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**Final resume on the research on the research unit  
Laboratory of Plant Ecophysiological responses to  
Environmental Stresses (LEPSE) under the supervision  
of the following institutions and research bodies,  
Montpellier SupAgro - Institut "Agro", Institut  
National de Recherche pour l'Agriculture,  
l'Alimentation et l'Environnement - INRAE**  
Nelly Dupin, Erwin Dreyer, Sebastien Carpentier, Mathilde Causse, Sylvain  
Delzon, Christian Meyer, Thierry Ameglio, Philippe Hintzinger, Peter  
Rogowsky, Marie-Stephane Tixier

► **To cite this version:**

Nelly Dupin, Erwin Dreyer, Sebastien Carpentier, Mathilde Causse, Sylvain Delzon, et al.. Final resume on the research on the research unit Laboratory of Plant Ecophysiological responses to Environmental Stresses (LEPSE) under the supervision of the following institutions and research bodies, Montpellier SupAgro - Institut "Agro", Institut National de Recherche pour l'Agriculture, l'Alimentation et l'Environnement - INRAE: evaluation campaign 2019-2020, group A. HCERES. 2020. hal-04220775

**HAL Id: hal-04220775**

**<https://hal.science/hal-04220775>**

Submitted on 28 Sep 2023

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## FINAL RESUME ON THE RESEARCH UNIT:

Laboratory of Plant Ecophysiological responses to Environmental Stresses (LEPSE)

## UNDER THE SUPERVISION OF THE FOLLOWING INSTITUTIONS AND RESEARCH BODIES:

Montpellier SupAgro - Institut "Agro"

Institut National de Recherche pour l'Agriculture, l'Alimentation et l'Environnement - INRAE

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## EVALUATION CAMPAIGN 2019-2020 GROUP A



In the name of Hcéres<sup>1</sup>:

Nelly Dupin, Acting  
President

In the name of the experts committee<sup>2</sup>:

Erwin Dreyer, Chairman of the committee

Under the decree No.2014-1365 dated 14 November 2014,

<sup>1</sup> The president of Hcéres "countersigns the evaluation reports set up by the experts committees and signed by their chairman." (Article 8, paragraph 5);

<sup>2</sup> The evaluation reports "are signed by the chairman of the experts committee". (Article 11, paragraph 2).

Tables in this document were filled with data submitted by the supervising body on behalf the unit.

## UNIT PRESENTATION

<b>Unit name:</b>	Laboratory of Plant Ecophysiological responses to Environmental Stresses
<b>Unit acronym:</b>	LEPSE
<b>Current label and N°:</b>	UMR 759
<b>ID RNSR:</b>	197717799B
<b>Application type:</b>	Renewal
<b>Head of the unit (2019-2020):</b>	Mr Bertrand MULLER
<b>Project leader (2021-2025):</b>	Mr Pierre MARTRE
<b>Number of teams and/or themes:</b>	2

## EXPERTS COMMITTEE MEMBERS

<b>Chair:</b>	Mr Erwin DREYER, INRAE, Champenoux
<b>Experts:</b>	Mr Sébastien CARPENTIER, Bioversity International, Belgique Ms Mathilde CAUSSE, INRAE, Montfavet Mr Sylvain DELZON, INRAE, Pessac (CNECA representative) Mr Christian MEYER, INRAE, Versailles (CSS INRAE representative)

## HCÉRES REPRESENTATIVE

Mr Thierry AMEGLIO

## REPRESENTATIVES OF SUPERVISING BODIES

Mr Philippe HINTZINGER, INRAE  
Mr Peter ROGOWSKY, INRAE  
Ms Marie-Stéphane TIXIER, SupAgro-Montpellier

## INTRODUCTION

### HISTORY AND GEOGRAPHICAL LOCATION OF THE UNIT

UMR LEPSE was launched during 1993 at Montpellier, in cooperation between INRA and Montpellier-SupAgro and developed as an UMR between the two institutions since that time. LEPSE built up on a very original and explicit expertise with a unique combination of plant ecophysiology, quantitative genetics and modelling based on explicit biological processes. LEPSE was since the start hosted by the INRA and Montpellier SupAgro Campus, and since 2005 in a building shared with UMR BPMP (Biologie et Physiologie Moléculaires des Plantes).

At local level, LEPSE is integrated into a unique research and higher education ecosystem. LEPSE is partner of a LabEx Agro . These three LabEx are important components of the I-SITE "Montpellier Université d'Excellence-MUSE" launched 2017, which should be definitely validated during 2021. LEPSE plays an important role in this unique research and higher education ecosystem with a large potential, through a well-developed research network.

LEPSE plays also a central role in the development of research infrastructures devoted to "Phenomics" at national level, through PIA projects like Phenome which it coordinates, and at European level within the ESFRI initiatives and the current "Emphasis" project.

Finally, LEPSE is contributing to a national Carnot Institute (Plant2Pro) lead by INRAE for more applied research. It also interacts with an ecosystem for innovation in agriculture with several local and national companies.

