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PREPARATION OF TRANSFERABLE CARBON FARMING TRAINING MATERIALS

https://carbon4soilquality.interreg-euro-med.eu/

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Table of contents

List of tables

List of figures

List of annexes

EXECUTIVE SUMMARY

The aim of this activity was to prepare training materials on carbon farming, test them on selected trainees, and evaluate their feedback.

The training materials were prepared aiming to provide an introduction to carbon farming to the following stakeholder groups: advisors/agronomists, farmers/practitioners, policy makers, researchers, and students. The training materials were organized into the following chapters that cover the subject of carbon farming: soil quality, soil carbon cycle, introduction to carbon farming, benefits of carbon farming and how to choose appropriate carbon farming techniques, and a practical guide for farmers to benefit from carbon credits.

The training materials were organized in presentations, videos, brochures and self-evaluation quizzes. All were uploaded on a dedicated lesson of an eLearning platform so that participants could have access before and after the training sessions.

One training session took place in each of the participating countries during March and April 2025. Altogether they were attended by 51 trainees from the above-mentioned stakeholder groups.

The overall mean satisfaction was 4.6 out of 5 (Figure 1). Students reported the highest satisfaction (5 out of 5), followed by Policy Makers (4.7 out of 5). The mean satisfaction score for both Advisors/Agronomists and Research/Academia was also high, 4.6 out of 5. Farmers reported the lowest, though still positive, mean satisfaction (4.3 out of 5).

Overall, participants expressed a high level of satisfaction with the training content, delivery, and relevance. The total mean satisfaction score was 4.6 out of 5, with 81% of responses falling in the 'High' to 'Very high' categories across eleven Likert-scale items. Cronbach's Alpha ($\alpha = 0.881$) confirmed the excellent internal consistency of the survey items, affirming the reliability of findings.

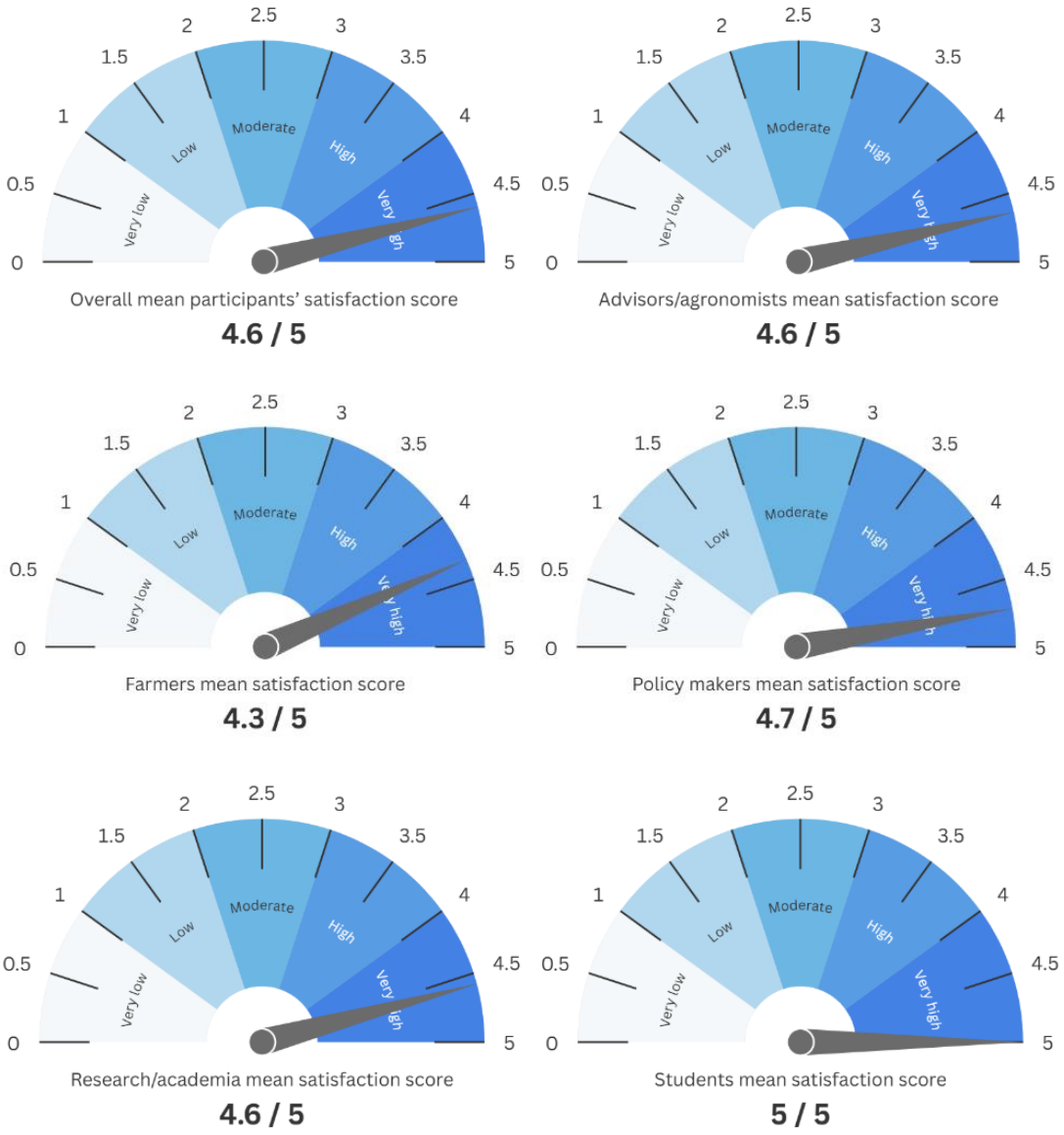

Figure 1: Mean satisfaction scores overall and per participant role

1 INTRODUCTION

Many practitioners, mainly farmers, have little concerns or expectations about Soil Organic Matter (SOM) and soil quality. This is largely due to a lack of knowledge about soils, and soil quality, the role of SOM in drought resistance and the lack of perception of an imminent economic benefit. This training material has been prepared for agricultural advisors and practitioners to improve their awareness of key soil ecosystem services, the importance of soil biota for ecosystems and carbon sequestration benefits and different carbon farming techniques for the environment. Training material has been tested by all partners in their regions (one training per region) to receive feedback, improve materials and prepare the final version, ready to be transferred. The training materials will be ready-to use and could be upscaled within a follow-up project or individually by agriculture practitioners. The material will be publicly available without any restrictions and prepared in English language.

The whole training material is organized under an eLearning platform (Chapter 2).

Training material includes the following modules (Chapter 3):

- Soil quality
- Soil carbon cycle
- What is carbon farming?
- Benefits of carbon farming - How to choose appropriate carbon farming techniques
- A practical guide for farmers to benefit from carbon credits

It is in the form of brochures, on-line courses and videos ready for agriculture advisors or farmers. Additional resources are provided for further reading.

In order to test the training material six training sessions were organized in six countries: Greece, North Macedonia, Slovenia, Montenegro, Italy, and Spain (Chapter 4).

The primary target groups were agriculture advisors, decision makers and scientific arena. Secondary target groups were farmers, foresters and other practitioners of carbon farming.

The evaluation of the training material was conducted by collecting feedback from stakeholders in the form of questionnaires (Chapter 5). The questionnaire is shown in ANNEX I.

2 eLEARNING PLATFORM

The training material was organized as an online course under an eLearning platform that was provided by Aristotle University of Thessaloniki (Figure 2).

The course included seven topics:

1. An introduction to Carbon for Soil Quality project.
2. The “Soil Quality” module.
3. The “Soil Carbon Cycle” module.
4. The “What is Carbon Farming?” module.
5. The “Benefits of Carbon Farming and How to choose appropriate Carbon Farming techniques” module.
6. “A practical guide for farmers to benefit from carbon credits” module.
7. The Evaluation and Feedback topic that included the questionnaire.

