays de la Loire / FranceAgriMer / ARELPAL

**CTIFL³**-Carquefou; **CODIM**; **EPHOr¹**; **HortiMax France Cheminant**

The aim is to test and validate innovative crop management methods for greenhouse-grown cucumber, that have been determined according to the plant physiology. For this, the project conciliates **energy savings** and **optimization of yield** while reducing the impact of *Didymella Bryoniae* (a pathogenic fungus).

- **Results**: Recommendations on how to **optimally control the climate** in production greenhouses, improve the efficiency of cucumber crops (for example: partial relocation of the heating systems and the ventilation fan for the entire canopy).

Control your climatic parameters to manage pathogens

**Projet PHYSI’HOR** (2012-2017) - funds from Région Pays de la Loire + private companies.

This innovative collaborative project involving **EPHOr¹**, **IRHS²**, **BHR²**, **BIOGER⁷** research unit of INRA-Grignon and the hydrangea producers of Maine et Loire (Chauvin Hortensia, Hortensia France Production, Sicamus Productions) studied the climatic and physiological factors influencing the conservation of hydrangea plants when stored in a cold room.
Collaborate with research

Take advantage of... • scientific expertise • advanced equipment • a network of collaborators • innovative ideas

Reinforce your R&D team with... • Master trainees • PhD students under Cifre modality • « Young » PhD graduates

➤ Contact us to help you build your projects and support them:

Examples of possible collaboration topics

- Evaluation of the physical properties of alternative materials to peat
- Effectiveness of products as substrates rewetting agents (natural or synthetic wetting agents)
- Agronomic interest of the use of biodegradable pots compared to plastic pots
- Characterization of the microbiological performance of substrates
- Assessment of the energy performance of greenhouses
- Equipent efficiency: relocated heating, fans, screens... on productions
- Seeking solutions to improve crop management (instructions, temperature integration...)
- Crop modeling (quantification of transpiration, effect of water restriction)
- Concept of innovative greenhouse with low environmental impact

Training for professionals

- Soilquality: concept and evaluation methods from 3rd to 5th October 2018, Rennes
- Greenhouse approach: from project development to delivery of buildings
- Cultivation of plants in pots under glass

Also remember to recruit alternating students
(in professionalization contract or apprenticeship contract).

Do not miss, in Angers, France

The congress will include a specific session dedicated to professionals (producers, technicians, start-ups, applied research), on June 19th.

https://www.greensys2019.org/professionnels-professionnels
Contact: pierre-emmanuel.bournet@agrocampus-ouest.fr

Objectif Végétal Research, Training & Innovation in Pays de la Loire is a regional program (2014-2019) promoted by the Pays de la Loire Region which involves higher education and research institutions (University of Angers, project leader, Agrocampus Ouest ESA Inra University of Nantes) as well as the Végépolys competitiveness cluster.

Objectif Végétal aims to increase the visibility of upstream research, increase the attractiveness of the training center and its links ith companies and strengthen the economic value of the results of academic research.

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