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Novel Biotechnological Solutions in Climate Change Mitigation
2024-1-EL01-KA220-HED-000251373

LT TA Organisation and Evaluation Report

1. Activity Overview

- **Project Title**

Novel Biotechnological Solutions in Climate Change Mitigation (BIOSHIELD)

- **Activity Type**

WP4 - Online LTТА Pre-Piloting Training

- **Leading Organisation**

University of Maribor (UM)

- **Target Group**

Proposed: 50 students (10 per partner) and 5 lecturers (1 per partner)

In the LTТА activity 89 students participated in total, including the ones who attended at least 1 day. Out of 89, 19 students attended the LTТА regularly for 5 days, 50 students attended the LTТА for at least 4 days, and 68 students participated in the LTТА at least for 3 days. The partnership agreed to consider at least 3 days of participation as eligible for certificate issuance, though it was indicated in the project proposal 70% attendance whose rate mathematically requires 3.5 days of participation. However, all the LTТА training was recorded and video records were shared with the students to follow the training delivery in case they couldn't participate. So, 3 days of participation was deemed eligible.

- **Methodology**

Online learning, lectures, case studies, and group presentations over 5 days. Student Evaluations through satisfaction survey including open ended questions that will be used in replacement of student diaries.

- **Process**

The first day, Prof Dr Yiannis Kourkoutas made an opening speech. Prof Dr Kemal Melih Şahin introduced the activity and Assoc. Prof Dr Hudson Ashrafi gave a lecture about Climate Change and Disasters' Effect on Agricultural Productivity, Blueberry as a Case Study. Then question and answer session followed and students asked their questions.

The second day started under the moderatorship of Prof Dr Yiannis Kourkoutas and Assist Prof Dr Dunja Samec introduced Dr Erna Karalija (University of Sarajevo) to give a lecture about Phytoremediation. After the lecture, Q&A session continued.

The third day, Assist Prof Dr Vasiliki Kachrimanidou gave a lecture about Industrial biotechnology, followed by the Q&A session. The fourth day, Assoc Prof Dr Silva Grobelnik Mlakar gave a lecture about Microbial Biotechnology in soil-plant systems, followed by the Q&A session.

The final day of the LTТА, the student groups from partner universities presented innovative applications in biotechnology to mitigate the climate crisis.

[Hackathon Programme](#)

[Lectures](#)

[Student Evaluations](#)

2. Student Satisfaction Survey Analysis

A. Participant Demographics and Focus Areas - University of Maribor

The following table summarises the distribution of participants across academic years and their primary biotechnological focus areas as defined in the training questionnaire.

Table 1: Participant Profile Summary

Category	Metric	Total (N= 14)	Percentage (%)
Academic Year	1st Year	-	-
	2nd Year	8	57.1
	3rd Year	5	37.7
	4th Year	1	7.1
	Graduate (MSc or PhD)	-	-
LTTA Focus Area	Climate Change Mitigation	-	-
	Mitigation of Disaster Effects	-	-
	Plant Biotechnology	2	14.3
	Microbial Biotechnology in Soil-Plant Systems	12	85.7
	Industrial Biotechnology	-	-
	Other	-	-

B. Statistical Analysis of Participant Feedback

This section presents the mean scores for quantitative feedback based on the 1-5 agreement scale (1 = Strongly Disagree, 5 = Strongly Agree).

Table 2: Feedback on Training Effectiveness and Career Aspirations

Survey Question	Mean Score (1-5)	Achievement % (Agree - 4 /Strongly Agree - 5)
Preparedness: Training made me feel more prepared for the actual pilot course.	4.07	64.3
Entrepreneurship: Considering starting a biotech startup or initiative.	2.86	14.3
Industry Preference: Prefer to work in biotech industry (public/private).	3.36	35.7
Satisfaction: Overall LTTA organisation met expectations.	4.36	85.7

C. Learning Attainments and Theoretical Insights

This section summarises the "Key Learning Attainments" reported by students, focusing on new concepts encountered during the 5-day session.

- **New Concepts Learned: (Please summarise the answers)**

- Students reported gaining new knowledge in several interconnected areas related to biotechnology, plant science, and sustainable agriculture. Many participants encountered new concepts related to plant-microbe interactions, biological nitrogen fixation, and the role of microorganisms in improving plant resilience to environmental stress. Students also reported learning about the impact of climate change on agricultural systems and crop production, as well as about plant breeding and biotechnology approaches used to develop climate-resilient crops. Several responses highlighted increased understanding of plant stress responses, including the effects of heavy metals and the concept of stress memory. In addition, students gained insights into agricultural production systems, including blueberry cultivation, harvesting technologies, and seed production, as well as crop rotations and the role of legumes such as soybean in improving soil fertility. Participants also reported learning about the importance of sustainable soil management and the role of digital tools and data-supported decision making in agriculture, such as platforms that integrate soil data, crop rotations, and biological processes. Importantly, some students - particularly those with a background in geography - emphasized that the LTTA helped them understand how geographical knowledge, including land-use patterns and environmental conditions, can be applied to address contemporary challenges in agriculture and sustainable food production.