Each of the five modules included the following material (Figure 3):

- The pdf version of the presentation
- The video of the presentation
- The brochure of the module
- Additional resources
- A self-evaluation quiz

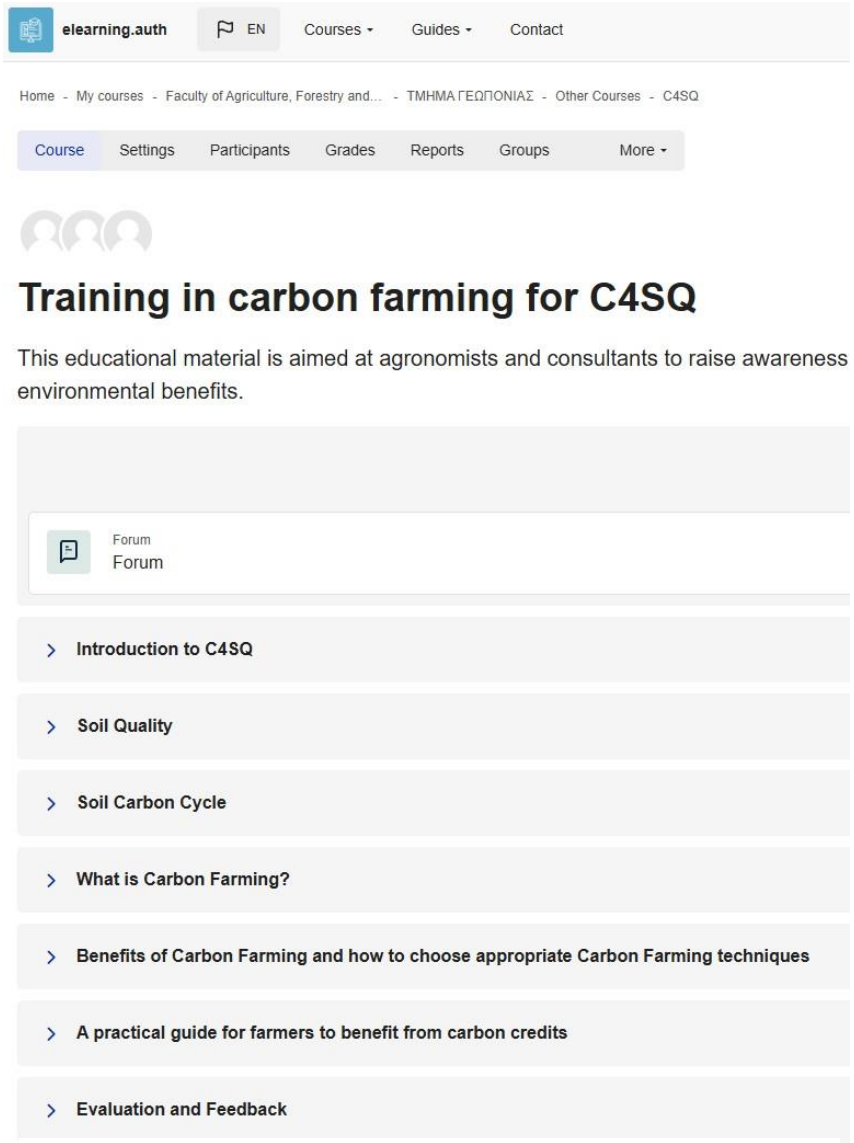

Figure 2: The eLearning platform

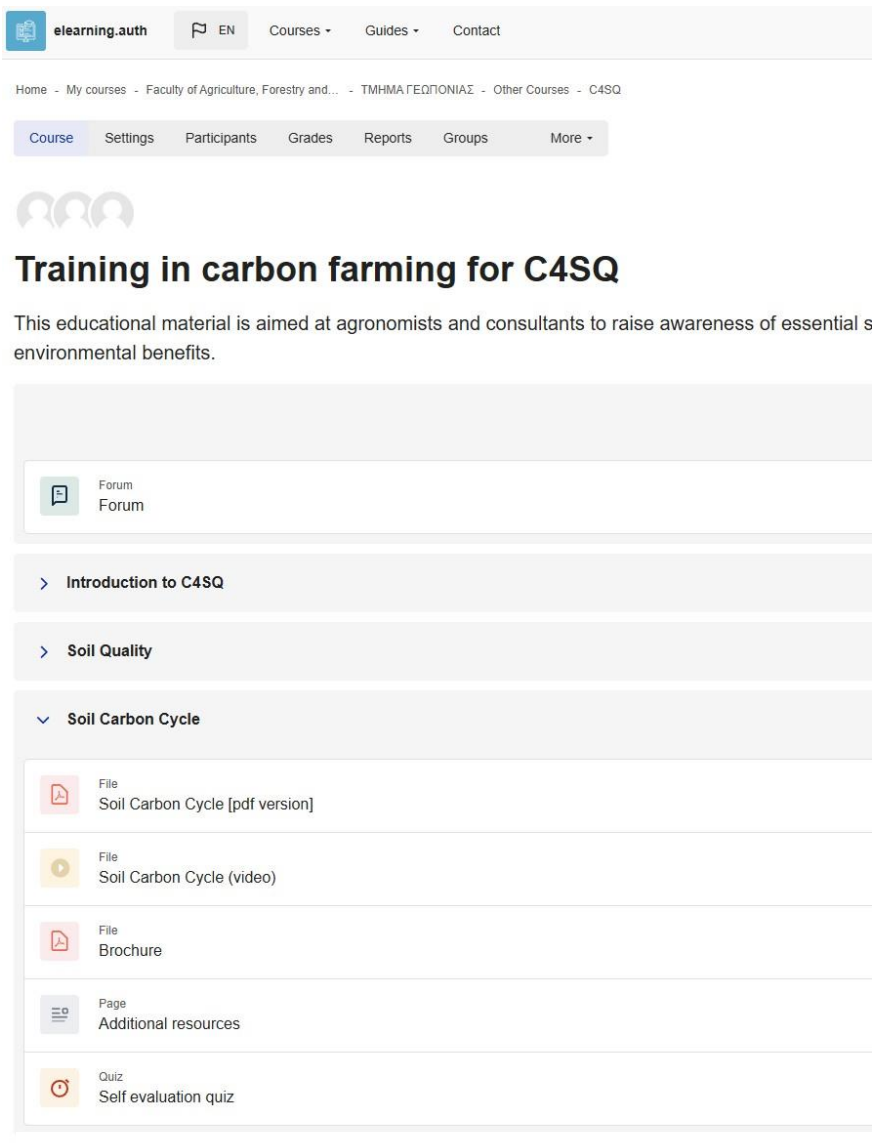

Figure 3: Example of the material included in the "Soil Carbon Cycle" module

3 TRAINING MATERIAL

3.1 Modules

3.1.1 SOIL QUALITY

Soil quality is defined as the capacity of soil to function within ecosystem and land-use boundaries to sustain biological productivity, maintain environmental quality, and promote plant and animal health. Healthy soils are rich in nutrients, have good structure, support a variety of organisms, are vital for sustainable agriculture, ecosystem services, and the overall health of our environment. Furthermore, they facilitate carbon sequestration contributing to the reduction of greenhouse gas emission, thus mitigating climate change.

Soil quality is closely related to carbon farming and soil carbon sequestration and is an interesting topic for farmers, practitioners, agronomists and decision and policy makers so it was included in the training material.

The objectives of this module were to:

- define soil quality
- emphasize its importance
- present the benefits of its improvement

3.1.2 SOIL CARBON CYCLE

The soil carbon cycle is a vital part of the Earth's overall carbon cycle. It involves the movement and transformation of carbon through the soil, and it's crucial for ecosystem health, plant growth, and climate regulation.

The objectives of this module were to:

- explain the global and soil carbon cycle
- describe soil carbon sequestration
- outline how farming practices influence the soil carbon cycle
- describe techniques for measuring soil carbon

3.1.3 WHAT IS CARBON FARMING?

Carbon farming is a set of agricultural practices aimed at capturing and storing atmospheric carbon dioxide in plants, soils, and trees. The goal is to reduce greenhouse gases in the atmosphere and help combat climate change while also improving soil health and farm productivity.

The objectives of this module were to:

- introduce stakeholders to carbon farming
- describe soil carbon sequestration
- present effective practices for carbon sequestration
- highlight potential aspects of carbon farming

3.1.4 BENEFITS OF CARBON FARMING AND HOW TO CHOOSE APPROPRIATE CARBON FARMING TECHNIQUES

Carbon farming offers a wide range of environmental, economic, and social benefits.

Choosing the right carbon farming techniques depends on a variety of environmental, economic, and operational factors.

The objectives of this module were to highlight the environmental, economic, and social benefits of carbon farming and provide guidance on selecting suitable techniques.

3.1.5 A PRACTICAL GUIDE FOR FARMERS TO BENEFIT FROM CARBON CREDITS

Carbon credits are permits that represent the reduction or removal of carbon dioxide or its equivalent in other greenhouse gases from the atmosphere. They're part of global efforts to fight climate change and support environmental sustainability.

