



EPPN Newsletter

February 2013

EPPN - a short profile

Phenotypic analysis has become a major limiting factor in genetic and physiological analyses in plant sciences and in plant breeding. Yet phenotyping - quantitative information on genotype-environment relations - is the key for progress in basic plant science and to address major challenges such as feed and food for a growing population. This emerging field of science depends on specialized infrastructure and simultaneous development of technologies and protocols to quantitatively assess plant structure and function under relevant environmental conditions and thus to support basic plant science and plant industry.

EPPN is an EU funded project with 14 partners with an overall goal to overcome current limitations by creating structural and functional synergies between the leading plant phenotyping institutions in Europe by linking phenotyping experts, user communities and technology development. In particular EPPN aims for:

- integration of European plant phenotyping efforts,
- enabling close interaction between users of phenotyping platforms and developers of phenotyping technology,
- development of sensor technology, definition and promotion of good phenotyping practice and IT standards for plant phenotyping,
- support of access to major plant phenotyping facilities in Europe.

With this newsletter we provide useful information about the status of the project and upcoming events, but also the latest developments within the field of phenotyping and we recommend new and useful literature.

EPPN in FOCUS: Transnational Access

EPPN offers Transnational Access to a range of phenotyping installations in the partner organizations. The access is based on a simple peer-review supported application procedure. This allowed in the first year of the project that 19 experiments were initiated at the EPPN partner facilities by European user groups. We expect that the number of applications for Transnational Access will further increase in the forthcoming second year. Proposals for access to any specific installation can be submitted at any time by researchers or research teams before the deadline marked in the access calendar on the EPPN website. Potential users are asked to contact the platform operators before submitting an application.

More details: <http://www.plant-phenotyping-network.eu/eppn/guidelines>

Upcoming EPPN Events

2nd EPPN Information Workshop in Porto Heli, Greece, on 5th of September 2013

The workshop is organized as a satellite meeting of the EPSO conference on 1-4th of September 2013
<http://www.epsoweb.org/7th-epsoweb-conference-1-4-september-2013-greece>.

The workshop aims at discussing the needs and opportunities of plant phenotyping and the possibilities to access the EPPN facilities. The workshop will be divided into three sessions:

1. case studies by users who obtained access to the EPPN installations,
2. current EPPN platforms capacities, traits and technologies through case studies,
3. recent developments in plant phenotyping.

More details: http://www.plant-phenotyping-network.eu/eppn/information_workshop

EPPN Summer School, in Szeged, Hungary, August 2013

EPPN will organize a summer school-type course for small groups of student and users to provide theoretical and practical training on plant phenotyping and the use of the instruments and tools of plant phenotyping.

More details will be available on the EPPN website soon: <http://www.plant-phenotyping-network.eu>

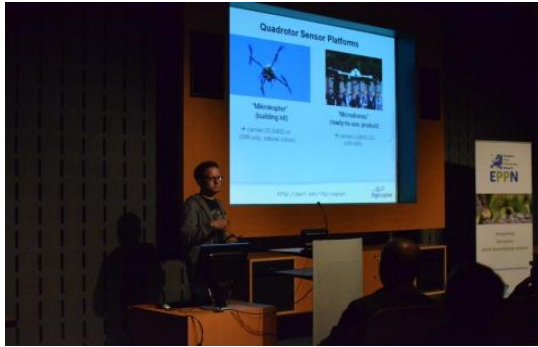
EPPN at the meeting of Italian Society of Agricultural Genetics, in Foggia, Italy, August 2013

EPPN will support a plant phenotyping session at the annual meeting of the Italian Society of Agricultural Genetics (SIGA)

More details will be available on the EPPN website soon: <http://www.plant-phenotyping-network.eu>

Previous EPPN Events

Developer's Workshop, September 2012 (Wageningen, NL)



About 70 participants from very diverse fields joined the EPPN workshop which was organized by Wageningen UR and enabled a lively discussion and interaction between technology developers and the plant phenotyping community. The scope of the workshop covered novel sensor technologies, including, but not limited to, novel sensor development, new vision and new robotics techniques suitable for application in plant phenotyping.

More details: http://www.plant-phenotyping-network.eu/eppn/developers_workshop

EPPN at the International Workshop on Image Analysis Methods for the Plant Sciences, September 2012 (Nottingham, UK)

The goal of this EPPN supported workshop was to bring together scientists actively engaged in the development of image analysis techniques and tools addressing problems arising within the plant sciences. Non-invasive technology and in particular imaging of plants represents one of the key tools in phenotyping.

More details: <http://www.cpib.ac.uk/events/image-analysis-workshop-2012/>

1st EPPN Information Workshop, May 2012 (Warsaw, PL).



About 130 participants joined the EPPN workshop organized by the Polish Academy of Sciences (PAN) and Polish Society of Experimental Plant Biology (PTBER). A number of phenotyping cases was presented and enabled a lively discussion about the needs and opportunities of plant phenotyping as well as the needs and possibilities to access the EPPN installations by diverse user groups.

More details: http://www.plant-phenotyping-network.eu/eppn/developers_workshop

NEWS from the Phenotyping Communities

Recently several national plant phenotyping platforms have been launched establishing core centers for plant phenotyping in Europe:

German Plant Phenotyping Network (DPPN) is a project funded by the German Federal Ministry of Education and Research (BMBF) with a budget of approximately 35 Million EURO. The project is coordinated by Prof. Ulrich Schurr from Forschungszentrum Jülich and includes two other partners, Leibniz-Institut für Pflanzengenetik und Kulturpflanzenforschung (IPK) in Gatersleben and the Helmholtz-Zentrum München (HMGU). The overall goal is to establish plant infrastructure to support German and international developments in plant sciences. Following the 5 years project funding DPPN will be continued inside the institutional funding of the participating research organizations.