- **Most Inspiring Aspect: (Please summarise the answers)**

- Students reported that the most interesting and inspiring aspects of the LTTA were practical examples showing how scientific research and biotechnology can address current agricultural and environmental challenges. Participants particularly appreciated case studies demonstrating how biotechnological approaches can support agriculture in adapting to climate change and environmental stress. Many students found topics related to plant-microbe interactions and microbial biotechnology especially inspiring, particularly the role of beneficial microorganisms in improving plant resilience, nutrient cycling, and sustainable crop production. The use of phytoremediation and microbial approaches to remove heavy metals from soil was also highlighted as an interesting example of environmentally friendly technological solutions. Participants were also engaged by examples from plant production and breeding, including the diversity of blueberry species and the development of crop varieties adapted to changing climatic conditions. Students additionally reported gaining new perspectives on agricultural systems and resource management. Finally, the opportunity to exchange ideas with students from different countries and disciplines was described as highly inspiring, as it allowed participants to connect biotechnology, agriculture, and geographical perspectives when addressing challenges in sustainable food production.

- **Career Impact: (Please summarise the answers)**

- Students' responses indicate that the LTTA influenced their career thinking in several ways. Many participants reported an increased interest in careers related to biotechnology and sustainable agriculture and expressed motivation to pursue further studies or professional paths in areas such as applied microbiology, plant biotechnology, and Agri-Tech innovation. The LTTA also strengthened students' orientation toward practical and applied agricultural work, as they better understood how scientific knowledge can be translated into solutions for farmers, including crop adaptation to climate change, the use of microbial technologies, and more sustainable farm management practices. In addition, several students reported greater openness to innovation, entrepreneurship, and international opportunities, noting that the experience increased their confidence in developing new ideas, participating in innovative projects, and exploring study or career paths connected to sustainable agriculture and environmental challenges in an international context.

D. Identified Challenges and Obstacles

Participants were asked to identify major obstacles in the lecture topics or challenges encountered during the online activities.

- **Reported Challenges: (Please summarise the answers)**

- Students reported that the main challenges during the LTTA were related to the complexity of some scientific concepts, particularly those involving biotechnology, plant-microbe interactions, and molecular or microbial processes. For several participants, understanding interdisciplinary topics that combine knowledge from biology, chemistry, agriculture, and economics required additional effort. The use of specialized scientific terminology, especially for students coming from different academic backgrounds, was also mentioned as a challenge. Some students noted that linking theoretical concepts with practical applications in agriculture or industry required considerable concentration. Understanding how laboratory research can be translated into real agricultural solutions or scaled to industrial production, as well as considering economic and environmental aspects of these processes, was particularly demanding but also intellectually stimulating. A few participants also mentioned language and technical challenges, such as following lectures in a non-native language or dealing with occasional internet connection issues during the sessions. Despite these difficulties, students emphasized that overcoming these challenges helped deepen their understanding of the topics and contributed positively to their overall learning experience.

- **Mitigation Strategy for Piloting: (Propose a mitigation strategy)**

- During the pilot implementation of Module 3: *From Micro to Macro: Soil Microbiome for Climate-Smart Farming*, several measures will be applied to support students' understanding of complex topics related to plant-microbe interactions and the role of soil microbiomes in climate-smart agriculture. As the module integrates knowledge from soil science, microbiology, and

agronomy, special attention will be given to the clear explanation of key terminology and concepts, supported by visual materials and step-by-step presentations of biological processes. Through the implementation of flipped learning and elements of the design thinking approach, students will first engage with selected learning materials independently, while in-class activities will focus on clarifying complex or potentially unclear concepts, discussion, problem-solving, and applying knowledge to practical agricultural challenges. To strengthen the connection between theory and practice, the module will include case studies and applied examples demonstrating how soil microorganisms influence plant health, nutrient cycling, and resilience to environmental stress. The module will be delivered in the local language, which will help reduce potential barriers related to specialized terminology. Interactive elements such as quizzes and short reflective tasks will support active learning and help consolidate key concepts.

E. Transversal Skills Application

In accordance with the project's goal to connect data with transversal skills, participants identified specific skills they consciously applied during the training.