The objectives of this module were to:

- explain the essentials of carbon credits — what they are, how they work and why they are important
- describe how agriculture fits into these markets and what farmers can do to benefit from them
- look at the EU framework for certifying carbon removals and what this means for carbon farming
- talk about where carbon credits in agriculture are heading, looking at market trends, policies and new technologies that will shape the future

3.2 Presentations

Five presentations were produced, one for each module (topic), and are shown in Annex II.

3.3 Videos

Based on the presentations, five videos were produced with a duration of 11-15min that were available on the eLearning platform in case a trainee could not attend the training session (ANNEX III).

3.4 Brochures

Brochures were created for every module apart from “Soil Quality” module. They are shown in ANNEX IV.

3.5 Quizzes

In order to evaluate the trainees’ understanding of the topic presented, a self-evaluation quiz was created for each module and was available by the eLearning platform (ANNEX V).

4 TRAINING SESSIONS

Six training sessions were organized in six countries: Greece, Italy, Montenegro, North Macedonia, Slovenia, and Spain (Table 1). Participants included:

- Farmers
- Students
- Research/Academia
- Advisors/Agronomists
- Policy makers

Table 1: Dates of training sessions and number of participants

Country	Date	Participants
Greece	21/03/2025	8
Italy	21/03/2025	6
Montenegro	15/04/2025	9
North Macedonia	02/04/2025	14
Slovenia	04/04/2025	6
Spain	11/04/2025	8

5 STAKEHOLDER FEEDBACK ANALYSIS

This chapter presents the results of an evaluation of the carbon-farming training program delivered in six European countries (Greece, North Macedonia, Slovenia, Montenegro, Spain and Italy). In each country, small-group workshops introduced participants to carbon-farming principles, soil-carbon dynamics and practical tools for entering carbon-credit schemes. Immediately following each session, attendees completed a structured survey comprising eleven Likert-scale items and one open-ended question; both quantitative and qualitative data were analyzed.

Stakeholders across diverse professional roles, ranging from policymakers and advisors/agronomists to farmers and academics engaged actively with the training material. Open-ended responses underscored the perceived value of the training while also highlighting content areas requiring further development, especially in terms of regional applicability, technical clarity, and integration of economic and policy frameworks.

5.1 Methodology

5.1.1 DESCRIPTION OF THE QUESTIONNAIRE

The evaluation survey was constructed to assess stakeholder perceptions regarding the training program on carbon farming material and associated agronomic topics. The questionnaire comprised twelve items (ANNEX I), of which eleven were closed-ended questions utilizing a 5-point Likert scale ranging from 1 ('Very Low') to 5 ('Very High'). These questions aimed to capture respondents' perspectives toward the clarity, usefulness, completeness, and interactivity of the training material. The final item (Question 12) was open-ended, allowing respondents to indicate any additional topics of interest they felt were not addressed in the training.

The questions covered five core thematic modules:

1. Soil Quality
2. Soil Carbon Cycle
3. Principles of Carbon Farming
4. Benefits and Selection of Carbon Farming Techniques
5. Practical Guidance for Farmers on Carbon Credits

In addition, each question was supplemented with an optional comment field to gather qualitative feedback, thereby enriching the interpretative depth of the responses.

5.1.2 RESPONDENT DEMOGRAPHICS

The survey sample consisted of a diverse representation of stakeholders across six European countries: Greece, North Macedonia, Slovenia, Montenegro, Spain, and

Italy. Respondents were affiliated with a wide range of professional categories, reflecting the multidisciplinary engagement necessary for effective carbon farming discourse. These included, but were not limited, to agricultural practitioners, scientific and academic personnel (e.g., researchers, Ph.D. students), policy and advisory professionals, technical experts and consultants, and institutional representatives from national and regional bodies.

To make the descriptive statistics more comprehensive, we simplified the clustering based on the stakeholder role/job, by setting the following classes/clusters: (1) Student, (2) Policy maker, (3) Advisor/agronomist, (4) Research/academia, (5) Farmer.

Partnerships within the consortium played a pivotal role in facilitating stakeholder engagement. Key institutional partners included:

- AUTH (Aristotle University of Thessaloniki, Greece)
- RI.NOVA (Ri.nova Cooperative Society, Italy)
- IAS (Institute of Soil Science, North Macedonia)
- KIS (Agricultural Institute of Slovenia)
- UCG (University of Montenegro)
- UAL (University of Almería, Spain)

5.1.3 DATA COLLECTION APPROACH AND TOOLS USED FOR ANALYSIS

The data collection process was conducted in person during meetings held immediately after the presentation of the training material in the form of PowerPoint slides. This approach ensured accessibility and encouraged participation from stakeholders across all participating countries. The same procedure was followed by all countries and partners to ensure broad and representative engagement. All training meetings were completed by May 2025.

Quantitative data from the Likert-scale items were statistically analyzed. Frequency distributions, mean scores, and standard deviations were computed for each closed-ended item to gauge central tendencies and variability. Crosstabulations were also performed to explore patterns across stakeholder categories and countries. Qualitative responses from open-ended fields were subjected to thematic content analysis. This process involved coding and categorizing the responses to identify common themes, concerns, and suggestions that were not captured through the fixed-response format. Data integrity and confidentiality were rigorously maintained throughout the analysis, in alignment with ethical standards for survey research.

5.2 Results

5.2.1 KEY INSIGHTS FROM STAKEHOLDER GROUPS

The evaluation results reveal distinct patterns in satisfaction and feedback across stakeholder roles (Table 2). Students expressed complete satisfaction (mean score: 5.00), highlighting a desire for more practical assignments. Policy makers (4.72) valued the training's strategic orientation and suggested further integration of policy frameworks. Advisor/agronomists (4.63) appreciated the hands-on content but requested more region-specific examples. Research and academia participants (4.49) sought a deeper theoretical foundation with additional references. Farmers, while positive (4.42), emphasized the need for clearer language and visual aids to better support learning.

Table 2: Total satisfaction score and primary feedback per stakeholder role

Stakeholder role	Total mean	Primary Feedback
Students	5.00	Fully satisfied; request practical assignments
Policy makers	4.72	Appreciate strategic alignment; seek deeper policy framing
Advisor/agronomists	4.63	Value hands-on examples; ask for more region-specific cases
Research/academia	4.49	Desire expanded theoretical background and citations
Farmers	4.42	Welcome clear guidance; need simpler language and visuals

5.2.2 GENERAL SATISFACTION LEVEL

Despite slight cross-national and role-based variations, the training was broadly well-received. The average total score, combined with low standard deviation values, indicates consensus regarding the training's utility and effectiveness. Participants valued the clarity of objectives, relevance to their work, and the knowledge gained.

Boxplots and cross-tabulations showed that satisfaction was particularly high among those involved in government administration, extension services, and environmental consulting, whereas some variability emerged among practitioners

in advisory roles and agricultural production.

5.2.3 RECOMMENDATIONS FOR IMPROVEMENT

Based on thematic analysis of qualitative feedback, the following recommendations are proposed to enhance future iterations of the training program:

a) **Enhance accessibility:** Simplify technical content and include case studies and visuals tailored to non-specialist audiences, particularly smallholder farmers.

b) **Integrate socioeconomic and policy dimensions:** Expand content to address economic risks, carbon market mechanisms, and alignment with CAP and EU Green Deal initiatives.

c) **Regional adaptation:** Develop region-specific modules that address local soil types, climatic conditions, and farming systems.

d) **Increase scientific depth:** Incorporate more bibliographic references and expand sections on microbial processes and biogeochemical cycles.

e) **Include emerging practices:** Introduce applied technologies (e.g., micro-biogas plants, digestate fertilization) and lessons from related international projects.

f) **Strengthen motivation and engagement:** Provide actionable strategies to engage and motivate resource-constrained or indifferent landowners.

The overall feedback suggests that the training material succeeded in raising awareness and in imparting foundational knowledge on carbon farming. With targeted refinements, particularly around localization, economic framing, and engagement strategies, it holds strong potential for broader application and impact across agricultural and environmental policy landscapes in Europe.

5.2.4 RELIABILITY STATISTICS

To assess the internal consistency of the survey items, Cronbach's Alpha was calculated. For the set of questions related to general training satisfaction (Questions 1–11), the reliability coefficient was found to be $\alpha = 0.881$, indicating very good internal consistency (Figure 4, a). This suggests that the items are well-correlated.

