



EMPHASIS



European Infrastructure for Multi-scale Plant Phenomics and Simulation

Website

<https://emphasis.plant-phenotyping.eu/>

Headquarters

Vlaams Instituut voor
Biotechnologie
Ghent, Belgium

Legal Status

In preparation (specify status:
i.e. step 1, 2 etc.)

Type

distributed

Access

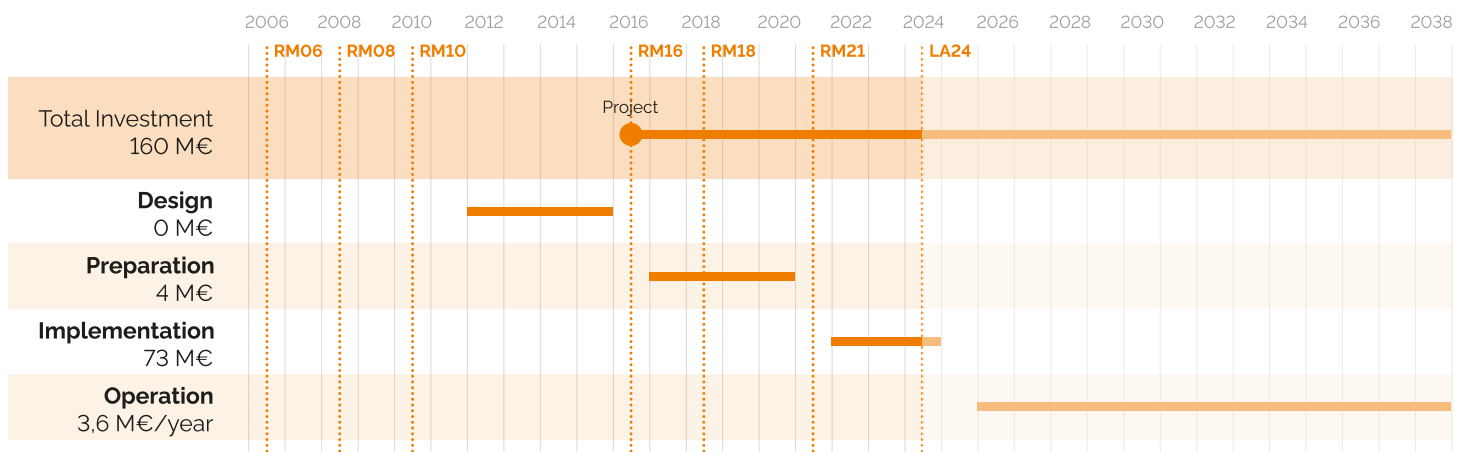
virtual,
physical

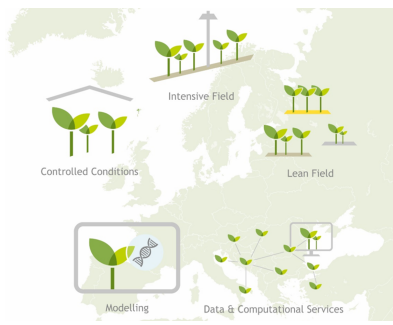
DESCRIPTION

The European Infrastructure for Multi-scale Plant Phenomics and Simulation (EMPHASIS) is a distributed Research Infrastructure dedicated to developing and providing access to facilities and services tailored to multi-scale plant phenotyping across various agro-climatic scenarios. The goal of EMPHASIS is to establish an integrated European phenotyping infrastructure, enabling the analysis of genotype performance under diverse environmental conditions. EMPHASIS aims to quantify the diversity of traits contributing to performance across varied environments, encompassing plant architecture, major physiological functions and output, yield components, and quality. By addressing the technological and organizational challenges inherent in European phenotyping, EMPHASIS strives for the full exploitation of genetic and genomic resources available for crop improvement amidst a changing climate. This will be achieved through facilitating transnational collaboration among researchers, institutions, and stakeholders across Europe, while ensuring seamless linkage of data acquisition to a comprehensive data management and analysis system. Promoting FAIR data usage and supply across Europe and fostering the development, evaluation, and dissemination of knowledge and novel technologies are integral

aspects of our mission. The primary users of EMPHASIS services encompass a diverse spectrum: scientists and managerial staff operating the installations implement new technologies and standardizations, facilitating effective and cost-efficient implementation of novel methods. Academia and industry users raise varied scientific questions related to basic plant science, applied plant sciences, and other related disciplines. Technology developers find applications beyond the plant phenotyping community, extending to fields such as precision agriculture and medicine. Start-up companies and small to medium-sized enterprises (SMEs) benefit from access to EMPHASIS resources, as in-house development of such resources is typically unaffordable for larger enterprises. Funders and policymakers receive valuable insights through EMPHASIS reports and recommendations, aiding in shaping research strategy agendas to advance Europe's agricultural and plant sciences. Engagement with EMPHASIS contributes to advancing sustainable food security, a concern that resonates with everyone. Together, we strive to foster innovation, collaboration, and progress in plant phenotyping and agricultural sciences for the betterment of society.

