NATIONAL DEVELOPMENT PLAN 2020

EUROPEAN UNION
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Decision Support Tool for an Integrated Food Waste Valorisation System

Annual report on dissemination, communication, mobility and training activities, and progress and risk monitoring: 2021

DeSTInation

Prepared within the project "Decision Support Tool for an Integrated Food Waste Valorisation System (DeSTInation)" (No. 1.1.1.2/VIAA/3/19/528)

12.05.2021.

The report is prepared within the project's work package 4.

The scientific objective of the project is to develop a decision support tool for an integrated food waste valorisation system where the availability of feedstock, its bioconversion efficiency, and the related environmental and techno-economic effects are considered.

Results of the project: Four activities are planned in the project:

1. Modelling of food production and waste management macro-systems,
2. Modelling of biotechnology and waste conversion micro-systems,
3. Evaluation of an integrated food waste valorisation system,
4. Knowledge transfer, mobility and training.

The project will develop and validate an innovative methodology based on the Latvian example. The method will combine mathematical models created for different purposes in a single tool. In addition (1) 3 scientific articles will be published in journals indexed in Scopus and Web of Science databases with a citation index of 50% of the industry average; (2) results will be presented at 2 international scientific conferences; and (3) the young researcher (postdoctoral student) will develop her competence in research, study, international mobility and networking activities for a total of at least 3 months, as well as develop her transferable skills.

Information about the project: Food waste is among the most generated biogenic waste around the globe. Annually 1/3 of the global food produced is wasted, and waste occurs at all stages of the food supply chain causing negative environmental, economic and social effects. Food waste can efficiently be used as feedstock in waste biorefinery that can result in a number of value-added products. Food waste can play an important role in developing sustainable circular bioeconomy. Yet, there is a lack of tools for assessment of food waste valorisation systems. In the project a decision support tool will be developed for an integrated food waste valorisation system where the availability of feedstock, its bioconversion efficiency, and the related environmental and techno-economic effects are considered. The novelty of the project is the selected hybrid modelling methodology that provides the possibility to test and assess a variety of food waste valorisation scenarios before their implementation.

As a result of the project, the postdoctoral researcher will significantly improve her scientific, managerial and communication skills, which will help her achieve the status of an independent, mature researcher.

The project will promote the development and implementation of the smart specialization strategy area "Knowledge-intensive bioeconomy" through more efficient use of resources (eco-innovative products, new technologies), innovation capacity building (innovative decision support tool), knowledge base and human resources development (knowledge-intensive bioeconomy), innovation systems (eco-innovative products) and overcoming social, environmental, climate and energy challenges. The results of the project will be used by several target groups.

Project period: 01.05.2020. – 30.04.2023. (36 months)

Project costs: 133 805.88 EUR (113 734.99 EUR from EU as ERDF funding; 6690.31 EUR – the share of the University of Latvia)

Source of funding: European Regional Development Fund Specific Objective 1.1.1 "Improve research and innovation capacity and the ability of Latvian research institutions to attract external funding, by investing in human capital and infrastructure" 1.1.1.2. measure "Post-doctoral Research Aid". Project application selection round No.3.

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CONTENT

DISSEMINATION, EXPLOITATION AND COMMUNICATION ACTIVITIES

The project was started on May 1, 2020. In the first year of the project, dissemination and communication activities have been carried out in the shadow of the global pandemics.

Three scientific articles have been envisaged to report the results of the project. In the first year of the project, one article has been published in the journal *Sustainability* (ISSN 2071-1050, IF=2.576). In the article, system dynamics modelling has been applied for assessing the sustainability of the agricultural supply chain. The agricultural sector is at the core of the food supply chain and its sustainable development is a prerequisite for the continuity of food supplies and, at the same time, for the sustainability of the ecosystem (carrying capacity). Meanwhile, operational effectiveness of the agricultural supply chain determines the generation of food waste during the first i.e. production phase of the food supply chain. The article presents a novel, dynamic sustainability assessment tool that combines two methods – system dynamics and temporal soil carbon modelling. The article has been published in collaboration with colleagues from the Aarhus University in Denmark. The article "Dynamic sustainability assessment tool. Case study of green biorefineries in Danish agriculture" is available open access: https://doi.org/10.3390/su12187389

Meanwhile, another manuscript has been submitted for review in the *Computational and Structural Biotechnology Journal* (ISSN 2001-0370, IF=6.018). In the manuscript, the sustainable metabolic engineering (SME) concept is proposed to assess and optimize the sustainability of biotechnological production that can be derived from the features of metabolism of the exploited organism. The reviewers' comments have not yet been received upon the preparation of this report.

