SCAP
SOCIEDADE DE CIÊNCIAS AGRÁRIAS DE PORTUGAL

Terratech ERASMUS+ project tackling the objectives of the Farm to Fork Strategy

Projeto ERASMUS+ Terratech na persecução dos objetivos da Estratégia do Prado ao Prato

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ABSTRACT

The success of the Farm to Fork strategy, aimed at the transition to the sustainability of European agriculture, will depend on the technological solutions that already exist and the ones that will be developed. These new technologies will allow the integration of several factors (e.g.: soil properties, climatic factors, intrinsic factors of the cultivars) in predictive assessments of water and nutrient needs, of the symptoms of pests and infections, and thus contribute to early, accurate and automated responses with less consumption of resources and agrochemicals. Similarly, better spatial management of land use will be possible. However, the large-scale digitization of agricultural production systems depends on the elimination of several sociological barriers, such as the digital illiteracy of many farmers and soil advisors. In this context, a consortium formed by 14 European partners, developed the TERRATECH Project, submitted to the ERASMUS+ Program, which aims to develop a master's course in Agriculture 4.0. During the first 18 months, the consortium developed the study plan and teaching materials for theoretical, field and laboratory classes. The course includes one period of student mobility in companies in the agri-food industry. The objective is to develop training that can be transferred to other universities.

Keywords: digitalization, production systems, agriculture 4.0 education, MSc Course

RESUMO

O sucesso da estratégia do Prado ao Prato, que visa a transição para a sustentabilidade da agricultura europeia, irá depender das soluções tecnológicas já existentes e das que se irão desenvolver num futuro próximo. Estas tecnologias permitirão integrar diversos fatores (ex.: propriedades do solo, fatores climatéricos, fatores intrínsecos das cultivares) em avaliações preditivas das necessidades de água e nutrientes, da sintomatologia de pragas e infeções, e assim

contribuir para respostas precoces, precisas e automatizadas com menor consumo de recursos e de agroquímicos. Do mesmo modo, será possível uma melhor gestão espacial do uso do solo. Contudo, a digitalização em larga escala da produção agrícola depende da eliminação de diversas barreiras sociológicas, como a iliteracia digital de muitos agricultores e técnicos de campo. Neste contexto, um consórcio formado por 14 parceiros europeus, desenvolveu o Projeto TERRATECH, submetido ao Programa ERASMUS+, que visa o desenvolvimento de um curso de mestrado em Agricultura 4.0. Durante os primeiros 18 meses, o consórcio desenvolveu o plano de estudos e os materiais didáticos para as aulas teóricas, de campo e laboratoriais. O curso inclui um período de mobilidade dos estudantes em empresas da indústria agroalimentar. O objetivo é desenvolver uma formação que possa ser transferida a outras universidades.

Palavras-chave: digitalização, sistemas de produção, agricultura 4.0, educação, Curso de mestrado

INTRODUCTION

The Farm to Fork Strategy, a core component of the European Green Deal, aligned with the new CAP and other European policies, assumes the urgency of farmers to make the transition for more sustainable production systems relying on nature-based, technologic, digital, and space-based solutions. The aim is to guarantee the climate resilience of the systems, the protection of natural resources, the improvement of health and quality of life of people, and the income of farmers (EC, 2020).

Sensors and remote sensing using satellites may allow an accurate evaluation of crops (phenotypes, yield and conditions) increasing the capacity of predicting needs, with a subsequent on-site optimization of irrigation, fertilization and pesticides inputs. These and other Internet of Things (IoT) technologies, associated with wireless sensor networks, cloud computing, middleware systems and mobile applications allow a strict control of crop conditions and automation of several processes, both in field and under protected crop cultivation. Enhanced computation capabilities and infrastructures allows the storage and processing of great amount of information, including different variables with a great spatial and temporal coverage, while artificial intelligence (AI) obtains algorithms for trends' analysis, large-scale monitoring (e.g. variation of soil organic carbon content of soils) and knowledge acquisition (Gómez-Chabla *et al*., 2019; Garske *et al*., 2021).

