International Carbon Registry

AgroEcology_Italy: Reducing GHG Emissions and Increasing Carbon Sequestration in Italian Agriculture

Project design description

Abstract

This project is dedicated to empowering Italian farmers through the adoption of regenerative agricultural practices, including tree planting and agroforestry. We provide vital financial incentives and expert guidance to overcome adoption barriers. By championing sustainability, we significantly contribute to mitigating greenhouse gas emissions and combating climate change, while transforming Italy's agricultural landscape for a more sustainable future.

ALBERAMI

Alberami S.R.L., Italy

Project design description (PDD)

Basic Information	
ID of project	ICR-48
Project name	AgroEcology_Italy: Reducing GHG Emissions and Increasing Carbon Sequestration in Italian Agriculture
Project proponent	Alberami SRL Società Benefit
Representative	Mr. Francesco Musardo, CEO, f.musardo@alberami.it, +39 0832 1827 840 | +39 351 821 4474 Dr. Edivando Vitor do Couto, Head of Carbon Projects and MRV, e.couto@alberami.it, +49 176 62870337
Statement by the project proponent	The Project Proponent states he is responsible for the preparation and fair presentation of the Project Design Document (PDD) and all accompanying documentation provided.
Pre-registration date	04/10/2023
The version number of the PDD	3.1
Date of version	01/07/2024
Methodology(ies) applied and version number	Proprietary – ALB.AE.1.0 The C-Farms framework, Verra's VM0042 Version 1.0 methodology, and the CDM's AR-AMS0007 Version 3.1 framework are all incorporated into the project's methodological framework, which serves as the project's foundation.
Criteria for validation	☐ ICR requirement document v.4 ☒ ICR requirement document v.5 ☒ ISO 14064-2 ☒ Other The methodologies C-Farms, VM0042, and the CDM's AR-AMS0007 serve as supporting tools to demonstrate conformity to the established criteria.
Host country(ies)	Italy
Host country approval	☐ Yes ☒ No
Sectoral scope of project activity	14 Afforestation and reforestation 15 Agriculture
Multiple project activities	☐Yes ☒ No
Type (CDR, avoidance, hybrid)	☒CDR ☐ Avoidance ☐Hybrid
MRV cycle:	2-years cycle Start date of MRV cycle – 01.01.2022 End date of MRV cycle – 31.12.2023
Estimated annual average GHG emission mitigation (t CO2-e)	1,142,682

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1. Project description

1.1 Purpose, objectives, and general description of the project

The environmental Agri-tech Alberami S.r.l. Società Benefit ("Alberami"), based in Lecce, southern region of Puglia, Italy, is the driving force behind the ground-breaking "AgroEcology_Italy" project (from now on referred to as the "Project"). The Project's purpose is to promote adopting sustainable agriculture practices among local farmers. This comprehensive initiative aims to empower and support farmers in their journey towards reducing their dependence on synthetic fertilizers and pesticides. Additionally, the project seeks to enhance the organic matter content in soil and promote the efficient recycling of organic materials. By implementing these sustainable practices, the project aims to contribute to the long-term environmental well-being of the region while ensuring the economic viability of the agricultural sector.

At the core of Alberami's visionary initiative lies a paramount objective: to effectively tackle the pressing issue of carbon emissions, while fostering the growth and prosperity of landscapes and communities. The objective of the Project is to facilitate a comprehensive and multifaceted transformation by implementing cutting-edge and sustainable strategies that have a positive impact on the environment, society, and economy.

The Project Design Document (PDD) integrates all elements into the project's methodological framework, which serves as the project's structure.

The project has been developed following a scientific methodology tailored specifically for this initiative. It seamlessly incorporates various components and tools from established methodologies, ensuring a comprehensive and scientifically robust approach. The methodology integrates elements and tools from other recognized methodologies:

- LIFE C-Farms: This methodological framework forms the foundation of the project's approach. Most procedures and emission reduction quantifications are based on this methodology. It is a meticulously designed plan collectively developed through partnerships between renowned Italian universities, research institutions, private enterprises, and associations representing the agricultural and woodworking sectors. This innovative project has secured co-financing from the 2020 LIFE Program of the European Commission, identified by the code "LIFE20 PRE IT/017."

- Verra's VM0042 Methodology: Elements from Verra's VM0042 methodology have been integrated to enhance the project's methodological framework, providing additional robustness and credibility based on the Approach 1 models.

- CDM's AR-AMS0007 Methodology: Elements from the Clean Development Mechanism (CDM) AR-AMS0007 methodology, specifically focusing on agroforestry below and above-ground biomass, have been incorporated to further ensure the project's scientific and methodological integrity.

These methodologies and frameworks are recognized and approved for use in carbon offset projects developed under ISO 14064-2. Additionally, the project adheres to the International Carbon Registry (ICR) Standards, Procedures, Decisions, and Guidance, all of which are developed under ISO 14064-2. When assessing reductions in emissions, improving soil carbon sequestration, and putting agroforestry principles into action, these methodologies offer an accurate approach. By conforming to the requirements of the International Carbon Registry and connecting itself with the 2020 LIFE Programmer of the European Commission, the project establishes a high standard for activities aimed at offsetting carbon emissions.

For further information about the methodological approach, please refer to Section 4: "Methodology".

- The project aims to achieve the following overall objectives through multiple project instances under this grouped project:
- Carbon Dioxide Emission Reduction. The primary objective of our grouped project activity is to actively contribute to the reduction of carbon emissions in the atmosphere. By strategically adopting regenerative agricultural practices, we disrupt the status quo of conventional land use, effectively curbing the release of harmful greenhouse gases that fuel climate change. Through this approach, we not only align with global climate targets but also strive to exceed them by embracing cutting-edge methodologies.
- Enhancing Carbon Sequestration. Central to our strategy is the amplification of carbon sequestration in both soil and biomass. We recognize the potential of nature's inherent mechanisms to store carbon, and we harness this potential through meticulous soil management, the implementation of agroforestry activities, and the thoughtful planting of trees. These actions not only remove carbon from the atmosphere but also enrich ecosystems, yielding benefits that reverberate through generations.
- Empowering Farmers and Communities. Our vision extends beyond ecological benefits. We are dedicated to empowering farmers and local communities with a new paradigm of sustainable prosperity. By facilitating the creation and sale of carbon credits within the voluntary carbon market, we create a transformative opportunity for farmers to access additional income streams. This economic empowerment cascades into improved livelihoods, rural development, and the revitalization of communities in the face of changing agricultural landscapes.
- Catalyzing Holistic Change. Our project's scope encompasses not just carbon reduction, but an all-encompassing shift toward a more resilient, regenerative, and harmonious coexistence with nature. By embracing agroforestry practices, restoring degraded land, fostering biodiversity, and cultivating partnerships with local stakeholders, we catalyze a holistic change that transcends carbon capture and engages in the broader endeavor of sustainable development.

Agroforestry and regenerative agriculture practices serve as vast natural reservoirs of CO_2 (Carbon Dioxide). These practices absorb CO_2 through chlorophyll photosynthesis, converting it into oxygen and carbon, which is then stored in biomass and soils. This process makes agroforestry and regenerative agriculture highly effective natural tools against pollution. It's observed that orchards and woody perennial plantations managed with sustainable agricultural practices have a higher carbon dioxide uptake capacity than conventional methods with synthetic products.

To participate in the Project, farmers must adopt at least three new agronomic practices outlined in Table 1 for each project instance under the grouped project. This includes both the initial project instances and any future ones. Farmers must apply using the platform Alberami at the following URL: [https://alberami.cleama.earth/backend/login].

A 15-year contractual agreement with the Project Proponent is required, committing to these selected Best Agricultural Practices (BAPs), which should be additional to their standard practices and not previously used in the baseline scenario. This ensures the project's additionality by preventing the double counting of carbon reductions that might have occurred anyhow or be financed elsewhere, such

as through EU CAP subsidies. Therefore, the additional carbon credits estimated in this PDD are generated solely from the new sustainable actions implemented on the farms.
The conditions prior to the project activity or baseline scenario are conventional agricultural practices. Since practices prior to the implementation of the Project vary by farm, if not also by fields, baseline agricultural management practices are identified for each field based on the practices implemented during at least the three years prior to the implementation of regenerative practices under the project. In the baseline scenario, we can expect that soil carbon levels will continue to be reduced due to the depletion of soil organic matter resulting from conventional tillage and lack of organic inputs. Soil erosion and nutrient loss due to the use of synthetic fertilizers and pesticides may also be contributing to a decline in soil quality. Additionally, the baseline scenario would likely result in a loss of biodiversity in the region due to the lack of conservation measures and management of land use. This may also contribute to a decline in ecosystem services provided by the region, including carbon sequestration, water regulation, and habitat for wildlife.
As of September 2023, the Project Proponent has received more than 20,000 hectares (ha) of potential Project instances for the grouped project activity, of which 75% are represented by existing plantations, and the remaining 25% are represented by farmers interested in creating new, biodiverse productive plantations. Currently, 296 farmers are registered on Alberami's platform, with many more expected to join in the coming months and years during the crediting period of the grouped project. The first project instances are in Puglia, Calabria, Basilicata, Sicily, Campania, Abruzzo, Molise, Lazio, and Tuscany regions of Italy.
For the design of the project, we have divided the estimations into two large groups: For the first project instance, 67 farmers, with a combined agricultural land surface of 1474.89 ha, are already implementing carbon farming practices with some elements of agroforestry on existing woody perennial plantations.

PROJECT FINAL FORECAST: The Project plans to cover a minimum of 200,000 ha by the year 2030 with farmers implementing at least three ALBERAMI practices. Currently, 2,000 farmers in all regions of Italy are projected to participate. Of these, 296 farmers are currently registered on Alberami's platform, as visualized in Figure 13.
The first project instance of the project activity encompasses 67 farmers with a combined agricultural land surface of 1474.89 ha who have adopted our regenerative practices between 2021 and 2023. These farmers will be part of the first project instance that will undergo the first verification of the grouped project activity.
Additionally, 1,367 farmers have already committed to implementing agricultural or agroforestry practices shortly for the next project instance once the project gets registered. The project has been designed as a grouped project that will be registered using the first project instance and intends to include additional project instances throughout its crediting period. The Project plans to expand to at least 25,000 hectares of cultivated land within the first three years, by 31st December 2024, and to increase by 25,000 hectares per year until it covers a minimum of 200,000 hectares by the year 2030. It is 45-year crediting period (15 years initially, to be renewed twice for a total of 3x15 years).

Additionally, the Project estimates a Total Gross Carbon Removal of 51,420,690 tons of CO2e, with an Average Annual Gross Carbon Removal of 1,142,682 tons of CO2e. The Total Estimated Net Carbon Removal is projected to be 46,278,621 tons of CO2e, resulting in an Average Annual Net Carbon Removal of 1,028,414 tons of CO2e over the 45-year crediting period. The Project's first crediting period started on the 1st of January 2022 and is set to end on the 31st of December 2036. In accordance with ICR standards, the project, classified as a CDR (Carbon Dioxide Removal) project, may be renewed up to two times, thereby extending its expected end date to the 31st of December 2066.

Listed below, Table 1, are sustainable and regenerative Best Agricultural Practices (BAPs) targeted for comprehensive implementation within the existing woody perennial fields under the project activity. These BAPs have a primary objective of optimizing carbon dioxide (CO_2) sequestration within both the arboreal biomass and soil substrates. The strategic application of these practices is anticipated to yield a quantifiable generation of Carbon Credits.

Table 1: Proposed Best Agricultural Practices (BPAs) under the grouped project activity.

Project Activity N.	Project Activity Name	Project Activity Definition	Benefits of the practices	References
1	Capillary promotion of organic agriculture management (certified and non-certified).	Organic farming is defined by the Reg. UE 2018/8482	- Enhancement in the accumulation of soil organic carbon in the organic agricultural land	1) Farina, R., et al. (2018) 2) Gattinger, A., et al. (2012) 3) Lazzerini, G., et al. (2014) 4) Namirembe, S., et al. (2020) 5) Petersson, T. et al. (2017) 6) Poeplau, C., et al. (2015) 7) Powlson, D. S., et al (2012) 8) Sacco, D., et al. (2015)
2.a	Zero Tillage	Sod-seeding	- Enhancement in the accumulation of soil organic carbon in the organic agricultural land	9) Álvaro-Fuentes, J., et al. (2007) 10) Álvaro-Fuentes, J., et al. (2008) 11) Álvaro-Fuentes, J., et al. (2014) 12) Baiamonte, G. et al. (2022) 13) Cillis, D., et al. (2018) 14) Fiorini, A., et al. (2020) 15) Mazzoncini, M., et al. (2011) 16) Troccoli, A., et al. (2022)
2.b	Minimum tillage	Non-inversion tillage at maximum 15-10 cm depth	- Enhancement in the accumulation of soil organic carbon in the organic agricultural land	9) Álvaro-Fuentes, J., et al. (2007) 10) Álvaro-Fuentes, J., et al. (2008) 11) Álvaro-Fuentes, J., et al. (2014) 13) Cillis, D., et al. (2018) 14) Fiorini, A., et al. (2020) 15) Mazzoncini, M., et al. (2011) 16) Troccoli, A., et al. (2022)
3.a	Green Cover: spontaneous or sowed vegetation	Establishing and maintaining a continuous herbaceous cover	Enhancement in the accumulation of soil organic	6) Poeplau, C., et al. (2015) 17) Lal, R. (2018) 18) Sartori, F., et al. (2006) 19) Zhang, K. (2020)

		in an area, which can be either naturally occurring (spontaneous) or intentionally planted (sown).	carbon in the organic agricultural land	
3.b	Use of Cover Crops	Crops cultivated to obtain plant biomass incorporated into soil with tillage operations or mowed/trimmed and left on soil surface as dead mulch	Enhancement in the accumulation of soil organic carbon in the organic agricultural land	5) Petersson, T. et al. (2017) 20) FAO (2021) 21) IPCC (2021)
4	Intercropping	The practice of growing two or more crops in a field at the same time	Enhancement in the accumulation of soil organic carbon in the organic agricultural land	6) Poeplau, C., et al. (2015) 22) Franzluebbers, A. J. (2005) 23) Jian, J., et al. (2020) 24) Locatelli, J. (2020)
5	Farm management with hedges, rows and forest integrated into field crops	Establishment of natural or planted hedgerows and windbreakers delimiting cropland or grassland	Enhancement in the accumulation of soil organic carbon in the organic agricultural land	25) Francaviglia, R. (2017)
6	Management of woody plantation pruning residue: Soil Conditioner	Pruning residue used as mulch / conditioner	Increased in carbon sequestration in the woody perennials	26) Blonska, E. (2017) 27) Galan-Martin, A., et al. (2022) 28) Gomez-Munoz, B., et al. (2016) 29) Knoblauch, C., et al. (2021) 30) Michalopoulos, G., et al. (2020) 31) Smith, P., et al. (2015) 32) Freibauer, A., et al. (2004) 33) Musacchi, S., et al. (2021) 34) Ronga, M., et al. (2008)
7	Application of inorganic natural	Application of mineral	Carbon sequestration	35) Berge, H. F. M., et al. (2012) 36) Dietzen, C., et al. (2018)

	substances and natural leaf fertilizers (minerals rocks or powder)	substances such as Kaolin and Zeolites to the soil and leaves	as a result of enhanced rock weathering	37) Haque, F.; Santos R. M.; Chiang, Y. W. (2020) 38) Kelland, E. M., et al. (2020) 39) Swoboda, P.; Döring, T. F.; Hamer, M. (2022) 40) Thorben, A., et al. (2020)
8	Radical reduction of synthetic fertilizers	Reduction of SF by at least 15% in the first year	Reduction in N_2O emissions (a potent greenhouse gas)	25) Francaviglia, R., et al. (2017)
9	Radical reduction of pesticides	Reduction of Pesticides by at least 50% in the first year	Prevention of harmful effects of pesticides on humans	41) Cooper, J., et al. (2016) 42) Krauss, M., et al. (2020) 43) Krauss, M., et al. (2022)
10.a	Recycling of farm's organic matter: Agro-industrial waste	Organic waste obtained from crop industrial transformation (e.g., olive (*Olea europaea*)mill waste)	Increase in soil fertility and increase in essential soil nutrients. Increase in soil carbon stock.	5) Petersson, T. et al. (2017) 44) Bertora, C., et al. (2009) 45) Forte, A.; Fagnano, M.; Fierro, A. (2017) 46) Tomasoni, C., et al. (2009) 47) Maris, S. C., et al. (2021) 48) Morari, F., et al. (2006)
10.b	Recycling of farm's organic matter: Biochar	Carbon-rich material obtained by plant biomass pyrolysis		
10.c	Recycling of farm's organic matter: Anaerobic Digestate	Semi-liquid OA with fertilizer characteristics obtained from anaerobic digestion of plant biomass and/or animal manure and slurry as by-product of biogas plants		
10.d	Recycling of farm's organic matter: Compost	Humus-like material with fertiliser characteristics obtained from aerobic digestion of solid waste		
10.e	Recycling of farm's organic matter: Farmyard Manure	Decomposed animal feces mixed with		

		stubble with fertilizer characteristics		
11.a	New Planting: Vine	Conversion from annual crop to vineyard plantation	Carbon sequestration in aboveground and belowground biomass	5) Petersson, T. et al. (2017) 49) Tommaso, C., et al. (2018) 50) Chiti, T., et al. (2018) 51) Regni, L., et al. (2017)
11.b	New Planting: Orchard	Conversion from annual crop to orchard plantation		
11.c	New Planting: Olive Trees (*Olea europaea*)	Conversion from annual crop to olive plantation		
11.d	New Planting: Other Woody Perennial Species	Conversion from annual crop to other plantation		
12	Cropland or conversion of cropland with annual crops to grassland/pastureland or permanent crops		Increase in Soil carbon sequestration	5) Petersson, T. et al. (2017) 25) Francaviglia, R., et al. (2017)
13.a	Improved Crop Rotations	Practice of growing different kinds of crops in recurrent succession on the same land	Increase in Soil carbon sequestration	5) Petersson, T. et al. (2017) 25) Francaviglia, R., et al. (2017)
13.b	Crop Rotations: Industrial Hemp	Practice of growing Industrial Hemp crops in recurrent succession on the same land	Increase in Soil carbon sequestration and Carbon sequestration in aboveground biomass	52) European Commission (2024) 53) Desta et al., 2020 54) Wolske et al., 2019; 55) Suter et al., 2019 56) Amaducci et al., 2015; 57) Bouloc et al., 2022 58) Hartl & Hess, 2024; 59) Taylor & Williams, 2022

Please refer to "Section 1.6: Technology Applied" for a detailed explanation of each practice and a breakdown of the sources used for each practice's emission reduction estimation.

Provisions for Activity Shifting Leakage

The Project Proponent will ensure that there will not be any displacement of pre-project activity (leakage) which changes the baseline agricultural practices for the project activity.

1.2 Project type and sectoral scope

Sectoral scope	Scope (14) – "Afforestation and Reforestation" and Scope (15) – "Agriculture"
Project type	CDR

1.3 Project

Provide information if the project is:

- ☐ Single location/area or installation
- ☐ Bundled project (multiple locations/areas or installations)
- ☒ Grouped project (locations/areas or installations added post validation)
- ☐ Bundled and grouped project.

1.3.1 Eligibility criteria for grouped project

The AgroEcology_Italy project qualifies as an example of Grouped Projects due to its integrated and multifaceted approach to promoting sustainable and regenerative agricultural practices aimed at reducing and removal GHG. The project's structure is designed to cluster multiple activities under common management, which is fundamental to the concept of grouped projects. Here are the key points justifying the classification of the AgroEcology_Italy project as a grouped project:

i. Implementation of Multiple Best Agricultural Practices (BAPs): The project requires farmers to select and implement at least three BAPs that have not been previously adopted on their lands. This approach not only encourages the adoption of sustainable and regenerative practices but also allows the combination of multiple emission reduction activities under a single initiative.

ii. Common Management and Collective Monitoring: The management structure of the AgroEcology_Italy project facilitates the coordination and collective monitoring of the activities implemented by participating farmers. Through signing contracts with Alberami, farmers commit to implementing selected BAPs, monitoring, and reporting progress, and ensuring that all activities follow the same methodology and can be collectively monitored.

iii. Technical Assessment and Ongoing Support: The technical assessment process to verify the eligibility and feasibility of the chosen BAPs, including technical visits to the properties, ensures that all implemented activities are aligned with the project's objectives. Additionally, the project provides technical training, resources, and financial incentives to support the effective implementation of practices, facilitating unified activity management.

iv. Use of Advanced Technologies for Monitoring and Evaluation: The application of advanced technologies for data collection and analysis strengthens the project's ability to monitor and evaluate activities collectively, allowing for continuous adjustments and improvements in practices and farmer engagement. This is essential for grouped projects, where collective monitoring of reduced emissions and environmental, economic, and social benefits is crucial.

v. Annual Reporting and Carbon Credits Generation: Documenting outcomes in annual reports and independent verification of these results enable the generation of carbon credits. This aspect demonstrates the project's ability to quantify the environmental benefits of grouped activities, a key element for grouped projects aiming to offset greenhouse gas emissions.

The structure of the AgroEcology_Italy project, with its integrated approach to implementing sustainable and regenerative agricultural practices, collective monitoring of activities, and generation of quantifiable benefits, aligns perfectly with the criteria for grouped projects. The project not only promotes emission reduction-removals through common management but also provides a model for the collective monitoring and evaluation of activities, essential for the success and sustainability of grouped initiatives in the context of climate change mitigation.

Justification and Confirmation of the first project instance

The first project instance of the AgroEcology_Italy project, referred to as project instance 67, has demonstrably met all outlined eligibility criteria. This confirmation is based on several critical components detailed within the project documentation.
Implementation of Multiple Best Agricultural Practices (BAPs)
Farmers participating in project instance 67 have been required to implement at least three new BAPs that had not been previously used on their lands. This ensures the adoption of innovative and sustainable agricultural practices specifically aimed at reducing greenhouse gas (GHG) emissions and enhancing carbon sequestration. The adoption of these practices aligns with the project's goals of promoting sustainable agriculture and environmental stewardship.
Common Management and Collective Monitoring
The project is structured under a common management system where participating farmers enter into agreements with Alberami SRL. These agreements outline the responsibilities of both parties, including detailed plans for implementing BAPs, processes for monitoring progress, and regular reporting requirements. This collective management approach ensures that all project activities are coordinated and monitored consistently across all participating farms, facilitating effective oversight and accountability.
Technical Assessment and Ongoing Support
Prior to their inclusion in the project, each application underwent a rigorous technical assessment to verify the feasibility and suitability of the selected BAPs. This included on-site visits by the technical team to ensure that the practices were appropriate for the specific conditions of each farm. Additionally, the project provided extensive training, resources, and financial incentives to support the implementation of these practices, ensuring that farmers had the necessary tools and knowledge to succeed.
Use of Advanced Technologies for Monitoring and Evaluation
Advanced technologies have been integral to the monitoring and evaluation processes of project instance 67. Data collection and analysis have been conducted using cutting-edge tools to provide real-time monitoring capabilities and facilitate necessary adjustments. This technological approach ensures that the project can accurately measure the impact of the implemented practices, thus verifying their effectiveness in achieving the project's sustainability goals. The results from these monitoring activities

are meticulously documented in annual reports, which are independently verified to maintain transparency and credibility.
Annual Reporting and Carbon Credits Generation
The project has established a robust reporting framework where outcomes are documented in annual reports. These reports undergo independent verification to ensure accuracy and reliability. This verification process is crucial for the generation of carbon credits, which serve as a quantifiable measure of the project's environmental benefits. The generation of carbon credits not only underscores the project's success in reducing GHG emissions but also provides financial incentives for continued sustainable practices.
Project instance 67 of the AgroEcology_Italy initiative has clearly demonstrated compliance with all outlined eligibility criteria. Through the strategic implementation of sustainable agricultural practices, robust management and monitoring frameworks, technical assessments, and the use of advanced technologies, the project has successfully met its objectives. The comprehensive documentation and independent verification processes further confirm that project instance 67 aligns with the highest standards of environmental sustainability and accountability. This first instance sets a solid foundation for the continued success and expansion of the AgroEcology_Italy project, contributing significantly to the goals of reducing greenhouse gas emissions and promoting sustainable agriculture in Italy.

1.4 Location

The Project is in the European country of Italy and encompasses the following Italian regions, namely (from north to south and islands):

Address	Grouped project
Country	Italy
Region	North-West: Aosta Valley, Liguria, Lombardy, Piedmont; North-East: Emilia-Romagna, Friuli-Venezia Giulia, Trentino-South Tyrol, Veneto; Centre: Lazio, Marche, Tuscany, Umbria; South: Abruzzo, Apulia, Basilicata, Calabria, Campania, Molise; Islands: Sardinia, Sicily.
Geographic location	
Lat.	36° N, 8° E; 36° N, 18° E
Long.	47° N, 8° E; 47° N, 18° E
Map link	https://www.google.com/maps/d/u/0/edit?mid=1vHTVuqVqc0BZpo3FGBOrPMO5wrFtub8&usp=sharing

Italy is a diverse country with a range of climatic and soil conditions, which leads to a diverse range of agricultural practices. Here is a region-by-region analysis of agriculture in Italy:
Northern Italy: This region is characterized by a cooler and wetter climate, which is suitable to produce grains, soybeans, meat, and dairy products. It is also home to a significant wine-making industry.
Central Italy: This region has a Mediterranean climate with hot, dry summers and mild winters. It is known to produce fruits, vegetables, olive oil, wine, and durum wheat.

Southern Italy: The climate in this region is Mediterranean with hot, dry summers and mild winters. It is known to produce fruits, vegetables, olive oil, wine, and cereals.
Island regions: The island regions of Italy, such as Sardinia, Sicily, and the Aeolian Islands, have a Mediterranean climate with hot, dry summers and mild winters. They are known to produce fruits, vegetables, olive oil, wine, and cereals.
The maps in Figures 1 and 2 below depict the project's geographic boundaries. The locations of the initial project instances are depicted in Figure 13 in Section 3.3 of this PDD, and KML files containing the project boundary and the boundaries of the initial project instances have been provided as Appendix 6.2. The total area of the initial project instances is 1474.89 ha. Private landowners and/or tenant growers oversee maintaining and managing the project lands. The project lands are owned and managed by private landowners and/or tenant growers. Project ownership has been established for each instance according to the details outlined in section 1.7 of this document.

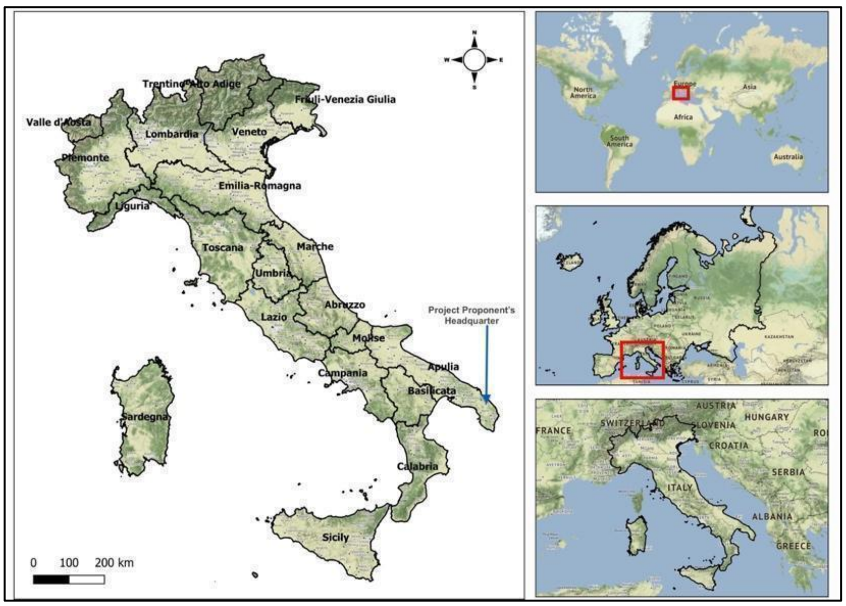


Figure 1: Map of the project's location and boundaries.