The Scale Statistics table (Figure 4, b) provides a descriptive summary of the total scores across the 11 items included in the questionnaire. On average, participants scored 50.58 (out of 55) across the 11 items, that reflects the high level of satisfaction or agreement depending on the scale used. A standard deviation of 4.5 suggests that most scores clustered closely around the mean, implying a reasonable level of agreement among respondents. Overall, these statistics suggest that the scale

behaves consistently, with no excessive dispersion, and supports its use for further analysis such as reliability and factor analysis

Reliability Statistics

Cronbach's Alpha	Cronbach's Alpha Based on Standardized Items	N of Items
,881	,889	11

(a)

Scale Statistics

Mean	Variance	Std. Deviation	N of Items
50,58	20,333	4,509	11

(b)

Item-Total Statistics

	Scale Mean if Item Deleted	Scale Variance if Item Deleted	Corrected Item-Total Correlation	Squared Multiple Correlation	Cronbach's Alpha if Item Deleted
Q1	45,88	17,218	,685	,569	,866
Q2	46,08	18,291	,251	,198	,896
Q3	46,00	16,255	,661	,699	,866
Q4	46,04	16,551	,634	,662	,868
Q5	45,92	16,801	,607	,577	,870
Q6	45,79	17,402	,637	,548	,869
Q7	46,08	16,546	,596	,574	,871
Q8	45,98	17,383	,657	,560	,868
Q9	45,94	16,570	,749	,640	,861
Q10	46,13	17,005	,579	,483	,872
Q11	46,00	17,021	,625	,623	,869

(c)

Figure 4: Reliability statistics to assess internal consistency of survey items

Upon deletion, no item showed a significantly improved Alpha value (Figure 4 ,c), confirming the adequacy of all items in contributing to the overall reliability of the scale.

5.2.5 OVERALL SATISFACTION SCORES

The general assessment of the training was captured through a series of closed-ended questions (Q1–Q11) measured on a 5-point Likert scale. To quantify stakeholder satisfaction, we analyzed mean, median, and standard deviation scores, while also examining cross-country and stakeholder-specific variations.

5.2.5.1 Descriptive Statistics

A total of 51 participants took part across the countries. Overall, participants expressed high satisfaction with the training activities. The overall mean score across all respondents and questions was 4.6, indicating strong approval of the training's content, relevance, and delivery. Median values for most groups closely aligned with their respective means, further demonstrating consistency in the responses.

Figure 5 presents the distribution of the overall participant satisfaction scores with carbon farming training material per country and participant role. In Figure 5, country-level responses show generally high satisfaction across all regions, with mean scores clustered around 4.5–5.0. Montenegro and North Macedonia recorded the highest satisfaction levels, while Spain exhibited the widest variability,

indicating a more heterogeneous experience among its participants. Italy showed the lowest overall median, though still within a generally positive range.

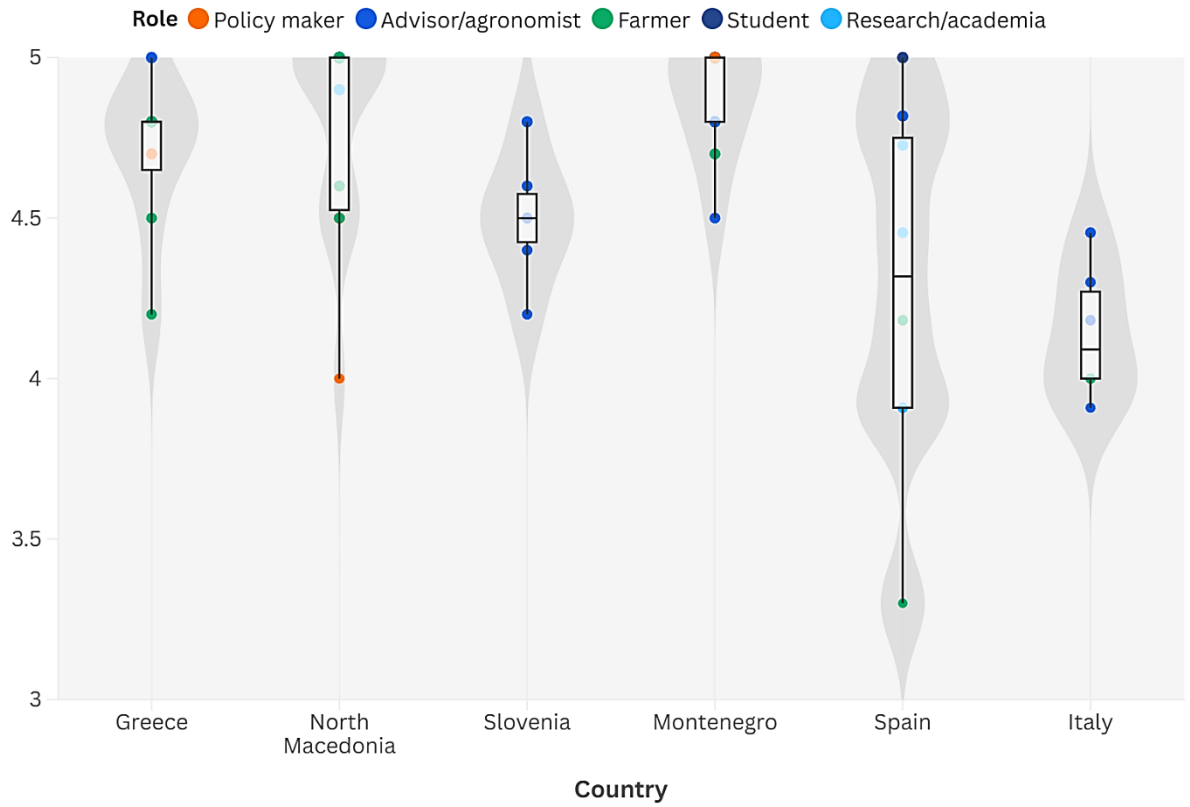

Figure 5: Box and violin plots for depicting the distribution of the overall satisfaction levels per Country (data is plotted based on the role of participant)

5.2.5.2 Country-Level Comparisons

Based on the comparative analysis of mean satisfaction scores per country, it can be concluded that overall stakeholder perceptions of the training were highly positive across all participating countries (Figure 6). Montenegro recorded the highest satisfaction level at 4.88, followed closely by North Macedonia (4.79) and Greece (4.70). Slovenia also reported a strong score of 4.50, while Spain (4.28) and Italy (4.14) showed comparatively lower satisfaction.

These results suggest slight variations in participants' experiences, with Southeast European countries generally expressing higher approval of the training activities.

This consistency suggests a broadly effective and well-received training program, with potential for further enhancement through region-specific refinements and

increased alignment with local needs.

