The Carbon Farming Program of Lithuania

Document Prepared by UAB Heavy Finance

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Prepared By	UAB Heavy Finance
Contact	Violeta Gevorkjan, Project Development Lead, UAB Heavy Finance address: Gedimino pr. 27, 01104 Vilnius, Lithuania tel: +37061414446 e-mail: violeta@heavyfinance.com web: www.heavyfinance.com

CONTENTS

1 Project Details

1.1 Summary Description of the Project

The Carbon Farming Program of Lithuania is a collaboration between UAB Heavy Finance, operating under the brand name HeavyFinance, and local farmers. This program uses private funding to promote sustainable land management practices in agriculture, with the goal of creating a long-term shift towards climate change mitigation and biodiversity-friendly farming methods.

The main objective of HeavyFinance is to assist farmers in overcoming obstacles that hinder their adoption of sustainable land management practices. HeavyFinance provides financial support, scientific knowledge, training, and technical assistance to aid the successful implementation of climate mitigation strategies in farming. The HeavyFinance program will expand and eventually encompass various conservation-focused farming methods in Lithuania with the aim of transitioning from conventional agricultural practices to more durable and sustainable agrifood production systems.

The program seeks to compensate farmers for adopting agricultural land management practices that reduce greenhouse gas emissions (GHGs) and promote sustainability. By sharing the revenue from the sale of verified carbon units (VCUs) generated through verified emissions reductions and removals projects, farmers are incentivized to achieve a balance in economic, environmental, and social aspects. Improved agricultural land management practices and techniques focus on maintaining soil health and fertility by increasing the soil's organic carbon, reducing harmful gasses from chemical fertilizers, and adopting methods listed in Appendix 1 of the VM0042 methodology. These changes, listed below, accelerate the transition to more productive, yet sustainable farming agroecosystems.

- Reduced tillage
- Improved residue management
- Reduced fertilizer (inorganic) application
- Increased organic fertilizer application (e.g., manure, compost)
- Improved crop planting and harvesting techniques (crop rotations and cover crops)
- Monitoring crop health and nutritional status

The Carbon Farming Program of Lithuania[1] is a comprehensive initiative that generates GHG emission reductions or removals through agricultural land management practices. HeavyFinance's sustainability department manages the project's activities, which involve project management, partnerships, carbon science, engineering, software development, and more. The project uses a reliable infrastructure to produce verified carbon credits through farmer consultancy and outreach, data collection, soil sampling, QA/QC, modeling, and quantification. To estimate the GHG emission reductions/ removals, a biogeochemical RothC model is employed at various sample points during each reporting period. Default equations are used to quantify carbon pools and GHG sources to support the output of modeling results. The project accounts for all quantification results, including leakage, uncertainty, and buffer pool contributions.

The project only covers areas within the national boundary of the Lithuanian Republic, following a grouped project format specified by the VCS Standard, which involves multiple growers with multiple enrolled fields bundled as project instances. The project's aim is to encourage more farms to adopt regenerative practices and participate in the project. Each farmer is individually contracted with HeavyFinance for every field they enroll in the grouped project. Each project activity instance must demonstrate a beneficial change in soil organic carbon (SOC) storage flux or GHG emissions compared to fluxes that would have occurred under a baseline scenario.

As the project moves forward, new project instances are included and organized. Initially considering the project start date on May 1st, 2020, there have been approximately 60 farms with different land shapes, totaling 15,000 hectares. At the end of the first monitoring period on August 31, 2023, the total area of the GHG removal project was approximately 21,045 hectares of 74 farms, grouped into 39 family farms across the country.

This program is predicted to cut down on average 79,994 tons of carbon dioxide (tCO_2-eq) each year, and a total of 1,599,888 tons over the 20-year project crediting period. The activities are carried out and supervised based on the "VM0042 Methodology for Improved Agricultural Land Management (v2.0)" under VCS Sectoral Scope 14, AFOLU. The project can be credited for up to 20 years, with a possible extension period of 100 years.