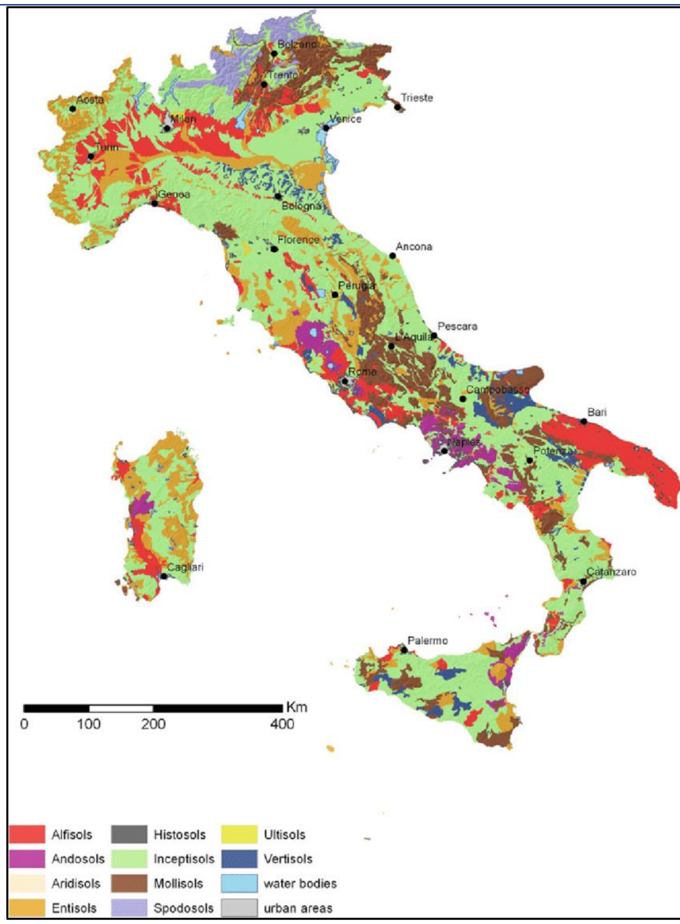


Figure 2: Map of the project's boundaries by soil order.

For this location, there are several challenges that olive farmers in Italy face, including low demand, high production costs, weather-related issues, pests and diseases, and market concentration. To address these challenges, farmers may need to diversify their product offerings, improve efficiency, and reduce production costs, add value to their products, and advocate for policies that support small-scale olive farmers and promote fair pricing for olive oil. It is also generally a good strategy for olive farmers to focus on producing high-quality olive oil, as consumers are often willing to pay a premium for high-quality products. To produce high-quality olive oil, farmers can consider adopting regenerative agriculture practices, which focus on improving soil health, increasing biodiversity, and sequestering carbon. These practices can help to improve the resilience of olive farms, increase productivity, and enhance the quality of the olive oil produced. In addition, adopting regenerative agriculture practices can help olive farmers differentiate their products in the market and attract environmentally conscious consumers. While adopting regenerative agriculture practices may require an initial investment, it can ultimately be a profitable and sustainable approach for olive farmers. There is scientific evidence (Servili, M., et al., 2014), O'Donoghue, T. et al. (2022), to suggest that regenerative agriculture practices can improve the quality of olive oil and other fruit and nut products, and products in general by enhancing nutrient content, sensory characteristics, and other factors.

Due to the prominent participation from southern regions, most properties registered till the current time are placed in the regions of Puglia, Calabria, Sicilia, and minor numbers Sardegna, Lazio, Toscana and Campania.

As remarked at section 1.1 to-date (September 2023), the Project has received interest from more than 2,000 farmers in all regions of Italy. Of these, 296 farmers are currently registered on Alberami's platform, and they could be visualized at the following map.
To move forward with this procedure, a process consisting of a census survey with cadastral nature is carried out using a pre-established form, called T1. This form is required to be filled as a start point of each property and details the initial state of the project site, regarding factors such as vegetation cover, soil type, and carbon content estimations, which will serve as a baseline for assessing carbon stock changes during the project's duration.
These forms are applied to each plot of land use, whose application of practices will be homogeneous; From this procedure, it is concluded that a single contract may be constituted of a varied number of parcels, and consequently each one of them shall be registered on specific form T1.
As a demonstration, a property placed in Puglia was selected to illustrate the process, as the following figures 3, 4. In this case, it was selected to demonstrate the parcels that integrate the property registered under the contract number 1000000287.

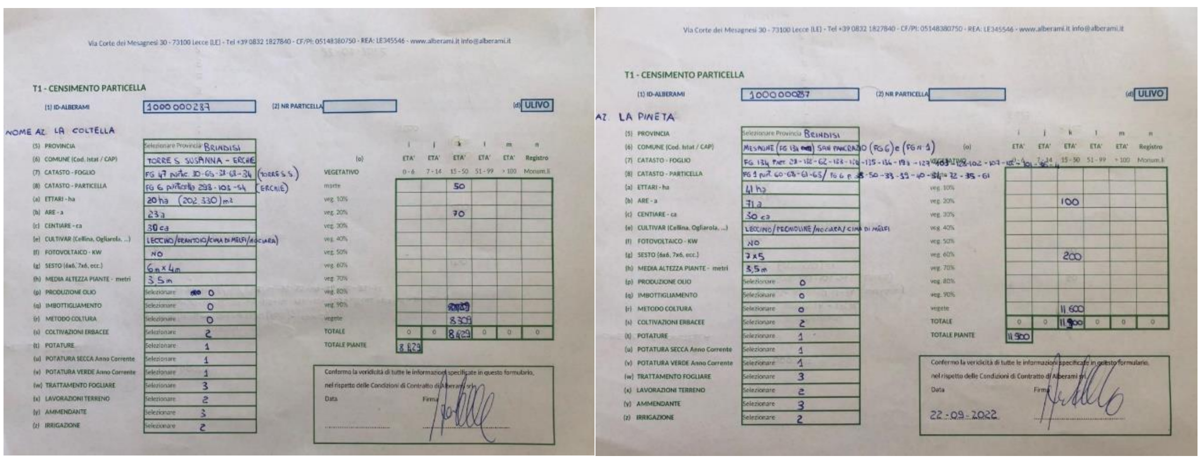


Figure 3: Example of the Census questionnaire prior to the implementation of the activities.

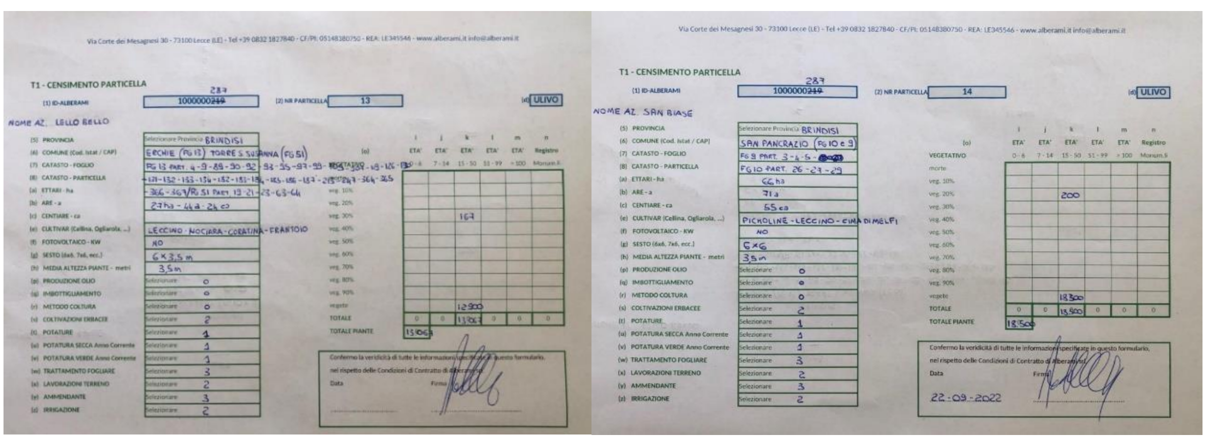


Figure 4: Example of the Census questionnaire prior to the implementation of the activities.

The data gathered from this form feeds the spreadsheet for controlling the execution of practices by properties which allows the quick understanding of responsibilities of each contract, as noticeable on the spreadsheet in the Figure 5.

	C	D	E	F	G	H	I	J	K	L	M	N	O	P
1		A	**NEW Practice (implemented because of the project)**											
2		N	Practice **NOT** Applied											
3		P	Practice **Applied through PAC/CAP** financing											
4		Y	Practice **ALREADY APPLIED** Prior to Project Start											
5		I	**Included in Practice 1**											
6														
7		**PRACTICES**												
8	**Joining Dat**	**1**	**2**	**3**	**4**	**5**	**6**	**7**	**8**	**9**	**10**	**11**	**12**	**12**
9														
10	1/1/2022	Y	Y	Y	A	A	AA	A	Y	Y	Aa	A3	.	.
11	1/1/2022	N	AA	AA	N	N	AA	N	N	N	N	A3	.	.
12	1/9/2022	N	AA	AA	N	N	AA	N	A	A	Aa	A3	.	.
13	1/14/2022	Y	Y	AA	N	N	AA	Y	Y	Y	Y	A3	.	.
14	1/17/2022	Y	Y	Pa	A	A	AA	Y	Y	Y	Y	Y	.	.
15	1/17/2022	Y	Y	Y	Y	A	AA	A	Y	Y	Y	Y	.	.
16	4/29/2022	Y	Y	Y	N	N	AA	A	Y	Y	Aa	A3	.	.
17	5/5/2022	y	AA	y	A	Y	Y	A	Y	Y	Aa	N	.	.
18	5/12/2022	Y	AA	Pa	A	A	PA	A	Y	Y	Aa	A3	.	.
19	5/14/2022	Y	AA	AA	N	P	PA	A	Y	Y	N	N	.	.
20	5/18/2022	Y	AA	Pa	A	A	PA	A	Y	Y	Aa	A3	.	.
21	5/23/2022	Y	AA	AA	A	A	AA	A	Y	Y	Y	A3	.	.
22	5/28/2022	Y	AA	Pa	A	A	PA	A	Y	Y	Aa	A3	.	.
23	5/31/2022	Y	Y	Y	Y	A	Y	Y	Y	Y	Aa	A3	.	.
24	6/7/2022	Y	AA	N	A	A	PA	A	Y	Y	Aa	A3	.	.
25	6/11/2022	N	AA	AA	N	N	AA	a	y	N	N	N	.	.
26	7/4/2022	A	AA	AA	A	A	AA	A	I	I	Aa	A3	.	.
27	7/4/2022	Y	AA	Pa	A	P	PA	A	Y	Y	Aa	A3	.	.
28	7/11/2022	Y	AA	Pa	A	P	PA	A	Y	Y	Aa	A3	.	.

Figure 5: Data summarization in a general project database.

The full understanding of the codes and their correspondence with obligations agreed in the contract are better explained at Sections 6 and 10.

The spreadsheet, in turn, has a reflection in the KML files, which enables the spatialization of information in the form of attributes, thus allowing the recording of the application in each parcel of land under the contract's validity.

The following map, Figure 6, demonstrates all the properties located at Puglia and highlights the spatial area referred to in contract 1000000287.

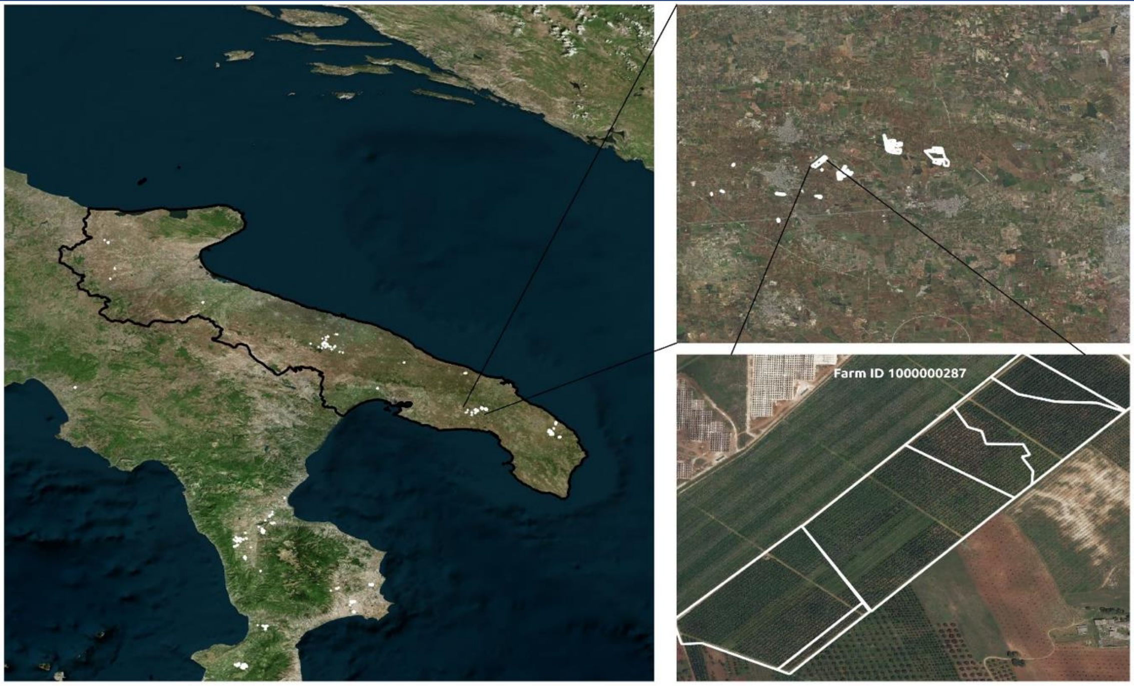


Figure 6: map demonstrates all the properties located at Puglia and highlights the spatial area referred to in the contract 1000000287.

The contract pertains to a single lot or a group of lots owned by the same contractor, upon which a set of practices that will be applied according to the spreadsheet for monitoring practices by contract, as the following Figure 7.

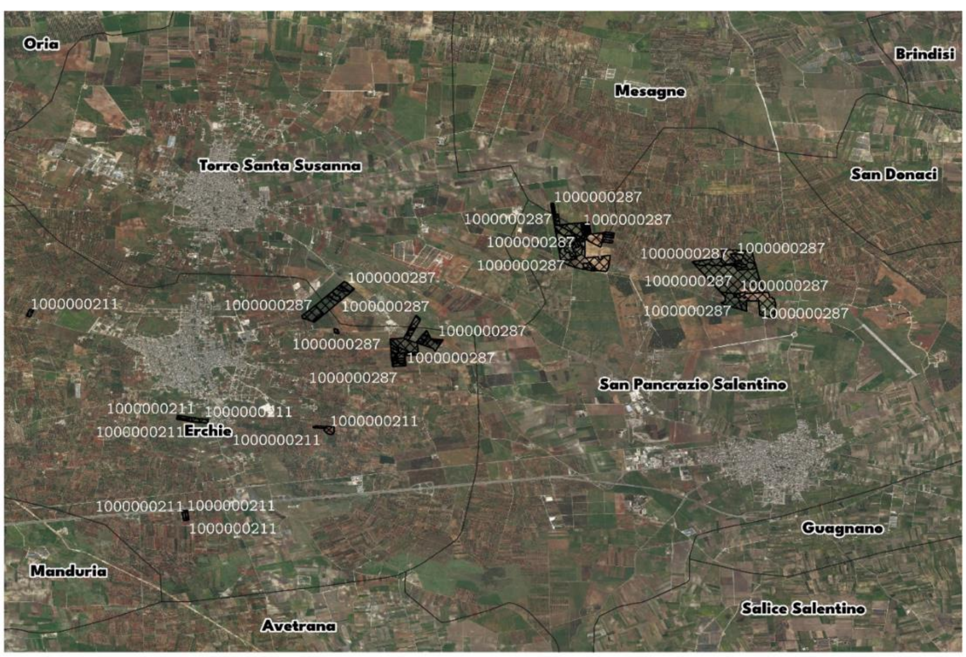


Figure 7: Properties under the contract 1000000287.

The contract 1000000287 (Figure 8) regulates the application of a set of practices with a total area of 156.70 ha, all duly referenced in relation to their baseline scenario, identifying among the menu of practices, three already applied prior to the project and 4 practices to be applied additionally.

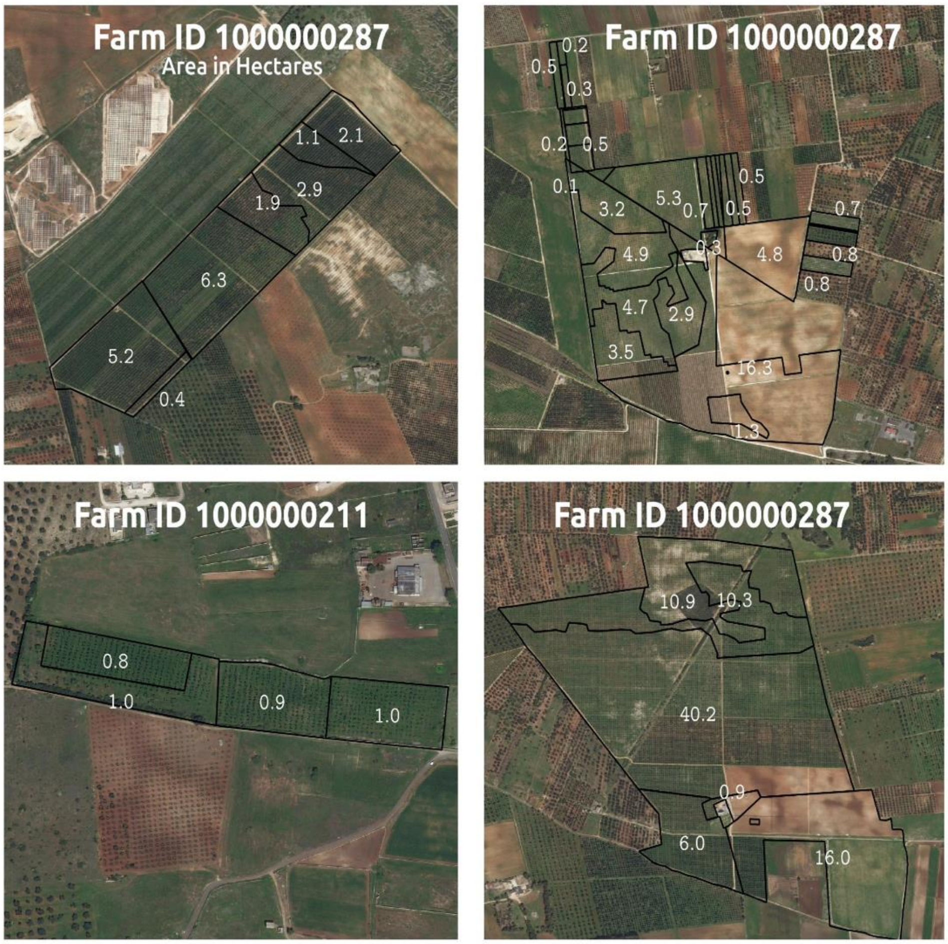


Figure 8: Land parcels under contract 1000000287 and 1000000211.

The contract 1000000287 is made up of four distinct parcels that are better represented and more detailed as illustrated in the composite map.

Address	As per the enrolled farmer under the grouped project
County/province	● North-West: Aosta Valley, Liguria, Lombardy, Piedmont; ● North-East: Emilia-Romagna, Friuli-Venezia Giulia, Trentino-South Tyrol, Veneto; ● Centre: Lazio, Marche, Tuscany, Umbria; ● South: Abruzzo, Apulia, Basilicata, Calabria, Campania, Molise; ● Islands: Sardinia, Sicily.
Country	Italy
Region	Mediterranean

Geographic location	
Latitude	KML file contains geo-coordinates as per the enrolled farms in the grouped project
Longitude	KML file contains geo-coordinates as per the enrolled farms in the grouped project
Map link	KML files as per the enrolled farms

1.5 Conditions prior to implementation

The conditions before the project activity, or baseline scenario, are rooted in conventional agricultural practices. Since practices prior to the implementation of the Project vary by farm, and even by individual fields, baseline agricultural management practices are identified for each field based on the practices implemented during at least the three years before the adoption of regenerative practices under the project. In the baseline scenario, we can expect a continued reduction in soil carbon levels due to the depletion of soil organic matter resulting from conventional tillage and a lack of organic inputs. Soil erosion and nutrient loss due to the use of synthetic fertilizers and pesticides also contribute to the decline in soil quality. Additionally, the baseline scenario would likely result in a loss of biodiversity in the region due to the absence of conservation measures and land use management. This, in turn, may lead to a decline in ecosystem services provided by the ecosystem, including carbon sequestration, water regulation, and habitat for wildlife.

The baseline period for this project has been established as spanning from 1990 to 2013. This period relies on the foundational research conducted by Fantappiè et al. (2018), which provided an in-depth analysis of the Italian portion of the Global Soil Organic Carbon Map (GSOCMAP). Their research offers crucial insights into the soil organic carbon stocks across Italy during this period, serving as a pivotal reference for understanding the baseline conditions of soil organic carbon (SOC).

To complement this baseline, the RothC (Rothamsted Carbon) model was employed to extend the period from 2013 to 2021. The RothC model is a well-established tool for simulating the turnover of organic carbon in non-waterlogged soils. It uses inputs such as land use data, historical agricultural practices, and climate data—including precipitation, temperature, and evapotranspiration—to predict changes in SOC stocks over time. The model operates by dividing organic matter into different pools, each with its own decomposition rate, allowing for a detailed and nuanced understanding of carbon dynamics in the soil.

The application of the RothC model for the period from 2013 to 2021 provides a robust framework for evaluating the impact of land use changes and agricultural practices on SOC stocks. This approach was justified and validated through its publication in a scientific journal by Fantappiè et al. (2018), which underscores its credibility and relevance. The study offered an in-depth analysis of the Italian portion of the GSOCMAP, highlighting the importance of detailed and localized data in understanding SOC dynamics.

Using the RothC model, we incorporated various data sources, including land use data and historical practices, as well as climate data such as precipitation, temperature, and evapotranspiration. This comprehensive dataset enabled us to model the baseline conditions accurately, ensuring a reliable reference point for assessing the effectiveness of the project's regenerative agricultural practices.

By extending the baseline period through the RothC model, we provide a continuous and comprehensive reference frame that spans from 1990 to 2021. This extended timeline is instrumental in offering a detailed understanding of the initial state and the progressive development of SOC stocks under conventional agricultural practices. It allows for a thorough evaluation of the project's impact on enhancing soil carbon sequestration and improving overall soil health. More details on this modeling process and its results can be found in Section 6 of this report.

1.6 Technology applied

In the Italian territory, implementing sustainable agricultural practices plays a crucial role in enhancing soil health, sequestering carbon, and supporting biodiversity. The capillary promotion of organic agriculture management, as defined by Reg. UE 2018/8482, is particularly significant. Organic farming minimizes the use of synthetic inputs and emphasizes the recycling of resources, which enhances the accumulation of soil organic carbon. This practice is pivotal in improving soil structure, water retention, and fertility, aligning with Italy's environmental conservation goals and reducing the overall carbon footprint.

Zero tillage and minimum tillage practices, which involve reducing soil disturbance, are also vital. These methods contribute to the enhancement of soil organic carbon by preserving soil structure and preventing erosion. In Italy, where soil degradation and erosion are prevalent concerns, these practices are essential for maintaining long-term soil health and ensuring sustainable agricultural productivity. By minimizing soil disruption, these practices also enhance water infiltration and retention, further benefiting crop growth and resilience.

Maintaining a continuous herbaceous cover through green cover, whether spontaneous or sown, and the use of cover crops are practices that significantly improve soil organic carbon levels. These methods prevent soil erosion, improve biodiversity, and maintain soil fertility, which are particularly important in Italy's diverse agricultural landscapes. The roots of these plants help stabilize the soil, while the biomass they produce adds organic matter, enriching the soil and promoting a healthy ecosystem.

Intercropping, the practice of growing multiple crops simultaneously in the same field, offers numerous benefits, including enhanced soil organic carbon accumulation. This method is particularly suitable for Italy's agricultural systems as it optimizes space usage, improves crop yields, and enhances soil health through diversified root structures and organic matter inputs. Intercropping can also reduce pest and disease pressure, further contributing to sustainable farming.

The integration of hedgerows, rows, and forest patches into agricultural fields enhances soil organic carbon by providing natural barriers against wind and water erosion. In Italy, these features support biodiversity, improve microclimates, and contribute to the overall sustainability of agricultural practices. Hedgerows and windbreaks serve as habitats for various species, promoting a balanced ecosystem and protecting crops from environmental stressors.

Managing woody plantation pruning residue as mulch or soil conditioner increases carbon sequestration in woody perennials. This practice is particularly relevant in Italy, where vineyards and orchards are prevalent. Utilizing pruning residue not only enhances soil fertility but also reduces waste, supporting a circular economy and sustainable land management.

The application of inorganic natural substances, such as Kaolin and Zeolites, enhances rock weathering and sequesters carbon. In Italy, this practice improves soil quality and plant health, contributing to long-term carbon sequestration and sustainable agricultural productivity. These natural amendments can also mitigate the impact of pests and diseases, reducing the need for chemical inputs.

Radically reducing the use of synthetic fertilizers and pesticides significantly lowers N2O emissions, a potent greenhouse gas, and prevents harmful effects on human health. For Italy, known for its high-quality agricultural products, these reductions are essential for improving environmental and public health. By adopting more sustainable input management, Italian agriculture can reduce its environmental impact while maintaining productivity and quality.

Recycling farm organic matter, including agro-industrial waste, biochar, anaerobic digestate, compost, and farmyard manure, is crucial for increasing soil fertility and essential nutrients. These practices support sustainable waste management and enhance soil carbon stocks, promoting a healthy and productive agricultural system in Italy. Utilizing organic amendments helps improve soil structure, water retention, and microbial activity, leading to more resilient and sustainable farming systems.

New plantings of vineyards, orchards, and olive trees, as well as other woody perennial species, increase carbon sequestration in both aboveground and belowground biomass. These conversions from annual crops to perennial systems are particularly beneficial for Italy, renowned for its wine and olive oil production. These practices not only sequester carbon but also improve soil health, biodiversity, and long-term agricultural sustainability.

Converting cropland with annual crops to grassland, pastureland, or permanent crops enhances soil carbon sequestration, a crucial factor in Italy's efforts to combat climate change. This conversion supports biodiversity, improves soil health, and makes agricultural systems more resilient to climate variability. By adopting these practices, Italy can enhance its agricultural sustainability and contribute to global carbon sequestration efforts.

Improved crop rotations, including the cultivation of industrial hemp, further increase soil carbon sequestration and improve soil health. These practices are essential for enhancing agricultural resilience and sustainability in Italy. Diverse crop rotations disrupt pest and disease cycles, improve soil nutrient availability, and reduce the need for synthetic inputs, contributing to a more stable and productive agricultural sector.

The adoption of these sustainable agricultural practices in Italy enhances soil health, increases carbon sequestration, and supports biodiversity. These practices align with the country's environmental goals and ensure long-term agricultural sustainability, contributing significantly to the global effort to mitigate climate change.