There was, on January 1, 2020, an important change in the organisms in charge of LEPSE with the launch of INRAE (Institut National de Recherche pour l'Agriculture, l'Alimentation et l'Environnement) resulting from a merger of INRA and IRSTEA, and "Institut National d'Enseignement supérieur pour l'Agriculture, l'Alimentation et l'Environnement" (Institut-Agro) resulting from a merger between AgroSup Montpellier and AgroCampus Ouest.

### Management team

During the 2015-2020 period, Bertrand MULLER was head of LEPSE. The new director will be Pierre MARTRE. He will be helped by a deputy director Myriam DAUZAT.

### HCÉRES NOMENCLATURE

SVE1\_3 Biotechnologies, sciences environnementales, biologie synthétique, agronomie

SVE1\_2 Évolution, écologie, biologie des populations

### THEMATICS

LEPSE develops its research activity around a very original and well-defined combination of skills, including plant ecophysiology, phenomics, function-structure plant modelling and quantitative genetics.

The main topic was and still is the adaptation of crop plants (maize, wheat, grapevine,...) and of model plants (*Arabidopsis thaliana*) to water deficit and temperature. The emphasis was put on responses of growth (mainly shoots, leaves, and fruits) to those stresses, with the idea that phenological development was the main determinant of yield under limited water availability. The main application field is indeed agriculture and crop sciences; some applications relate more to adaptive plant ecology (particularly in the case of the natural variability within *A. thaliana*).

## UNIT WORKFORCE

<b>Laboratory of Plant Ecophysiological responses to Environmental Stresses (LEPSE)</b>		
<b>Active staff</b>	<b>Number 06/30/2019</b>	<b>Number 01/01/2021</b>
Full professors and similar positions		
Assistant professors and similar positions	2	<b>2</b>
Full time research directors (Directeurs de recherche) and similar positions	4	<b>5</b>
Full time research associates (Chargés de recherche) and similar positions	4	<b>5</b>
Other scientists ("Conservateurs, cadres scientifiques des EPIC, fondations, industries, etc.")	0	
High school teachers	0	
Supporting personnel (ITAs, BIATSSs and others, notably of EPICs)	14	<b>14</b>
<b>Permanent staff</b>	<b>24</b>	<b>26</b>
Non-permanent professors and associate professors, including emeritus	0	
Non-permanent full time scientists, including emeritus, post-docs (except PhD students)	4	
PhD Students	9	
Non-permanent supporting personnel	17	
<b>Non-permanent staff</b>	<b>30</b>	
<b>Total</b>	<b>54</b>	

## GLOBAL ASSESSMENT OF THE UNIT

Since its creation, LEPSE's expertise has led it to study the adaptation of plants to stressful environments, focusing on water deficits and temperature. LEPSE has rapidly become an expert in the characterization of multiple phenotypes in crops and model plants, and in the study of genotype x environment interactions (with the recent addition of crop management). Interestingly, LEPSE remained at a stable size since many years. Similarly, the initial concept on which its expertise was constructed, was refined, applied to different situations, and now bases on a variety of new tools allowing high throughput screening of plant phenotypes with all the technical (robotization) and data management developments. Nevertheless, it remained essentially stable and proved quite effective in terms of research developments.

This unique expertise (we are not aware of a similar research unit in the agronomic research ecosystem, albeit the expertise is present elsewhere) was immediately and still is tightly linked to a research network bringing the complementary expertise in several fields, for example in quantitative genetics, plant breeding, function/structure plant modelling, data management. This was done at local, national and European levels.

For the committee, there is no doubt that LEPSE is an outstanding research unit due to many unique features: as an outstanding scientific production with many high impact publications in multidisciplinary journals, a strong scientific identity and culture shared by all team members, a very original mix of domains of expertise that contribute to a clear scientific identity, a strong involvement in very efficient research networks at national and

international levels, impressive research facilities (M3P) supporting internal and external research projects, tight links with professional organizations in agriculture and viticulture with shared research objectives, an efficient support to innovation with a few partner companies, including start-ups that emerged from inside LEPSE, and a high level of funding from many European and national grants.

The project developed by LEPSE and the two teams is outstanding. It is based on the existing expertise in LEPSE, complemented by the arrival of a quantitative geneticist and a plant modeler, and on its outstanding research facilities. This unique expertise and the research facilities attract high level international cooperation. LEPSE is and will remain an important player in the field of adaptation of crops to changing environmental conditions and to climate extremes at European level.

The reorganization of LEPSE in two teams provides a suitable frame for the future development of scientific axes of the unit, although there would be a need to better highlight the coherence of the strategies of the two teams MAGE and ETAP. The important internal reorganization of the technical and engineering staff around the M3P infrastructure and other technical facilities provides an opportunity to further develop the already impressive experimental skills in LEPSE, which is an important concern.

The committee raised a few concerns for the future of the unit, the most important one being the negative trend in human resources, particularly with respect to the engineering skills required for data management, given the amount of highly valuable data produced by the experiments. Links to higher education should be enhanced, both at international scale as well as locally within I-SITE MUSE.

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