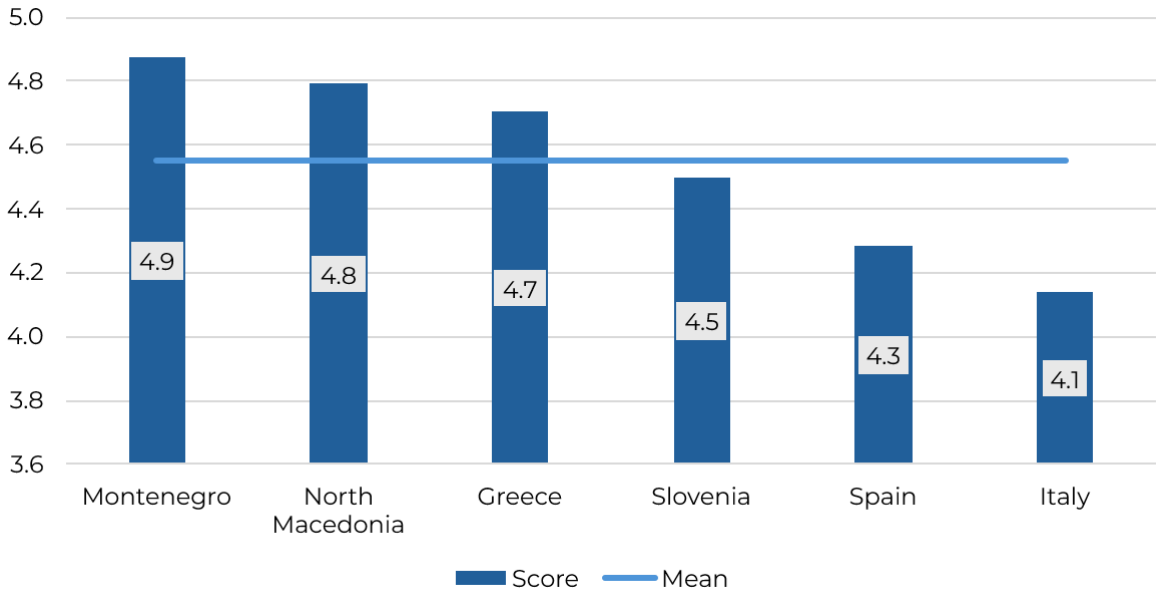

Figure 6: Mean Satisfaction Score per Country

The heatmap of Figure 7 displays the satisfaction scores across 11 questionnaire items (Q1–Q11) for participants in six participating countries. The color gradient, ranging from light to dark blue, represents increasing levels of satisfaction, with darker shades indicating scores closer to the maximum value of 5. Overall, Montenegro and Greece exhibit consistently high satisfaction across all items, as shown by the predominance of darker shades. In contrast, Italy shows greater variability, with lighter shades in Q2, Q4, and Q7 indicating comparatively lower satisfaction. North Macedonia also demonstrates high satisfaction, except for a slight decrease in Q2 and Q10. These patterns highlight slight cross-national differences in stakeholder responses, which may reflect variations in training delivery, content relevance, or local contextual factors.

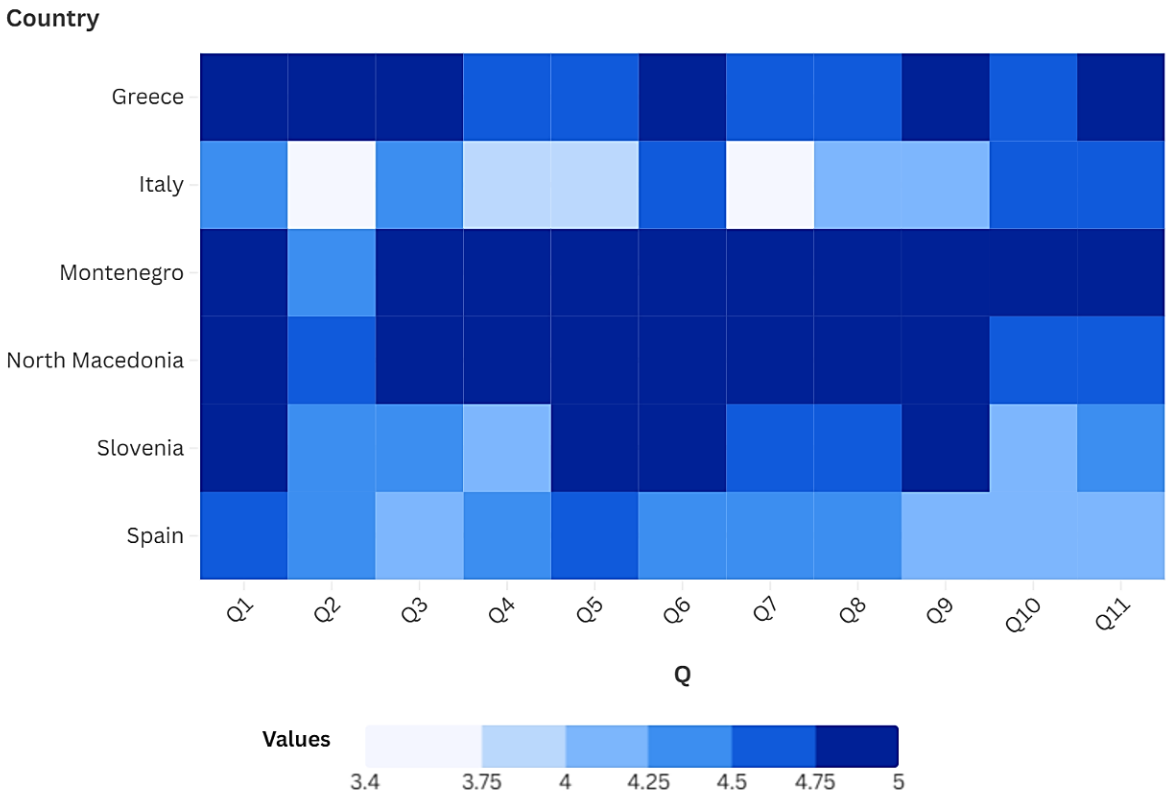

Figure 7: Heat-map to depict the mean satisfaction score per question per Country

5.2.5.3 Stakeholder-Level Comparisons

The variability in responses is visualized through a box and violin plot (Figure 8), which demonstrates the range and interquartile spread of responses within each stakeholder category. Stakeholders involved in advisory, research, and education roles tended to exhibit slightly more variability in their responses.

Students reported the highest satisfaction with a consistent score of 5.0 and no variation, suggesting a uniformly positive experience. Policy makers and advisors/agronomists also rated the training highly, though with slightly broader distribution. Farmers and members of the research/academic community expressed somewhat more variability, with farmers showing the widest range of responses, reflecting differing levels of accessibility and relevance among this group.

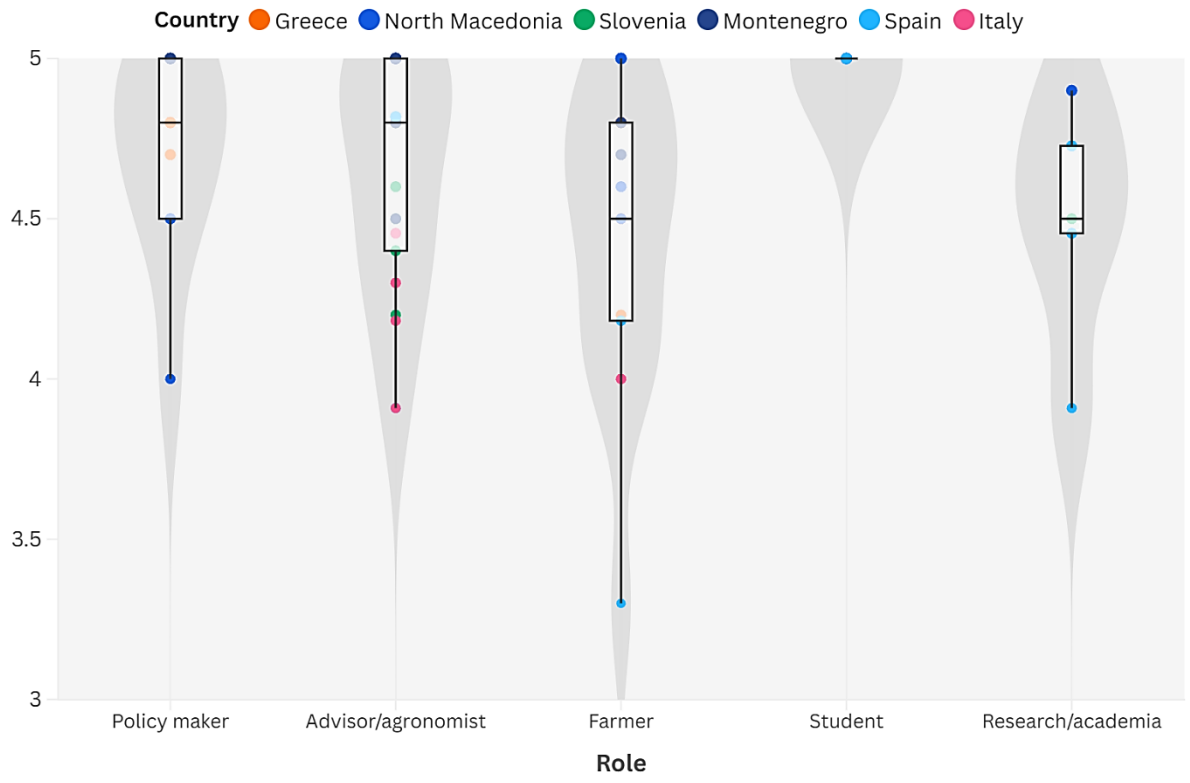

Figure 8: Boxplots for depicting the overall satisfaction levels: a) per Country, and b) per stakeholder role

The heatmap of Figure 9 illustrates the satisfaction scores of different stakeholder roles across six participating countries. Darker shades indicate higher satisfaction, with values approaching the maximum of 5. Students consistently reported high satisfaction in the countries where data was available. Policy makers, advisors/agronomists, and farmers also exhibited generally high scores, particularly in North Macedonia and Montenegro. Conversely, lower scores appear among farmers in Spain and Italy, as well as among advisors/agronomists in Italy. The absence of data for some role-country combinations suggests either non-participation or insufficient responses in those categories.