1st Project Instance	No. of farmer groups	Total No. of entities	Total farm area (ha)
Total 1st instances	39 family groups	74 farms	21,045

[1] https://heavyfinance.com/carbon-farming/

1.2 Sectoral Scope and Project Type

The project falls under the sectoral scope 14: Agriculture, Forestry and Other Land Use (AFOLU). The category of the project is Agriculture Land Management (ALM). This project is developed using the methodology "VM0042 Methodology for Improved Agricultural Land Management (version 2.0)".

The type of the project activity is Improved Cropland Management (ICM) activity since the practices involved in the project activity demonstrably reduce net GHG emissions of cropland systems by increasing soil carbon stocks and reducing N_2O emissions.

The project is a Grouped project.

1.3 Project Eligibility

This project fulfills all the eligibility criteria mentioned in VCS Standard v4.4 appendix A1.2 for AFOLU Projects.

Eligible ALM activities include Improved Cropland Management. This category includes practices that demonstrably reduce net GHG emissions of cropland systems by increasing soil carbon stocks and reducing soil N_2O emissions. The project focuses on introducing such practices that will contribute to reducing net GHG emissions. Furthermore, it meets the eligibility criteria as the croplands involved in the project have remained unchanged for the past ten years and are not part of any wetland.

The reduction/removal of the mentioned GHG would not have been possible without the implementation of the planned activities of this project, therefore, making this project eligible under the requirements of the VCS Standard and the methodologies for reducing and eliminating GHG emissions

Criterion	Fulfilled (Yes/No)	Justification
The six Kyoto Protocol greenhouse gasses	Yes	The practices demonstrably reduce net GHG emissions of cropland systems by increasing soil carbon stocks and reducing N_2O emissions, which belong to the six Kyoto Protocol greenhouse gasses.
Ozone-depleting substances	Not applicable	The project activity does not involve any Ozone-depleting substances.
Project activities supported by a methodology approved under the VCS Program through the methodology approval process	Yes	The project activity is supported by the VCS methodology VM0042 - ”Methodology for Improved Agricultural Land Management” (version 2).
Project activities supported by a methodology approved under an approved GHG program unless explicitly excluded	Yes	The project activity is supported by the VCS methodology VM0042. The project activity does not belong to any project categories which are excluded by the VCS program.
Jurisdictional REDD+ programs and nested REDD+ projects as set out in the VCS program document Jurisdictional and Nested REDD+(JNR) Requirements	Not applicable	The project activity is not a jurisdictional REDD+ program. The criterion is not applicable.

1.4 Project Design

This project is meant to include multiple instances of project activities organized as a group. According to VCS terminology, a project activity instance refers to a group of farms that adopt a set of Agricultural Land Management (ALM) activities outlined in the Project Description.

As more farms adopt ALM practices and join the project, additional project activity instances (fields) will be added, following the guidelines in the VCS Standard for grouped projects. The project will be validated based on initial activity instances across the Republic of Lithuania.

☐ The Project includes a single location or installation only

☐ The project includes multiple locations or project activity instances, but is not being developed as a grouped project

☒ The project is a grouped project.

Eligibility Criteria

The Carbon Farming Program of Lithuania meets the eligibility criteria listed in section 4 of the VCS Methodology VM0042, Version 2.0.

New project instances can be added to grouped projects after initial validation according to the VCS Standard v4.4. However, these instances must meet specific eligibility criteria, including being located within the political boundaries of Lithuania, complying with at least one type of regenerative farming practice, and providing sufficient technical, financial, and geographic information for monitoring and verification. Evidence of project activities must also be provided from the start date of each activity, which cannot be earlier than the grouped project start date of 1st May, 2020. Additionally, activities can only be credited for GHG emission reductions or removals generated during the project crediting period, not for any previous verification periods.