Project Activity N.	Project Activity Name	Mean Δ ($tCO_2/ha/yr$)	References
1	Capillary promotion of organic agriculture management (certified and non-certified).	3.29	1) Farina, R., et al. (2018) 2) Gattinger, A., et al. (2012) 3) Lazzerini, G., et al. (2014) 4) Namirembe, S., et al. (2020) 5) Petersson, T. et al. (2017) 6) Poeplau, C., et al. (2015) 7) Powlson, D. S., et al (2012) 8) Sacco, D., et al. (2015)
2.a	Zero Tillage	2.08	9) Álvaro-Fuentes, J., et al. (2007) 10) Álvaro-Fuentes, J., et al. (2008) 11) Álvaro-Fuentes, J., et al. (2014) 12) Baiamonte, G. et al. (2022) 13) Cillis, D., et al. (2018) 14) Fiorini, A., et al. (2020) 15) Mazzoncini, M., et al. (2011) 16) Troccoli, A., et al. (2022)
2.b	Minimum tillage	1.13	
3.a	Green Cover: spontaneous or sowed vegetation	2.7	6) Poeplau, C., et al. (2015) 17) Lal, R. (2018) 18) Sartori, F., et al. (2006) 19) Zhang, K. (2020)
3.b	Use of Cover Crops	1.85	5) Petersson, T. et al. (2017) 20) FAO (2021) 21) IPCC (2021)
4	Intercropping	1.1	6) Poeplau, C., et al. (2015) 22) Franzluebbers, A. J. (2005) 23) Jian, J., et al. (2020) 24) Locatelli, J. (2020)
5	Farm management with hedges, rows and forest integrated into field crops	4.0	25) Francaviglia, R. (2017)
6	Management of woody plantation pruning residue: Soil Conditioner	2.9	26) Blonska, E. (2017) 27) Galan-Martin, A., et al. (2022) 28) Gomez-Munoz, B., et al. (2016) 29) Knoblauch, C., et al. (2021) 30) Michalopoulos, G., et al. (2020) 31) Smith, P., et al. (2015) 32) Freibauer, A., et al. (2004) 33) Musacchi, S., et al. (2021) 34) Ronga, M., et al. (2008)

7	Application of inorganic natural substances and natural leaf fertilizers (minerals rocks or powder)	1.9	35) Berge, H. F. M., et al. (2012) 36) Dietzen, C., et al. (2018) 37) Haque, F.; Santos R. M.; Chiang, Y. W. (2020) 38) Kelland, E. M., et al. (2020) 39) Swoboda, P.; Döring, T. F.; Hamer, M. (2022) 40) Thorben, A., et al. (2020)
8	Radical reduction of synthetic fertilizers	1.27	25) Francaviglia, R., et al. (2017)
9	Radical reduction of pesticides	0.28	41) Cooper, J., et al. (2016) 42) Krauss, M., et al. (2020) 43) Krauss, M., et al. (2022)
10.a	Recycling of farm's organic matter: Agro-industrial waste	2.05	5) Petersson, T. et al. (2017) 44) Bertora, C., et al. (2009) 45) Forte, A.; Fagnano, M.; Fierro, A. (2017) 46) Tomasoni, C., et al. (2009) 47) Maris, S. C., et al. (2021) 48) Morari, F., et al. (2006)
10.b	Recycling of farm's organic matter: Biochar	2.05	
10.c	Recycling of farm's organic matter: Anaerobic Digestate	2.05	
10.d	Recycling of farm's organic matter: Compost	2.05	
10.e	Recycling of farm's organic matter: Farmyard Manure	2.05	
11.a	New Planting: Vine	1.8	5) Petersson, T. et al. (2017) 49) Tommaso, C., et al. (2018) 50) Chiti, T., et al. (2018) 51) Regni, L., et al. (2017)
11.b	New Planting: Orchard	2.6	
11.c	New Planting: Olive Trees (*Olea europaea*)	2.2	
11.d	New Planting: Other Woody Perennial Species	1.5	
12	Cropland or conversion of cropland with annual crops to grassland/pastureland or permanent crops	4.69	5) Petersson, T. et al. (2017) 25) Francaviglia, R., et al. (2017)
13.a	Improved Crop Rotations	0.63	5) Petersson, T. et al. (2017) 25) Francaviglia, R., et al. (2017)

13.b	Crop Rotations: Industrial Hemp	12	52) European Commission (2024) 53) Desta et al., 2020 54) Wolske et al., 2019; 55) Suter et al., 2019 56) Amaducci et al., 2015; 57) Bouloc et al., 2022 58) Hartl & Hess, 2024; 59) Taylor & Williams, 2022

1.7 Roles and responsibilities

1.7.1 Project proponent(s)

Organization Name	Alberami SRL Società Benefit
Role in the project	Project Proponent
Contact person	Francesco Musardo, MSc
Title	CEO
Address	Via Padre Bernardo Paoloni, 10, 73100, Lecce, Italy
Telephone	+39 0832 1827840
Email	F.musardo@alberami.it

1.7.2 Others involved in the project

NA

1.8 Chronological plan/implementation

The main project milestones are detailed below:

1. Start date: 01/01/2022
2. Baseline Period: 5 years prior to implementation - 01/01/2016 to 31/12/2021 (See the baseline calculation methodology in item 6)
3. Termination of the Project: 31/12/2066
4. Frequency of monitoring reporting, crediting period: each 1 year

5. Validation and Verification activities: Submission of Validation/Verification Findings 15/12/2023 Validation (29/04/2024), 1°Verification (13-15/12/2023), 2°Verification (30/05/2025), 3°Verification (30/05/2026).

The overall project Gantt is included in the Appendix 13.

1.9 Eligibility

The AgroEcology_Italy complies with the eligibility criteria described in section 3.3 of the guidelines provided. Below is a detailed justification of this compliance, addressing each requirement point by point:

1. Eligibility Criteria for Climate Change Mitigation

Mitigation of Climate Change: The project is dedicated to empowering Italian farmers through the adoption of regenerative agricultural practices, including tree planting and agroforestry, which significantly contribute to mitigating greenhouse gas emissions and combating climate change.
Conformity with ISO 14064-2: The project aligns with the ISO 14064-2 standards as it utilizes methodologies from recognized standards and includes detailed monitoring and verification cycles.

2. Project Start Date and Historical Additionality

Start Date: The project's first Monitoring, Reporting, and Verification (MRV) cycle started on January 1, 2022, making it eligible under the criteria that all projects must have a start date after January 1, 2020, .

3. Crediting Period Specification

Crediting Period: The project specifies a 15-year initial crediting period, with possibilities for renewal. This period is based on a conservative estimate of the technical lifetime of the implemented agricultural practices.

4. Double Counting, Issuance, and Claiming

Prevention of Double Counting: The Project asserts that no double counting will occur as it is not registered with any other GHG program, and measures are in place to ensure that GHG mitigation outcomes from this project are unique and accounted for independently.

5. Renewal of Crediting Period

Renewal Process: The project outlines a process for applying to renew the crediting period at the end of each cycle, including updating the PDD and re-evaluating baseline scenarios, which will be subject to validation by an approved VVB.
Overall, the project adheres to the specified eligibility criteria by demonstrating compliance with ISO 14064-2, maintaining appropriate project start dates, ensuring historical additionality, establishing a clear crediting period, and implementing mechanisms to prevent double counting and ensure accurate reporting and renewal of crediting periods.

1.10 Funding

Alberami has received public funding from the European Regional Development Fund (ERDF), amounting to €280,000. This funding is part of a project development application totaling €350,000. More specifically, the funding comprises a €180,000 grant and a €100,000 interest-free loan, in addition to €70,000 from the startup's own funds. These funds will be utilized for the development of the necessary technological infrastructure, which aims to enhance transparency in carbon credit transactions through the implementation of blockchain technology. Additionally, they will cover essential technical consultancy services, staff salaries, operational expenses, marketing initiatives, and support the overall development of the startup, contributing to its successful launch. Beyond this public funding, the project developer relies on carbon funding in the form of a percentage of carbon credit sales for its survival.

The funding provided by European Regional Development Fund (ERDF) has directed only to the Project Proponent for covering infrastructure and management costs associated with registering a carbon finance project. The Project Proponent has shared Fund releasing letter given by European Regional Development Fund (ERDF) in which it has been clearly mentioned where this fund has to be used.

1.11 Ownership

To establish ownership of the project, Alberami will enter into an enforceable and irrevocable agreement with the holder of the statutory, property, or contractual rights in the land that generates GHG emission reductions or removals for each project instance (the grower). For growers who own the fields enrolled in Alberami's program, attestation of ownership can be verified through the corporate file of an agricultural company, which typically includes documents such as the company's articles of association, property register, crop register, animal register, and equipment register. Growers who do not own the enrolled fields but have access to them through other agreements with the legal landowner must provide attestation of their right to manage the land and participate in the program. To facilitate this, Alberami offers an optional lease addendum for the tenant grower and landowner to affirm the tenant's rights to participate in the project. While evidence of project ownership established through these means has been provided to ICR and the VVB, it is not included in the public version of this document for privacy reasons.

1.12 Other certifications

This project has not sought nor received another form of GHG-related environmental credits. Furthermore, participating growers have attested that they have not sought or received another form of GHG-related environmental credit.

1.13 Double counting, issuance and claiming

This project has neither sought nor received any other type of GHG-related environmental credits. Additionally, the participating growers have confirmed that they have not pursued or obtained any other GHG-related environmental credits.

1.13.1 Other registration and double issuance

Is the project registered or intends to be registered with another GHG program?

☐ Yes,

☒ No

Has the project been rejected by another GHG program

☐ Yes,

☒ No

1.13.2 Double claiming and other instruments

Are the project activities also included in a GHG emissions trading program or subject to binding emission limit?

☐ Yes,

☒ No

Has the project activity applied for, received, or is planning to receive instruments from another GHG-related environmental crediting system, e.g. IREC or Guarantees of Origin.

☐ Yes,

☒ No

Do project activities affect GHG emissions accounted for within a value chain (goods/service, i.e. scope 3 emissions and the project proponent or Authorized representative a buyer or a seller of such goods/services?

☐ Yes

☒ No

The project has not been refused registration or is seeking registration under any other GHG program. Furthermore, each participating grower has attested that they have not registered and will not seek to register their enrolled fields under other GHG programs during the duration of their contract with Alberami.

Growers involved in this project are allowed to participate in government programs that support practices that are similar or complementary to project activities that yield non-GHG environmental credits, such as water quality credits and subsidy measures such as Common Agricultural Policy (CAP) that support practices that are similar or complementary to project activities but do not measure their impact in terms of CO2 or other GHG sequestration.

1.14 Other benefits

Sustainable Development Goals (SDG) indicators within the context of the AgroEcology_Italy project

1. Data Collection Framework

To rigorously monitor and assess the selected Sustainable Development Goals (SDG) indicators within the context of the AgroEcology_Italy project, a comprehensive and systematic data collection framework will be meticulously constructed. This framework will harmoniously amalgamate both quantitative and qualitative data acquisition methodologies, thereby facilitating a comprehensive appraisal of the project's impact vis-à-vis poverty alleviation, food security enhancement, economic growth stimulation, climate action promotion, and biodiversity conservation.

2. Surveys and Interviews

A pivotal facet of the data collection strategy will encompass the administration of surveys and interviews targeting project beneficiaries and pertinent stakeholders. A proficient team of trained enumerators will be strategically deployed for the meticulous execution of structured surveys and semi-structured interviews. The surveys will be thoughtfully designed to elicit pertinent information pertaining to income dynamics, employment opportunities, accessibility to essential services, savings and asset accumulation, crop diversification, yield augmentation, access to nutritive sustenance, and the assimilation of innovative technological facets within the agricultural sphere.

3. Baseline Data Establishment

Preceding the initiation of project interventions, a comprehensive baseline dataset will be meticulously collected to serve as a benchmark against which the efficacy and impact of the project can be judiciously evaluated. This foundational dataset will encompass an array of vital metrics encompassing household income levels, employment statuses, accessibility to essential services, crop diversity indices, agricultural yield statistics, dietary consumption patterns, and the extent of technological adoption within the project area.

4. Monitoring and Reporting Regimen

The data collection endeavor will be perpetually sustained throughout the entirety of the project's lifecycle. Regular intervals for monitoring and reporting, conventionally set on an annual basis, will be methodically instituted. This periodicity of assessment will capacitate the project to effectuate expedient course-corrections and interventions in response to emerging trends and dynamics within the realm of the selected SDG indicators.

5. Data Analysis and Dissemination

The acquired dataset will be subjected to meticulous analysis employing both quantitative statistical software and qualitative analysis techniques. Routine generation of comprehensive reports will be executed, encapsulating the salient progress and significant insights pertinent to each of the targeted

SDG indicators. These reports will be disseminated systematically among project stakeholders, including governmental entities, collaborative organizations, and the local populace.

6. Quality Assurance and Validation

To bolster data accuracy and fortify its veracity, an array of stringent quality assurance protocols will be diligently adhered to. These encompass thorough data validation assessments, meticulous inter-rater reliability evaluations for interview processes, and periodic site visits conducted by project supervisors to meticulously validate the integrity of data collection processes.

7. Ethical Considerations in Alignment with European Union Compliance

Data collection activities will scrupulously adhere to ethical precepts in alignment with European Union directives. This entails securing informed consent from all participants, ensuring data confidentiality, and meticulously upholding participant anonymity. Participants will be comprehensively apprised of the precise objectives underpinning data collection efforts, while their privacy and personal information will be vigilantly safeguarded in accordance with the robust data protection regulations set forth by the European Union.

SDG impacts during the monitoring period See the questionnaire and the results of the questionnaire in the appendix 2 folder				
SDG target	**Indicator (text from the SDG indicator)**	**Net impact (implemented activities to increase or decrease)**	**Current contributions**	**Lifetime contributions**
1. No poverty				
1.1	By 2030, eradicate extreme poverty for all people everywhere, currently measured as people living on less than $1.25 a day.	Positive. The project has contributed to a noticeable improvement in reducing extreme poverty.	The project has made a substantial impact in improving the financial resilience of small-scale farmers in Italy. Although extreme poverty isn't a widespread issue in this context, the project has addressed the significant income variability that these farmers often face. By introducing sustainable and profitable farming practices, along with access to new income streams like carbon credits, the project has contributed to stabilizing and potentially increasing their earnings. This initiative helps mitigate the economic vulnerabilities inherent in small-scale farming.	The project`s long-term goal is to establish a sustainable and stable economic foundation for small-scale farmers in Italy. By continually supporting and advancing sustainable agricultural practices and facilitating access to financial incentives like carbon credits, the project aims to ensure that farming remains a viable and stable livelihood. This approach is expected to significantly reduce the susceptibility of these farmers to economic fluctuations and enhance their overall economic well-being, contributing to the broader objective of reducing poverty in all its dimensions.
1.2	By 2030, reduce at least by half the proportion of men, women and children of all ages living in poverty in all its dimensions according to national definitions.	Positive. The project has effectively contributed to reducing multi-dimensional poverty among participants.	The project has notably enhanced economic stability among participant farmers, leading to greater resilience against poverty. This has been achieved through diversifying income sources, particularly by integrating carbon credit earnings and promoting more profitable sustainable farming practice.	The project is poised to contribute to a long-term reduction in multi-dimensional poverty. This will be achieved through the continued economic empowerment of farmers, fostered by the sustained adoption of regenerative practices and ongoing skill development. Over time, these efforts will enhance the overall quality of life for farmers and their communities, leading to lasting changes that extend beyond financial stability to encompass improved health, education, and social well-being, in line with the

				comprehensive goals of reducing poverty in all its dimensions.
2. Zero hunger				
2.3	By 2030, double the agricultural productivity and incomes of small-scale food producers, in particular women, indigenous peoples, family farmers, pastoralists and fishers, including through secure and equal access to land, other productive resources and inputs, knowledge, financial services, markets and opportunities for value addition and non-farm employment.	Highly Positive. The project has significantly improved agricultural productivity and income for small-scale producers.	The project has led to a significant boost in agricultural productivity and income for small-scale producers, a remarkable achievement given the typically expected transitional period in adopting new farming practices. Within just two years, participating farmers have reported early positive outcomes, underscoring the effectiveness of the sustainable and regenerative farming practices introduced by the project. These practices have not only increased crop yields but have also contributed to the overall financial stability of the farmers.	The early successes of the project bode well for the long-term enhancement of small-scale producer`s; livelihoods. This positive trend is anticipated to continue, with potential for further growth in income and productivity as the farmers become more adept with and refine the sustainable practices. The project is poised to sustainably double productivity and income for small-scale food producers, ensuring a more prosperous and secure future for them and their communities.
2.4	By 2030, ensure sustainable food production systems and implement resilient agricultural practices that increase productivity and production, that help maintain ecosystems, that strengthen capacity for adaptation to climate change, extreme weather, drought, flooding and other disasters and that progressively improve land and soil quality.	Highly Positive. The project is significantly contributing to the sustainability and resilience of food production systems.	The project`s implementation of regenerative agriculture has been instrumental in transforming the food production systems into more sustainable and resilient models. This includes practices like crop diversification, soil health improvement, and efficient water use, all contributing to enhanced productivity while minimizing environmental impact. Over 95% of farmers currently enrolled onto the program are organic-certified, in the process of becoming certified or adopting organic farming practices.	Ongoing commitment to sustainable agriculture, ensuring long-term food security and ecosystem health. The widespread adoption of organic and regenerative practices is expected to lead to enduring improvements in the sustainability and resilience of food production systems. The high rate of organic certification and adoption among participants indicates a long-term commitment to environmentally responsible farming, which will contribute to food security, ecosystem health, and climate resilience well into the future.

8. Decent work and economic growth				
8.2	Achieve higher levels of economic productivity through diversification, technological upgrading, and innovation, including through a focus on high-value added and labor-intensive sectors	Positive. The project has contributed to enhanced economic productivity through innovative agricultural practices.	The project has fostered increased economic productivity by introducing innovative agricultural practices that diversify farming activities. Through the adoption of regenerative farming methods and the integration of agroforestry, farmers are achieving higher yields and better soil health, which contributes to greater economic output and efficiency.	The introduction and continuous improvement of regenerative practices and agroforestry are expected to provide lasting economic benefits. By promoting agricultural diversity and technological innovation, the project supports the long-term growth of economic productivity. As farmers adapt and refine these practices, there will likely be a ripple effect that bolsters the sustainability and resilience of farming systems. This transformation is expected to generate enduring, positive changes within the agricultural sector, contributing to the vitality of the broader economy and supporting a shift towards more sustainable economic development.
8.3	Promote development-oriented policies that support productive activities, decent job creation, entrepreneurship, creativity and innovation, and encourage the formalization and growth of micro-, small- and medium-sized enterprises, including through access to financial services.	Positive. The project supports the development of policies favoring sustainable agricultural practices and rural development.	The project has advanced the development and implementation of policies that incentivise sustainable agriculture, which has been instrumental in fostering a supportive environment for rural development. It has encouraged the uptake of practices that contribute to economic empowerment and environmental stewardship among the agricultural community.	The project`s financial incentives and expert guidance facilitate the creation of decent jobs and support entrepreneurship in the agricultural sector. In the long term, the project is set to reinforce a policy framework that consistently supports sustainable agricultural innovations. This will help to solidify a foundation for enduring rural prosperity, environmental health, and community resilience, further catalyzing socio-economic development aligned with sustainable practices.
8.5	By 2030, achieve full and productive employment and decent work for all women and men, including for young people and persons with	Moderate. The project has made some progress in improving employment quality within the agricultural sector.	The project has contributed to improvements in employment quality by promoting fair labor practices and investing in skills development. These efforts have	The ongoing commitment to sustainable agricultural practices is expected to drive continuous improvements in employment conditions. By fostering a stable and skilled workforce, the project aims to secure lifelong

	disabilities, and equal pay for work of equal value		begun to elevate job satisfaction and security for agricultural workers, setting a precedent for quality employment standards.	livelihoods for agricultural workers, contributing to broader economic stability and prosperity.
9. Industry, innovation, and infrastructure				
9.3	Increase the access of small-scale industrial and other enterprises, in particular in developing countries, to financial services, including affordable credit, and their integration into value chains and markets	Positive. The project has significantly enhanced access to financial services for small-scale agricultural enterprises.	The initiative has successfully broadened access to financial services for small-scale farmers, enabling them to invest in sustainable agriculture. This has included providing easier access to credit and financial instruments that facilitate the adoption of regenerative practices and technological upgrades.	The project`s commitment to financial inclusivity is poised to have lasting effects, ensuring that small agricultural businesses can continually access the capital needed for innovation and growth. This sustained financial empowerment is integral to building a resilient agricultural sector that can adapt to market and environmental changes.
9.5	Enhance scientific research, upgrade the technological capabilities of industrial sectors in all countries, in particular developing countries, including, by 2030, encouraging innovation and substantially increasing the number of research and development workers per 1 million people and public and private research and development spending	Highly Positive. The project has substantially contributed to the integration of innovative technologies in agriculture and the creation of highly skilled research and development roles.	The project has not only integrated innovative farming technologies but also recruited a team of highly skilled professionals, including experts in Agriculture 4.0, remote sensing, data science, and IT with blockchain expertise. This skilled workforce is enhancing the efficiency and productivity of agricultural practices and fostering a knowledge-based environment within the sector.	With a focus on continuous improvement and adaptation, the project is set to drive long-term technological progression within the agricultural sector. This commitment to research and technological development is expected to meet future environmental challenges and market demands, fostering a dynamic and progressive agricultural industry. The influx of specialized expertise and the adoption of advanced technologies pave the way for continuous agricultural innovation. The project`s environment of innovation not only benefits current practices but also attracts additional talent, driving further advancements. This progressive approach promises to evolve with and adapt to future environmental and market demands,

				cementing a legacy of technological leadership in agriculture.
12. Responsible consumption and production				
12.2	By 2030, achieve the sustainable management and efficient use of natural resources	Highly Positive. The project significantly promotes the efficient and sustainable use of natural resources.	The project has effectively implemented regenerative agricultural practices that significantly improve resource efficiency. These practices include optimized water usage, soil fertility enhancement, and reduced reliance on non-renewable inputs. The initiative also focuses on minimizing environmental impact through eco-friendly farming techniques, which are instrumental in promoting sustainable resource management within the agricultural community.	The project`s long-term vision is rooted in the continuous implementation and refinement of regenerative practices, contributing to the sustainable management of natural resources. These efforts are aimed at ensuring ecological balance, preserving biodiversity, and maintaining resource availability for future generations. Through educational programs, community engagement, and policy advocacy, the project seeks to instill a legacy of resource stewardship that upholds the principles of sustainability well beyond its immediate scope.
12.4	By 2020, achieve the environmentally sound management of chemicals and all wastes throughout their life cycle, in accordance with agreed international frameworks, and significantly reduce their release to air, water and soil in order to minimize their adverse impacts on human health and the environment.	Highly Positive. The project has been effective in promoting environmentally sound practices in chemical and waste management.	The project has successfully fostered a reduction in the use of harmful agricultural chemicals by advocating for and facilitating the transition to natural farming alternatives. With the majority of participant farmers practicing or transitioning to organic farming, there has been a marked decrease in the chemical footprint on the land, leading to improved soil health and reduced environmental contamination.	The dedication to organic farming principles among the project`s participants lays the groundwork for a lasting impact on chemical and waste management in agriculture. This commitment is expected to sustain a minimal chemical and waste footprint, as organic practices become more deeply embedded in the agricultural sector. The project's influence promises to extend beyond its immediate circle, setting industry-wide standards for the environmentally sound management of chemicals and waste.
12.8	By 2030, ensure that people everywhere have the relevant information and	Highly Positive. The project plays a crucial role in educating and informing	The project has established a robust information-sharing platform that actively disseminates	By ingraining the importance of sustainable development in the current generation of farmers, the project is cultivating a legacy of

	awareness for sustainable development and lifestyles in harmony with nature.	people about sustainable development.	knowledge on sustainable practices within the farming community. This includes providing access to the latest research, best practices in sustainable agriculture, and the benefits of adopting these methods. Digital content, workshops, training sessions, and on-the-ground support have all played a part in enhancing farmers'; understanding and application of sustainability principles.	environmental stewardship. The ongoing educational initiatives are designed to evolve with emerging sustainable technologies and practices, ensuring that the farming community remains at the forefront of sustainable development. This commitment is key to fostering a resilient agricultural sector that can contribute to the well-being of society and the planet for years to come.
13. Climate action				
13.1	Strengthen resilience and adaptive capacity to climate-related hazards and natural disasters in all countries.	Positive. The project has effectively enhanced the resilience of agricultural practices to climate change.	The project has notably increased the resilience of agricultural practices to climate-related hazards through the adoption of regenerative farming techniques. This includes practices like improved soil management, water conservation, and biodiversity enhancement, which have been effective in mitigating the impacts of climate variability. Farmer feedback underscores the success of these methods in creating more resilient farming systems.	The long-term strategy of the project is focused on continually strengthening the adaptability of agricultural practices to meet the challenges posed by a changing climate. This includes not only maintaining but also evolving regenerative practices and technologies to anticipate future environmental conditions. The project's dedication to climate resilience aims to ensure that agricultural systems are robust and sustainable, capable of withstanding climate fluctuations and contributing to overall environmental health.
13.3	Improve education, awareness-raising and human and institutional capacity on climate change mitigation, adaptation, impact reduction and early warning	Highly Positive. The project is instrumental in raising awareness and education about climate change.	The project has played a pivotal role in increasing the awareness and understanding of climate change issues among farmers. Through various initiatives, it has actively disseminated information about the impacts of climate change and effective mitigation strategies. Farmers have been	The project is dedicated to developing and enhancing comprehensive education and training programs focused on climate change adaptation and mitigation. These programs aim to empower not only the current generation of farmers but also future generations, instilling a culture of environmental consciousness and proactive response to climate challenges. The

			introduced to methods for reducing their carbon footprint and adapting to climate variations, which includes practices like water conservation, soil management, and the use of renewable energy sources in agriculture.	continuous evolution of these educational initiatives ensures that they remain relevant and effective in equipping the agricultural community to face the ongoing and future impacts of climate change.
15. Life on land				
15.5	Take urgent and significant action to reduce the degradation of natural habitats, halt the loss of biodiversity and, by 2020, protect and prevent the extinction of threatened species	Highly Positive. The project has a significant positive impact on habitat conservation and biodiversity.	The project has made a considerable impact on habitat conservation and biodiversity enhancement, primarily through the implementation of key agroforestry practices. These practices include the protection and re-creation of natural landscapes within agricultural areas, the establishment of buffer strips and windbreaks to protect soil and water resources, and the introduction of biodiversity in traditional Mediterranean monocultures. This approach has not only improved habitat quality but also contributed to the overall health of the ecosystem.	The long-term focus of the project is to continue and expand upon these agroforestry practices. By consistently implementing and promoting measures like natural landscape preservation, the creation of ecological buffer zones, and the integration of diverse species into agricultural systems, the project aims to enhance biodiversity and ecosystem health substantially. This ongoing commitment will contribute to the reduction of natural habitat degradation and promote a balanced coexistence of agriculture with the natural environment.
17. Partnership for the goals				
17.6	Enhance North-South, South-South and triangular regional and international cooperation on and access to science, technology and innovation and enhance knowledge sharing on mutually agreed terms,	Implementation of a North-South technology transfer involving Sicrex Sagl, a Swiss company, and Alberami, utilizing blockchain technology for the exchange of carbon dioxide removal credits. The use of blockchain technology in this context significantly increases	This project exemplifies North-South cooperation, strengthening ties between Swiss technology and Alberami`s local knowledge and implementation capabilities. It serves as a model for other regions looking to engage in similar technology transfers, thereby	The project has the potential to create a long-lasting impact by establishing a robust system for carbon credit exchange that can be replicated and scaled in other regions. Over its lifetime, the initiative could significantly contribute to global carbon reduction efforts, playing a vital role in achieving climate change targets.

	including through improved coordination among existing mechanisms, in particular at the United Nations level, and through a global technology facilitation mechanism Indicators	transparency and reliability in the exchange of carbon dioxide removal credits. This not only fosters trust between the Northern and Southern entities but also sets a precedent for similar collaborations. The initiative contributes to environmental sustainability by promoting carbon dioxide removal, a crucial aspect in the fight against climate change. Increase in the efficiency and security of environmental credit transactions, leading to potentially higher volumes of carbon credit exchanges. Decrease in the risks associated with fraud or mismanagement in the carbon credit market, thanks to the inherent security features of blockchain technology.	enhancing international cooperation in environmental sustainability. Alberami gains access to advanced Swiss blockchain technology, enhancing its technological base and innovation capacity. The Swiss company, in turn, benefits from insights into local conditions and requirements in Alberami`s region, potentially informing future innovations.	The continuous exchange of knowledge and technology between the Swiss company and Alberami will build capacity in both entities, leading to ongoing improvements and innovations in their respective fields. The project could also serve as a case study or blueprint for future North-South and South-South technology transfers, contributing to the global knowledge base in this area.

1.15 Host country attestation

☐ Host country attestation

☒ No host country attestation

1.16 Additional information

No adding of additional information beyond the one already provided until this Section is necessary.

1.16.1 Confidential/sensitive information

North-South Technology Transfer Involving Sicrex Sagl and Alberami Utilizing Blockchain Technology
The confidentiality of the North-South technology transfer contract between Sicrex Sagl, a Swiss company, and Alberami, which utilizes blockchain technology, is paramount for several compelling reasons. Firstly, the sensitive nature of personal and financial data necessitates strict privacy measures to protect against identity theft, financial fraud, and unauthorized data access, which could have severe repercussions for the individuals and entities involved.
Secondly, the proprietary nature of the technology being transferred, including the specific application of blockchain technology in this context, is likely to encompass trade secrets, intellectual property, and competitive advantages that require protection to maintain business integrity and market position.
Lastly, confidentiality ensures compliance with international data protection regulations, such as GDPR in Europe, which mandate stringent handling and sharing of personal information. The sensitive and proprietary nature of the information exchanged in this contract, coupled with legal compliance requirements, underscores the necessity of maintaining strict confidentiality throughout the process.

2. Crediting

2.1 Project start date

Project start date	01/01/2022

2.2 Expected operational lifetime or termination date

The lifetime of the project "AgroEcology_Italy - Climate Change Mitigation through Environmentally-Conscious Farming" has been set as 45 years compiled. The project proponents have chosen to design this project as a 15 year-long project renewable twice for 15 years, making 45 years in total:

- 15 years of enrolment period: from 01.01.2022 until 31.12.2036
- 15 years (first renewal): from 01.01.2037 to 31.12.2051
- 15 years (second renewal): from 01.01.2052 to 31.12.2066

As per the ICR guidelines, for project activities involving CDR, a crediting period of a maximum of 15 years or a conservative estimate of the technical lifetime of the installed technologies or implemented measures and associated impacts. The crediting period is renewable a maximum of twice.