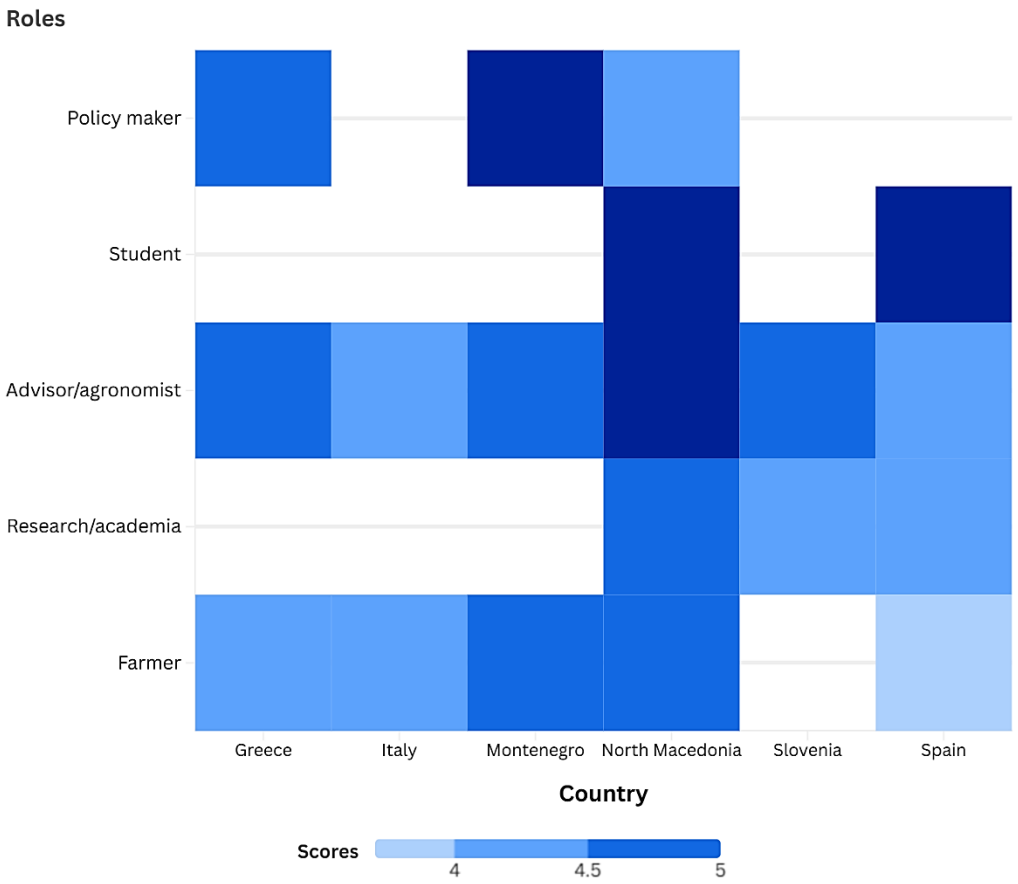

Figure 9: Satisfaction scores by stakeholder role per country

Figure 10 illustrates the distribution of participant roles and their corresponding satisfaction scores across six participating countries. Each bar represents the proportional composition of stakeholder categories—Farmers, Researchers/Academics, Advisors/Agronomists, Policy Makers, and Students—within each country, annotated with average satisfaction scores per group.

Notably, Advisors/Agronomists consistently represent a substantial proportion across countries and report high satisfaction, particularly in North Macedonia (5.00) and Montenegro (4.84). Students in North Macedonia and Spain also report maximal satisfaction (5.00), despite their lower representation. Conversely, Farmers in Spain and Italy show comparatively lower satisfaction levels (3.73 and 4.00, respectively). These findings underscore both the heterogeneity of stakeholder engagement and the variability in satisfaction, possibly reflecting differences in stakeholder expectations, training relevance, or implementation contexts.

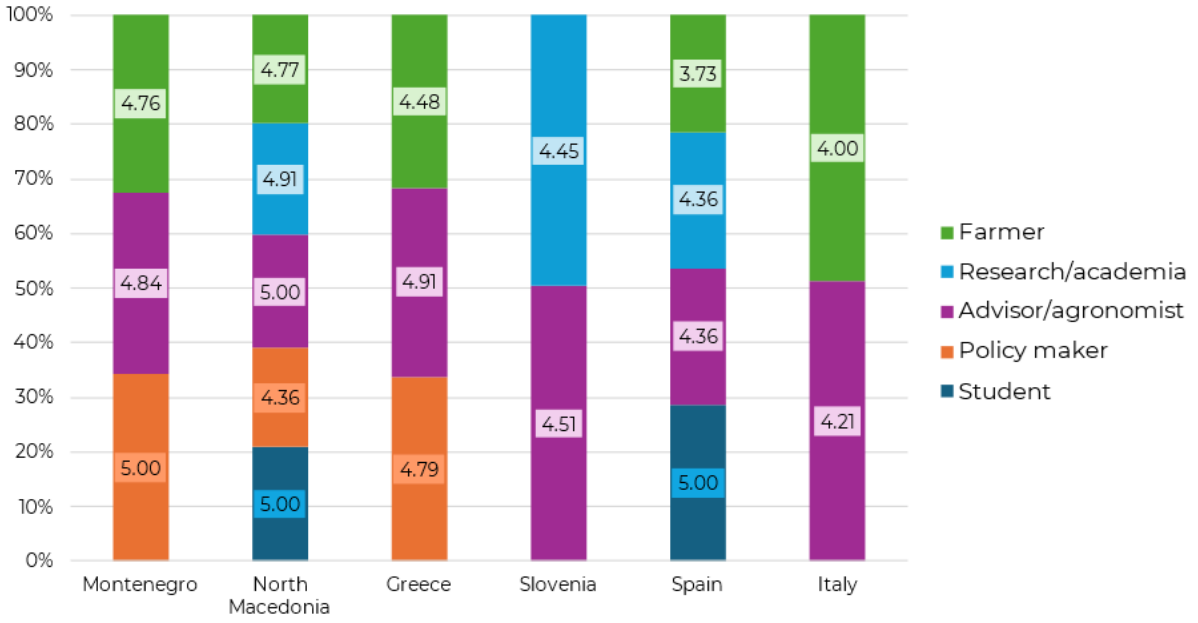

Figure 10: Mean satisfaction scores and percentage of participation by stakeholder role per country

5.2.5.4 Agreement Levels

The standard deviation of satisfaction scores across all responses was moderate, indicating a fair degree of consensus. Higher consistency was observed in countries and roles where the mean was at or above 4.8, such as in Montenegro, suggesting a broadly positive and uniform training experience.

Figure 11 presents a heatmap illustrating the standard deviation of satisfaction scores across stakeholder roles in six participating countries. The intensity of red shading denotes the degree of variation, with darker hues indicating greater variability in responses. Advisor/agronomist roles in Slovenia and Italy show the highest standard deviations, suggesting heterogeneous experiences or expectations within these groups. Policy makers in North Macedonia and Spain, as well as Farmers in Spain and Montenegro, also exhibit notable variability. In contrast, several roles in Greece and North Macedonia display low variability, indicating more consistent satisfaction levels. These findings highlight role-specific and country-specific disparities in perceived training quality, which may warrant further qualitative investigation to understand underlying causes.