To join Lithuania's Carbon Farming Program, interested farmers can visit HeavyFinance's website, which has integrated information about the program. The farmers undergo an initial interview with a representative from the Sustainability Department to ensure they meet the requirements of the eligibility criteria as set out for the grouped project. Following the initial stages, the Project Proponent evaluates the proposed instance cases eligible for enrollment. This includes the following criterion:

- Located within project boundary
- The baseline data going back at least 3 years before inclusion (to demonstrate previous practices and to ensure that non-eligible practices and land use changes have not occurred for the last 10 years)

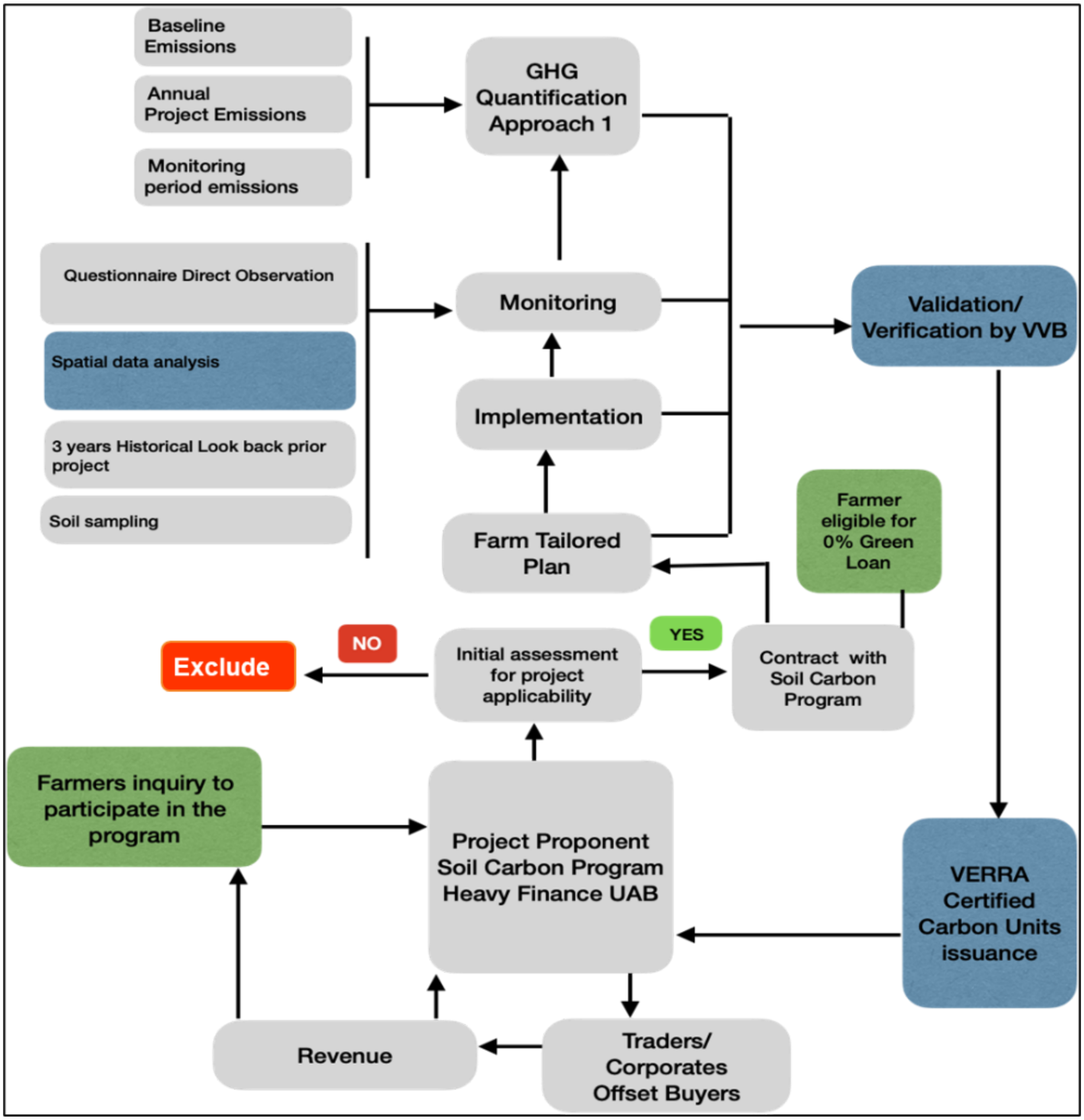
- The project includes IALM practices as eligible activities, excluding those that are ineligible, such as forestry and wetlands.