More information: <http://www.dppn.de>

PHENOME is a project funded by French investment for the future infrastructure call 2011. It is coordinated by François Tardieu, INRA-LEPSE in Montpellier and includes 12 academic groups and two applied research organizations. Its objective is to create a French center dedicated to high throughput plant phenotyping.

More information: <http://www.inra-transfert.fr/en/page.php?optim=phenome>

UK Plant Phenomics Network (UKPPN) is focused on plant phenotyping and organized around existing and developing platforms within UK.

More information: <http://www.ukppn.org.uk>

3rd International Plant Phenotyping Symposium (IPPS)

The 3rd International Plant Phenotyping Symposium will be organized by the International Plant Phenotyping Network (IPPN). IPPN has the aim to bring together the international community on plant phenotyping from academia and industry and to provide networking opportunities between users, platform operators and experts in technologies. The board of the IPPN is currently exploring the options for the next symposium by discussing with potential local organizers. The date and location of the 3rd International Plant Phenotyping Symposium will be announced in a short term.

New and Recommended Literature

- Special Issue on Plant Phenotyping in: *Functional Plant Biology* (2012) Volume 39.
<http://www.publish.csiro.au/nid/103/issue/5847.htm>
Summary of the special issue: This special issue with 13 research papers focusses on several aspects centred around plant phenotyping including general aspects of phenotyping, novel techniques and approaches, phenotyping platforms, dedicated case studies and data management issues.
- Kohl P, Crampin EJ, Quinn TA, Noble D (2010) Systems Biology: An Approach. *Clinical Pharmacology & Therapeutics* 88, 25-33. <http://www.ncbi.nlm.nih.gov/pubmed/20531468>
Abstract: In just over a decade, Systems Biology has moved from being an idea, or rather a disparate set of ideas, to a mainstream feature of research and funding priorities. Institutes, departments, and centers of various flavors of Systems Biology have sprung up all over the world. An Internet search now produces more than 2 million hits. Of the 2,800 entries in PubMed with "Systems Biology" in either the title or the abstract, only two papers were published before 2000, and >90% were published in the past five years. In this article, we interpret Systems Biology as an approach rather than as a field or a destination of research. We illustrate that this approach is productive for the exploration of systems behavior, or "phenotypes," at all levels of structural and functional complexity, explicitly including the supracellular domain, and suggest how this may be related conceptually to genomes and biochemical networks. We discuss the role of models in Systems Biology and conclude with a consideration of their utility in biomedical research and development.
- Arvidsson S, Pérez-Rodríguez P, Mueller-Roeber B (2011) A growth phenotyping pipeline for *Arabidopsis thaliana* integrating image analysis and rosette area modeling for robust quantification of genotype effects. *New Phytologist*, 191, 895-907.
<http://onlinelibrary.wiley.com/doi/10.1111/j.1469-8137.2011.03756.x/full>
Abstract:
 - To gain a deeper understanding of the mechanisms behind biomass accumulation, it is important to study plant growth behavior. Manually phenotyping large sets of plants requires important human resources and expertise and is typically not feasible for detection of weak growth phenotypes. Here, we established an automated growth phenotyping pipeline for *Arabidopsis thaliana* to aid researchers in comparing growth behaviors of different genotypes.
 - The analysis pipeline includes automated image analysis of two-dimensional digital plant images and evaluation of manually annotated information of growth stages. It employs linear mixed-effects models to quantify genotype effects on total rosette area and relative leaf growth rate (RLGR) and ANOVAs to quantify effects on developmental times.
 - Using the system, a single researcher can phenotype up to 7000 plants d⁻¹. Technical variance is very low (typically < 2%). We show quantitative results for the growth-impaired starch-excess mutant *sex4-3* and the growth-enhanced mutant *grf9*.
 - We show that recordings of environmental and developmental variables reduce noise levels in the phenotyping datasets significantly and that careful examination of predictor variables (such as *d* after sowing or germination) is crucial to avoid exaggerations of recorded phenotypes and thus biased conclusions.

- Tuberosa R (2012) Phenotyping for drought tolerance of crops in the genomics era. *Frontiers in Plant Physiology* 3, 347.

http://www.frontiersin.org/Plant_Physiology/10.3389/fphys.2012.00347/abstract

Abstract: Improving crops yield under water-limited conditions is the most daunting challenge faced by breeders. To this end, accurate, relevant phenotyping plays an increasingly pivotal role for the selection of drought-resilient genotypes and, more in general, for a meaningful dissection of the quantitative genetic landscape that underscores the adaptive response of crops to drought. A major and universally recognized obstacle to a more effective translation of the results produced by drought-related studies into improved cultivars is the difficulty in properly phenotyping in a high-throughput fashion in order to identify the quantitative trait loci that govern yield and related traits across different water regimes. This review provides basic principles and a broad set of references useful for the management of phenotyping practices for the study and genetic dissection of drought tolerance and, ultimately, for the release of drought-tolerant cultivars.



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The Newsletter appears 3-4 times a year and is automatically sent to all colleagues who have subscribed the letter at the EPPN website.

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