The project Gantt chart is included in the Appendix Section for reference.

2.3 Crediting period

The initial crediting period for this project is 15 years, starting from January 1, 2022, and ending on December 31, 2036. This project is designed with a renewable nature, allowing for a total potential crediting period of 45 years. Following the end of the first 15-year period, the project can be renewed for two additional periods of 15 years each, subject to validation and verification processes.

Start date of crediting	01/01/2022
Crediting period	☐ Five years, renewable twice. ☐ Ten years, fixed. ☒ Fifteen years, renewable twice (CDR only). ☐ Other, provide information on how that conforms with ICR requirement document.

2.4 Calendar year of crediting

Table 2: Calendar year of gross crediting.

Calendar year of crediting	Estimated ER total
	Agroecology_Italy Project
1 January 2022 to 31 December 2022	1,899
1 January 2023 to 31 December 2023	6,146
1 January 2024 to 31 December 2024	162,185
1 January 2025 to 31 December 2025	324,370
1 January 2026 to 31 December 2026	486,555
1 January 2027 to 31 December 2027	648,740
1 January 2028 to 31 December 2028	810,925
1 January 2029 to 31 December 2029	973,110
1 January 2030 to 31 December 2030	1,297,480
1 January 2031 to 31 December 2031	1,297,480
1 January 2032 to 31 December 2032	1,297,480
1 January 2033 to 31 December 2033	1,297,480
1 January 2034 to 31 December 2034	1,297,480
1 January 2035 to 31 December 2035	1,297,480
1 January 2036 to 31 December 2036	1,297,480
1 January 2037 to 31 December 2037	1,297,480
1 January 2038 to 31 December 2038	1,297,480
1 January 2039 to 31 December 2039	1,297,480

1 January 2040 to 31 December 2040	1,297,480
1 January 2041 to 31 December 2041	1,297,480
1 January 2042 to 31 December 2042	1,297,480
1 January 2043 to 31 December 2043	1,297,480
1 January 2044 to 31 December 2044	1,297,480
1 January 2045 to 31 December 2045	1,297,480
1 January 2046 to 31 December 2046	1,297,480
1 January 2047 to 31 December 2047	1,297,480
1 January 2048 to 31 December 2048	1,297,480
1 January 2049 to 31 December 2049	1,297,480
1 January 2050 to 31 December 2050	1,297,480
1 January 2051 to 31 December 2051	1,297,480
1 January 2052 to 31 December 2052	1,297,480
1 January 2053 to 31 December 2053	1,297,480
1 January 2054 to 31 December 2054	1,297,480
1 January 2055 to 31 December 2055	1,297,480
1 January 2056 to 31 December 2056	1,297,480
1 January 2057 to 31 December 2057	1,297,480
1 January 2058 to 31 December 2058	1,297,480
1 January 2059 to 31 December 2059	1,297,480
1 January 2060 to 31 December 2060	1,297,480
1 January 2061 to 31 December 2061	1,297,480
1 January 2062 to 31 December 2062	1,297,480

1 January 2063 to 31 December 2063	1,297,480
1 January 2064 to 31 December 2064	1,297,480
1 January 2065 to 31 December 2065	1,297,480
1 January 2066 to 31 December 2066	1,297,480
Total Estimated Net Carbon Removal (tCO2e)	51,420,690
Total Crediting years	45
Avg. ER	1,142,682

3. Safeguards

3.1 Statutory requirements

The project proponent, Alberami, asserts compliance with these EU and national regulations, ensuring the project aligns with both EU-wide and Italian-specific environmental, labor, and safety standards. The initiative prioritizes sustainability, adhering to stringent legislative frameworks to promote environmental integrity and social responsibility.

EU Compliance Level:

(a) EU LULUCF Regulation (2018/841): This regulation integrates greenhouse gas emissions and removals from land use, land use change, and forestry (LULUCF) into the EU's 2030 climate and energy framework. It mandates Member States to account for emissions and removals from LULUCF, aiming to enhance sustainability and climate-friendly land management, thus supporting the EU's commitment under the Paris Agreement towards emission mitigation by 2030 Appendix 3.1.

(b) EU Climate Law (2021/1119): Enacted on 29 July 2021, this law establishes a binding objective for the EU to achieve net-zero greenhouse gas emissions by 2050 and sets an interim target of at least 55% reduction of net emissions by 2030 compared to 1990 levels. It emphasizes the crucial role of both emission reductions and removal enhancements, aligning with the ambitious goals for LULUCF under the European Green Deal Appendix 3.2.

(c) EU Nature Directives: Encompassing the Habitats Directive (92/43/EEC) and the Birds Directive (79/409/EEC), these directives are pivotal in EU biodiversity conservation, promoting the maintenance of biodiversity while considering socio-economic factors. They establish the Natura 2000 network, safeguarding valuable natural habitats and species across the EU from adverse impacts Appendix 3.3.

(d) EU Forest Strategy for 2030: As part of the European Green Deal, this strategy aims to improve the quantity, quality, and resilience of EU forests. It advocates for increased carbon sequestration and aligns with the biodiversity strategy for 2030, emphasizing the protection, restoration, and sustainable management of forests to meet EU climate neutrality and biodiversity objectives, including the ambitious target of planting at least three billion trees by 2030 Appendix 3.4.

National Compliance Level (Italy):

(a) Occupational Health and Safety Act (D.Lgs. 81/2008): This act ensures the safety and health of workers, outlining the obligations of employers and the rights of employees in the workplace, promoting a safe and healthy working environment. Appendix 3.5.

(b) Fair Labor Standards Act (D.Lgs. 66/2003): This legislation governs labor standards in Italy, including work hours, rest periods, and other conditions of employment, ensuring fair treatment and adequate rest for workers. Appendix 3.6.

(c) Civil Rights Act of 1964 (Legge n. 903/1977): Although inspired by the US model, this Italian law addresses anti-discrimination in employment, ensuring equal treatment and opportunities for all employees regardless of gender, race, or other protected characteristics. Appendix 3.7 and 3.8.

(d) Italian Law on Disability Discrimination (D.Lgs. 205/2000): This law provides protections against discrimination for individuals with disabilities, ensuring access to employment, public services, and accommodations. Appendix 3.9 and 3.10.

(e) Environmental Impact Assessment (D.Lgs. 152/2006): This regulation mandates the assessment of environmental impacts for certain infrastructure projects before their approval, ensuring that potential environmental consequences are considered and mitigated. However, since AgroEcology_Italy does not fall under the category of infrastructure projects, an Environmental Impact Assessment (EIA) is not required. For reference, see Appendix 3.11.(e) Environmental Impact Assessment (D.Lgs. 152/2006): This regulation requires the assessment of environmental impacts for certain projects before their approval, ensuring that potential environmental consequences are considered and mitigated. Appendix 3.11.

(f) Water Pollution Control Act (D.Lgs. 152/2006): This act includes provisions for managing water quality, focusing on preventing pollution and promoting sustainable water use practices to protect aquatic environments and public health. Appendix 3.12.

(g) Land Use Planning Act (D.Lgs. 42/2004): This legislation governs land use and planning, ensuring that development is sustainable, respects environmental considerations, and aligns with regional and national planning objectives. Appendix 3.13.

(h) Food Security Act (D.Lgs. 193/2007): This act outlines requirements for agricultural practices, especially concerning the management of highly erodible lands or wetlands, aiming to ensure food safety and security while protecting the environment. Appendix 3.14.

3.2 Potential negative environmental and socio-economic impacts

This initiative is not expected to have negative environmental impacts. In fact, it is expected to have positive environmental impacts beyond reducing greenhouse gas emissions, such as reducing erosion, reducing nutrient runoff into waterways, and increasing resilience to extreme weather events. Additionally, it is not expected to have negative socio-economic impacts at the community level. Instead, it is expected to have positive economic impacts, as a transition to more sustainable farming

practices and, if applicable, certified organic farming, may result in higher valued end produce, which often commands a premium of 35-50% in Italy over non-organic produce.
Farmers may experience some financial challenges in the early years of the project due to the upfront costs of adopting new practices and potential changes to yield. However, these potential economic impacts are expected to be minimal and temporary.
Alberami has implemented measures to mitigate these potential impacts, including providing agronomic support and training to farmers to ensure that the new practices have a net neutral or positive impact on their operations and yield.
Additionally, financial support through upfront payments and the sale of carbon credits is intended to offset any initial increases in expenses or changes to revenue. In the long term, Alberami expects farmers to see financial benefits from increased yields, especially in extreme weather years, thanks to improved soil health and overall farm resilience and improved yield quality overall (Magkos, F., Arvaniti, F., and Zampelas, A., 2003) "Sustainability and quality in organic and conventional food products: A systematic review" American Journal of Clinical Nutrition.

3.3 Consultation with interested parties and communications

A public consultation will be held for 30 days. The starting and closing dates are defined in the Project Gantt about the stakeholder’s consultation (it is provided in the Appendix section). The initial kick-off stakeholders meeting for the project activity was conducted in Oliveti d'Italia – Andria in Puglia region of Italy on 21st February 2022 (Figures 11, 12). In the meeting, the basic information of project activity was provided to the participants and interested farmers/growers. They were given presentation on best agricultural practices which can reduce greenhouse gas emissions. Similar meetings were conducted in the following locations and dates.

- Grumo Appula, Puglia region on 19 July 2022
- Confagricoltura Offices, Bari on 6 February 2023
- Campobello di Mazara, Sicily on 29 March 2023

In addition, the Project Proponent has conducted site visits and field-level demonstrations to the interested farmers/growers (Figure 13). The first such demonstration and site visit was conducted in Torano Castello in Calabria region on 2 May 2023.
The consultation meetings aimed not just at presenting and discussing the project but also at fostering relationships with local associations and cooperatives, a key aspect for the expansion of the project in the area. Such meetings are key aspects for long-term success of the project activity. Therefore, the Project Proponent will keep on conducting these meetings in the future as well for initial project instances as well as for future instances to be added as described in the item 3.1.1 item Ongoing consultation.

Figure 11: First kick off consultation meeting at Puglia region of Italy.

Figure 12: In the project scenario, technical visits, capacity building, and field days with stakeholders organized by Alberami.

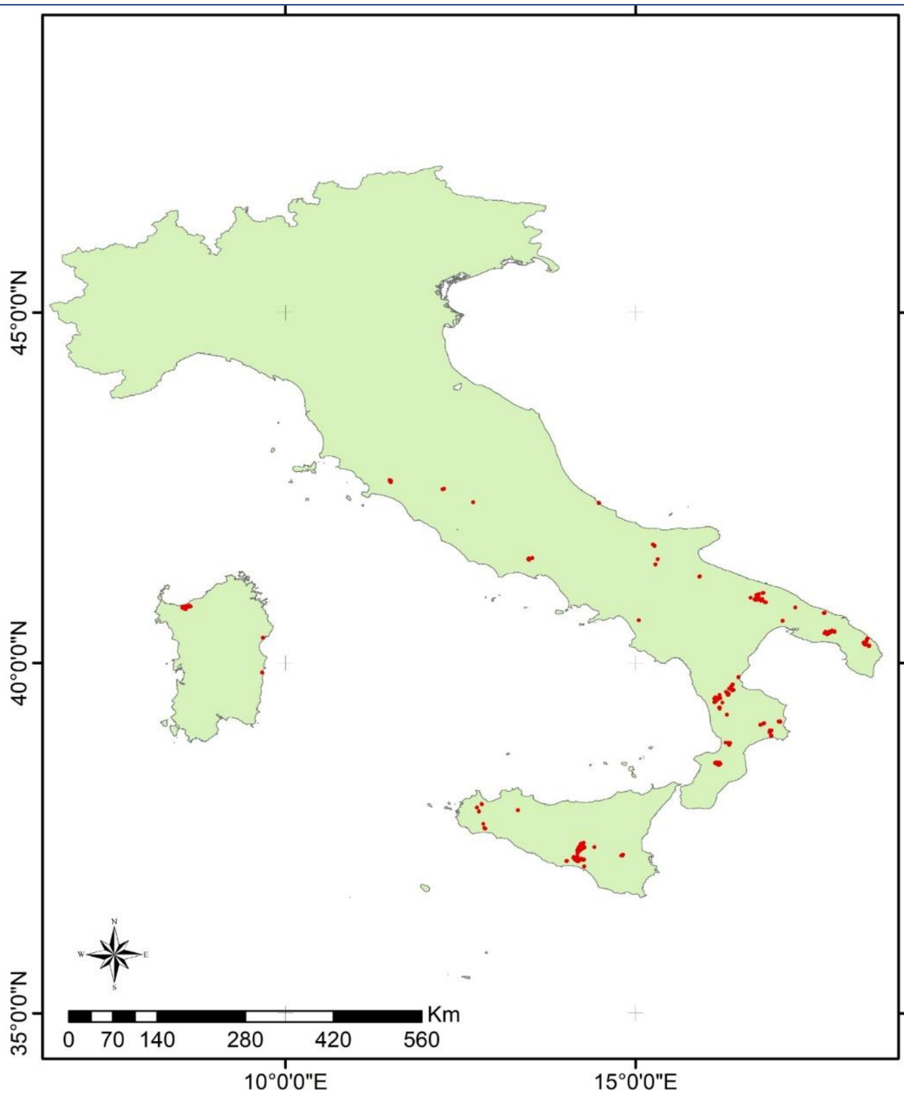


Figure 13: Locations of the initial project instances

3.3.1 Stakeholders and consultation

Stakeholder	Farmers and growers from a consortium. Oliveti d'Italia is a consortium that brings together a diverse group of stakeholders in the olive oil industry, including farmers, cooperatives, millers, producer associations, and businesses. The consortium's supply chain covers an impressive expanse of over 13,000 hectares of olive groves, located in the most significant olive oil-producing areas of Italy. This extensive network is supported by the efforts of 2,500 producers.
Legal rights	The farmers have full legal rights over their lands
Diversity	Farmers, growers, Project Proponent and representatives of farming communities
Location	Puglia, Italy
Effects	The effects were positive. No negative effects were identified.

Date of consultation	21/02/2022
Stakeholder engagement	The stakeholders were identified and informed prior to the consultation meeting.
Consultation	During the inaugural meeting, participants, including the consortium's representatives, key local farmers and two representatives from Alberami were engaged through a comprehensive PowerPoint presentation. This presentation formed the cornerstone of the meeting, offering critical insights and detailed information that paved the way for meaningful discussions. Central to these discussions was the exploration of integrating agroecological practices with carbon farming, specifically within olive groves. The primary aim was to investigate how this integration could generate an additional revenue stream for farmers. This topic garnered significant interest and engagement from the attendees. The presentation set the tone for the meeting, leading to an extensive question-and-answer session. This interactive segment allowed for a richer exchange of ideas, establishing a cooperative and dynamic platform for ongoing dialogues and collaborative initiatives in this innovative field
Stakeholder input	All the stakeholders input were considered which were relevant to the project activity.
Free prior informed consent	The participation to the project activity is purely voluntary.
Conclusion	Overall the stakeholders consultation was a success.
Ongoing consultation	The Project Proponent will be in regular touch with the identified stakeholder.

Stakeholder	Farmers and growers
Legal rights	The farmers have full legal rights over their lands
Diversity	Farmers, growers, Project Proponent and representatives of farming communities
Location	Puglia, Italy
Effects	The effects were positive. No negative effects were identified.
Date of consultation	19/07/2022
Stakeholder engagement	Direct invitations were given to the consultation meeting prior to the meeting date.
Consultation	At the invitation of the mayor of Grumo Appula, a city in the Bari province renowned for its extensive olive and almond cultivation, a focused stakeholder consultation was convened. The city hall of Grumo Appula served as the venue where Francesco Musardo presented to 35 attendees, encompassing prominent local farmers and specialists. The core of the presentation was to present our project and investigate the potential integration of agroecological methods and carbon farming into the local

	prevailing agricultural practices, particularly in olive and almond production, boosting the agrarian economy with innovative cultivation techniques. The initiative aimed not just at presenting and discussing the project but also at fostering relationships with local associations and cooperatives, a key aspect for expansion of the project in the area. Following the presentation, a dynamic Q&A session unfolded, engaging attendees in a practical examination of how carbon farming could be implemented in harmony with Grumo Appula's agricultural legacy. The exchange fostered a discourse on sustainable progression that respects the city's long-standing relationship with its land.
Stakeholder input	All the stakeholders input were considered which were relevant to the project activity.
Free prior informed consent	The participation to the project activity is purely voluntary.
Conclusion	Overall the stakeholders consultation was a success.
Ongoing consultation	The ongoing process of consultation with stakeholders for the Agroecology Project incorporates several interactive and accessible methods: Online Questionnaires: Utilized to gather a wide range of feedback and insights from stakeholders, allowing for broad participation. Telephone Hotline: Offers immediate and direct communication for stakeholders to express concerns or ask questions. +44 351 821 4474 Digital Platforms: Information sharing and engagement through the project's website and Instagram account to reach a diverse audience. Facebook: https://www.facebook.com/Alberami.it LinkedIn: https://it.linkedin.com/company/alberami Instagram: https://www.instagram.com/alberami_it Website: www.alberami.com Online and face-to-face Meetings: Facilitates real-time discussions and updates, enabling stakeholders from different locations to participate without travel constraints.

Stakeholder	Farmers and growers
Legal rights	The farmers have full legal rights over their lands
Diversity	Farmers, growers, Project Proponent and representatives of farming communities
Location	Bari, Italy
Effects	The effects were positive. No negative effects were identified.
Date of consultation	06/02/2023
Stakeholder engagement	Direct invitation were given to the consultation meeting prior to the meeting date.
Consultation	Confagricoltura Puglia, an integral part of Italy's oldest agricultural association, in 2011 has marked over 120 years of tradition since its inception. With a robust

	presence across the Puglia region through 5 Provincial Farmers' Unions and 70 local offices, headquartered at the Executive Center in Bari, it stands as one of Puglia's most prominent Professional Agricultural Organizations. This widespread presence enables Confagricoltura Puglia to effectively represent and safeguard the interests of agricultural enterprises across the region. The organization is a key advocate for its members, addressing specific issues faced by Puglian agricultural businesses and liaising with regional public entities and professional, labor, and economic organizations. In the regional agricultural landscape, Confagricoltura Puglia is particularly influential in key crops such as cereals, olives, vines, and fruit trees. Through its CAA (Centro Assistenza Agricola), the organization manages 43,318 farm files, which account for 12.1% of the total in Puglia, overseeing 251,571 decoupled entitlements (20.7% of the regional total) and covering a total area of 228,474 hectares, representing 22.2% of the regional agricultural land. This highlights Confagricoltura Puglia's significant contribution to the region's agricultural sector. The event was structured with a presentation and a Q&A session.
Stakeholder input	All the stakeholders input were considered which were relevant to the project activity.
Free prior informed consent	The participation to the project activity is purely voluntary.
Conclusion	Overall the stakeholders consultation was a success.
Ongoing consultation	The Project Proponent will be in regular touch with the identified stakeholder.

Stakeholder	Farmers and growers
Legal rights	The farmers have full legal rights over their lands
Diversity	Farmers, growers, Project Proponent and representatives of farming communities
Location	Campobello di Mazara (TP) – Sicily, Italy
Effects	The effects were positive. No negative effects were identified.
Date of consultation	29/03/2023
Stakeholder engagement	Direct invitation were given to the consultation meeting prior to the meeting date.
Consultation	The stakeholder consultation on the Island of Sicily, a bastion of agricultural heritage, focused on marrying the island's storied tradition of olive and citrus cultivation with the innovative practices of carbon farming. In this pivotal first meeting beyond our local region, key local farmers and representatives from Alberami delved into a detailed PowerPoint presentation. The discourse aimed at exploring how agroecological practices could be integrated within the traditional farming systems of olives, citrus, and annual crops without disrupting the island’s delicate ecosystems.

	The subsequent Q&A session was a deep dive into Sicily's distinctive agricultural practices, assessing the feasibility of carbon farming in such a storied landscape. The dialogue was insightful, pivoting on how these new farming practices could align with the region's established agricultural rhythm, ensuring that progress could be achieved in harmony with preservation.
Stakeholder input	All the stakeholders input were considered which were relevant to the project activity.
Free prior informed consent	The participation to the project activity is purely voluntary.
Conclusion	Overall the stakeholders consultation was a success.
Ongoing consultation	The Project Proponent will be in regular touch with the identified stakeholder.

Stakeholder	Farmers and growers
Legal rights	The farmers have full legal rights over their lands
Diversity	Farmers, growers, Project Proponent and representatives of farming communities
Location	Torano Castello, Calabria, Italy
Effects	The effects were positive. No negative effects were identified
Date of consultation	02/05/2023
Stakeholder engagement	Direct invitation were given to the consultation meeting prior to the meeting date
Consultation	Field visits to various potential project sites provided practical insights into the feasibility and potential impact of implementing carbon farming practices in different agro-ecological zones. The objective of the Calabria field visits was to assess the viability of carbon farming across varied agro-ecological areas. Engaging with farmers, cooperative representatives, and local agronomists, we gathered valuable insights into the region's agricultural practices. These conversations were key in shaping the project's approach, ensuring that the implementation of carbon farming would be well-suited to local conditions and supported by the community. These interactions laid the foundation for the project's future in Calabria, promising to harmonize environmental benefits with sustainable agriculture. The initiative aims to demonstrate how carbon farming can complement traditional farming, enhancing the region's agricultural legacy.
Stakeholder input	All the stakeholders input were considered which were relevant to the project activity.
Free prior informed consent	The participation to the project activity is purely voluntary.
Conclusion	Overall the stakeholders consultation was a success.
Ongoing consultation	The Project Proponent will be in regular touch with the identified stakeholder.

3.3.1 Public comments

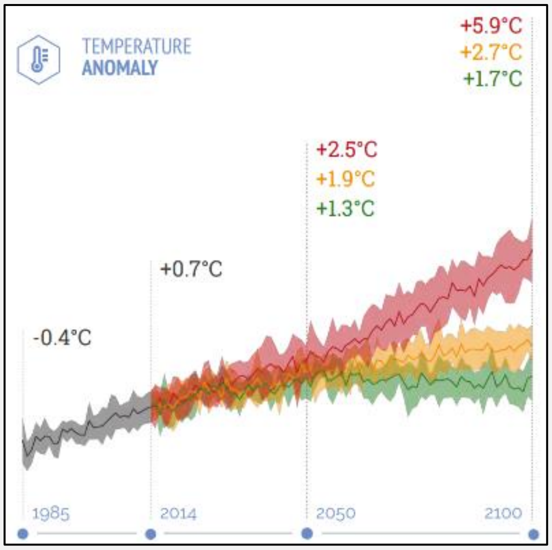
Comments received	Action taken
No comments were received.	No comments were received. Therefore, no action was required.

3.4 Environmental impact assessment

No environmental impact assessments were carried out for this project. This project will not involve any permitting or activities that are required to conduct environmental impact assessments by existing regulation, and no negative environmental impacts are anticipated. As described in Section 3.2, project activities are expected to yield positive environmental outcomes and increased agroecosystem resilience.

3.5 Risk assessment

	Risks identified	Mitigation measures
Risk 1	**The environmental risk:** The Mediterranean Basin faces several critical challenges, including diminishing water resources, soil erosion, rampant forest fires, soil degradation, desertification, and declining agricultural and ecosystem productivity. Furthermore, the region contends with the exacerbating effects of ongoing climate change, which serve as potential catalysts for highly adverse outcomes in the coming decades. According to the Risk Analysis. Climate Change in Italy, a document elaborated by the The Euro-Mediterranean Center on Climate Change CMCC Foundation in 2020, In Italy, climate change is manifesting through rising temperatures, altered rainfall patterns, and an increase in extreme weather events. The most severe scenario, RCP8.5, projects a troubling +5°C rise in average temperatures by 2100 compared to the turn of the century. This will be accompanied by a significant reduction in annual precipitation levels and a heightened intensity of rainfall on wet days. Furthermore, Italy can expect more frequent hot and dry days throughout the year, exacerbating the challenges posed by climate change. Notably, Italy's marine environment will also undergo substantial changes, including rising surface temperatures and sea levels. These transformations will have detrimental effects on the provision of vital "ecosystem goods and services" along the coastlines, with implications for the socio-economic system as a whole. To mitigate these impacts and adapt to a changing climate, Italy must prioritize sustainable strategies and proactive measures in its environmental and economic planning. According to the report, In the coming decades, Italy can anticipate relatively stable annual precipitation patterns, with discernible variations observed on a seasonal scale, such as decreased summer rainfall in central-southern regions and increased winter precipitation in the north. In a low emissions scenario, the projected temperature fluctuations are expected to stay relatively moderate, with an increase of approximately +1.5°C by both 2050 and 2100. Conversely, in a high emissions scenario where greenhouse gas (GHG) emissions remain unchecked, significantly more substantial temperature deviations are anticipated for both 2050 and 2100. The following graph (Figure 14) demonstrates the forecast of different scenarios for mean temperature evolution in the next 80 years.	Please refer to section 8.3

	 *Figure 14: The forecast of different scenarios for mean temperature evolution in the next 80 years. (Source: CMC, 2020)*	
Risk 2	*Geo-hydrological Perils:* Italy is profoundly susceptible to geological, hydrological, and hydraulic instabilities, posing a substantial hazard to its population. The escalating temperatures and the heightened occurrence of localized precipitation events significantly contribute to the exacerbation of these geo-hydrological risks across the region. Furthermore, human activities, including land consumption, urban sprawl, and occupation of riverine zones, coupled with rising temperatures and an uptick in localized precipitation events, play a pivotal role in amplifying these perilous challenges. With the anticipated rise in temperatures, the consequences of melting snow, ice, and permafrost will become more severe, particularly impacting the Alpine and Apennine regions in terms of the magnitude and seasonal timing of disruptive events. Additionally, the expected increase in intense precipitation patterns heightens hydraulic risks for smaller basins, which tend to overflow during heavy rains before larger basins and raises the vulnerability to surface landslides in areas with more porous soils. Overall, Italy's climate change impacts are set to intensify the challenges posed by geo-hydrological instability, compounding an already complex situation. Consequently, addressing climate risks in Italy necessitates a comprehensive strategy that combines mitigation, such as reducing river flow to the ridge and redesigning defense structures for various disruptions in the hydrological and geological domains, with adaptation measures aimed at enhancing resilience within the social system.	Refer to section 8.3
Risk 3	*Water resources:* The analysis, conducted at the district and river basin levels, reveals that climate change is leading to a reduction in both the quantity and quality of water resources. Over the coming decades, factors like rising average temperatures, increased evapotranspiration, and decreased rainfall are expected to significantly diminish water flow, with a projected 40% reduction by 2080. Anthropogenic activities, particularly increased water withdrawals, are further anticipated to cause a 10-15% decline in flow rates. This intensifies the competition for water resources among sectors, including civil use, tourism, industry, power generation, and agriculture, emphasizing the	Refer to section 8.3

	growing importance of maintaining a delicate balance between water demand and availability. These conflicts are most pronounced during the summer months when demand peaks but water resources are scarcer. Outdated and inadequate infrastructure underscores the pressing need for enhanced water resource management to ensure not only human needs but also the allocation of sufficient water flow to ecosystems. Extended dry periods, which are projected to increase in Italy based on climate change scenarios, are expected to have detrimental effects on water quality, leading to reductions in flow rates and inflow velocities. These phenomena contribute to eutrophication, characterized by an upsurge in aquatic plant biomass that degrades the overall quality of water resources. Moreover, prolonged droughts and reduced flow rates, coupled with water resource over-exploitation, heighten the vulnerability of watercourses and coastal groundwater reserves, particularly in lowland areas, to rising sea levels. This can result in saltwater intrusion and increased salinity in freshwater reserves. Lastly, the anticipated increase in heavy rainfall in Italy is likely to lead to sudden floods and runoff events, which, in turn, elevate the input of nutrients and contaminants from agriculture and livestock farming into the water systems.	
Risk 4	*Agriculture impacts expected:* Italy holds a prominent position as a significant agricultural producer and exporter, with agriculture remaining a crucial sector in terms of both GDP contribution and employment generation. The Italian agricultural landscape exhibits remarkable diversity, ranging from highly intensive farming practices in the northern regions to extremely marginal and fragmented farms in mountainous and southern areas. Arable crops cover more than half of the total agricultural area (54.5%), with the remaining land comprising grasslands and pastures (26.7%) and agricultural woody crops (18.5%). Maize and wheat cultivation alone contribute to approximately 80% of the total cereal production, while notable tree crops include olive and grape cultivation. Irrigation plays a pivotal role, accounting for around 50% of total water usage in agriculture. It is predominantly employed for crops such as maize, vegetables, fodder crops, and various tree crops like olives, grapes, and citrus, underscoring its significance in sustaining Italian agriculture. For crops, the projected rise in average temperatures is expected to bring about alterations in the duration of the growing season, earlier onset of phenological phases, and the possibility of shifting cultivation areas towards higher latitudes and altitudes, where more favorable conditions for growth and development may prevail. However, Italy may face reduced productivity, particularly for spring-summer crops, especially those that rely on non-irrigated methods. There's also the potential for a northward shift in arable land use, particularly for crops like olive trees and grapevines, although this expansion might be curtailed by the anticipated increase in extreme weather events. The livestock sector is not immune to the impact, as elevated temperatures lead to prolonged heat stress, which in turn affects animal welfare and product quality, ultimately impacting the sector's overall productivity. the primary anticipated effects on crop and animal production by employing two approaches: an examination of existing literature and model simulations that gauge yield fluctuations in cereal crops. This comprehensive analysis also accounts for uncertainties associated with climate projections and explores how the direct impact of rising atmospheric CO_2 concentrations may mitigate adverse climate change effects on crops. Additionally, for the livestock sector, the report examines expected projections for the Temperature Humidity Index (THI), a composite measure that reflects the combined influence of temperature and humidity. This evaluation helps assess potential implications for animal welfare and well-being. In the forthcoming decades, it is anticipated that certain regions may experience a substantial decline in irrigated corn yields, ranging from 25% to 50% compared to current levels, as indicated by the examined scenarios. Yield reductions are also expected for wheat, particularly in southern Italy and the Italian islands, while certain areas in central and northern Italy may witness yield	

increases. Elevated atmospheric CO2 concentrations have the potential to enhance photosynthetic activity and crop water utilization efficiency. However, this could have adverse consequences on product nutritional quality, leading to decreased protein content in cereals, impaired wheat baking quality, and diminished concentrations of essential nutrients such as iron and zinc, thereby impacting nutritional aspects. It is imperative to conduct further research to comprehensively investigate the impact of increased atmospheric CO2 concentrations on crop productivity and food quality.

the assessment of climate risk in irrigated agriculture due to climate change is intricately linked to the unique crop requirements and prevailing climatic conditions in each region. It necessitates a meticulous evaluation of the susceptibility and adaptability of water supply systems to accommodate the growing demand for crop irrigation. Anticipated adverse climate change effects on livestock are multifaceted, encompassing aspects related to the health, production, and reproduction of various species. Dairy cattle and pigs are deemed particularly vulnerable, while poultry exhibits a medium level of vulnerability, and beef cattle range from low to medium vulnerability.