If the proposed project instances meet the eligibility criteria, the Project Proponent will proceed to sign a contract with the farmer that includes information about land tenure, commercial terms, commitment period, legal compliance, participation in other GHG schemes, and project activities. Once contracted, the farmers will undergo an extensive data collection procedure where comprehensive information about their farm will be filed:

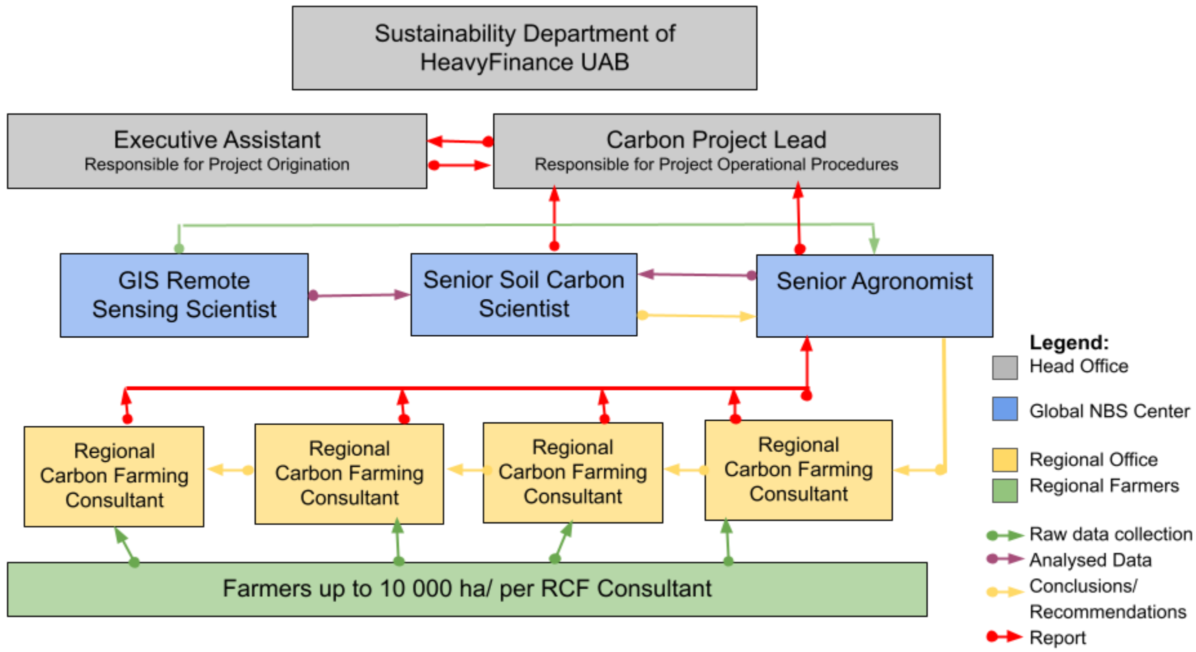
- The geospatial data for each proposed instance
- The agricultural practices (crop rotation, fertilization, land management practices)
- Soil data

Farmers who meet the requirements for participation in the project can take advantage of 0% interest loans managed by HeavyFinance UAB. By participating in The Carbon Farming Program of Lithuania, farmers are seen as low-risk borrowers because the project team provides constant supervision to ensure that the best agricultural practices are implemented. This helps to improve farming activities and build resilience to climate change effects like droughts, floods, and high and low temperatures. The scheme offers immediate financial benefits to farmers, helping them overcome financial barriers during their transition period. Farmers can use the funds to purchase new equipment and machinery and maintain their farm's cash flow throughout the season. It's important to note that this service is optional.

