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OPERATIONAL PROGRAMME
SCIENCE AND EDUCATION
FOR SMART GROWTH

Project BG05M2OP001-1.003-0001 "Project PlantaSYST: Establishment of a Center for Plant System Biology and Biotechnology for the transformation of basic scientific research into sustainable bio-based technologies in Bulgaria"

Procedure: BG05M2OP0011.003 - "Complementary support for Bulgarian research organizations implementing projects under the Horizon 2020 Framework Program, WIDESPREAD-Teaming competition, Phase 2"

Beneficiary: Center for Plant System Biology and Biotechnology

Associated partners:

Maritsa Vegetable Crops Research Institute (VCRI);

Stefan Angelov Institute of Microbiology, BAS (IMicB);

University of Potsdam, Germany;

Max Planck Research Society, Germany;

Max Planck Molecular Biology and Biotechnology Institute (MBBC).

Budget: BGN 29,998,861.62;

Duration: 44 months;

Project aim:

The project "PlantaSYST" aims to establish a new Center of Plant Systems Biology and Biotechnology (CPSBB) in Plovdiv. CPSBB is registered as an independent legal entity, whose core activity is research. The Center for Plant System Biology and Biotechnology is supported by the Bulgarian and German partners in the PlantaSYST project, the governments of the two countries, and the Municipality of Plovdiv. The mission of the Center is to have a leading position in the field of plant sciences in Europe. Advanced techniques in functional genomics, metabolomics, and bioinformatics will be used to identify the regulatory mechanisms and metabolic pathways that drive plant development, stress physiology, and the synthesis of potential valuable metabolites to find market applications. The basic research carried out in the departments of the CPSSB for Plant Development, Physiology, and Molecular Basis of Stress, Metabolomics and Bioinformatics will be included in the applied research



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of the departments' Plant Cell Biotechnology and Selection and Production of Vegetable Crops. The CPSBB will provide a junction between academia and industry in the region and will play a leading role in training a new generation of researchers in plant systems biology and biotechnology. The technology transfer office will support the flow of knowledge and technology towards partners and end-users. The newly established Center for Excellence CPSBB will significantly increase the research potential of Bulgaria, will expand in a significant way the country's capacity in the field of plant genomics, and will stimulate the development of the scientific and economic potential of Plovdiv and the region. Construction of a new campus of the CPSBB and a building equipped with modern equipment is envisaged with the funds from the current procedure.

The new campus is planned to be constructed on the territory of Plovdiv and will include an administrative building with offices, seminar rooms and a large auditorium, laboratory complex with adjacent specialized rooms, as well as two greenhouses.

The work on applied research is structured in three main tasks:

1. Plant Cell Biotechnology. This task envisages close cooperation between the partners in the direction of a better understanding of plant biochemical mechanisms and development of means for sustainable, mass bioproduction of valuable molecules, using the concept of "green factories".
2. Synthetic Biology. The methods of Synthetic Biology will be used for the re-programming of microorganisms (yeast of the species *Saccharomyces cerevisiae*) and plants (*Marchantia polymorpha*) in the direction of production of specialized metabolites for pharmaceutical or industrial (flavours) purposes.
3. Vegetable production. Within the project activities, a variety collection of *Capsicum annuum* L. and *Solanum lycopersicum* L. will be created, serious attention will be paid to the preservation of the Balkan varieties of Peppers, which are considered endemic forms with highly specialized features.

The project envisages the organization and holding of specialized courses:

- Courses in plant biotechnology organized following the program of previous courses under the CropStrengthen project - H2020 and a course of BMBF project Plant-INNO;
- Courses on "R programming environment" and use of other software applications developed in the Bioinformatics Department of the CPSBB;



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- Training in basic and advanced metabolomics. The courses will be organized following the program of previous courses under the CropStrengthen project - H2020 and projects C3to4 and OPTICHINA - FP7;
- NMR based metabolomics courses (1D and 2D).

The Center for Plant Systems Biology and Biotechnology envisages establishing a School of Plant Breeding for advanced learners.

The CPSBB has among its partners some of the most prominent vegetable growers and genomics experts in the world, as well as the relevant infrastructure. This expertise, as well as the developed knowledge, will be used to organize two levels for the School of Plant Breeding for advanced learners:

- Training entry-level aimed at farmers, students, and specialists in crop production on topics such as conservation of genetic resources, pest control, preservation of soil fertility, etc.
- Advanced training will be targeted at advanced citizens and producers from the private sector, postdoctoral students, Ph.D. students, etc., focusing on phenotyping, retrograde cultivation, introduction, analysis and preservation of data, interpretation of genotyping statistical tools for populations, QTL GWAS analysis.

The training will include classroom work and fieldwork involving 20 - 25 participants for each. After receiving accreditation, CRSBB will conduct training in doctoral programs in the field of higher education: "Natural Sciences, Mathematics and Informatics", professional orientation "Biological Sciences", and in the field of higher education: "Technical Sciences", professional orientation "Biotechnology".

Project results:

The transformation of the Center for Plant System Biology and Biotechnology into a leader in the territory of Bulgaria and for Southeast Europe in the field of plant sciences. The center will set up sustainable relationships in areas that are subject to the Innovation Strategy for Intelligent Specialization of Bulgaria and will play a leading role in training a new generation of young scientists in the field of plant systems biology and biotechnology. The project will develop high-quality research in areas such as molecular biology, genetics, functional genomics, metabolomics, and bioinformatics, as well as new products for the Bulgarian and European markets (new plant breeding technologies, new varieties, and lines with increased resistance to abiotic and biotic stress, varieties with improved



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nutritional qualities, plant products with new pharmaceutical qualities for innovative applications in the medicine).

The Center will create an attractive working environment that will retain good specialists from Bulgaria and will attract leading specialists from abroad in the field of plant science. The aim is to establish itself as a link between academic organizations and business in Plovdiv and as a catalyst for start-up companies, which will serve as the core of a future science and business park in Plovdiv.

The project is an example of the synergies between European Structural and Investment Funds and the Horizon 2020 Programme as the funding from OP “Science and Education for Smart Growth” is complementing the funding, received by the project from Horizon 2020 Framework Program, WIDESPREAD-Teaming competition, Phase 2.

Project site: <http://www.plantasyst.eu>