In parallel, a report was published in Latvian to inform a wider society and national policy makers about the assessment results of biowaste and food waste amount and management till 2035. The assessment was made based on modelling results of the waste management system. The report is available open access online.

The communication activities of the project include (1) participation in the 79th International Scientific Conference of the University of Latvia, session Climate change and its impacts on sustainability of natural resources, with the presentation "Waste bioconversion in to new products" (in Latvian: Atkritumu biokonversija jaunu produktu ieguvei), and (2) participation in a seminar dedicated to environmental and sustainability modelling techniques with the presentation "Modeling Environmental Systems and Sustainability: Application of System Dynamics, LCA and MCA".

A dedicated section has been developed at the website of the University of Latvia, that informs visitors about the project's aims, tasks and progress, while also providing links to all results published as an outcome of the project (information is provided in Latvian). Also, the website of the Computational Systems Biology Group holds a section dedicated to the project (information is provided in English). In addition, a project has been developed at ResearchGate, where periodic updates of the project's progress are published.

At the beginning of the project, an information plate (A3 size) about the project and funding provider was placed in the premises of the University of Latvia – the House of Nature. The plate will be maintained for the whole project, thus informing employees and visitors of the House of Nature and acknowledging the funder of the research project.

MOBILITY AND TRAINING ACTIVITIES

The project was started on May 1, 2020. In the first year of the project, no mobility activities have been possible due to the traveling restrictions of the global pandemics. In the post-doctoral researcher's opinion, the virtual mobility is not an efficient international mobility option, thereof it has not been considered or used.

The post-doctoral researcher has participated in the training sessions on stoichiometric metabolic modelling provided by the Computational Systems Biology Group, University of Latvia. Also, various national and international level webinars have been attended to learn about a range of topics, including scientific, motivational, managerial, and personal development topics. No certificates of attendance have been received, yet the post-doctoral researcher has used the vast opportunities provided by organizers of virtual events available during the pandemics.

Importantly, multiple international contacts have been established by the post-doctoral researcher. An international collaboration has been discussed and initiated with colleagues from the University of Padova (Italy), Lund University (Sweden), Laapenranta-Lahti University of Technology (Finland), Kaunas University of Technology (Lithuania), National Chung Hsing University (China), SINTEF AS (Norway), National Institute of Chemistry (Slovenia), Masaryk University (Czech Republic), Sustainability Worldwide Center 2050 (Spain), Ca' Foscari University of Venice (Italy), and many others.

All the activities have resulted in the post-doctoral researcher being elected as the senior researcher of the University of Latvia, thus affirming her professional development and competence.

PROGRESS AND RISK MONITORING

The project was started at the peak of the global pandemics, thus challenging implementation of the project according to the work plan and timely delivery of the envisaged results. Nevertheless, the work package #1 has been completed with a system dynamics model for biowaste and food waste management. A public report on the modelling results has been prepared. Also, a scientific research article has been published in the journal *Sustainability* (ISSN 2071-1050, IF=2.576): “Dynamic sustainability assessment tool. Case study of green biorefineries in Danish agriculture" is available open access: https://doi.org/10.3390/su12187389. Finally, presentation at a conference about the results of the work package #1 is postponed for the second year of the project. Similarly, due to the global pandemics mobility and training activities initially planned for the 1st year of the project are now moved to the 2nd year of the project. Meanwhile, implementation of the work package #2 has started with a submitted manuscript to the *Computational and Structural Biotechnology Journal* (ISSN 2001-0370, IF=6.018), and a manuscript in preparation about waste cooking oils and their microbial conversion. The articles published, submitted and in preparation indicate that the results generated during the first year of the project are novel and topical to the scientific community. Thus, with some minor rescheduling the project is being implemented and run to deliver all the planned results by the end of the project.

In conclusion, risk and progress monitoring has been performed on a regular basis to assess the progress of the project, correspondence with the project’s timeline and evaluate the possible risks in coming phases of the project. The needed mitigation and contingency plans have been initiated and implemented by rescheduling some of the planned activities and deliverables.