The purpose of the Carbon Farming Program of Lithuania is not to serve as the primary source of income for farmers. Instead, it aims to provide additional financial and technical assistance to encourage better land management practices that have positive impacts on the environment, society, and economy.



Picture 1. Project organization chart



Picture 2. Project staff and data flow chart

1.5 Project Proponent

Organization name	Heavy Finance UAB
Contact person	Violeta Gevorkjan
Title	Project Development Lead
Address	Gedimino pr. 27, 01104 Vilnius, Lithuania
Telephone	Tel: +37061414446
Email	e-mail: violeta@heavyfinance.com; web: www.heavyfinance.com

1.6 Other Entities Involved in the Project

No other entities are directly involved in the project implementation.

1.7 Ownership

UAB HeavyFinance is the developer of "The Carbon Farming Program of Lithuania" project (hereafter "the Project Proponent") and has the ownership and legal right to the project activities. The project ownership consists of a project 'Ownership Agreement' with each landowner or land lessee of the land within which the project activities lie. The Project Proponent has the ownership and legal right to develop and present the tasks leading to the GHG emission reduction and removal to VERRA on behalf of each landowner or land lessee, who has the legal right to control and operate the project activities at the farm level. This is demonstrated via the project 'Ownership Agreement' signed between each participating farmer and the Project Proponent. The Project Proponent is not expected to be the owner of the farm operations unless there is documented evidence that proves otherwise.

Legal title to the land: The legal title of the parcels of land belongs to the individual landowners who also have legal title deeds; the status of the land is private land. Copies of the land records are available from the landowners and can also be accessed through the Real Estate Registry of the Country. Additionally, land lessees who can provide evidence of long-term lease agreements or demonstrate a consistent history of short-term leases being renewed are eligible to participate in the project.

The ownership of The Carbon Farming Program of Lithuania has been granted to the Project Proponent via an 'Ownership Agreement' setting out:

An enforceable and irrevocable agreement with the holder of the statutory, property, or contractual right in the plant, equipment, or process that generates GHG emission reductions and/or removals which vests project ownership in the Project Proponent. An enforceable and irrevocable agreement with the holder of the statutory, property, or contractual right in the land, vegetation, or conservational or management process generates GHG emission reductions or removals that vests project ownership in the Project Proponent.

1.8 Project Start Date

The project officially began on **May 1st, 2020**. According to the VCS Standard (v4.4), the project start date for AFOLU projects signifies the commencement of activities aimed at reducing or removing greenhouse gas emissions. In this case, the project records show that improved land management practices were initiated as part of the program to reduce and remove GHGs starting from **May 1st, 2020**.

1.9 Project Crediting Period

The objective of the project instances under the proposed grouped project is primarily aimed at removing greenhouse gas emissions by increasing soil organic carbon stock along with reducing synthetic fertilization to avoid excessive N_2O and reducing fossil-derived CO_2 emissions from equipment and machinery combustion as part of the ALM practice.

According to VCS standard requirement for AFLOU projects, section 3.9.3 of VCS standard (v4.4), the program's crediting period should be a minimum of 20 years up to a maximum of 100 years, which may be renewed at most four times, with the total project crediting period not exceeding 100 years.

Therefore, the first crediting period chosen is 20 years, from **01/05/2020** *to* **30/04/2040** *(**both dates included**).* This crediting period may be renewed four times with the total project crediting period not exceeding 100 years.