Table 3: Application of Transversal Skills

Skill Identified	Frequency of Mention	Specific Examples
Entrepreneurial Thinking	2	Students developed innovative project ideas such as digital application combining GIS, soil data, and plant recognition to recommend optimal growing conditions and microorganisms. Some participants reported thinking about practical agricultural innovations and sustainable solutions that could support future entrepreneurial activities.
Critical Thinking	9-10	Students analyzed how climate change affects agricultural productivity and critically evaluated different solutions, such as microbial inoculants, biological nitrogen fixation, and sustainable crop management practices.
Problem-Solving	4-5	Participants applied problem-solving when translating theoretical knowledge into practical agricultural solutions, for example when proposing strategies to improve soil fertility using legumes or microbial technologies.
Effective Communication	5-6	Participants presented ideas, discussed scientific concepts, and explained project solutions to peers while adapting complex information to a broader audience. Communication was also important for coordinating work within the teams.
Teamwork	8	Students frequently highlighted collaboration during group work and the hackathon. They described sharing

		responsibilities, distributing tasks according to expertise, negotiating ideas, and working together to develop joint project outcomes and presentations.
Analytical Skills	3-4	Students analyzed scientific literature, interpreted experimental results, and compared agricultural approaches (e.g., chemical fertilizers vs. microbial inoculants) to evaluate their environmental and agronomic impacts.

F. Indicators of Achievement

- **Attendance Rate:** (Requirement: 70% for certification, determined for at least 3 days of participation).
- **Certification:** 14 participants (10 participants fulfilled the attendance requirement based on the records in Appendix 1. An additional 4 participants were certified based on their active participation in the hackathon. Participants who missed some online sessions due to study obligations were provided with lecture recordings and completed the activities asynchronously.)

G. Conclusion and Recommendations

Assess whether the LTTA met the specific objective of enabling students to feel ready to think about how to generate creative biotech ideas for the mitigation of climate change impacts.

The LTTA successfully met its objective of encouraging students to think creatively about how biotechnology can contribute to mitigating the impacts of climate change in agriculture. Through lectures, discussions, and hackathon activities, students demonstrated their ability to connect scientific knowledge with practical solutions for sustainable and climate-resilient farming systems.

Students from different academic backgrounds, including agriculture and geography, contributed diverse perspectives when analysing environmental challenges and developing project ideas.

Report Prepared By: Silva Grobelnik Mlakar and Danijel Davidović, University of Maribor

Date: 13/03/2026

Verification: [Attendance Sheets](#)
[Screenshots](#)

Appendix 1

List of 68 Qualifying Participants by University (Participated at least 3 days or more)

Democritus University of Thrace (DUTH)

1. Vasiliki Bouladaki: 5 days (Days 1, 2, 3, 4, and Hackathon)
2. Glykeria Psarra: 4 days (Days 1, 2, 3, and Hackathon)
3. Katerina Tounta (Aikaterini Paraskevi Tounta): 3 days (Days 1, 4, and Hackathon)
4. Anastasia Karvouni: 3 days (Days 1, 3, and Hackathon)
5. Aspasia Riga: 3 days (Days 1, 4, and Hackathon)
6. Spyridoula Papadopoulou: 3 days (Days 1, 2, and 4)

Çanakkale Onsekiz Mart University (ÇOMÜ)

1. Akikat Dimagambetov: 5 days (Days 1, 2, 3, 4, and Hackathon)
2. Ayşe Öncüler: 5 days (Days 1, 2, 3, 4, and Hackathon)
3. Berk Çelikel: 5 days (Days 1, 2, 3, 4, and Hackathon)
4. Ecem Arslan: 5 days (Days 1, 2, 3, 4, and Hackathon)
5. Eftelya Nergis Özbiçerler: 5 days (Days 1, 2, 3, 4, and Hackathon)
6. Esmâ Zehra Sağlam: 5 days (Days 1, 2, 3, 4, and Hackathon)
7. Ezgi Coşkun: 5 days (Days 1, 2, 3, 4, and Hackathon)
8. Melis Buse Uslu: 5 days (Days 1, 2, 3, 4, and Hackathon)
9. Melis Köleoğulları: 5 days (Days 1, 2, 3, 4, and Hackathon)
10. Altuğ Dirim (Altuğ Didim): 4 days (Days 1, 3, 4, and Hackathon)
11. Asya İrem Kayış: 4 days (Days 2, 3, 4, and Hackathon)
12. Ayşe Ayzıt Bekirhan: 4 days (Days 1, 2, 3, and 4)
13. Ceren Şevval Yıldız: 4 days (Days 1, 2, 3, and 4)
14. Ecem Dilay Demirkalp: 4 days (Days 1, 3, 4, and Hackathon)
15. Eray Ekrem: 4 days (Days 1, 2, 3, and Hackathon)
16. Eylül Türkmen: 4 days (Days 1, 2, 3, and Hackathon)
17. Hiranur Başak: 4 days (Days 1, 2, 3, and Hackathon)
18. Nurten Coşkun: 4 days (Days 2, 3, 4, and Hackathon)
19. Zülal Hoş: 4 days (Days 1, 3, 4, and Hackathon)
20. Cansu Demirboğa: 3 days (Days 1, 2, and Hackathon)
21. Didem Durmuş: 3 days (Days 1, 3, and Hackathon)
22. Emek Can: 3 days (Days 1, 2, and 4)
23. Melike Güneş: 3 days (Days 1, 2, and 4)
24. Mert Doğrucu: 3 days (Days 1, 2, and 4)
25. Muhammed Emir Karagöz: 3 days (Days 1, 3, and 4)
26. Ranya Demir: 3 days (Days 1, 3, and 4)
27. Zübeyde Gökteke: 3 days (Days 1, 3, and 4)