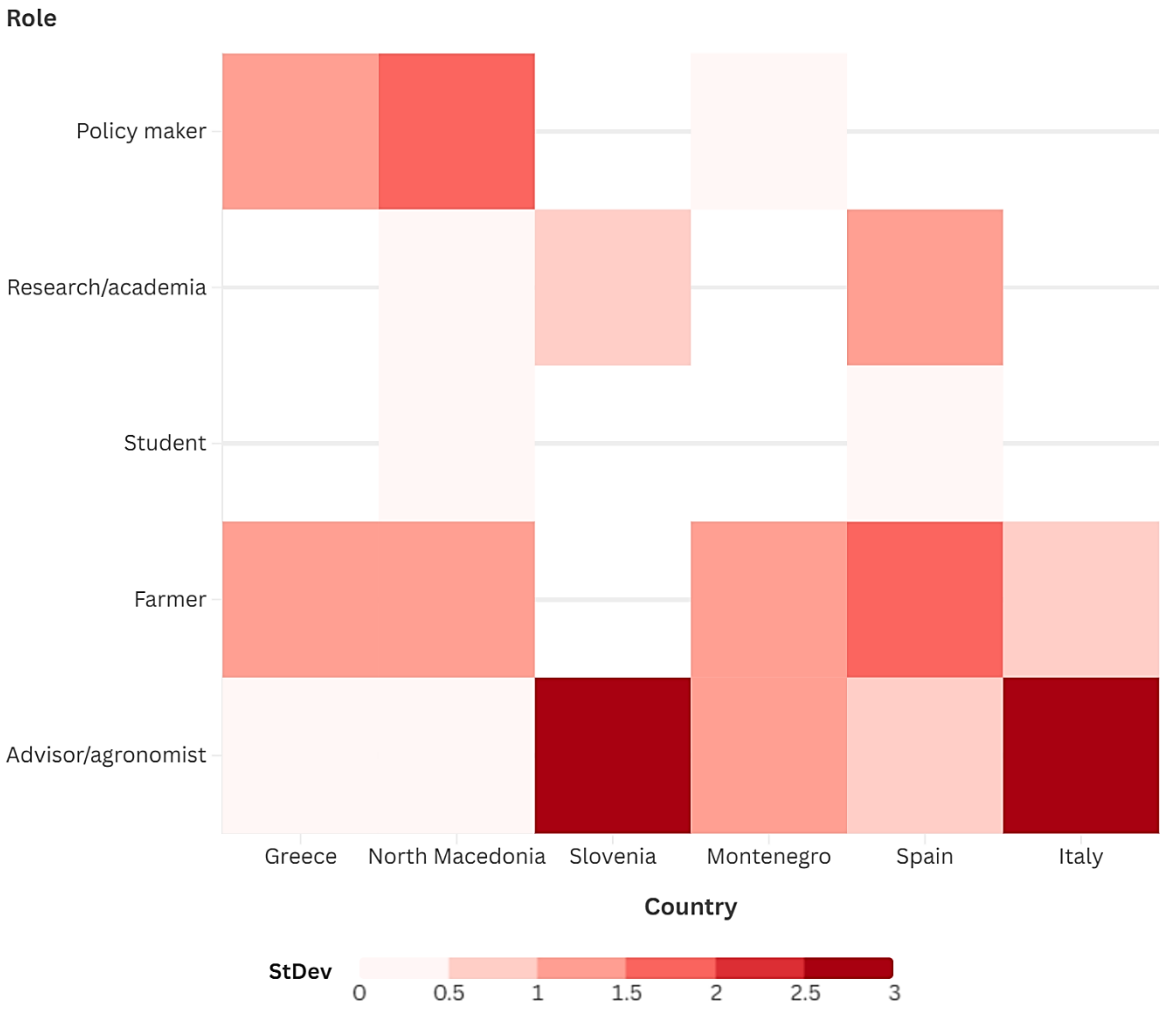

Figure 11: Standard deviation of satisfaction scores by stakeholder role per country

5.2.6 EVALUATION OF TRAINING EFFECTIVENESS

Training effectiveness was primarily assessed using the first six questions, which addressed general training components such as clarity of objectives, usefulness of knowledge, sufficiency of tools, and opportunities for discussion and interaction.

Highest-rated aspects included the clarity of training objectives (Q1) and usefulness of knowledge for professional activities (Q2), each with mean scores frequently above 4.7 across most stakeholder categories. Lower ratings were occasionally noted for the adequacy of time allocated for discussion (Q5) and opportunities for participant interaction (Q6), especially among educators and farmers.

5.2.6.1 *Stakeholder-Specific Variation*

Research/academia, students and policy makers consistently rated training effectiveness more favorably compared to farmers. This discrepancy may reflect differences in expectations and content applicability across professional domains.

5.2.7 CONTENT-SPECIFIC FEEDBACK

Questions 7 through 11 invited stakeholders to reflect on the clarity and depth of the five training modules. The mean satisfaction scores for both the clarity and depth of the models and the training effectiveness were too close and generally high. Figure 12 displays a comparative line graph evaluating two key aspects of the training: (a) Clarity and Depth of Modules (Q7 to Q11) and (b) Training Effectiveness (Q1 to Q6) across the six countries.

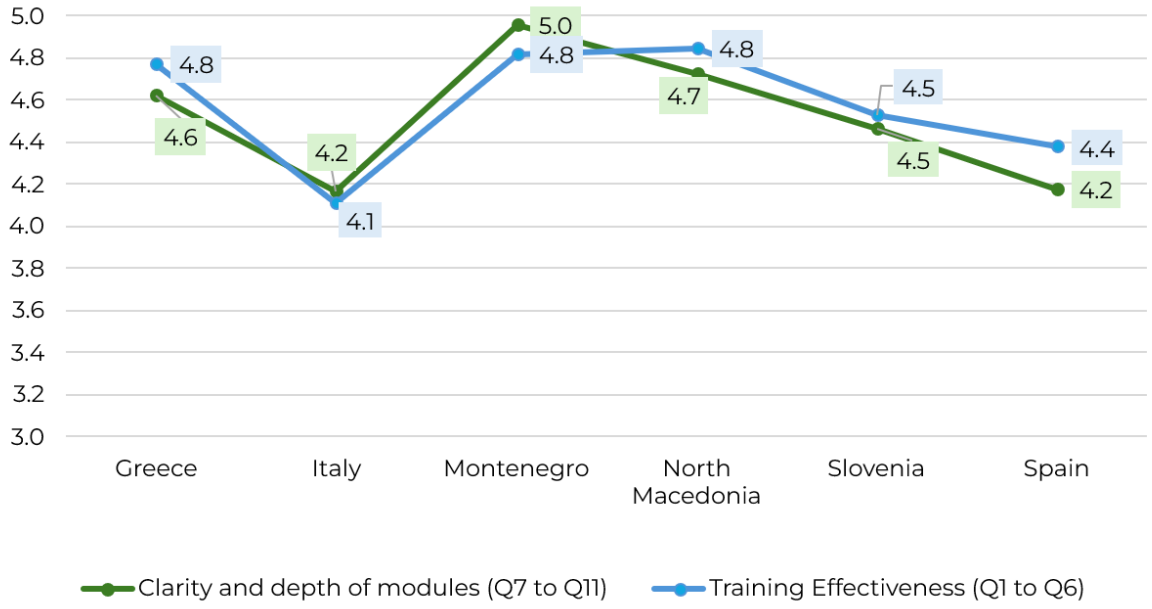

Figure 12: The mean satisfaction scores by question category (Q1 to Q6: training effectiveness, and Q7 to Q11: clarity and depth of the training modules)

Both metrics follow similar trends, with Montenegro achieving the highest ratings (5.0 and 4.8, respectively), indicating exemplary performance in both training structure and outcomes. Greece and North Macedonia also demonstrate strong evaluations, particularly in effectiveness (4.8). Conversely, Italy consistently receives the lowest scores (4.2 for clarity, 4.1 for effectiveness), suggesting room for improvement in the delivery of customized content and perceived impact. A modest decline is observed from Slovenia to Spain in both dimensions, reflecting potential challenges in maintaining high standards of instructional clarity and utility across contexts. The alignment between the two lines supports the premise

that perceived training quality is closely linked to content clarity.

5.2.7.1 Modules requiring clarification

Feedback indicated that Module 3 (What is carbon farming?) and Module 5 (A practical guide for farmers to benefit from carbon credits) were most frequently flagged as needing further clarification. Stakeholders from agricultural advisory and practitioner roles particularly expressed this need, suggesting potential gaps in practical linkage and technical application.

5.2.7.2 Stakeholder trends

Farmers and policy advisors requested additional focus on Module 2 (Soil Carbon Cycle). Academics and PhD students emphasized the need for deeper theoretical framing, especially in Module 1 (Soil Quality).

5.2.8 ADDITIONAL TOPICS OF INTEREST (QUESTION 12)

Open-ended responses to Question 12 invited stakeholders to suggest supplementary topics and reflect on content areas requiring further development. A qualitative thematic analysis was conducted to cluster similar feedback into representative themes. These themes inform future iterations of the training material and its alignment with diverse stakeholder needs.