1.10 Project Scale and Estimated GHG Emission Reductions or Removals

According to section 3.10 of VCS Standard (v4.4), projects are categorized by size according to their estimated average annual GHG emission reductions or removals. As per section 3.10.1 of VCS Standard (v4.4) project size categorizations are as follows:

1) Projects: Estimated average annual GHG emission reductions or removals of less than or equal to 300,000 tons of CO_2e per year.
2) Large projects: Estimated average annual GHG emission reductions of greater than 300,000 tons of CO_2e per year.

Project Scale	
Project	X
Large project	

Year	Estimated GHG emission reductions or removals (t CO_2-eq)
2020	25,453
2021	57,658
2022	68,112
2023	67,641
2024	77,587
2025	78,924
2026	80,142
2027	81,250
2028	82,260
2029	83,181
2030	84,022
2031	84,790
2032	85,492
2033	86,134
2034	86,723
2035	87,263
2036	87,759
2037	88,214
2038	88,634
2039	89,020
2040	29,629
Total estimated ERs	1,599,888 t CO_2-eq
Total number of crediting years	**20**
Average annual ERs	79,994 t CO_2-eq

1.11 Description of the Project Activity

The Carbon Farming Program of Lithuania is run by UAB Heavy Finance, which provides farmers with capital for equipment purchases, cash flow, and other farming activities. The Sustainability Department at HeavyFinance manages the design and implementation of GHG reduction projects, focusing on promoting Improved Cropland Management practices. The goal of the program is to reduce GHG emissions.

Per Appendix 1 of VM0042 (v2.0), one or a combination of the following practices must be implemented in the project:

- Reduction of soil disturbance;
- Reduction of inorganic fertilizer application;
- Improved management of organic fertilizers;
- Improved plant residue management/ cover crops and intercropping/ crop rotation and harvesting.

Reduction of soil disturbance

This program aims to improve soil fertility and increase cash-crop yields while also making farming systems more resilient to the effects of climate change. It also aims to reduce greenhouse gas emissions from agricultural practices in Lithuania. One of the project's primary goals is to introduce proper residue management and minimize soil disturbance. This involves changing tillage practices from intensive to minimal, no-till, or strip-till in order to increase soil organic carbon stock retention and accumulation and improve organic matter, water-holding, and nutrient capacity. Additionally, the practice aims to keep the soil surface covered to create the best environment for the microbiome to grow, where organic carbon is a primary component of fundamental soil processes. Moreover, the soil is recognized as the second largest carbon (C) pool after the oceans and one of the crucial components of the biosphere, supplying primary ecosystem services and functions[2]. There are various elements that impact the amount of organic matter present in a location. These include the humidity of the climate, which aids in the decomposition of residual plant material, as well as better land management practices that are carried out during Lithuania's Carbon Farming Project. Improved modern machinery for IALM practices reduces GHG emissions from combustion. CO_2 emission avoidance from excessive fuel combustion of machinery and equipment is a part of The