Ionian University (IU)

1. Andriana Argyrakou: 5 days (Days 1, 2, 3, 4, and Hackathon)
2. Eleftheria Michou: 5 days (Days 1, 2, 3, 4, and Hackathon)
3. Konstantina Voukelatou: 5 days (Days 1, 2, 3, 4, and Hackathon)
4. Lydia Epitropaki: 5 days (Days 1, 2, 3, 4, and Hackathon)
5. Maria Gkouzou: 5 days (Days 1, 2, 3, 4, and Hackathon)
6. Maria Martini: 5 days (Days 1, 2, 3, 4, and Hackathon)
7. Panagiota Skoufa (Skoufa Panagiwta): 5 days (Days 1, 2, 3, 4, and Hackathon)
8. Georgia Konstantina Tsami: 4 days (Days 1, 3, 4, and Hackathon)
9. Maria Serafeimidi (Maria Serafimeidi): 4 days (Days 1, 2, 3, and Hackathon)
10. Maria-Epistimi Kanaki (Maria Epistimi Kanaki): 4 days (Days 1, 3, 4, and Hackathon)
11. Michael Koumianos (Mike Koumianos): 4 days (Days 1, 2, 3, and Hackathon)
12. Argiro Avgoustidou: 3 days (Days 1, 3, and 4)
13. Regina Evliatou (Reggina Eyliatou): 3 days (Days 1, 4, and Hackathon)

Univerza v Mariboru (UM)

1. Jovana Jevtić: 5 days (Days 1, 2, 3, 4, and Hackathon)
2. Matjaž Muršec: 5 days (Days 1, 2, 3, 4, and Hackathon)
3. Milica Marković: 5 days (Days 1, 2, 3, 4, and Hackathon)
4. Irina Mozhginskaya: 4 days (Days 1, 2, 3, and Hackathon)
5. Lara Ribič: 4 days (Days 1, 2, 3, and Hackathon)
6. Nika Hozjan: 4 days (Days 1, 2, 3, and Hackathon)
7. Hana Skrbinšek: 3 days (Days 1, 4, and Hackathon)
8. Mojca Duh: 3 days (Days 1, 3, and Hackathon)
9. Til Trinkaus: 3 days (Days 1, 3, and Hackathon)
10. Vid Švab: 3 days (Days 1, 3, and Hackathon)

University North (UNIN)

1. Bojana Đurašević 4 days (Days 1, 2, 3, and Hackathon)
2. Ema Zavrtnik 4 days (Days 1, 2, 3, and Hackathon)
3. Gabriela Berić 4 days (Days 1, 2, 3, and Hackathon)
4. Inka Jakupec 4 days (Days 1, 2, 3, and Hackathon)
5. Iva Škrlec 4 days (Days 1, 2, 3, and Hackathon)
6. Jana Iličić (Jana Iličič) 4 days (Days 1, 2, 3, and Hackathon)
7. Lara Bosanac 4 days (Days 1, 2, 3, and Hackathon)
8. Maja Crljenica 4 days (Days 1, 2, 3, and Hackathon)
9. Martina Blažun 4 days (Days 1, 2, 3, and Hackathon)
10. Mia Nardić 4 days (Days 1, 2, 3, and Hackathon)
11. Michaela Zrnić (Michael Zrnić) 4 days (Days 1, 2, 3, and Hackathon)
12. Paula Vidoša 4 days (Days 1, 2, 3, and Hackathon)

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