The water demand for irrigation is expected to increase in a wide range of Italian territory, that could variate between 17 to 20% of the volume amount required and its impact is expected in almost all the regions as demonstrated through the following map presented by CMCC foundation (Figure 15).

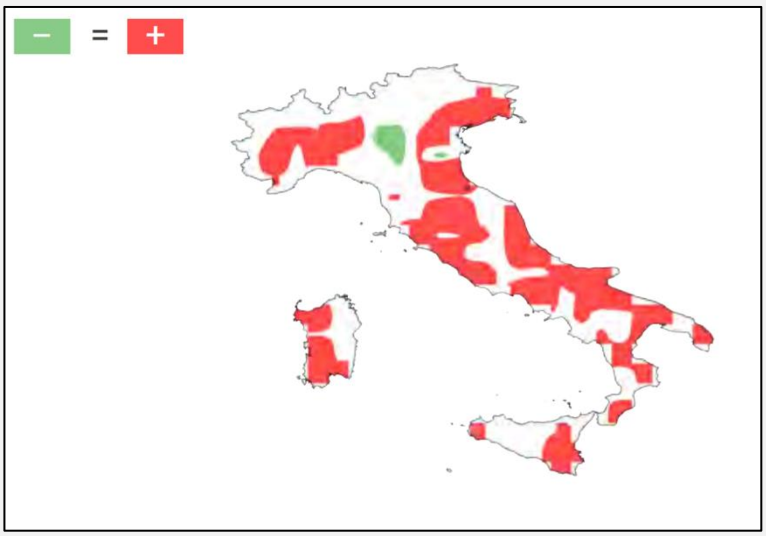


Figure 15: The water demand for irrigation in Italy.

The findings from this analysis underscore a heightened risk scenario for southern Italy, where lower water availability is expected to result in elevated irrigation costs. This scenario is likely to intensify competition among sectors for access to water resources, jeopardizing productive processes, particularly in downstream areas of the primary water basins (Figure 16).

The quantitative productivity impact was also evaluated in a study coordinated by the department of civil and environmental engineering of University of Perugia[1] which concludes that even in the more optimistic scenario some productive reduction is expected in general, although some regions could face a slight increase that do not compensate the most intense lost in the majority part of the Italian olive production.

[1] Orlandi, F; Rojo, Jesús; Picornell,A; Oteros, J; Pérez-Badia, R; Fornaciari, M. Impact of Climate Change on Olive Crop Production in Italy. Aviable at < https://www.mdpi.com/734596 >

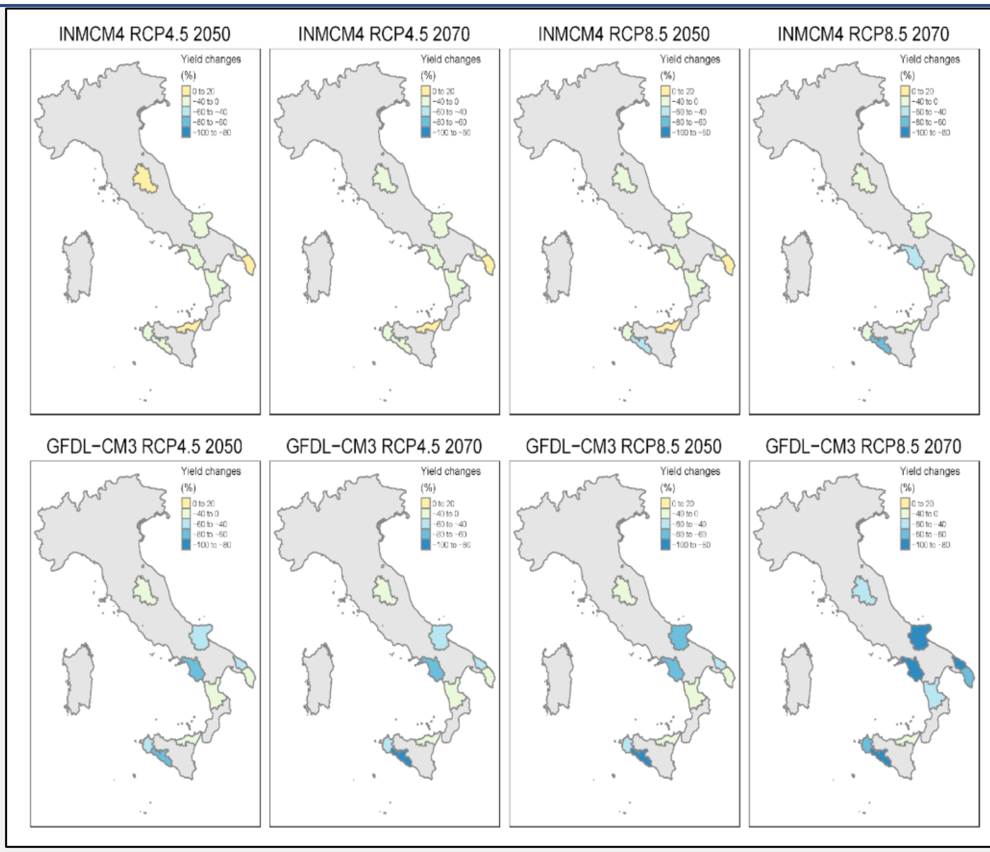


Figure 16: Future climate change scenarios.

The results from climate models indicate that by 2050, there is an average projected reduction in olive production of approximately 26.6% to 34.1%, depending on the climate scenario considered (RCPs 4.5 and 8.5). However, some Italian provinces, such as Perugia, Lecce, and Messina, may experience a modest increase in production, typically below 20% compared to current production. As the time horizon extends to 2070, the projections suggest an even more pronounced decrease in olive production, with some areas facing reductions exceeding 40%. These negative impacts on olive production are primarily attributed to rising temperatures and arid conditions during the summer, posing a significant challenge to traditional olive farming in the region.

Forest fires

Described in section 8.3

In Italy, all climate scenarios project a significant fire risk increase exceeding 20%, along with an expected extension of the fire season by 20 to 40 days in the upcoming decades. These changes are anticipated to result in an increase in burned areas ranging from 21% to 43%, contingent upon the scenario under consideration. The expansion of burned regions will consequently lead to heightened emissions of vegetation fires, including CO2 and particulate matter, adversely impacting local air quality and human health. Furthermore, this situation may exert a substantial influence on the atmospheric budget and regional as well as global carbon cycles.

Technical risks. The listed technical risks associated with each one of practices, are related with eventual and temporary decrease of productivity due to the transitory process of learning and adaptation to new practices which replace, at least in part, the traditional knowledge usually applied by decades.

3.5.1 Additional information on risk management

No direct risks to project activities have been identified, which aligns with the comprehensive risk assessment conducted in sections 8.3 and 3.5. In section 8.3, we utilized the Verra-developed AFOLU Non-Permanence Risk Tool Version 4.0 to assess internal, external, and natural risks associated with the project. The detailed analysis showed that internal risks were mitigated by ensuring the use of indigenous species, securing project funding, and establishing long-term contractual agreements with farmers. Financial security and a clear governance structure further reduced internal risks. External risks were minimized by clearly defining ownership and resource access rights, which are held by the same entities, and a stable governance score from the World Bank. Natural risks, including geological events and extreme weather, were managed through strategic project location and regenerative agricultural practices, while integrated pest management and prohibition of biomass burning mitigated risks from pests and fires.

Section 3.5 focused on natural risks such as geological events, extreme weather, and pests. The findings indicated that the project's agricultural lands are mostly away from high-risk seismic zones, historical data on weather events show manageable levels of risk, and the project's practices enhance resilience. The use of integrated pest management and other sustainable practices reduced the impact of pests and diseases.

The conclusion that no direct risks to project activities have been identified is supported by the detailed assessments in sections 8.3 and 3.5. These sections provide a thorough examination of potential risks and demonstrate that the mitigation measures in place are robust and effective. The alignment between these sections ensures that the project's risk management strategy is comprehensive and reliable, providing confidence in the project's long-term sustainability and success.

4. Methodology

4.1 Reference to applied methodology and applied tools

The project's methodological framework is built upon the integration of the C-Farms methodology, Verra's VM0042 methodology, and the CDM's AR-AMS0007 framework. These methodologies collectively serve as the foundational pillars for the project's design and implementation. - LIFE C-Farms: This methodological framework forms the foundation of the project's approach. Most procedures and emission reduction quantifications are based on this methodology. It is a meticulously designed plan collectively developed through partnerships between renowned Italian universities, research institutions, private enterprises, and associations representing the agricultural and woodworking sectors. This innovative project has secured co-financing from the 2020 LIFE Program of the European Commission, identified by the code "LIFE20 PRE IT/017."

- Verra's VM0042 Methodology: Elements from Verra's VM0042 methodology have been integrated to enhance the project's methodological framework, providing additional robustness and credibility based on the Approach 1 models.

- CDM's AR-AMS0007 Methodology: Elements from the Clean Development Mechanism (CDM) AR-AMS0007 methodology, specifically focusing on agroforestry below and above-ground biomass, have been incorporated to further ensure the project's scientific and methodological integrity.

Type (methodology, tool, module)	Reference ID	Version	Title
Methodology	Link of methodology reference:https://c-farms.eu/wp-content/uploads/2023/04/STANDARD-CARBON-FARMING-STORAGE-Public-Consultation-ENG.pdf[2]	N/A	CARBON FARMING CERTIFICATION SCHEME STANDARD
Methodology	VM0042 Methodology for Improved Agricultural Land Management, v1.0 - Verra	V1.0	VM0042 Methodology for Improved Agricultural Land Management, v1.0
Methodology	CDM: Afforestation and reforestation project activities implemented on lands other than wetlands --- Version 3.1 (unfccc.int)	V.3.1	AR-AMS0007: Afforestation and reforestation project activities implemented on lands other than wetlands --- Version 3.1

VM0042 version 1 was used initially for this PDD as version 2 had not been released at the start of the project's initial activities. Version 2 was only released after the implementation of these initial stages. Therefore, for the first MRV and this PDD version, we followed version 1. For subsequent MRVs, we will adhere to version 2.

[2] Reference : https://c-farms.eu/wp-content/uploads/2023/04/STANDARD-CARBON-FARMING-STORAGE-Public-Consultation-ENG.pdf

4.2 Applicability of methodology

Based on the applicability conditions listed in the C-Farms, VM0042, and the CDM's AR-AMS0007 framework, we can strongly state that the project meets the applicability conditions listed in all those methodologies:

This standard is applicable to all the operator/groups of operators that want to generate certified carbon removal units from carbon farming practices on land where they have the ownership or the legal right to operate.

Methodology ID	Applicability condition	Justification
Carbon Farming Certification Scheme Standard	Internal Management and Monitoring	The project proponent commits to maintaining the application of selected farming practices throughout the monitoring period, with continuous internal monitoring performed annually ensuring the implementation of the proposed practices, while verifying that surface occupied by recognized carbon removal land uses within the whole farmland are not subjected to a decrease. (Section 10. Monitoring)
Carbon Farming Certification Scheme Standard	Stakeholder Consultation	A public consultation will be held for 30 days as part of the project plan. (Appendix)
Carbon Farming Certification Scheme Standard	Carbon Removals Estimation Needs to Consider Possible Risks Associated with Permanence	A buffer pool has been determined and applied in the quantification of the project's Net GHG mitigation, to cover the risks associated with non-permanence. (Section 8.3 Permanence Risk Assessment)
VM0042	Additionality and Baseline	The project ensures additionality by implementing practices that go beyond existing requirements, ensuring GHG reductions or removals are genuinely additional. (Section 3.1 Additionality)
VM0042	Project Boundary	The project clearly defines its boundaries, including all areas where activities are implemented, ensuring accurate monitoring and reporting. (Section 4 Project Boundary)
VM0042	Leakage	Potential leakage emissions are considered, and appropriate measures are implemented to manage and mitigate leakage. (Section 5 Leakage)
CDM's AR-AMS0007	Eligibility of Lands	The project land meets the eligibility criteria defined in the methodology, ensuring the land is appropriate for project activities. (Section 2.1 Eligibility of Lands)

CDM's AR-AMS0007	Baseline Scenario	The baseline scenario is established, demonstrating that in the absence of the project, carbon stocks would remain constant or decrease. (Section 3.1 Baseline Scenario)
CDM's AR-AMS0007	Monitoring	A comprehensive monitoring plan is in place to regularly assess carbon stock changes and project performance. (Section 4 Monitoring)

4.3 Deviation from applied methodology

No deviation applied

4.4 Other Information relating to methodology application

In our project design document, it is important to state that the methodologies C-Farms, Verra's VM0042, and the CDM's AR-AMS0007 are not criteria for validation or verification. Instead, these methodologies serve as supporting tools to demonstrate conformity to the established criteria.

5. Additionality

5.1 Level 1 - ISO 14064-2 GHG emissions additionality

As per the section A.3.3 of ISO 14064-23, additionality as a concept of cause and effect. For any cause and effect, the effect can be described as additional if it would have not occurred in the absences of the GHG program in which it participates (for example, International Carbon Registry in this project). ISO 14064-2 states that in section A.3.3, the concept of additionality is inherent to the GHG baseline determination to ensure that GHG emission reductions or removal generated by the project go beyond what would have happened in the absence of the project. In the section 6 of the PDD, the PP has described the baseline scenario. To determine the baseline, a farmer plan (called the T1 form - included in the Appendix for reference) describe the original condition (business-as-usual or baseline condition) of the project site including details of the vegetation cover, soil type and their carbon content ad will measure, starting from the baseline, changes in the carbon stock at the site for the duration of the project in the absence of the project activities (i.e. business as usual). This baseline data will serve as a reference point for measuring changes in carbon stock at the site over the duration of the project in the absence of project activities.

By comparing the baseline scenario with the project scenario, the Project Proponent has determined the additional carbon sequestration and emissions reductions achieved through the implementation of the relevant 13 Best Agricultural Practices (BAPs) for the first project instance. For inclusion of the next project instance as well, the Project Proponent will first conduct baseline assessment of the project instance and accordingly will implement BAPs that will generate GHGs emissions reductions which will go beyond what would have occurred in the baseline scenario.

5.2 Level 2a – Statutory additionality

The best agricultural practices proposed under the project activity is not required or mandated by any law or regulations.

[3] https://www.iso.org/standard/66454.html

5.3 Level 2b – Non-enforcement additionality

Not applied in the project activity.

5.4 Level 3 – Technology, institutional, common practice additionality

There are no agriculture-based carbon projects registered in Italy. In addition, the organic farming holdings in Italy is less than the conventional farm holdings (as per EU data, 11% farm holdings in Italy area organic).

5.5 Level 4a – Financial additionality I

Not applied in the project activity.

5.6 Level 4b – Financial additionality II

The Agroecology_Italy project qualifies under Level 4b financial additionality, as defined by the ICR standard. This classification indicates that projects like Agroecology_Italy face significant financial barriers, which can only be mitigated through specific revenue streams. For this project, the sale of carbon credits is not just supplemental but essential, serving as the primary or sole source of funding. Without this revenue, the necessary initiatives for new plantings and the adoption of agroforestry practices among local farmers would not be feasible.

Additionally, while some agroforestry practices promoted by the project could potentially benefit from subsidies under the EU's Common Agricultural Policy (CAP) through the so-called Eco-schemes in Italy (2023-2027), these subsidies do not provide a reliable financial incentive. The transient nature of these subsidies, which fluctuate based on farmer participation and the segmentation within the eco-scheme, fails to offer long-term security to farmers. In contrast, carbon finance offers a more dependable solution. It provides sustained financial incentives based on actual environmental impacts and performance measurements, ensuring support for at least 15 years. This stability is crucial for encouraging farmers to transition to and maintain sustainable agricultural practices.

5.7 Level 5 – Policy additionality

Not applied in the project activity.

6. Baseline scenario

According to the ICR Requirement Document v5.0, the baseline scenario represents activities and GHG emissions that are most likely to occur in the absence of the project activity. As per the applied methodology, the baseline shall be determined considering the carbon removal performance of the common practices implemented and can be assessed using "standardized baseline". A standardized baseline provides the baseline scenario reflecting the standard performance of comparable activities in similar social, economic, environmental and technological circumstances and considers the geographical context, and positively recognizes the action of first movers who have already engaged in carbon removal activities. The standardized baseline is identified with conventional management in cropland which includes continuous cropping systems, monoculture, bare fallow, moldboard plough, crop residues removal and inorganic nitrogen fertilizer application.

Therefore, by taking the ICR guidelines and the applied methodology into the account, the conventional management in cropland has been considered as the baseline. As per the applied methodology, C-Farms methodology, the following practices are included in the conventional management of the cropland:

1. Continuous cropping systems
2. Monoculture
3. Bare fallow
4. Moldboard plough
5. Crop residue removal; and
6. Nitrogen fertilizer application

Under the grouped project activity, all cropping practices are carried out in the baseline in the first instance as well as for the whole group project activity.

To define a baseline, we need to mention that a baseline represents what would happen if the project did not occur. The most realistic baseline for this project would be the business-as-usual scenario (BAU), as this has been the practice that was kept and replicated for several years in the past.

Therefore, we need to first understand what the current business-as-usual (BAU) practices are for farmers in the region. This will serve as the basis for comparison against which we will measure the changes that occur because of the implementation of the 13 sustainable practices outlined in the Project.

Italy is a leader in organic farming, but organic agriculture still only represents a small portion of total farming in the country. Great part of the current agricultural practices for woody perennial plantations in the region are not sustainable, and there are no significant incentives for farmers to change their practices. As a result, we can assume that the baseline scenario for this project would involve the continuation of unsustainable agricultural practices, including conventional tillage, use of synthetic fertilizers and pesticides, lack of cover crops and crop rotations, and poor management of pruning residues and other organic matter.

Many areas in Italy also rely on monoculture crops, which are vulnerable to diseases, droughts, and the impacts of climate change. Olive farming has been significantly impacted by the Xylella Fastidiosa bacterium, which has caused the loss of millions of olive trees and significant economic and landscape damage in Puglia, Italy. In response to these challenges, the Alberami project aims to promote a more diversified, sustainable, and resilient form of farming that can also serve as a natural carbon sink.

In the baseline scenario, we can expect that soil carbon levels will continue to be reduced due to the depletion of soil organic matter resulting from conventional tillage and lack of organic inputs. Soil erosion and nutrient loss due to the use of synthetic fertilizers and pesticides may also be contributing to a decline in soil quality.

Additionally, the baseline scenario would likely result in a loss of biodiversity in the region due to the lack of conservation measures and management of land use. This may also contribute to a decline in ecosystem services provided by the region, including carbon sequestration, water regulation, and habitat for wildlife.

To assess the baseline scenario, the farmer plan should include details on the current condition of the project site, including the vegetation cover, soil type, and carbon content. Therefore, a farmer plan (called the T1 form - included in the Appendix for reference) describe the original condition of the project site including details of the vegetation cover, soil type and their carbon content ad will measure, starting from the baseline, changes in the carbon stock at the site for the duration of the project in the absence of the project activities (i.e. business as usual). This baseline data will serve as a reference point for measuring changes in carbon stock at the site over the duration of the project in the absence of project activities. By comparing the baseline scenario with the project scenario, we can determine the additional carbon sequestration and emissions reductions achieved through the implementation of the 13 sustainable practices.

Since practices prior to the implementation of the Project vary by farm, if not also by fields, baseline agricultural management practices are identified for each field based on the practices implemented during at least the three years prior to the implementation of regenerative practices under the project. The baseline period for this project has been established as spanning from 1990 to 2013, relying on the foundational research conducted by Fantappiè et al. (2018), which provided an in-depth analysis of the Italian portion of the Global Soil Organic Carbon Map (GSOCMAP), offering crucial insights into the soil organic carbon stocks across Italy during this period (Figure 17). To complement this baseline, RothC modeling was employed for the subsequent period from 2013 to 2021, adhering to the patterns of land use specified in the data survey on land use types (Appendix 1 folder contains the questionnaire and the results of the questionnaire). This timeline is instrumental in offering a comprehensive reference frame for evaluating the initial state and the progressive development of soil organic carbon (SOC) stocks.

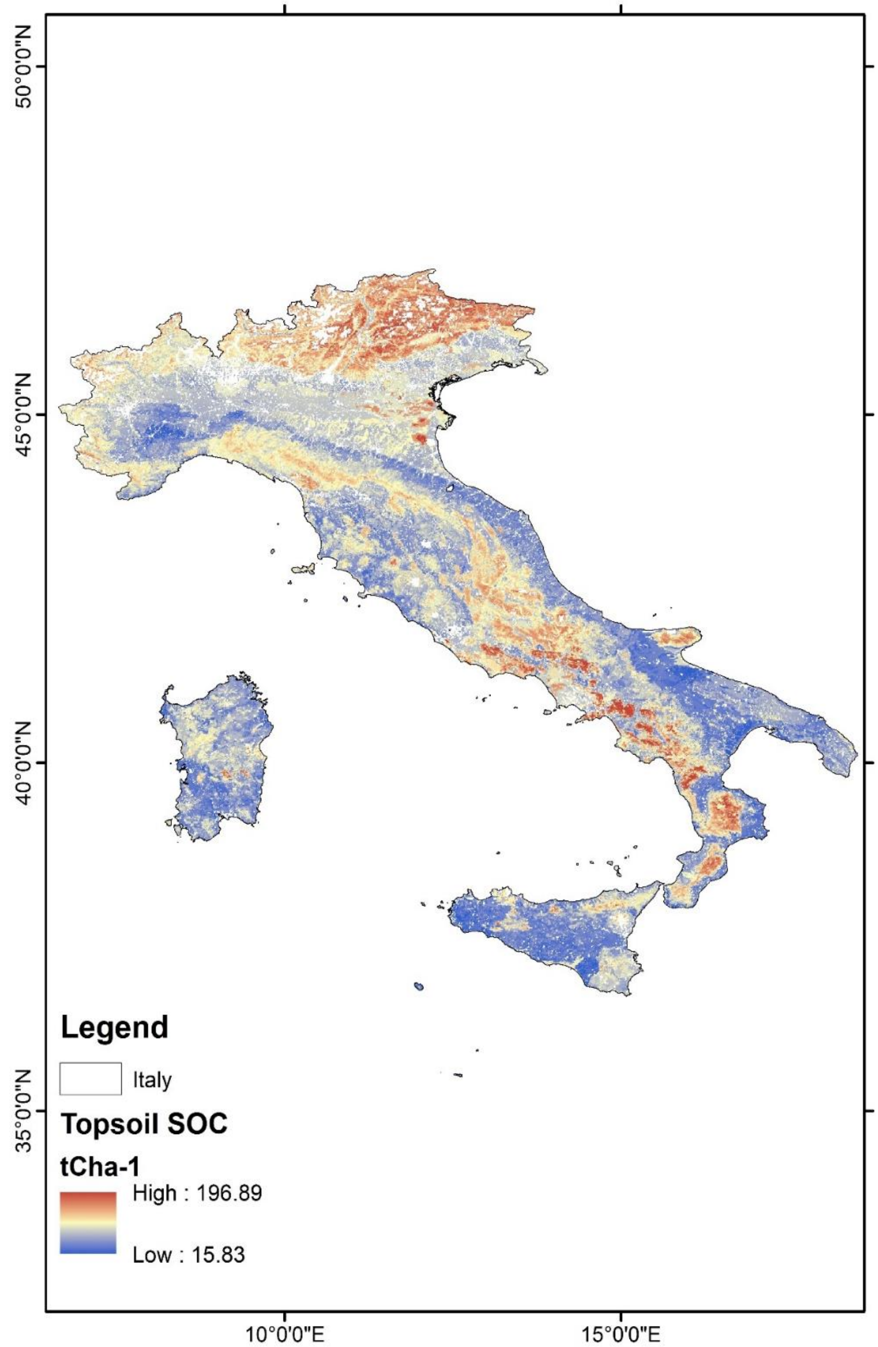


Figure 17: Global Soil Organic Carbon map (GSOCmap) of Italy. Source Fantappiè et al. (2018).

7. Project boundary

Following project's methodological framework is built upon the integration of the C-Farms methodology, Verra's VM0042 methodology, and the CDM's AR-AMS0007 framework, the following carbon pool are included or excluded from the project boundary in the baseline and project scenario.

Table 3: Carbon pools included in or excluded from the project boundary.

SSR		Controlled/ related/ affected	GHGs	Included? Y/N	Justification/ explanation	Coordinates
Baseline	Living biomass (Aboveground and belowground biomass)	Controlled	CO_2	Y	Living biomass must be included where project activities result in an increase of this pool (Plantations, agroforestry). Woody biomass removal due to project activity is excluded as for the applicability conditions. INCLUDED - Our Agroforestry project will generate changes in this carbon pool. Therefore, aboveground woody biomass will be included in the baseline and project scenario will be included in our analysis	As it is a grouped project, there are several locations available.
	Dead Wood	related	CO_2	N	Must be included where the project activity may significantly reduce the pool EXCLUDED - Carbon pool is not included because it is not subject to significant changes or potential changes are transient in nature on agricultural land	As it is a grouped project, there are several locations available.