5.2.9 EMERGENT THEMES (FROM STAKEHOLDER RESPONSES)

The following thematic categories emerged from the qualitative analysis:

1. Accessibility and Targeting of Training Content

Several respondents noted that the current format assumes a high level of prior knowledge, potentially limiting its accessibility for practitioners, particularly smallholder farmers. Recommendations included:

- Simplifying technical content
- Including real-life case studies
- Enhancing visual explanations
- Tailoring delivery to non-specialist audiences

> "*The presentations are aimed at people with a high level of knowledge... The format would need to be changed and made more accessible and explanatory by including real-life case studies*."

2. Socioeconomic and Policy Integration

Stakeholders highlighted the need for deeper integration of economic, regulatory,

and policy dimensions into the course. This includes:

- Economic risk assessments for farmers,
- Carbon market volatility,
- Investment-return dynamics,
- Alignment with the EU Green Deal, CAP, and national subsidy frameworks.

"Economic risk assessment for farmers… and a deeper look into how carbon farming can be aligned with existing national agricultural subsidy schemes…"

3. Regional and Context-Specific Guidance

The lack of regionally tailored practices was cited as a limitation. Respondents emphasized the importance of:

- Adaptations based on soil types, climate zones, and farming systems,
- Region-specific implementation strategies.

"There is little region-specific guidance or discussion about how techniques should be tailored… especially farming systems."

4. Scientific and Technical Depth

A subset of participants expressed the need for:

- More bibliographic references to support theoretical content,
- Deeper discussion of biogeochemical processes,
- Expanded sections on microbial biodiversity and the carbon and water cycles.

"I do miss more bibliographic material to support the statements…"

"Microorganisms involved in the carbon and water cycles, microbial biodiversity."

5. Additional Practice-Oriented Topics

Respondents proposed the inclusion of new practical components and emerging technologies, including:

- Micro-biogas plants in livestock systems,
- Fertilization with digestate,
- Broader integration with related ongoing projects,

- Comparative insights from international contexts.

"Micro-biogas plants in livestock farming could have great potential..."

6. Engagement and Motivation Strategies

A key concern was how to engage small and resource-constrained farmers:

- Motivation strategies for participation,
- Awareness-raising among indifferent landowners,
- Examples of successful transitions.

"How can we motivate as many farmers as possible, including smaller ones...?"

5.2.9.1 Stakeholder Consensus

Despite divergent professional backgrounds, there was a consensus that while the training was informative and engaging, it would benefit from additional practical tools, economic framing, and localized contextualization. Some respondents explicitly stated that the course was enjoyable and well-balanced for its intended audience.

"If the course is made for farmers/technicians... it focuses on the points that can be of most interest to them... It is enjoyable and does not get boring."

5.3 Key findings and recommendations

5.3.1 SUMMARY OF STRONG AND WEAK POINTS OF THE TRAINING

The evaluation of the training program, based on stakeholder feedback across six countries, indicated a generally high level of satisfaction. Montenegro (4.9) and North Macedonia (4.8) reported the highest mean satisfaction scores, followed by Greece (4.7) and Slovenia (4.5). Spain (4.3) and Italy (4.1) showed slightly lower scores, though still clearly positive.

Strengths of the training material included:

- Clear and accessible presentation of theoretical content, particularly in relation to soil improvement and carbon farming fundamentals.
- High relevance of training material, reflected in strong ratings for general training aspects (Questions 1–6).
- Effective facilitation of stakeholder engagement and exchange of experiences.

Weaknesses Identified included:

- A lack of region-specific guidance on practices such as cover cropping and no-till farming.
- A need to simplify materials when addressing farmers, including more real-life examples and accessible language.
- Insufficient discussion of economic risks and benefits, such as return on investment, market access, and subsidy alignment.
- Limited bibliographic references to support presented content.

5.3.2 SPECIFIC RECOMMENDATIONS FOR CONTENT IMPROVEMENT

To enhance the training's relevance and effectiveness, the following recommendations are proposed:

1. Include real-world case studies from participating countries to demonstrate practical application of techniques.
2. Provide localized recommendations tailored to regional climates, soil conditions, and farming systems.
3. Expand content on economic considerations, including risk analysis and connections to existing policy instruments (e.g., CAP, EU Green Deal).
4. Adapt content presentations for different audiences by incorporating visual aids, practical demonstrations, and interactive formats for farmers.
5. Strengthen the academic basis of the modules by referencing additional scientific literature.
6. Address emerging themes raised by participants, such as the role of microorganisms in the carbon and water cycles, and the potential of micro-biogas systems in livestock farming.

5.3.2.1 Consideration of Stakeholder-Specific Needs

Different stakeholder groups expressed varying preferences and priorities:

- Researchers and policy makers highlighted the need for more depth and academic rigor.
- Farmers and agricultural advisors/agronomists emphasized the need for clear, concise, and applicable information.
- Environmental professionals pointed to the importance of integrating broader policy and ecological perspectives.

Addressing these diverse needs through targeted content adaptation will be essential to improving both comprehension and application of the material across sectors.

6 CONCLUSIONS

Training materials have been developed for agricultural advisors and practitioners to raise awareness of key soil ecosystem services, the role of soil biota in ecosystem health, the benefits of carbon sequestration, and various environmentally friendly carbon farming techniques. These materials are designed to be ready-to-use and can be scaled up in future projects or adopted individually by agricultural professionals.

All training materials are hosted on an eLearning platform for easy access and dissemination.

To evaluate the effectiveness of the materials, six pilot training sessions were conducted across six countries: Greece, North Macedonia, Slovenia, Montenegro, Italy, and Spain.

Feedback was gathered from stakeholders through questionnaires to assess the training's relevance and quality.

Overall, the training program was well-received, with consistently high satisfaction levels across countries and stakeholder groups. Participants valued the relevance and structure of the training, while also providing constructive feedback on areas for enhancement.

Moving forward, efforts should focus on:

- Developing tailored training pathways for distinct stakeholder categories.
- Strengthening the link between theoretical concepts and practical application.
- Deepening the integration of economic, environmental, and policy dimensions.
- Maintaining regular consultation with stakeholders to ensure responsiveness to evolving regional needs.

These steps will support the continued development of an inclusive, effective, and impactful training program aligned with the goals of sustainable agriculture and carbon farming.

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ANNEXES

ANNEX I. QUESTIONNAIRE

Evaluation and feedback on the testing of Carbon 4 Soil Quality project training material (Activity 2.2)

Country:

Job:

Partner responsible for the training:

Training date:

Questions

Q.1 - The objective and contents of the training were easy to understand?

1	2	3	4	5

Not satisfied at all — Fully satisfied

Q.2 - Is the knowledge gained in training useful according to my professional activity?

1	2	3	4	5

Not satisfied at all — Fully satisfied

Q.3 – Have the topics presented been thoroughly addressed?

1	2	3	4	5

Not satisfied at all — Fully satisfied

Q.4 –Were the training tools adequate?

1	2	3	4	5

Not satisfied at all Fully satisfied

Q.5 – Was the time for the discussion sufficient?

1	2	3	4	5

Not satisfied at all Fully satisfied

Q.6 - Did I have the opportunity to interact and describe my experience on the topics?

1	2	3	4	5

Not satisfied at all Fully satisfied

Q.7 - Regarding the topics presented in Module 1 (Soil Quality), are there any aspects that were not explored in sufficient depth or remain unclear?

1	2	3	4	5

Not satisfied at all Fully satisfied

If so, which ones?

_____

_____

_____

Q.8 - Regarding the topics presented in Module 2 (Soil Carbon Cycle), are there any aspects that were not explored in sufficient depth or remain unclear?

1	2	3	4	5

Not satisfied at all Fully satisfied

If so, which ones?

_____
_____
_____

Q.9 - Regarding the topics presented in Module 3 (What is carbon farming?), are there any aspects that were not explored in sufficient depth or remain unclear?

1	2	3	4	5

Not satisfied at all Fully satisfied

If so, which ones?

_____
_____
_____

ANNEX II. MODULE PRESENTATIONS

Attached as separate files

ANNEX III. PRESENTATION VIDEOS

Attached as separate files

ANNEX IV. MODULE BROCHURES

Attached as separate files

ANNEX V. MODULE SELF-EVALUATION QUIZZES

Attached as separate files