The transformation of the agri-food sector thus depends on innovation, knowledge and skill development for the transition from hands-on food producers, used to manage simplified agroecosystems, to data-driven managers of complex ecosystems, taking into account several variables (e.g. soil properties, climate conditions, biodiversity etc.) (Reinhart, 2022). The lack of appropriate infrastructures in rural areas, the lack of digital literacy of farmers, which also results in the lack of trust on technology providers, have been identified as serious barriers to the incorporation of innovative digital solutions in agriculture (Reinhart, 2022). It has already been assumed that the success of the Farm to Fork strategy and of the new Common Agriculture Policy (CAP 2023-27) deeply relies on digital training and educational programs aimed in up-skill new generations of farmers, advisors and other agriculture stakeholders, and in re-skilling them during their working lives (AIOTI, 2019). The new generation of engineers and data scientists also need to have agronomic literacy to better communicate with farmers and advisors and to develop tailored solutions for their perceived needs.

In this context, after an analysis of the education programs offered at the European level, it was concluded that currently there were no hands-on IoT courses dedicated to the application of these systems to the Farming industry, in all 137 agriculture educational institutions. Hence, the ERASMUS+ project TERRATECH (Ref. 621568-EPP-1-2020-1-PT-EPPKA2-KA) was proposed and is ongoing.

The main aim of this project is to develop an advanced interactive MSc course related to Agriculture IoT Engineering that will train individuals with the necessary skills and knowledge to work in the rising "Smart Agriculture" industry. The course is also formulated to stimulate transversal competences such as the increased sense of initiative and entrepreneurships and will accept students with two main background profiles: agronomy and engineering.

MATERIAL AND METHODS

This project is being carried out by a consortium formed by 14 partners, from seven European Countries, including small and medium enterprises (SMEs) in the technological and certification fields, universities, research centres and farm associations, namely:

- University of Porto/GreenUPorto, Portugal (UPorto)
- International Hellenic University, Greece (IHU)
- University of Debrecen, Hungary (DEB)
- Cerca Trova Ltd, Bulgary (CET)
- University Pompeu Fabra, Spain (UPF)
- Catholic University of the Sacred Heart, Italy (UCSC)
- Vidzeme University of Applied Sciences, Latvia (VIA)
- Mediterranean Agronomic Institute of Chania, Greece (MAICh)
- ECQA GmbH, Austria (ECQA)
- Evolutionary Archetypes Consulting SL, Spain (EA)
- Ktima Filipou-Schoinoplokakis, Greece (KF)
- AgriWatch BV, The Netherlands (AW)
- Agroop, Portugal (AGP)
- Regional Federation of Cuma of the West, France (CO)

The academic curriculum of the master course was developed and consists in 22 curricular units, distributed in two semesters, plus an Intermediate Project in the first semester, and a Developing Tool Demonstrator in the second semester. The Master's ends up with one mobility period in two industrial partners, during which students will have the opportunity to experience working in SMEs involved in the project. The curricular units will be taught, both presential and remotely, by all the academic partners involved. The course was designed to follow the European Credit Transfer and Accumulation System (ECTS) credit standards for certification recognition across the EU. The objective is to develop a post-graduation training package that can be integrated by other European Academic Institutions in their training catalogue.

RESULTS AND CONCLUSIONS

The project achieved half of its duration (18 months) and despite the limitations caused by the pandemic, all the partners have been working remotely in developing the contents of all curricular units and corresponding teaching material, including lab experiments, field and laboratorial class protocols, laboratorial prototypes, among others. Great emphasis is being placed on hands-on-training, real-time laboratory experience, as well as cultural and educational exchange. A pilot year will be launched in October 2022 and the application period is currently open. The course has also received a great attention from students outside Europe. The meeting with stakeholders was extremely relevant and has shown how farmers are aware of the problems faced by agriculture, namely those linked with soil biodiversity and climate changes. Recommendations were made to the project partners, to include the aforementioned issues in the content of the curricular units. The strict collaboration of partners in this proposal has already set the grounds for submitting another project proposal aimed at boosting the digitalization of agriculture and soil management.

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