	Litter	related	CO2	N	Must be included where the project activity may significantly reduce the pool. INCLUDED - Our Agroforestry project will generate changes in this carbon pool, as it has 1 project activities related to pruning. Pruning plays a central role in the context of woody perennial species and is a key farm management activity that creates on average 3 tons of material per hectare every year.	As it is a grouped project, there are several locations available.
	Soil Organic Carbon	Controlled	CO2	Y	Must be included where the project activity may significantly reduce the pool INCLUDED - Main carbon pool affected by carbon farming activities that is expected to increase in the project scenario. Therefore, Soil Organic Carbon content will be included in the baseline and project scenario will be included in our analysis	As it is a grouped project, there are several locations available.
	Harvested wood Products	related	CO2	Y	Mandatory in case of perennial woody plantations as it is the main pool that need to ensure long term carbon storage INCLUDED - Even though the project does not plan to harvest wood	As it is a grouped project, there are several locations available.

					products, this carbon pool will be monitored to ensure long term carbon storage	
Project	Soil Organic Carbon	Controlled	CO2	Y	INCLUDED - This is expected to be the most significant pool affected by project activities.	As it is a grouped project, there are several locations available.
	Fossil Fuel	related	CO2	N	Methodology does not require accounting for CO_2 emissions from fossil fuels if project activities will not significantly increase emissions compared to baseline. However, it can be included where project activities may reduce emissions compared to the baseline scenario. EXCLUDED - Alberami anticipates that adopting no-till, for example, will reduce fossil fuel emissions from tractors. Therefore, excluding this GHG SSR is considered as conservative. This SSR will be excluded for the time being.	As it is a grouped project, there are several locations available.
	Soil Methanogenesis	related	CH4	N	Required if present - Must be included where the project activity may significantly increase emissions compared to the baseline scenario EXCLUDED - Soil methanogenesis is most prevalent in flooded cropping systems like rice and, thus, is	As it is a grouped project, there are several locations available.

					negligible in the cropping systems, project activities, and climate zones included in this project.	
	Enteric Fermentation	related	CH4	N	Required if present - Must be included where the project activity may significantly increase emissions compared to the baseline scenario EXCLUDED - Although livestock management is not a targeted project activity, the project may enroll growers who incorporate livestock into their cropping system in their baseline and project scenarios. As this practice is not yet implemented in any farm nor will be in the near future, it is temporarily excluded.	As it is a grouped project, there are several locations available.
	Manure Deposition	related	CH4&N2O	N	Required if present - Must be included where the project activity may significantly increase emissions compared to the baseline scenario EXCLUDED - Although livestock management is not a targeted project activity, the project may enroll growers who incorporate livestock into their cropping system in their baseline and project scenarios. As this practice is not yet implemented in any farm nor will be	As it is a grouped project, there are several locations available.

					in the near future, it is temporarily excluded.	
	Use of Nitrogen Fertilizers	related	N2O	Y	Required if present - Must be included where the project activity may significantly increase emissions compared to the baseline scenario INCLUDED - Reduction of synthetic nitrogen fertilizers are part of practice number 8. Therefore, this SSR will be included in the analysis	As it is a grouped project, there are several locations available.
	Use of Nitrogen-Fixing Species	related	N2O	Y	Required if present – If nitrogen fixing species are planted in the project, N2O emissions from nitrogen fixing species must be included in the project boundary INCLUDED - Nitrogen Fixing species is part of practice number 3. Carbon stock in this pool may increase due to implementation of practice number 3. Leguminous plants are nitrogen-fixing and will be present in some baseline and project scenarios. It is also likely that some cover crops planted under the project scenario will be N-fixing. Therefore, this SSR will be included in the analysis	As it is a grouped project, there are several locations available.
	Biomass Burning	related	CO_2	No		

			CH4	No	Required if present - Must be included where the project activity may significantly increase emissions compared to the baseline scenario INCLUDED - No biomass burning is allowed as for applicability conditions that exclude the burning	As it is a grouped project, there are several locations available.
			N2O	No		

8. Quantification of GHG emission mitigations

8.1 Criteria and procedures for quantification

CO2 removals that can be generated from the project activities are calculated as the difference between the project scenario (in which the virtuous practice is applied) and the standardized baseline. The difference (Δ) between these two scenarios correspond to the amount of CO2 stocked into the project pool. The unit of measurement used is the carbon dioxide equivalent ton (tCO2). A carbon removal activity shall provide a net carbon removal benefit, which shall be quantified using the following formula:

$$Net\ carbon\ removal\ benefit\ =\ CRbaseline - CRtotal - GHGincrease$$

where:

- $CRbaseline$= carbon removals under the baseline;
- $CRtotal$= total carbon removals of the carbon removal activity;
- $GHGincrease$ = increase in direct and indirect greenhouse gas emissions, other than those from biogenic carbon pools in the case of carbon farming, which are due to the implementation of the carbon removal activity.

8.1.1 Baseline emissions

The standardized baseline is identified with conventional management in cropland which includes continuous cropping systems, monoculture, bare fallow, moldboard plough, crop residues removal and inorganic nitrogen fertilizer application.

Carbon removal under the standardized baseline

At present, data and methodologies to define if soils under business-as-usual agricultural management within the project boundaries represent a net CO2 source or sink are lacking. Notwithstanding, for a conservative standardized baseline CO2 emission from cropland SOC losses may be assumed equal to 0.

8.1.2 Project emissions

The CRtotal, at the end of the monitoring period, is calculated on the basis of measurement of the carbon pools at two points in time to assess the carbon stock changes due to the application of the carbon farming practice. The carbon pools include soil (SOC), living biomass (LB) and are expressed in tons CO2/ha/yr.

Change in the carbon stocks in project, occurring in the selected carbon pools, in year t is calculated as follows:

$$CRtotal = \Delta \mathrm{CSOC} + \Delta \mathrm{CLB} + \Delta \mathrm{CHWP}$$

$$\Delta \mathrm{CSOC, LB} = \frac{(\mathrm{Ct1} - \mathrm{Ct0})}{t1 - \mathrm{t0}}$$

$$\Delta \mathrm{CO2} = \frac{-44}{12 * \Delta \mathrm{C}}$$

Where:

- $CRtotal$= Total change in carbon stocks under the carbon-farming project, expressed as tonnes C yr-1
- $\Delta CSOC$=Total change in soil organic carbon stocks under the carbon-farming project, expressed as tonnes C yr-1
- ΔCLB= Total change in above and below ground living biomass carbon stocks under the carbon-farming project, expressed as tonnes C yr-1.
- $\Delta CHWP$=Total change in harvested wood products carbon stocks under the carbon-farming project, expressed as tonnes C yr-1
- $\Delta CSOC, LB, HWP$= annual carbon stock change in the pool, tonnes C yr-1
- $Ct1$ = carbon stock in the pool at time t1, tonnes C
- $Ct0$ = carbon stock in the pool at the beginning of the certification period (time t0), tonnes C
- $\Delta CO2$ (i) = annual CO2 removals from net changes of the soil carbon stock during the monitoring period, in t CO2 yr-1.

Greenhouse Gas Increase (GHG increase)

To calculate GHGincrease under the project scenario, emissions in the carbon farming project must be compared with those generated in the baseline scenario and included only when the project activity significantly increases such emissions compared to the baseline scenario.
The GHG increase can be generated by direct and indirect emissions increase.
Therefore, GHGincrease is calculated through equation 5 (eq5) and evaluates only differences > 0 deriving from emissions between the carbon farming project and the baseline.

$$GHGincrease = GHGcf - GHGbsl$$

$$GHGcf = GHGdirect + GHGindirect$$

Where:

- GHGincrease = increase in direct and indirect greenhouse gas emissions, other than those from biogenic carbon pools in the case of carbon farming [tCO2eq/yr].
- GHGbsl = GHG emissions other than biogenic carbon pools in the baseline scenario [tCO2eq/yr], including soil emissions from fertilizer application and fossil fuel use related to agricultural operations.
- GHGcf = GHG emissions other than biogenic carbon pools in the project scenario [tCO2eq/yr] including soil emissions from fertilizer application and fossil fuel use related to agricultural operations.
- GHGdirect= Direct GHG emissions other than biogenic carbon pools due to the carbon farming activity within the project boundaries [tCO2eq/yr].
- GHGindirect = Direct GHG emissions including biogenic carbon pools due to the carbon farming activity outside the project boundaries [tCO2eq/yr].
- GHGbsl include direct and indirect GHG from inorganic nitrogen fertilizer application (GHG (INF)) and direct GHG from fossil fuel consumption (GHG(FUEL)) related to agricultural operations; it also may include GHGs from organic nitrogen fertilizer application (GHG(OA)), nitrogen-fixing cover crops (GHG(CC).
- GHGcf include GHGs from organic nitrogen fertilizer application (GHG(OA)), nitrogen-fixing cover crops (GHG(CC)), GHG emissions from fossil fuel consumption related to agricultural

operations (GHG(FUEL)) and GHG from inorganic nitrogen fertilizer (GHG(INF)) if this is applied in the project.

$$GHGcf; bsl = GHG(INF) + GHG(FUEL) + GHG(OA) + GHG(CC)$$

$$GHG(INF) = \frac{X(INF) \text{ x } EF(INF)}{1000}$$

$$GHG(FUEL) = \frac{X(FUEL) \text{ x } EF(FUEL)}{1000}$$

$$GHG(OA) = \frac{X(OA) \text{ x } EF(OA)}{1000}$$

$$GHG(CC) = \frac{X(CC) \text{ x } EF(CC)}{1000}$$

Where:

- GHGcf; bsl: total emissions from the baseline or the project, expressed as t CO2/ha/yr
- $GHG(INF)$: soil direct and indirect emissions from inorganic nitrogen fertilizer application, expressed as t CO2/ha/yr.
- $GHG(FUEL)$: direct emissions from fossil fuel use for machinery operations, expressed as t CO2/ha/yr.
- $GHG(OA)$: soil direct and indirect emissions from organic nitrogen fertilizer application, expressed as t CO2/ha/yr.
- $GHG(CC)$: soil direct and indirect emissions from nitrogen-fixing cover crops cultivation with biomass returned to soil, expressed as t CO2/ha/yr.
- X= amount of Nitrogen applied to soil, in kg N/ha/yr.

In the case of the AgroEcology-Italy Project, it has been considered that there is no GHGinc (equal to zero), since the application of the proposed practices would lead to GHGbsl being equal to or higher than GHGcf, because the use of fossil fuels and inorganic fertilizers would be considerably reduced by the application of the Practices 1,2 and 8.
In addition, the decrease in GHG emissions from these two sources will be greater than the emission from nitrogen application from any organic fertilizers or n-fixing species cover crops.

8.1.3 Leakage

Leakage is defined as net changes in GHG emissions outside the project boundaries. AgroEcology-Italy Project promotes the implementation and intensification of sustainable agricultural practices in areas that usually continue to play their productive role. Additionally, the implemented practices are expected to increase agricultural production in the regions, minimizing the leakage of activities outside the project boundaries.

8.2 Quantification of Net-GHG emissions and/or removals

The quantification of ex ante net removals were calculated using the areas of the farms enrolled in the project that apply each of the proposed practices and the average annual change in soil organic carbon stocks and living biomass values derived from scientific literature.

This equation is a formula for estimating the carbon dioxide (CO2) sequestration rate in tons per hectare per year (tCO2.ha-1.yr-1) based on various factors related to land use and agricultural practices. Here's a breakdown of the equation:

$$Area \times \left[\underbrace{0.56 \times 5.14}_{\substack{no\ new \\ plantations}} + \underbrace{0.14 \times (5.14 + 1.01 + 4)}_{practices\ 4\ and\ 5} + \underbrace{0.3 \times \left(5.14 + \left(\underbrace{0.8 \times 2.2}_{\substack{planting \\ olive\ trees}} + \underbrace{0.2 \left(\frac{1.8 + 2.6 + 1.5}{3} \right)}_{planting\ other\ trees} \right) \right)}_{new\ plantations} \right]$$

$$= Area \times 6.49\ tCO2.ha^{-1}.yr^{-1}$$

1. No new plantations: This component contributes 56% of the total ER. To calculate this, the equation multiplies the area by 0.56, which represents 56%, and then multiplies by 3.78. The value 3.78 represents the estimated carbon sequestration rate (in tons of CO2 per hectare per year) for areas with no new plantations.

2. Implementation of practices 4 and 5: This contributes 14% to the total ER. It multiplies the area by 0.14 (14%), then by 3.78 (the carbon sequestration rate for areas with no new plantations) and adds 1.01. This additional value of 1.01 represents the expected additional carbon sequestration resulting from implementing practices 4 and 5.

3. Planting new trees: This contributes 30% to the total ER. It's divided into two parts:

- Planting olive trees: It multiplies the area by 0.3 (30%), then by 3.78 (the carbon sequestration rate for areas with no new plantations), and by 0.8 (80% of 2.2). The value 2.2 represents the estimated carbon sequestration rate (in tons of CO2 per hectare per year) for olive tree plantations, and 0.8 represents 80%.
- Planting other trees: It multiplies the area by 0.3 (30%), then by 1.8 (the carbon sequestration rate for areas with no new plantations) and adds 2.6. The value 1.8 represents the estimated carbon sequestration rate (in tons of CO2 per hectare per year) for other tree plantations, and 2.6 represents the expected additional carbon sequestration from planting other trees.

For the quantification of emission reduction in the first instance Roth C model (Version 2.1)[4] was applied.

The RothC model is a soil carbon model that simulates the turnover of organic carbon in non-waterlogged topsoil. This model is widely used to predict the effects of changes in land use, climate, and farming practices on soil organic carbon, which is crucial for assessing soil health, fertility, and the global carbon cycle. Developed by Rothamsted Research in the UK, the RothC model operates on a monthly time step and can simulate soil carbon dynamics over years to centuries.

Key features of the RothC model include:

[4] https://www.rothamsted.ac.uk/rothamsted-carbon-model-rothc

1. Decomposition Process: The model simulates the decomposition of soil organic carbon into various pools with different turnover rates. These pools include decomposable plant material (DPM), resistant plant material (RPM), microbial biomass, humified organic matter, and inert organic matter.

2. Inputs and Outputs: Inputs to the model include the amount and type of organic material added to the soil, monthly climate data (temperature, precipitation), soil properties (clay content, which affects the decomposition rate), and vegetation cover. The primary output is the amount of soil organic carbon, but it can also predict CO2 emissions from soil as organic matter decomposes.

3. Applications: RothC has been applied in various studies to understand how different farming practices (like tillage, crop rotation, organic amendments) affect soil organic carbon levels. It's also used in climate change studies to predict how soil carbon stocks might change with global warming or changes in rainfall patterns.

4. User Friendliness: While the model is sophisticated in its simulation capabilities, it has been designed to be accessible to researchers and policymakers with a user-friendly interface in some versions, enabling the simulation of different scenarios without requiring in-depth programming knowledge.

5. Integration with Other Models: RothC can be integrated with other environmental and agricultural models to provide a more comprehensive understanding of ecosystem dynamics, particularly those related to carbon cycling and greenhouse gas emissions.
The RothC model's ability to simulate long-term soil carbon dynamics makes it a valuable tool in the study of global carbon cycles, aiding in the development of sustainable land management practices and climate change mitigation strategies.
The Roth C model is well applied in the SOC assessment specially in Italy. The peer-reviewed studies using Roth C Model for soil carbon assessment in Italy are mentioned below.

- Mondini, Claudio, et al. "Soil C storage potential of exogenous organic matter at regional level (Italy) under climate change simulated by RothC model modified for amended soils." Frontiers in Environmental Science 6 (2018): 144. (https://doi.org/10.3389/fenvs.2018.00144)

- Francaviglia, Rosa, et al. "Changes in soil organic carbon and climate change–Application of the RothC model in agro-silvo-pastoral Mediterranean systems." Agricultural Systems 112 (2012): 48-54. (https://doi.org/10.1016/j.agsy.2012.07.001)

- Fantin, Valentina, et al. "The RothC Model to Complement Life Cycle Analyses: A Case Study of an Italian Olive Grove." Sustainability 14.1 (2022): 569. (https://doi.org/10.3390/su14010569)

- Mondini, C., K. Coleman, and A. P. Whitmore. "Spatially explicit modelling of changes in soil organic C in agricultural soils in Italy, 2001–2100: Potential for compost amendment." Agriculture, ecosystems & environment 153 (2012): 24-32. (https://doi.org/10.1016/j.agee.2012.02.020)

- Mondini, Claudio, et al. "Modification of the RothC model to simulate soil C mineralization of exogenous organic matter." Biogeosciences 14.13 (2017): 3253-3274. (https://doi.org/10.5194/bg-14-3253-2017)

Model Framework

The segmentation of soil organic carbon by the RothC model into different pools is instrumental for understanding the intricacies of soil carbon turnover. These pools, characterized by their decay rates, are influenced by soil attributes such as temperature, moisture, and clay content, providing a nuanced view of soil organic matter dynamics.

Decomposition Dynamics
The decomposition rate for each carbon pool is governed by:

$$DecompRatei = ki \times Ci \times Effectclay \times Effecttemp \times Effectmoist$$

Where $DecompRatei$ delineates the decomposition rate for pool i, ki represents the specific decomposition rate constant, Ci the carbon content, and $Effectclay$, $Effecttemp$, and $Effectmoist$ are the environmental modifiers about clay, temperature, and moisture respectively.

Inter-Pool Carbon Fluxes
The transitions between carbon pools follow these relations:

$$DPMnew = (1 - fDPM) \times Input$$

$$RPMnew = fDPM \times Input$$
$$BIOnew = kDPM \times DPM + kRPM \times RPM$$

$$HUMnew = fHUM \times (kDPM \times DPM + kRPM \times RPM)$$

Here, $Input$ stands for the influx of fresh organic carbon, while fDPM and fHUM represent the portions allotted to decomposable material and humified substances, respectively.

Processes of Humification and Inertization

The transformation into humified and inert materials is described by:

HUMincrease = fHUM×BIOnew

$$IOMincrease = fIOM \times HUM$$

with $fIOM$ symbolizing the proportion of humified matter transitioning into inert status.

In accordance with the ICR Requirement Document v5.0 for guaranteeing the permanence over time of the credits generated, a buffer system has been established, in which a percentage of the carbon absorption units generated is reserved to guarantee the permanence over time of the credits generated. An estimation of 10% of the carbon removal units is set aside as a reserve to cover any losses (Buffer).
This value is divided in two different accounts:
10% of issued ICCs in the AFOLU buffer adjustment account.
Total emission reductions and removals are calculated below from the First Project instance of the Project activity and for the total goal of the Project, in accordance with the Standard:

Table 6: Estimated Net-GHG Emissions and Removals from the total goal of the Project.

Year	Baseline emissions (tCO_2e)	Project emissions (tCO_2e)	Estimated leakage (tCO_2e)	Reductions (tCO_2e)	Removals (tCO_2e)	Total GHG emission mitigations (tCO_2e)
1 January 2022 to 31 December 2022	0	0	0	0	1,899	1,899
1 January 2023 to 31 December 2023	0	0	0	0	6,146	6,146
1 January 2024 to 31 December 2024	0	0	0	0	162,185	162,185
1 January 2025 to 31 December 2025	0	0	0	0	324,370	324,370
1 January 2026 to 31 December 2026	0	0	0	0	486,555	486,555
1 January 2027 to 31 December 2027	0	0	0	0	648,740	648,740
1 January 2028 to 31 December 2028	0	0	0	0	810,925	810,925
1 January 2029 to 31 December 2029	0	0	0	0	973,110	973,110
1 January 2030 to 31 December 2030	0	0	0	0	1,297,480	1,297,480
1 January 2031 to 31 December 2031	0	0	0	0	1,297,480	1,297,480

1 January 2032 to 31 December 2032	0	0	0	0	1,297,480	1,297,480
1 January 2033 to 31 December 2033	0	0	0	0	1,297,480	1,297,480
1 January 2034 to 31 December 2034	0	0	0	0	1,297,480	1,297,480
1 January 2035 to 31 December 2035	0	0	0	0	1,297,480	1,297,480
1 January 2036 to 31 December 2036	0	0	0	0	1,297,480	1,297,480
1 January 20307 to 31 December 2037	0	0	0	0	1,297,480	1,297,480
1 January 2038 to 31 December 2038	0	0	0	0	1,297,480	1,297,480
1 January 2039 to 31 December 2039	0	0	0	0	1,297,480	1,297,480
1 January 2040 to 31 December 2040	0	0	0	0	1,297,480	1,297,480
1 January 2041 to 31 December 2041	0	0	0	0	1,297,480	1,297,480
1 January 2042 to 31 December 2042	0	0	0	0	1,297,480	1,297,480
1 January 2043 to 31	0	0	0	0	1,297,480	1,297,480

December 2043						
1 January 2044 to 31 December 2044	0	0	0	0	1,297,480	1,297,480
1 January 2045 to 31 December 2045	0	0	0	0	1,297,480	1,297,480
1 January 2046 to 31 December 2046	0	0	0	0	1,297,480	1,297,480
1 January 2047 to 31 December 2047	0	0	0	0	1,297,480	1,297,480
1 January 2048 to 31 December 2048	0	0	0	0	1,297,480	1,297,480
1 January 2049 to 31 December 2049	0	0	0	0	1,297,480	1,297,480
1 January 2050 to 31 December 2050	0	0	0	0	1,297,480	1,297,480
1 January 2051 to 31 December 2051	0	0	0	0	1,297,480	1,297,480
1 January 2052 to 31 December 2052	0	0	0	0	1,297,480	1,297,480
1 January 2053 to 31 December 2053	0	0	0	0	1,297,480	1,297,480
1 January 2054 to 31 December 2054	0	0	0	0	1,297,480	1,297,480

1 January 2055 to 31 December 2055	0	0	0	0	1,297,480	1,297,480
1 January 2056 to 31 December 2056	0	0	0	0	1,297,480	1,297,480
1 January 2057 to 31 December 2057	0	0	0	0	1,297,480	1,297,480
1 January 2058 to 31 December 2058	0	0	0	0	1,297,480	1,297,480
1 January 2059 to 31 December 2059	0	0	0	0	1,297,480	1,297,480
1 January 2060 to 31 December 2060	0	0	0	0	1,297,480	1,297,480
1 January 2061 to 31 December 2061	0	0	0	0	1,297,480	1,297,480
1 January 2062 to 31 December 2062	0	0	0	0	1,297,480	1,297,480
1 January 2063 to 31 December 2063	0	0	0	0	1,297,480	1,297,480
1 January 2064 to 31 December 2064	0	0	0	0	1,297,480	1,297,480
1 January 2065 to 31 December 2065	0	0	0	0	1,297,480	1,297,480
1 January 2066 to 31	0	0	0	0	1,297,480	1,297,480

December 2066						
Total	**0**	**0**	**0**	**0**	**51,420,690**	**51,420,690**
Annual average	**0**	**0**	**0**	**0**	**1,142,682**	**1,142,682**

8.3 Risk assessment for permanence.

The project has used as a proxy the methodology from Verra developed for AFOLU Non-Permanence Risk Tool Version 4.0 (version September 2019). This tool assesses a project's internal risk, external risk, natural risk and mitigation measures which help to reduce risk. The filing out of the tool forms is anchored in the risk assessment carried out in item 3.5 for natural risk. Internal and external risks are based on the 1.5, 1.8, 1.10,1.11, 1.14, 2, 3.2, 3.3, 5 and 8.

The following report demonstrates step by step, the way runned through to achieve a consistent risk assessment, considering the three categories of risk present at the guideline, as follows.

I. Internal risks

1 INTERNAL RISK

Project Management		
a)	Species planted (where applicable) associated with more than 25% of the stocks on which GHG credits have previously been issued are not native or proven to be adapted to the same or similar agro-ecological zone(s) in which the project is located.	0
b)	Ongoing enforcement to prevent encroachment by outside actors is required to protect more than 50% of stocks on which GHG credits have previously been issued.	0
c)	Management team does not include individuals with significant experience in all skills necessary to successfully undertake all project activities (ie, any area of required experience is not covered by at least one individual with at least 5 years experience in the area).	0
d)	Management team does not maintain a presence in the country or is located more than a day of travel from the project site, considering all parcels or polygons in the project area.	0
e)	**Mitigation:** Management team includes individuals with significant experience Management team includes individuals with significant experience in AFOLU project design and implementation, carbon accounting and reporting (eg, individuals who have successfully managed projects through validation, verification and issuance of GHG credits) under the VCS Program or other approved GHG programs.	-2
f)	**Mitigation:** Adaptive management plan in place	0
Total Project Management [a + b + c + d + e + f]		-2
Note: When a risk factor does not apply to the project, the score shall be zero for such factor		

Justification: There is no new species introduction in the project activity. All the species are indigenous to Italy and Mediterranean region (where Italy is located). The introduction of the species will be done based on climate suitability and local needs. The majority of woody perennial include in the project activity is olive tree (Olea europaea), which is a native.

Financial Viability		
Q	How many years does it take for the cumulative cashflow to break even?	d)
Q	What percentage of funding is needed to cover the total cash out before the project breaks even has been secured?	e)
a)	Project cash flow breakeven point is greater than 10 years from the current risk assessment	0
b)	Project cash flow breakeven point is between 7 and up to less than 10 years from the current risk assessment	0
c)	Project cash flow breakeven point between 4 and up to less than 7 years from the current risk assessment	0
d)	Project cash flow breakeven point is less than 4 years from the current risk assessment	0
e)	Project has secured less than 15% of funding needed to cover the total cash out before the project reaches breakeven	3
f)	Project has secured 15% to less than 40% of funding needed to cover the total cash out required before the project reaches breakeven	0
g)	Project has secured 40% to less than 80% of funding needed to cover the total cash out required before the project reaches breakeven	0
h)	Project has secured 80% or more of funding needed to cover the total cash out before the project reaches breakeven	0
i)	**Mitigation:** Project has available as callable financial resources at least 50% of total cash out before project reaches breakeven	-2
Total Financial Viability [(a, b, c or d) + (e, f, g or h) + i]		1
Note: When a risk factor does not apply to the project, the score shall be zero for such factor		

Justification: The PP has received the funding for project registration and issuance of carbon credits. It involves all the all cost to be incurred in the project registration and preparation of monitoring report followed by verification. Furthermore, the PP has provided the cash flow document (confidential) to the VVB as an evidence of cash flow for initial period of the project activity.

Opportunity Cost		
Q	What is the NPV from the most profitable alternative land use activity compared to NPV of project activity?	f)
a)	NPV from the most profitable alternative land use activity is expected to be at least 100% more than that associated with project activities; or where baseline activities are subsistence-driven, net positive community impacts are not demonstrated	0
b)	NPV from the most profitable alternative land use activity is expected to be between 50% and up to100% more than from project activities	0
c)	NPV from the most profitable alternative land use activity is expected to be between 20% and up to 50% more than from project activities	0
d)	NPV from the most profitable alternative land use activity is expected to be between 20% more than and up to 20% less than from project activities; or where baseline activities are subsistence-driven, net positive community impacts are demonstrated	0
e)	NPV from project activities is expected to be between 20% and up to 50% more profitable than the most profitable alternative land use activity	0
f)	NPV from project activities is expected to be at least 50% more profitable than the most profitable alternative land use activity	-4
g)	**Mitigation:** Project proponent is a non-profit organization	0
h)	**Mitigation:** Project is protected by legally binding commitment to continue management practices that protect the credited carbon stocks over the length of the project crediting period (see project longevity)	-2
i)	**Mitigation:** Project is protected by legally binding commitment to continue management practices that protect the credited carbon stocks over at least 100 years (see project longevity)	0
Total Opportunity Cost [(a, b, c, d, e or f) + (g + h or i)]		-6
Note: When a risk factor does not apply to the project, the score shall be zero for such factor		
Total may be less than zero		

Justification: Opportunity cost: The PP has entered into a contractual agreement with each enrolling grower/farmer who are willing to participate in the project activity. The agreement continues for the entire crediting period of the project activity.

Project Longevity		
Q	Does the project have a legally binding agreement that covers at least a 100 year period from the project start date?	No
Q	What is the project Longevity in years?	45
Q	Legal Agreement or requirement to continue management practice?	Yes
a)	Without legal agreement or requirement to continue the management practice	0
b)	With legal agreement or requirement to continue the management practice	8
Total Project Longevity		8
Note: Total may not be less than zero. Any project with a legally binding agreement that covers at least a 100 year period from the project start date will be assigned a score of zero. Any project with a project longevity of less than 30 years fails the risk assessment		

Justification: The project crediting period is 15 years which will be renewed twice making the whole crediting period of 45 years (15 + 15 + 15 = 45 years). The PP has entered into a contractual agreement with each farmer/grower.