TIMELINE & ESTIMATED COSTS





POLITICAL SUPPORT

Lead

BE

Prospective member

CH, EE, FR, IE, IL, IT, NL, RS, UK

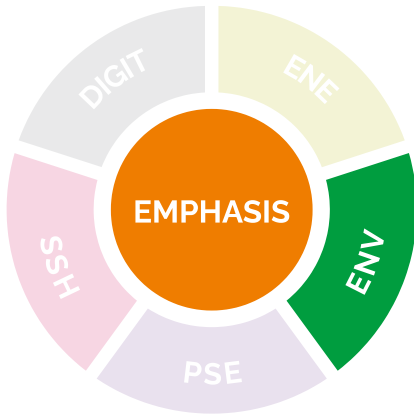


IMPACTS

EMPHASIS, a cutting-edge initiative, pioneers advancements across scientific, societal, and economic realms in agriculture. Scientifically, it serves as a crucible for innovating sensor methodologies, pivotal for measuring traits above and below ground in relevant throughput under different environmental dynamics, which is a bottleneck in basic and applied plant sciences. Through multi-scale applications, from molecular to ecosystem levels, it facilitates sustainable and resilient agriculture and a transition towards agroecology, vital for climate change mitigation. Data integration and modeling are paramount in handling the burgeoning phenotypic data. EMPHASIS champions the development of standards and FAIR approaches, fostering interoperable data access crucial for amalgamating phenotypic and omics data. This synergy elucidates mechanistic plant-environment interactions, fueling practical applications in breeding, agronomy, and agroecological transitions. Societally, EMPHASIS targets key challenges outlined in Horizon Europe, such as reducing agriculture's environmental footprint. By improving crop resilience and efficiency in resource usage, it contributes to sustainable agricultural practices. Moreover, it addresses soil health and restoration, vital for maintaining fertile soil quality and utilizing marginal field areas efficiently. Economically, EMPHASIS catalyzes technological innovation, propelling European companies to global leadership in plant phenotyping. The industry thrives on advancements in drones, sensor technologies, and machine learning, supported by EMPHASIS's provision of unique opportunities for sensor development and protocol refinement. Additionally, it empowers European agricultural industries by accelerating crop improvement processes, enabling the discovery of new traits and smart agricultural practices, thereby ensuring food security and fostering economic growth. Inserted into the ESFRI Roadmap in 2016, EMPHASIS is presently in its Implementation Phase. Aiming to submit in 2024, the Step 1 application for the European Research Infrastructure Consortium (ERIC) seeking European recognition as a legal entity to carry out more sustainable activities related to the Research Infrastructure. The goal is to achieve operational status by 2026.

SERVICES

EMPHASIS revolutionizes plant phenotyping by providing researchers across Europe access to state-of-the-art facilities, resources, and services. Its mission is to enhance our understanding of plant performance under diverse environmental conditions, translating this knowledge into practical applications. As it progresses through its implementation phase, EMPHASIS is developing a comprehensive service portfolio centered on physical and virtual infrastructure. The infrastructure encompasses physical services such as controlled environment facilities, intense field installations and lean phenotyping sites, as well as virtual services such as modeling platforms, and information systems. These resources enable researchers to conduct experiments ranging from controlled conditions to real-world field settings, incorporating advanced modeling and data management techniques. EMPHASIS aims to establish a cost-effective and efficient service model that meets user demand while fostering standardization and interoperability. By offering pan-European services, EMPHASIS reduces duplication of efforts, facilitates unified access to installations and data, and promotes excellence-driven research. The EMPHASIS Directorate serves as the central hub, overseeing strategic planning, stakeholder engagement, and service provision. Functional Units (FUs) within the Directorate focus on user access, advancing phenotyping practices, data management and modeling, education and training, communication, and industry engagement. Through these efforts, EMPHASIS aims to facilitate collaborative research, empower researchers with cutting-edge tools and resources, and foster innovation in plant phenotyping. By bridging the gap between academia and industry, EMPHASIS accelerates progress towards sustainable agriculture and food security in a changing climate.



EMPHASIS has successfully established collaborations and projects with other Research Infrastructures (RIs). In line with the FAIR principles for data management, EMPHASIS-Europe has initiated a joint strategy process with ELIXIR (emphasis.plant-phenotyping.eu/Collaboration_ELIXIR) within the framework of EOSC-Life, aiming to provide access to plant phenomics and genetic data across Europe. Common objectives are also shared with AnaEE, which provides access to experimental platforms for terrestrial and aquatic ecosystems. In 2017, EMPHASIS and AnaEE published a joint strategy emphasizing collaboration to bring innovative solutions for sustainable agricultural intensification (emphasis.plant-phenotyping.eu/Collaboration_AnaEE). Moreover, EMPHASIS is actively engaged in several projects alongside other RIs such as the PHENET project aimed at developing new tools and methods for identifying resilient combinations of species, genotypes, and management practices in the face of evolving climatic scenarios across Europe. Additionally, EMPHASIS contributes to the AI4Life project, aiming to leverage Artificial Intelligence (AI) and Machine Learning (ML) methods for bioimage analysis. Another notable project is AgroServ, which tackles complex challenges in agricultural systems. These are a few examples of the diverse collaborations in which EMPHASIS is involved. In addition to its project involvements, EMPHASIS plays an active role within the ENVRI Community, a consortium comprising 26 European Research Infrastructures focused on various aspects of the Earth system. Moreover, EMPHASIS is a member of the European Life Science Research Infrastructures (LS-RI), a cluster comprising 13 other European RIs dedicated to diverse topics in Life Science. These affiliations offer valuable opportunities for collaboration with both European RIs and national nodes, further enhancing EMPHASIS's exposure and potential for partnerships. Beyond Europe, a strong connection has been established with the Australian Plant Phenotyping Facility (APPF) leading to a Memorandum of Understanding that were initiated by the EU project RI-VIS (2019-2022) where EMPHASIS played an important role with respect to the internationalisation of the European Research Infrastructures. EMPHASIS has also analysed the state of collaboration with different regions (Australia, Latin America, Africa) and developed recommendations on future improvements which it has picked up in its engagement activities beyond Europe.