Based on the previous calculation, the pre-total for internal is presented as the following:

Total Internal Risk (PM + FV + OC + PL)	1
Note: Total may not be less than zero	

II. External risks

2 EXTERNAL RISK		
Q	Are the ownership and resource access/use rights held by the same of different entities?	Same
a)	Ownership and resource access/use rights are held by same entity(s)	0
b)	Ownership and resource access/use rights are held by different entity(s) (eg, land is government owned and the project proponent holds a lease or concession)	0
c)	In more than 5% of the project area, there exist disputes over land tenure or ownership	0
d)	There exist disputes over access/use rights (or overlapping rights)	0
e)	WRC projects unable to demonstrate that potential upstream and sea impacts that could undermine issued credits in the next 10 years are irrelevant or expected to be insignificant, or that there is a plan in place for effectively mitigating such impacts	0
f)	**Mitigation:** Project area is protected by legally binding commitment (eg, a conservation easement or protected area) to continue management practices that protect carbon stocks over the length of the project crediting period	0
g)	**Mitigation:** Where disputes over land tenure, ownership or access/use rights exist, documented evidence is provided that projects have implemented activities to resolve the disputes or clarify overlapping claims	0
Total Land Tenure [(a or b) + c + d + e + f +g)]		**0**
Note: When a risk factor does not apply to the project, the score shall be zero for such factor		
Total may not be less than zero		

Justification: The Project Ownership is with the PP whereas the land ownership with the respective individual owner/grower. So, the ownership and resource access/use rights held by the same entities.

a)	Less than 50 percent of households living within the project area who are reliant on the project area, have been consulted	0
b)	Less than 20 percent of households living within 20 km of the project boundary outside the project area, and who are reliant on the project area, have been consulted	0
c)	**Mitigation:** The project generates net positive impacts on the social and economic well- being of the local communities who derive livelihoods from the project area	-5
Total Community Engagement [a + b + c]		**-5**
Note: When a risk factor does not apply to the project, the score shall be zero for such factor		
Total may be less than zero		

Q	What is the country's calculated Governance score?	0.72
a)	Governance score of less than -0.79	0
b)	Governance score of -0.79 to less than -0.32	0
c)	Governance score of -0.32 to less than 0.19	0
d)	Governance score of 0.19 to less than 0.82	0
e)	Governance score of 0.82 or higher	
f)	**Mitigation:** Country implementing REDD+ Readiness or other activities such as: a) The country is receiving REDD+ Readiness funding from the FCPF, UN-REDD or other bilateral or multilateral donors b) The country is participating in the CCBA/CARE REDD+ Social and Environmental Standards Initiative c) The jurisdiction in which the project is located is participating in the Governors' Climate and Forest Taskforce d) The country has an established national FSC or PEFC standards body e) The country has an established DNA under the CDM and has at least one registered CDM A/R project	0
Total Political [(a, b, c, d or e) + f)]		**0**
Note: When a risk factor does not apply to the project, the score shall be zero for such factor		
Total may not be less than zero		

Justification:

The governance score has been gathered directly from the World Bank portal5 and has been calculated from the period between 2018 – 2022 and was calculated from 2018 to 2022 considering that the year 2023 is not yet included in the database.

	2018	2019	2020	2021	2022
Control of Corruption: Estimate	0.2	0.2	0.5	0.5	0.5
Government Effectiveness: Estimate	0.4	0.5	0.4	0.3	0.4
Political Stability and Absence of Violence/Terrorism: Estimate	0.3	0.4	0.4	0.6	0.4
Regulatory Quality: Estimate	0.7	0.9	0.5	0.5	0.5
Rule of Law: Estimate	0.2	0.3	0.2	0.2	0.3
Voice and Accountability: Estimate	1.0	0.9	1.1	1.1	1.1

Source: Worldwide Governance Indicators. Click on a metadata icon for original source information to be used for citation.

Overall Mean Calculated: 0.5.

Based on the previous calculation, the pre-total for external is presented as the following:

Total External Risk (LT + CE +PC)	**0**
Note: Total may not be less than zero	

III. Natural risks

[5] https://databank.worldbank.org/source/worldwide-governance-indicators

Risk Category Factors				Risk Rating
a)	Fire (F)	1	0.50	0.50
b)	Pest and Disease Outbreaks (PD)	5	0.50	2.50
c)	Extreme Weather (W)	2	0.50	1.00
d)	Geological Risk (G)	0	0.50	0.00
e)	Other natural risk (ON1)	0	1.00	0.00
f)	Other natural risk (ON2)	0	1.00	0.00
g)	Other natural risk (ON3)	0	1.00	0.00
Total Natural Risk [F + PD + W + G + ON]				4.00
Note: When a risk factor does not apply to the project, the score shall be zero for such factor Risk rating is determined by [LS x M]				

Justification:

Geological Risk: Italy has been divided into four seismic zones. The southern and central part and island of Sicily fall under zone 1 and zone 2 of seismic zone. Earthquakes can and do affect agricultural practices, the extent and nature of the impact can vary widely. Direct impacts might include damage to infrastructure (like irrigation systems or storage facilities) and changes in land topography. However, agricultural lands, especially those not near urban centers or major fault lines, might experience less immediate or severe damage from seismic events compared to built environments. Majority of the agricultural lands are located away from the built structures. Therefore, the is minimal opportunity of loss as a result of any earthquake events.
Reference: Pagliacci, Francesco, et al. "The socioeconomic impact of seismic events on animal breeding. A questionnaire-based survey from central Italy." International Journal of Disaster Risk Reduction 56 (2021): 102124.

(ii) Extreme weather – Italy has observed extreme weather events in the form of heatwaves, and floods (flash floods) in recent years in the range of 25-50 years. Major extreme events observed in Italy is related to floods in 1998 and 2002.
Reference: Kron, Wolfgang, Petra Löw, and Zbigniew W. Kundzewicz. "Changes in risk of extreme weather events in Europe." Environmental Science & Policy 100 (2019): 74-83.

(iii) Pests and disease outbreaks: pests are common in Italian agricultural systems which can affect the crops if not managed. In the project activity, the PP is applying integrated pest management, reduced pesticide application to control pests and disease outbreaks wherever, it is part of the Best Agricultural Practices (BAPs).

Reference: Gargani, Elisabetta, et al. "A survey on pests and diseases of Italian Hop crops." Italus Hortus 24.2 (2017): 1-17.

Fire risk – Fire risk are minimal in the project activity as biomass burning is prohibited by the applied methodology LIFE C-Farms

Based on the previous calculation, the pre-total for natural risks is presented as the following:

Total Natural Risk (F + PD + W + G + ON)	4.00
Note: Total may not be less than zero	
If the Total Natural Risk is above 35 then the project fails the entire risk analysis	

After diligently conducting a comprehensive risk assessment using the AFOLU Non-Permanence Risk Tool V4.0. Our rigorous evaluation has yielded an overall risk rating of 28 points, as the following:

Risk Category		Rating
a)	Internal risk	0.50
b)	External risk	0.00
c)	Natural Risk	4.00
Overall risk rating (a + b + c)		10

The methodology proposes that if the overall risk rating is greater than 60, project risk is deemed unacceptably high, and the project fails the entire risk analysis. The same is considered if each element overpasses the following limits: The total risk calculated is coming out to be 10 per cent, which lesser than 60 per cent.

Project's Innate Mitigation Potential

As part of our overall assessment of the risk associated with the Xylella fastidiosa bacterium, as a project promoting the widespread adoption of regenerative farming practices, we believe that the risk is further mitigated by the project's innate approach to farming. Regenerative Agriculture is a holistic approach that strengthens the plant's defensive mechanism, enhances soil health, increases biodiversity, and reduces greenhouse gas emissions. Practices like cover cropping, crop rotation, reduced tillage and drastic reduction of pesticides are part of this approach. Research supports that regenerative agricultural practices can help olive trees resist Xylella Fastidiosa infection. Studies have shown that olive trees grown in sustainable agricultural systems are more resistant to the bacterium, reducing the spread of the disease by limiting insect vectors. The project's focus on increasing biodiversity is also widely seen as a positive aspect. It is a known fact that the Xylella Fastidiosa spread throughout the region was simplified by the fact that the area is home to 2 prevalent olive tree cultivars, namely the Ogliarola Salentina and the Cellina di Nardò, both very susceptible to the disease.
Studies by Xiloyannis et al. (2017), found that olive trees grown in sustainable or regenerative agricultural systems were more resistant to Xylella Fastidiosa infection than olive trees grown in conventional agricultural systems. The studies also showed that regenerative agricultural practices can help olive trees and other trees affected by Xylella Fastidiosa to fend off the brunt of the disease and

continue to bear fruit. They also found that regenerative agricultural practices helped to reduce the spread of Xylella Fastidiosa by reducing the populations of insect vectors that transmit the bacterium.
We believe that the regenerative agricultural practices that we are implementing on our project will help to protect our olive trees from Xylella Fastidiosa infection and allow them to continue to bear fruit. By assisting farmers diversify their crops, planting associated plants and trees we can assist with creating more biodiversity which will provide a natural defense mechanism towards the bacterium's vector insects and generally provide a more holistic protection. These combined actions will help to ensure the long-term sustainability of our project and the permanence of the greenhouse gas emission mitigations that it generates. We are committed to working closely with the community and stakeholders to ensure the success of our project and the long-term well-being of the environment.

Additional Backstops and Mitigation Tool

In addition to this, as a project committed to a long-lasting efficacy of our project activities, for an additional portion of the credits generated by the adoption of our project activities, we have implemented a unique credit distribution strategy to motivate farmers, enhance risk mitigation, and align stakeholders' interests with the project's long-term sustainability.
These special credits are named "Participation Credits." This strategy involves setting aside an additional 10% of the credits during the first 5 years of the project, which are then distributed to them at the end of year 5, 10, and 15 in the following percentages: 25% at the end of year 5, 25% at the end of year 10 and the final 50% at the end of year 15. This strategy is motivated based on these aspects:

Motivation for Long-term Engagement
Incentivizing Farmers: By distributing Investment Credits at the end of year 5, 10, and 15, we encourage farmers to follow the project's sustainable practices for a minimum of 5 years and ideally throughout the entire 15-year credit period. This not only ensures the continuity of positive environmental impact but also supports the long-term success of the project.

Enhanced Risk Mitigation
Additional Insurance: Our credit distribution strategy serves as an extra level of insurance for both credit buyers and the project itself, particularly in the unlikely event that project participants abandon the project. This additional protection ensures financial stability and security for all stakeholders.

Participation in Market Growth
Linking to Market Growth: By allowing farmers to sell Investment Credits in 5, 10, and 15 years, we connect them to the potential growth of the project and the carbon credit market as a whole. This aligns their interests with the project's success and the expected growth in the price of carbon credits, providing them with an opportunity to benefit from evolving market dynamics.

Carbon Credit Management and Preservation to ensure the Project Longevity

To ensure the carbon credits generated from the project activity remains permanent and enrolling farmers stay with the project activity, the Project Proponent has taken two new approaches, which are described below.

Carbon Credit Separation: To ensure transparency and distinguishability, we keep Investment Carbon Credits in a separate account. This clear separation prevents any commingling with regular carbon credits and maintains their distinct identity.
Preservation Mechanism: We also employ a FIFO (First-In-First-Out) mechanism to "refresh" the credits every year. This process replaces the oldest vintage credits with newer vintage Participation Carbon Credits. This proactive approach safeguards the intrinsic value of the overall credits, ensuring their continued relevance and attractiveness to stakeholders.

This comprehensive strategy not only motivates long-term project participation and offers security but also positions stakeholders to benefit from the growth of the carbon credit market, all while preserving the value of the Investment Credits through careful management.
The proposed schema may be best visualized as in the two following Figures 18, 19. The composition of buffer percentage and the distribution mechanism.

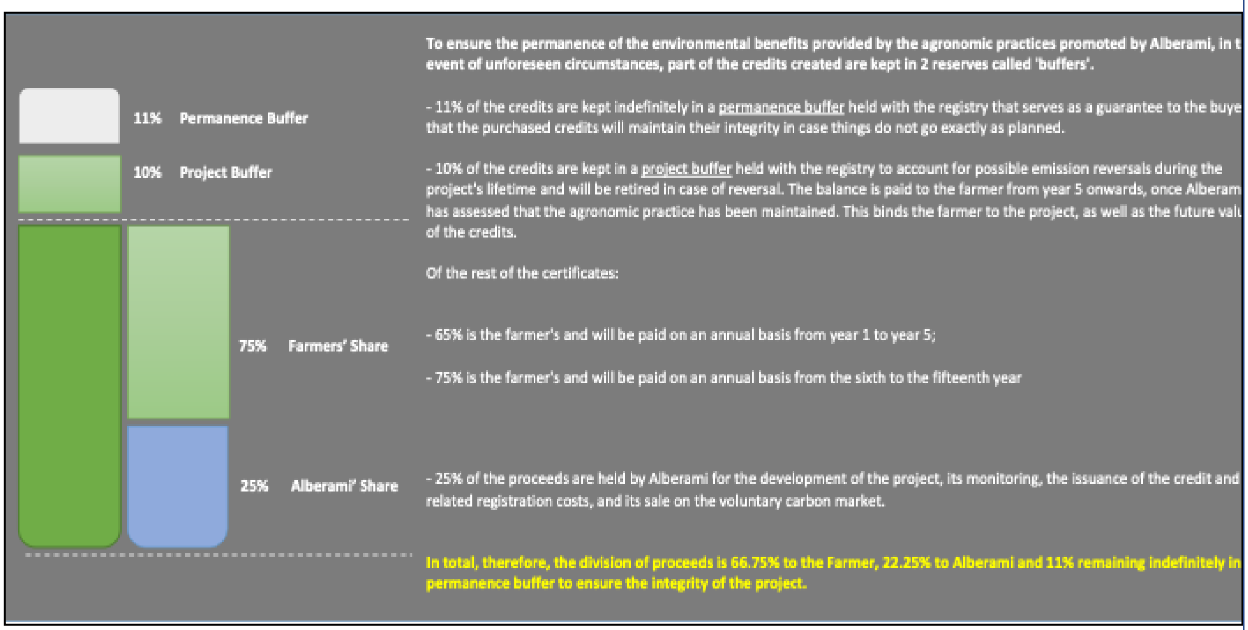


Figure 18: The proposed schema with buffer.

This proposed schema turns into the following carbon credits flow, that could be parted in three different periods, from the year 1-5, from the year 6 to 10 and from the year 11-15, as the following.

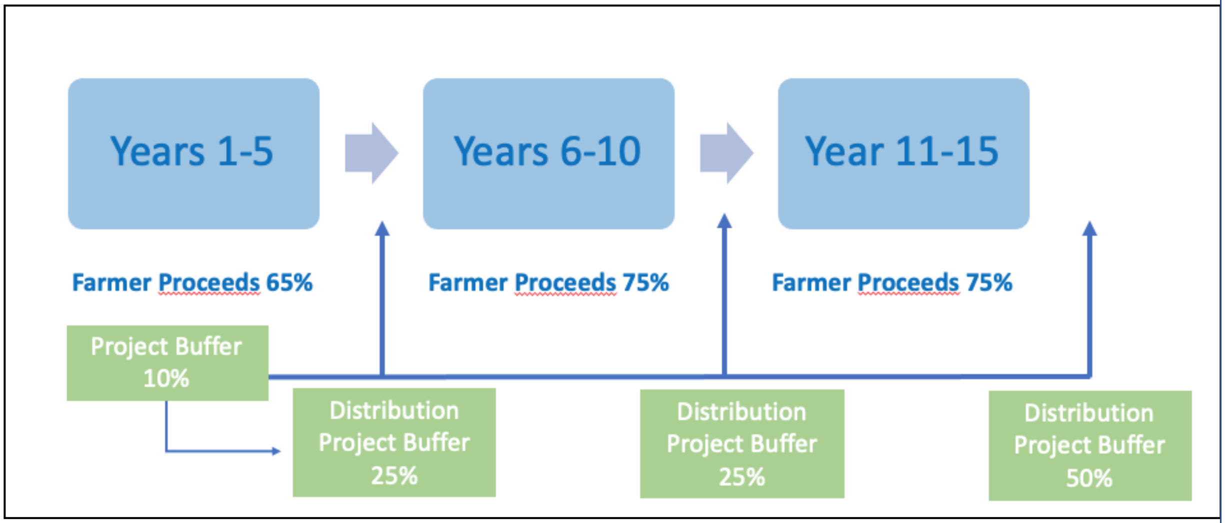


Figure 19: The proposed schema with three different periods.

Permanence risk (%)	10%

9. Management of data quality

The Project Developer has put in place procedures in order to establish roles and responsibilities of the personnel involved in the project activity and to guarantee that these personnel have knowledge of the project activities management and technical requirements with the aim to support these activities, as well as a quality assurance and quality control procedures applied in accordance with the registered monitoring plan.

In that sense, project participants must undergo annual GHG assessments, performed by ALBERAMI. The monitoring procedure and reporting structure should be aligned to what is required in this methodology and ISO 14064:2 (2019); as such, the methods for measuring, recording, storing, and reporting data are as follows:

Data collection and storage:

- All client data and resources are stored on a secure cloud-based storage system.
- Primary data collected from the farms and the accuracy/credibility of on-farm measurements and records are evaluated for their reliability according to their source material.
- Input data is benchmarked against industry data and global standards; if data falls outside the expected benchmark range, further information and validation are requested from farmer.
- ALBERAMI will assess the quality and reliability of input data and apply the determined uncertainty factor to the outcome of each GHG emission source and sink. The impact of the uncertainty is then discussed with the project participant to determine if they wish to initiate additional efforts to source more reliable data.
- ALBERAMI will conduct annual site visits to participating farms to provide data storage/reporting training and ensure the project activities are correctly implemented.
- ALBERAMI will remain in contact with Project Implementation Partners throughout the year and will assist with data collection and provide technical guidance.

Soil sampling:

All soil samples should be taken in compliance with ALBERAMI's internal protocol, and analysis must be performed by an accredited laboratory.

Copies of the original lab report should be stored, along with evidence of sample location.

Evaluation of the quality of SOC data according to several criteria, including variation (standard error) between samples and the number of soil samples taken will be done.

Quality assurance and control:

The ALBERAMI team and its partners consist of experts in the fields of soil fertility, agricultural science, sustainable agriculture, agronomists, carbon accounting, and environmental science. All members of the scientific team possess no less than a master's degree in their respective field and minimum of 5-years' experience.

Annual GHG assessments are internally reviewed against rigorous criteria before the farm input data collection form, GHG emission/removal calculations, and detailed report is audited by a third-party.

10. Monitoring

Purpose of monitoring

Monitoring of the project activity is essential to maintain the quality of work and outputs, ensuring the integrity of the credits. It helps in tracking the progress of the project against the planned objectives and timelines. Additionally, data for the parameters collected during monitoring will be verified to ensure the accurate issuance of carbon credits.List of parameters being measured and monitored.
The last parameters that will be monitored have been described in section 10.3 of the ICR PDD.
Types of data and information to be reported, including units of measurement and origin of data including monitoring methodology.

Enhanced Monitoring Parameters:
1) Soil Organic Carbon (SOC) and Biomass: Quantify SOC changes and biomass using detailed models and high-resolution imagery. Incorporate parameters such as vegetation cover, soil moisture levels, and land-use change indicators.
2) Implementation of Agricultural Practices: Assess the effectiveness and adherence to sustainable practices through temporal and spatial analysis of remote sensing data.

Advanced Monitoring Methodology:
1) Remote Sensing Activities:

- High-Resolution Satellite Imagery: Utilize Sentinel 2 and potentially other satellites to capture multispectral imagery. This imagery will be pivotal for identifying field boundaries, assessing crop health, and determining cover crop extents through vegetation indices like NDVI (Normalized Difference Vegetation Index).
- Temporal Analysis: Conduct seasonal and annual analyses to track changes in land use, crop rotation patterns, and the effectiveness of regenerative agricultural practices.
- Geospatial Analysis: Apply GIS tools to integrate various data layers, including satellite imagery, field surveys, and model outputs, for comprehensive spatial analysis.
- A time series of Sentinel-2 image, and Light Detection and Ranging (LiDAR) collection will be acquired to generate a geographical database containing Normalized Difference Vegetation Index (NDVI), Simple Ratio Index (SMI), Normalized Burn Ratio (NBR), Soil-Adjusted Vegetation Index (SAVI), Optimized Soil-Adjusted Vegetation Index (OSAVI), and VARI values for the five years preceding project implementation. This baseline remote sensing data will be used to identify the presence or absence of cover crops in each field.
- To accurately assess cover crop presence, the period during which the main crop grows will be excluded based on the crop calendar. The best index result (NDVI, SMI, NBR, SAVI, OSAVI, or VARI) values from the remaining period will be used to determine cover crop presence.
- To further validate the remote sensing-based cover crop assessments, data gathered from local farmers in the area, government agencies, research institutes, universities, NGOs, and scientific literature will be compared and integrated. This triangulation of data sources will enhance the accuracy and reliability of cover crop presence identification.

2) Modeling Using RothC:

- Model Calibration: Customize the RothC model parameters based on local soil types, climate data, and cropping patterns to enhance prediction accuracy.
- Data Inputs: Incorporate detailed land management records, including planting dates, crop types, tillage practices, and organic matter inputs, into the RothC model.
- Simulation Runs: Perform simulations to predict long-term changes in SOC under different management scenarios and climate change projections.
- Sensitivity Analysis: Assess the impact of various factors on SOC sequestration, identifying key levers for enhancing carbon storage.

3) Verra's VM0042 measure and model (Quantification approach 1 from VM0042):

- Utilizing a biogeochemical, process- based model to estimate GHG fluxes related to changes in Soil Organic Carbon (SOC), soil methanogenesis, and the use of nitrogen fertilizers and nitrogen- fixing species.
- Inputs include edaphic characteristics, actual agricultural practices, measured initial SOC stocks, and climatic conditions in sample fields.
- Conduct periodic measurements of SOC stocks every five years at a minimum.

Table 7: Guidance on collection of model inputs, where required by the model selected, for Quantification Approach 1 for the project scenario.

Model Input Category	Timing	Approach
SOC content and bulk density to calculate SOC stocks	Determined at project start via direct measurements at t = 0 or (back-) modeled to t = 0 from measurements collected within ±5 years of t = 0. Subsequent measurements are required every five years or more frequently.	Directly measured via conventional analytical laboratory methods — for example dry combustion or proximal sensing techniques (INS, LIBS, MIR and Vis- NIR) — with known uncertainty, following the criteria in Appendix 4 and VMD0053 guidance. See parameter table for SOCwp,i,t .
Soil properties (other than bulk density and SOC)	Determined ex ante	Measured or determined from published soil maps with known uncertainty. Estimates from direct measurements must: 1) Be derived from representative (unbiased) sampling; and 2) Ensure accuracy of measurements through adherence to best practices (to be determined by the project proponent and outlined in the monitoring plan).

Climate variables (e.g., precipitation, temperature)	Continuously monitored ex post	Measured for each model- specific meteorological input variable at its required temporal frequency (e.g., daily) for the model prediction interval. Measurements are taken at the closest continuously monitored weather station not exceeding 50 km from the sample field, or from a synthetic weather station (e.g., PRISM 32).
ALM activities (as identified following procedures in VMD0053, referencing categories of practices outlined in Applicability Condition 1)	Monitored ex post	Required model inputs related to ALM practices will be monitored and recorded for each project year t. Information on ALM practices will be monitored via consultation with, and substantiated with a signed attestation from, the farmer or landowner of the sample unit. Any quantitative information (e.g., discrete or continuous numeric variables) on ALM practices must be supported by one or more forms of documented evidence pertaining to the selected sample field and relevant monitoring period (e.g., management logs, receipts or invoices, farm equipment specifications). Units for quantitative information will be based on model input requirements.

4) AR- AMS0007 Simplified baseline and monitoring methodology for small scale CDM afforestation and reforestation project activities implemented on lands other than wetlands:

Table 8: Guidance on collection of model inputs, where required by the model selected, for Quantification Approach 2 for the project scenario.

Project Activity	Parameters Monitored	Method	Tools
New Planting: Vine - Conversion from annual crop to vineyard plantation	- Area of land planted - Species, age, density of planted trees - Survival rate of planted trees - Aboveground and belowground biomass	- Remote sensing of planted area - Field surveys to record species, age, density - Field surveys to count surviving vines - Allometric equations to estimate biomass [1]	- Satellite/aerial imagery - Field monitoring
New Planting: Orchard - Conversion from annual crop to orchard plantation	- Area of land planted - Species, age, density of planted trees - Survival rate of planted trees - Aboveground and belowground biomass	- Remote sensing of planted area - Field surveys to record species, age, density - Field surveys to count surviving trees - Allometric equations to estimate biomass	- Satellite/aerial imagery - Field monitoring
New Planting: Olive Trees - Conversion from annual crop to olive plantation	- Area of land planted - Species, age, density of planted trees - Survival rate of planted trees - Aboveground and belowground biomass	- Remote sensing of planted area - Field surveys to record species, age, density - Field surveys to count surviving trees - Allometric equations to estimate biomass	- Satellite/aerial imagery - Field monitoring

New Planting: Other Woody Perennial Species - Conversion from annual crop to other plantation	- Area of land planted - Species, age, density of planted trees - Survival rate of planted trees - Aboveground and belowground biomass	- Remote sensing of planted area - Field surveys to record species, age, density - Field surveys to count surviving trees - Allometric equations to estimate biomass	- Satellite/aerial imagery - Field monitoring
Cropland or conversion of cropland with annual crops to grassland/pastureland or permanent crops - Conversion of cropland or transformation from annual crops to grassland/pastureland or permanent crops.	- Area of land converted - Species of grass/pasture - Aboveground and belowground biomass	- Remote sensing of planted area - Field surveys to record species, age, density - Field surveys to count surviving trees - Allometric equations to estimate biomass	- Satellite/aerial imagery - Field monitoring
Improved Crop Rotations - Practice of growing different kinds of crops in recurrent succession on the same land	- Area under improved rotations - Crop species in rotation - Crop yields	- Remote sensing of planted area - Field surveys to record species, age, density - Field surveys to count surviving trees - Allometric equations to estimate biomass	- Satellite/aerial imagery - Field monitoring

The monitoring methodology follows the AR- AMS0007 methodology and uses remote sensing where possible to estimate parameters such as planted/converted area. Field monitoring is included to calibrate remote sensing, record species and management details, and estimate biomass using allometric equations as referenced in the methodology.

Monitoring roles and responsibilities, including procedures for authorizing, approving, and documenting changes to recorded data. The Monitoring roles and responsibilities is described below in the table 9.

Table 9: Monitoring roles and responsibilities.

	Role in the Monitoring, Reporting and Verification of the Project Activity
1	Project coordinator
2	MRV Manager
3	GIS /Remote Sensing Analyst
4	Data Analyst and Modeller
5	Lead Agronomist
6	Soil Scientist & Sampling Coordinator
7	Agronmist &
8	GIS / Remote Sensing Analist
9	Compliance and Legal Advisor
10	External Auditor or Verifier
11	Information Technology

The organogram hierarchy to smoothly manage the project activity is shown below (Figure 20):

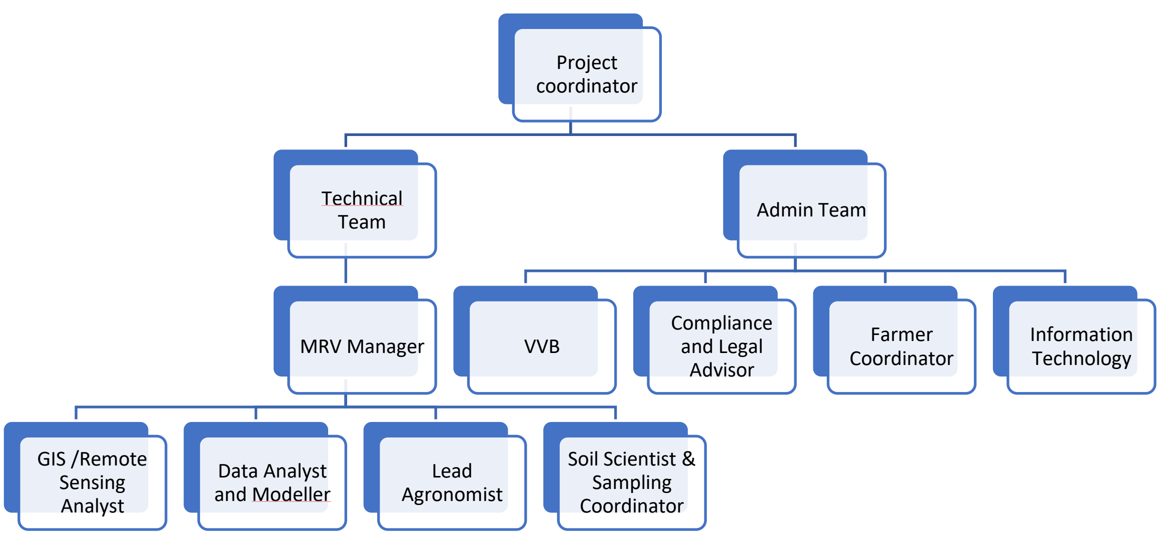


Figure 20: Project management organogram depicting project management hierarchy.

Controls that include internal data checks for input, transformation, and output, and procedures for corrective actions:

- Satellite Data Validation: Implement ground-truthing exercises to validate remote sensing findings. This involves field measurements of biomass, soil carbon stocks, and other relevant parameters to ensure satellite data accuracy.
- Model Verification: Regularly compare RothC model predictions with actual soil carbon measurements to refine the model over time.
- Data Integrity Protocols: Establish protocols for data collection, storage, and analysis to maintain the integrity and confidentiality of sensitive information.
- Independent Review: Engage external experts to periodically review the monitoring methodology, data quality, and model predictions to ensure robustness and transparency.

The mapping of Carbon Stock will be performed using soil sampling techniques in the field, coupled with models derived from Earth observation data. These models will be calibrated and validated using randomly sampled field data, with 75% of the samples designated for calibration and 25% for validation as referenced by VMD0053.

Earth Observation Data

The project will span three significant time milestones: the year 2024 marks the commencement of the project, 2027 signifies the inclusion of 100 thousand ha linked to the project, and by 2030, we aim to reach the milestone of 200 thousand ha, the maximum allowable area for the project. During this period, we will monitor the development of agroecological activities using satellite image data and field validations. This methodology will be repeated every 5 years as a way of monitoring the quality of the project's evolution and monitoring the evolution of parameters.

Baseline Remote Sensing Data

As part of our project's development, we will acquire a time-series of NDVI values for the five years preceding project implementation as baseline remote sensing data for each field. We will exclude the period during which the main crop grows based on the crop calendar and identify the presence or absence of cover crops based on the NDVI values from the remaining period. This information will be compared with data gathered from local farmers in the area, government agencies, research institutes, universities, NGOs and scientific literature.

Since determining the specific type of cover crop may not be feasible, we will focus on obtaining the number of winters during which cover crops were planted over the past five years. Subsequently, we will calculate the mean organic carbon (OC) input for a cover crop based on data for cover crops typical for Italy.

The detailed procedure is as follows:

1. Obtain time-series of NDVI values from Google Earth Engine: For the designated study area, during the defined time period (2018.01.01–2023.12.31), and ensuring cloud cover is less than 85%, we will collect datasets including Landsat 7 Surface Reflectance (SR) dataset, Landsat 8 SR dataset, and Sentinel 2 SR dataset. Finally, we will export the time-series of NDVI values for the five-year period in CSV format.
2. Remove NDVI values for the period during which the main crop grows (based on crop types and crop calendar): We will collect data from multiple sources, such as the Italian Weather Service (https://www.meteoam.it/it/home), to establish a crop calendar for each crop type. We will require only the start time of sowing and the date of harvest to remove NDVI data for the period between these two dates.
3. Determine the type of crop (summer/winter): We will reclassify all crops into summer and winter categories, considering that cover crops can only be grown during the winter preceding a summer crop.
4. Calculate the mean NDVI value for the period without a main crop. If the mean NDVI exceeds 0.4 during this period, it will be counted as 1; otherwise, it will be counted as 0. The sum of these values will represent the number of cover crop seasons during the five years.

This approach will result in the creation of an NDVI time series graph for each field, illustrating the organic carbon (OC) input for cover crops.

10.1 Monitoring plan

Advanced Monitoring Methodology:

Remote Sensing Activities:

- High-Resolution Satellite Imagery: Utilize Sentinel 2 and potentially other satellites to capture multispectral imagery. This imagery will be pivotal for identifying field boundaries, assessing crop health, and determining cover crop extents through vegetation indices like NDVI (Normalized Difference Vegetation Index).
- Temporal Analysis: Conduct seasonal and annual analyses to track changes in land use, crop rotation patterns, and the effectiveness of regenerative agricultural practices.
- Geospatial Analysis: Apply GIS tools to integrate various data layers, including satellite imagery, field surveys, and model outputs, for comprehensive spatial analysis.
- A time series of Sentinel-2 image, and Light Detection and Ranging (LiDAR) collection will be acquired to generate a geographical database containing Normalized Difference Vegetation Index (NDVI), Simple Ratio Index (SMI), Normalized Burn Ratio (NBR), Soil-Adjusted Vegetation Index (SAVI), Optimized Soil-Adjusted Vegetation Index (OSAVI), and VARI values for the five years

preceding project implementation. This baseline remote sensing data will be used to identify the presence or absence of cover crops in each field.

- To accurately assess cover crop presence, the period during which the main crop grows will be excluded based on the crop calendar. The best index result (NDVI, SMI, NBR, SAVI, OSAVI, or VARI) values from the remaining period will be used to determine cover crop presence.
- To further validate the remote sensing-based cover crop assessments, data gathered from local farmers in the area, government agencies, research institutes, universities, NGOs, and scientific literature will be compared and integrated. This triangulation of data sources will enhance the accuracy and reliability of cover crop presence identification.

Modeling Using RothC:

- Model Calibration: Customize the RothC model parameters based on local soil types, climate data, and cropping patterns to enhance prediction accuracy.
- Data Inputs: Incorporate detailed land management records, including planting dates, crop types, tillage practices, and organic matter inputs, into the RothC model.
- Simulation Runs: Perform simulations to predict long-term changes in SOC under different management scenarios and climate change projections.
- Sensitivity Analysis: Assess the impact of various factors on SOC sequestration, identifying key levers for enhancing carbon storage.

Rigorous Quality Assurance:

- Satellite Data Validation: Implement ground-truthing exercises to validate remote sensing findings. This involves field measurements of biomass, soil carbon stocks, and other relevant parameters to ensure satellite data accuracy.
- Model Verification: Regularly compare RothC model predictions with actual soil carbon measurements to refine the model over time.
- Data Integrity Protocols: Establish protocols for data collection, storage, and analysis to maintain the integrity and confidentiality of sensitive information.
- Independent Review: Engage external experts to periodically review the monitoring methodology, data quality, and model predictions to ensure robustness and transparency.

Verra's VM0042 measure and model (Quantification approach 1):

- Utilizing a biogeochemical, process- based model to estimate GHG fluxes related to changes in Soil Organic Carbon (SOC), soil methanogenesis, and the use of nitrogen fertilizers and nitrogen- fixing species.
- Inputs include edaphic characteristics, actual agricultural practices, measured initial SOC stocks, and climatic conditions in sample fields.
- Conduct periodic measurements of SOC stocks every year at a minimum (refer to Table 1).

Table 10: Guidance on collection of model inputs, where required by the model selected, for Quantification Approach 1 for the project scenario.

Model Input Category	Timing	Approach
SOC content and bulk density to calculate SOC stocks	Determined at project start via direct measurements at t = 0 or (back-) modeled to t = 0 from measurements collected within ±5 years of t = 0. Subsequent measurements are required every five years or more frequently.	Directly measured via conventional analytical laboratory methods — for example dry combustion or proximal sensing techniques (INS, LIBS, MIR and Vis- NIR) — with known uncertainty, following the criteria in Appendix 4 and VMD0053 guidance. See parameter table for SOCwp,i,t .
Soil properties (other than bulk density and SOC)	Determined ex ante	Measured or determined from published soil maps with known uncertainty. Estimates from direct measurements must: 1) Be derived from representative (unbiased) sampling; and 2) Ensure accuracy of measurements through adherence to best practices (to be determined by the project proponent and outlined in the monitoring plan).
Climate variables (e.g., precipitation, temperature)	Continuously monitored ex post	Measured for each model- specific meteorological input variable at its required temporal frequency (e.g., daily) for the model prediction interval. Measurements are taken at the closest continuously monitored weather station not exceeding 50 km from the sample field, or from a synthetic weather station (e.g., PRISM 32).

ALM activities (as identified following procedures in VMD0053, referencing categories of practices outlined in Applicability Condition 1)	Monitored ex post	Required model inputs related to ALM practices will be monitored and recorded for each project year t. Information on ALM practices will be monitored via consultation with, and substantiated with a signed attestation from, the farmer or landowner of the sample unit. Any quantitative information (e.g., discrete or continuous numeric variables) on ALM practices must be supported by one or more forms of documented evidence pertaining to the selected sample field and relevant monitoring period (e.g., management logs, receipts or invoices, farm equipment specifications). Units for quantitative information will be based on model input requirements.

AR- AMS0007 Simplified baseline and monitoring methodology for small scale CDM afforestation and reforestation project activities implemented on lands other than wetlands (Quantification approach 2).

Table 11: AR- AMS0007 Parameters Monitored.

Project Activity	**Parameters Monitored**	**Method**	**Tools**
New Planting: Vine - Conversion from annual crop to vineyard plantation	- Area of land planted - Species, age, density of planted trees - Survival rate of planted trees - Aboveground and belowground biomass	- Remote sensing of planted area - Field surveys to record species, age, density - Field surveys to count surviving vines - Allometric equations to estimate biomass [1]	- Satellite/aerial imagery - Field monitoring

New Planting: Orchard - Conversion from annual crop to orchard plantation	- Area of land planted - Species, age, density of planted trees - Survival rate of planted trees - Aboveground and belowground biomass	- Remote sensing of planted area - Field surveys to record species, age, density - Field surveys to count surviving trees - Allometric equations to estimate biomass	- Satellite/aerial imagery - Field monitoring
New Planting: Olive Trees - Conversion from annual crop to olive plantation	- Area of land planted - Species, age, density of planted trees - Survival rate of planted trees - Aboveground and belowground biomass	- Remote sensing of planted area - Field surveys to record species, age, density - Field surveys to count surviving trees - Allometric equations to estimate biomass	- Satellite/aerial imagery - Field monitoring
New Planting: Other Woody Perennial Species - Conversion from annual crop to other plantation	- Area of land planted - Species, age, density of planted trees - Survival rate of planted trees - Aboveground and belowground biomass	- Remote sensing of planted area - Field surveys to record species, age, density - Field surveys to count surviving trees - Allometric equations to estimate biomass	- Satellite/aerial imagery - Field monitoring

Cropland or conversion of cropland with annual crops to grassland/pastureland or permanent crops - Conversion of cropland or transformation from annual crops to grassland/pastureland or permanent crops.	- Area of land converted - Species of grass/pasture - Aboveground and belowground biomass	- Remote sensing of planted area - Field surveys to record species, age, density - Field surveys to count surviving trees - Allometric equations to estimate biomass	- Satellite/aerial imagery - Field monitoring
Improved Crop Rotations - Practice of growing different kinds of crops in recurrent succession on the same land	- Area under improved rotations - Crop species in rotation - Crop yields	- Remote sensing of planted area - Field surveys to record species, age, density - Field surveys to count surviving trees - Allometric equations to estimate biomass	- Satellite/aerial imagery - Field monitoring

The monitoring methodology follows the AR- AMS0007 methodology and uses remote sensing where possible to estimate parameters such as planted/converted area. Field monitoring is included to calibrate remote sensing, record species and management details, and estimate biomass using allometric equations as referenced in the methodology.

10.2 Data and parameters remaining constant

All data and parameters listed below will be monitored according to the applicability of the methodology and may or may not be included in the report.

Data / Parameter	AR
Data unit	Percent
Description	Weighted average adoption rate.
Source of data	Calculated for the project across the group or all activity instances.
Value applied	Must be less than or equal to 20%
Justification of choice of data or description of measurement methods and procedures applied.	See section 7 of VM0042.
Purpose of Data	Common practice assessment.
Comments	This information will be taken through surveys and platform developed by ALBERAMI

Data / Parameter	Areaan
Data unit	Ha
Description	Area of proposed project-level adoption of each activity
Source of data	Farm records and project activity commitments
Value applied	The proposed project-level adoption of Activityan
Justification of choice of data or description of measurement methods and procedures applied.	See section 7 of VM0042.

Purpose of Data	Common practice assessment
Comments	This information will be taken through surveys and platform developed by ALBERAMI

Data / Parameter	EAan
Data unit	Percentage
Description	Adoption rate of the n largest most common proposed project activity in the region
Source of data	Publicly available information contained in agricultural census or other government (e.g., survey) data, peer-reviewed scientific literature, independent research data, or reports/assessments compiled by industry associations. If all of the above sources are unavailable, signed and date attestation statement from a qualified independent local expert.
Value applied	Conditional on data source.
Justification of choice of data or description of measurement methods and procedures applied.	See source of data above and Section 7 of VM0042.
Purpose of Data	Common practice assessment.
Comments	This information will be taken through surveys and platform developed by ALBERAMI

Data / Parameter	A0
Data unit	Unit area

Description	Project area
Source of data	Measured in project area
Value applied	The project area will be measured prior to validation. In the present project instance, it is 1474.89 ha.
Justification of choice of data or description of measurement methods and procedures applied.	Delineation of the project area may use a combination of GIS coverages, ground survey data, remote imagery (satellite or aerial photographs), or other appropriate data. Any imagery or GIS datasets used must be geo-registered referencing corner points, clear landmarks, or other intersection points.
Purpose of Data	Calculation of baseline and project emissions
Comments	This variable is measured when farmers provide the slots of farms and is then digitalized in shapefiles by GIS Analysts

Data / Parameter	$MB_{g,bsl,i,t}$
Data unit	t DM
Description	Annual dry matter, including aboveground and below ground, of N-fixing species g returned to soils for sample unit *i* at time *t*
Source of data	See Box 1 of VM0042
Value applied	See Box 1 of VM0042
Justification of choice of data or description of measurement methods and procedures applied.	See Box 1 of VM0042
Purpose of Data	Calculation of baseline emissions.

Comments	None

Data / Parameter	The Italian Portion of The Global Soil Organic Carbon Map (GSOCMAP)
Unit	tCha-1
Description	The Global Soil Organic Carbon map for Italy estimates soil organic carbon stock (CS) at 0-30 cm depth, using data from 1990-2013. With 6748 sampled points, corrected SOC values and estimated bulk density, the map employs interpolation methods like neural networks and GLM, validated with MAE and RMSE statistics. Contact for data inquiries is available through the Research Centre for Agriculture and Environment (CREA).
Origin of data	CREA (Consiglio per la Ricerca in Agricoltura e l'analisi dell'Economia Agraria) - Italy
Value applied	NA
Justification of choice of data or description of measurement methods and procedures applied	The choice of data source for the Italian portion of the Global Soil Organic Carbon Map (GSOCmap) was justified based on its Research Centre for Agriculture and Environment (CREA), which is are significant soil data owner in Italy. The dataset, comprising 6748-point samples collected between 1990-2013, utilized soil organic carbon (SOC) values obtained through rigorous methods such as the Springer and Klee and flash combustion elemental analyzer methods, with correction applied to Walkey and Black method values. Bulk density (BD) measurements were conducted using undisturbed sampling, the core method, and the pit method. Mapping was achieved through Neural Networks and Generalized Linear Models (GLM), with validation statistics including Mean Absolute Error (MAE) and Root Mean Squared Error (RMSE) indicating robustness. The responsible entity for data maintenance and inquiries is the Research Centre for Agriculture and Environment (CREA), with contact provided via edoardo.costantini@crea.gov.it.
Purpose of Monitoring	☒ Calculation of baseline emissions ☐ Calculation of project emissions ☐ Calculation of leakage
Comments	The methodology used to model the data between 2013 and 2021 was based on the RothC model, considering that the available data referred to the period of point sample collection between 1990 and 2013. We applied the RothC model to model the data for the interval between 2013-2021 using inputs related to the land use history for the initial properties. The baseline scenario for soil organic carbon (SOC) stock was calculated as an average between 1990 and 2013 (Fantappie et al., 2018). Therefore, it was necessary to model the carbon dynamics for the period between 2014 and 2020. Environmental variables were extracted using the Google Earth Engine for this period and for the following period (2021-2023). Carbon inputs for the first period were treated as constant and corresponded to the expected input for olive tree crops (0.06 per month), based on the table of agricultural practice inputs. Subsequently, each property had its carbon inputs increased depending on the implemented practice.

Data / Parameter	500-meter grid of Derived Soil Profiles (DSP) for Italy - SuoliCella500
Unit	Sand (%) Silt (%) Clay (%) Soil Depth (cm)
Description	National database of Italian Soil Typological Units (STU) and corresponding Derived Soil Profiles (DSP) obtained on a 500 meters grid (1,109,672 points) by neural network. The most probable WRB Reference Soil Group (RSG), WRB Qualifiers, and USDA textural soil types were mapped on the 500 meters grid, by neural network. 18,707 Observed soil profiles and the respective 33,014 Soil Horizons were grouped into 4,472 STUs based on the combinations of Soil Region, WRB Reference Soil Group (RSG), WRB Qualifiers, and USDA textural soil types obtained on the 500 meters grid. Statistics were calculated (Mean Value, Standard Deviation Value, and Numerosity) for soil rooting depth and for the most common analytical parameters of the soil horizons (Coarse fragment content fraction; pH in water; Carbon (C) - organic; Carbonate (CO3--) - Total; Clay, Sand, and Silt fraction; Granulometry; Textural soil types). The 500 meters grid adopts EPSG 23032 (ED50 UTM-32). A reference scale of 1:250.000 may be attributed to the 500-meters grid map, on the base of the numerosity of DSP produced for the whole Italian territory.
Origin of data	CREA Consiglio per la ricerca in agricoltura e l'analisi dell'economia agrarian - Italy
Value applied	NA
Justification of choice of data or description of measurement methods and procedures applied	A 500-meter grid of Derived Soil Profiles (DSP) for Italy - SuoliCella500 contains data and information about soil characteristics throughout the territory of Italy. The data was selected for being official and containing information such as Sand (%), Silt (%), Clay (%), and Soil Depth (cm). The responsible entity for data maintenance and inquiries is the Research Centre for Agriculture and Environment (CREA), with contact provided via edoardo.costantini@crea.gov.it.
Purpose of Monitoring	☒ Calculation of baseline emissions ☐ Calculation of project emissions ☐ Calculation of leakage
Comments	NA

10.3 Data and parameters monitored

Data / Parameter	AR
Data unit	Percent
Description	Weighted average adoption rate
Source of data	Calculated for the project across the group or all activity instances
Description of measurement methods and procedures to be applied	Not applicable
Frequency of monitoring/recording	Whenever a new instance is added
Value applied	Variable
Monitoring equipment	N/A
QA/QC procedures to be applied	See Section 7 of VM0042
Purpose of data	Common practice assessment
Calculation method	See Section 7 of VM0042
Comments	None

Data / Parameter	Areaan
Data unit	Unit area

Description	Area of proposed project-level adoption of each activity
Source of data	Farm records and project activity commitments
Description of measurement methods and procedures to be applied	The area is estimated prior to verification
Frequency of monitoring/recording	Whenever a new instance is added
Value applied	Variable
Monitoring equipment	N/A
QA/QC procedures to be applied	Delineation of the sample unit area may use a combination of GIS coverages, ground survey data, remote imagery (satellite or aerial photographs), or other appropriate data. Any imagery or GIS datasets used must be geo-registered referencing corner points, clear landmarks or other intersection points.
Purpose of data	Common practice assessment
Calculation method	N/A
Comments	None

Data / Parameter	EAan
Data unit	Percent
Description	Adoption rate of the n largest most common proposed project activity in the region

Source of data	Publicly available information contained in agricultural census or other government (e.g., survey) data, peer-reviewed scientific literature, independent research data, or reports/assessments compiled by industry associations. If all the above sources are unavailable, signed and date attestation statement from a qualified independent local expert
Description of measurement methods and procedures to be applied	N/A
Frequency of monitoring/recording	Whenever a new instance is added
Value applied	Variable
Monitoring equipment	N/A
QA/QC procedures to be applied	See Section 7 of VM0042
Purpose of data	Common practice assessment
Calculation method	N/A
Comments	None

Data / Parameter	A_i
Data unit	Unit area
Description	Area of sample unit *i*
Source of data	Determined in project area

Description of measurement methods and procedures to be applied	The sample unit area is measured prior to verification
Frequency of monitoring/recording	Monitoring must be conducted at least every five years, or prior to each verification event if less than five years
Value applied	Variable
Monitoring equipment	N/A
QA/QC procedures to be applied	Delineation of the sample unit area may use a combination of GIS coverages, ground survey data, remote imagery (satellite or aerial photographs), or other appropriate data. Any imagery or GIS datasets used must be geo-registered referencing corner points, clear landmarks or other intersection points.
Purpose of data	Calculation of baseline and project emissions
Calculation method	N/A
Comments	None

Data / Parameter	$SOC_{bl,I,t-1}$
Data unit	t CO_2e/unit area
Description	Areal-average soil organic carbon stocks in the baseline scenario for sample unit *i* in year *t-1*
Source of data	Measured in project area
Description of measurement methods and procedures to be applied	See $SOC_{bl,I,t}$ above

Frequency of monitoring/recording	Monitoring must be conducted at least every five years, or prior to each verification event if less than five years.
Value applied	Variable
Monitoring equipment	Soil sampling equipment
QA/QC procedures to be applied	See $SOC_{bl,I,t}$ above
Purpose of data	Calculation of baseline emissions
Calculation method	N/A
Comments	Specific parameters pertaining to SOC sampling are detailed in VM0042

Data / Parameter	$\Delta C_{TREE,bsl,i,t}$ and $\Delta C_{SHRUB,bsl,i,t}$
Data unit	t CO_2e/unit area
Description	Change in carbon stocks in trees and shrubs in the baseline
Source of data	Determined in project area
Description of measurement methods and procedures to be applied	Calculated using the CDM A/R Tools Estimation of carbon stocks and change in carbon stocks of trees and shrubs in A/R CDM project activities and Simplified baseline and monitoring methodology for small scale CDM afforestation and reforestation project activities implemented on lands other than wetlands.
Frequency of monitoring/recording	First measuring will be carried out in 2023 and on-site monitoring will be conducted prior to each verification event. On top of that remote monitoring will be done each year.

Value applied	Variable
Monitoring equipment	N/A
QA/QC procedures to be applied	See description of measurement methods and procedures to be applied
Purpose of data	Calculation of baseline emissions
Calculation method	See description of measurement methods and procedures to be applied
Comments	None

Data / Parameter	Reference evapotranspiration (ASCE Penman-Montieth)
Unit	mm
Description	evapotranspiration (ASCE Penman-Montieth)" refers to a dataset provided by Idaho EPSCoR and TERRACLIMATE. It represents reference evapotranspiration calculated using the ASCE Penman-Montieth method. Evapotranspiration is the combined process of water evaporation from the soil surface and transpiration from plant leaves. The ASCE Penman-Montieth method is a widely used approach for estimating reference evapotranspiration, which is the amount of water that would evaporate from a well-watered grass surface under specified climatic conditions. This dataset is valuable for understanding water dynamics in various ecosystems and for applications in agriculture, hydrology, and climate research.
Origin of data	The data/parameter "IDAHO_EPSCOR/TERRACLIMATE Reference
Monitored value	Reference evapotranspiration per farm polygon
Justification of choice of data or description of measurement methods and procedures applied	Availability of monthly data for all of Europe
Monitoring frequency	monthly
Purpose of data	☒ Calculation of baseline emissions ☐ Calculation of project emissions ☐ Calculation of leakage

Quality assurance and control	NA
Comments	NA

Data / Parameter	MODIS Temperature
Unit	degrees Celsius
Description	The MOD11A2.061 dataset provides global coverage of land surface temperature (LST) and emissivity data derived from Terra satellite observations. With an 8-day temporal resolution and a spatial resolution of 1 kilometer, it offers valuable insights into surface energy balance, environmental changes, and ecosystem dynamics. Widely used in climate research, agriculture, hydrology, and environmental monitoring, this dataset aids in studying land surface processes, urban heat islands, drought conditions, and vegetation health. Overall, it serves as a crucial resource for understanding land surface dynamics and climate-related phenomena at regional and global scales.
Origin of data	MODIS/061/MOD11A2
Monitored value	MOD11A2.061 Terra Land Surface Temperature and Emissivity 8-Day Global 1km
Justification of choice of data or description of measurement methods and procedures applied	Availability of monthly data for all of Europe
Monitoring frequency	monthly
Purpose of data	☒ Calculation of baseline emissions ☐ Calculation of project emissions ☐ Calculation of leakage
Quality assurance and control	NA
Comments	NA

Data / Parameter	CHIRPS Rainfall
Unit	mm/pentad
Description	The CHIRPS Pentad dataset, developed by the Climate Hazards Group, combines satellite infrared data with ground station observations to provide high-resolution precipitation estimates. It operates on a pentad (5-day) temporal resolution and offers global coverage. By integrating both satellite and ground-based data, CHIRPS Pentad enhances the accuracy and reliability of precipitation monitoring, making it valuable for various applications including drought monitoring, hydrological modeling, and

	agricultural planning. This dataset serves as a crucial tool for assessing climate-related hazards and supporting decision-making processes in areas vulnerable to precipitation variability.
Origin of data	UCSB-CHG/CHIRPS/PENTAD
Monitored value	Provide estimation on value
Justification of choice of data or description of measurement methods and procedures applied	Justify the choice of data source, providing references where applicable. Where values are based on measurement, include a description of the methods and procedures applied, including estimation, modeling, measurements, calculation approach and uncertainty. More detailed information may be provided in an appendix.
Monitoring frequency	monthly
Purpose of data	☒ Calculation of baseline emissions ☐ Calculation of project emissions ☐ Calculation of leakage
Quality assurance and control	NA
Comments	NA

Data / Parameter	i) Soil Organic Matter (SOM) (%)
Unit	%
Description	i) Soil Organic Matter (SOM) (%): Soil Organic Matter refers to the amount of organic material present in the soil, typically expressed as a percentage of the soil's total weight. It includes decomposed plant and animal residues, microorganisms, and other organic materials. SOM plays a crucial role in soil fertility, structure, and nutrient cycling.
Origin of data	field collections
Monitored value	NA
Justification of choice of data or description of measurement methods and procedures applied	Soil Organic Matter (SOM) (%): Measurement of SOM percentage can be carried out using methods such as the Walkley-Black method, loss on ignition (LOI), or dry combustion method. The chosen method should be validated and accredited, with uncertainty estimates provided. References to recognized standards, protocols, and previous studies validating the chosen methods can strengthen the justification for the data source. Additionally, transparency regarding the measurement procedures, calculation approaches, and associated uncertainties enhances the credibility and reliability of the soil data obtained.
Monitoring frequency	Annually

Purpose of data	☒ Calculation of baseline emissions ☐ Calculation of project emissions ☐ Calculation of leakage
Quality assurance and control	NA
Comments	NA

Data / Parameter	ii) Bulk Density (g/cm^3)
Unit	g/cm^3
Description	Bulk Density (g/cm^3): Bulk density represents the mass of soil per unit volume and is typically measured in grams per cubic centimeter (g/cm^3). It provides insights into soil compaction, porosity, and water retention capacity. Bulk density affects root penetration, soil aeration, and overall soil health.
Origin of data	field collections
Monitored value	NA
Justification of choice of data or description of measurement methods and procedures applied	Bulk Density (g/cm^3): Bulk density is typically measured using soil cores or cylinders collected from the field. The soil sample is oven-dried, weighed, and then volume is determined. The bulk density is calculated as the ratio of dry soil mass to its volume. Proper sampling techniques and calibration procedures should be followed to minimize measurement uncertainty. References to recognized standards, protocols, and previous studies validating the chosen methods can strengthen the justification for the data source. Additionally, transparency regarding the measurement procedures, calculation approaches, and associated uncertainties enhances the credibility and reliability of the soil data obtained.
Monitoring frequency	Annually
Purpose of data	☒ Calculation of baseline emissions ☐ Calculation of project emissions ☐ Calculation of leakage
Quality assurance and control	NA
Comments	NA

Data / Parameter	Organic Carbon (mg/kg)

Unit	mg/kg
Description	Organic Carbon (mg/kg): Organic carbon concentration in soil is measured in milligrams per kilogram (mg/kg). It represents the amount of carbon stored in organic matter within the soil. Organic carbon is a key component of soil organic matter and influences soil structure, water retention, nutrient availability, and microbial activity. Monitoring organic carbon levels is essential for assessing soil quality and ecosystem functioning.
Origin of data	field collections
Monitored value	NA
Justification of choice of data or description of measurement methods and procedures applied	Organic Carbon (mg/kg): Organic carbon content in soil can be measured using methods such as the Walkley-Black or loss on ignition (LOI) method. The laboratory should specify the method used, including details on sample preparation, heating temperatures, and calculation procedures. Uncertainty estimates should be provided for the reported values. References to recognized standards, protocols, and previous studies validating the chosen methods can strengthen the justification for the data source. Additionally, transparency regarding the measurement procedures, calculation approaches, and associated uncertainties enhances the credibility and reliability of the soil data obtained.
Monitoring frequency	Annually
Purpose of data	☒ Calculation of baseline emissions ☐ Calculation of project emissions ☐ Calculation of leakage
Quality assurance and control	NA
Comments	NA

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Appendix I

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