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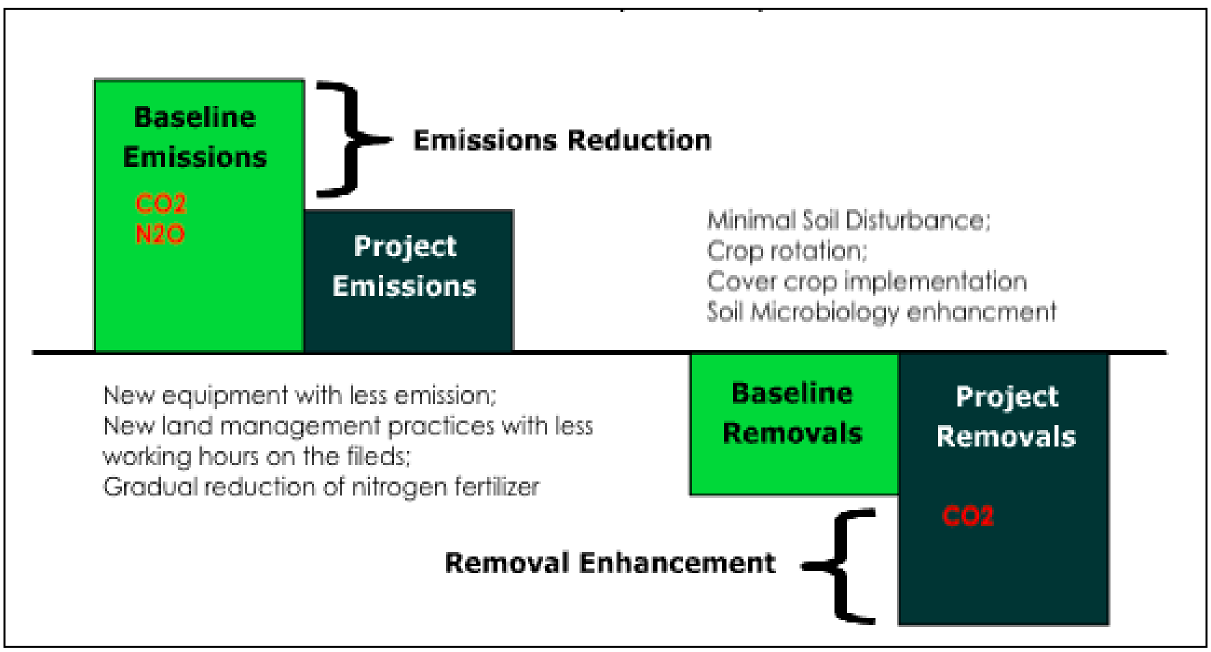
[2] Batjes NH. Total carbon and nitrogen in the soils of the world. Eur J Soil Sci. 1996;47:151–163. doi: 10.1111/j.1365-2389.1996.tb01386.x.

Carbon Farming Program of Lithuania. The modern machinery upgrade, which meets European emission standards, significantly contributes to the reduction of greenhouse gas (GHG) emissions during farming practices on 21,045 hectares of fields. Additionally, by applying improved land management methods with modern equipment, work time in the fields has shortened significantly. The importance of Improved Agriculture Land Management is prominent to reduce excessive CO_2 from the atmosphere and mitigate global warming by limiting global temperature increase below 1.5C or 2C[3], in accordance with the targets of the Paris Agreement.

Reduction of inorganic fertilizer application and improved management of organic inputs

The following sustainable practice of the project to implement is gradually lowering the use of synthetic nitrogen fertilizers to reduce nitrous oxide (N_2O) emissions. Nitrous oxide emissions are significant contributors to GHG emissions and climate change and have nearly 300 times the global warming potential of carbon dioxide.[4] The specific objective of this practice is the precise application of nitrogen fertilizer based on field parameters to avoid overuse and gradual substitution with organic fertilizers, manure, or compost. Incorporation of legume crops in the crop rotation increases the release of nitrogen in the organic form. This process results in a substantial net reduction of N_2O emissions.



Picture 3. Project Emission Reduction and Removal Scheme

[3] Lal Rattan Monger Curtis Nave LukeSmith Pete 2021The role of soil in regulation of climate*Phil. Trans. R. Soc. B*3762021008420210084 http://doi.org/10.1098/rstb.2021.0084

[4] Reay, D., Davidson, E., Smith, K. *et al.* Global agriculture and nitrous oxide emissions. *Nature Clim Change* 2, 410–416 (2012). https://doi.org/10.1038/nclimate1458

Improved plant residue management /cover crops and intercropping /crop rotation and harvesting

Incorporating cover crops between cash crop production periods requires more financial resources and advanced agronomic skills. However, it has a significant impact on the soil microbiome and carbon sequestration. This practice helps to reduce soil erosion, increase above- and below-ground biomass, and enhance soil microbial biodiversity, as well as return organic material to the soil and restore micronutrient balance[5]. The cover crop practice will be introduced to farmers based on individual approaches for carbon sequestration and soil improvements.
The project involves implementing and maintaining improved agricultural land management practices to increase SOC storage and reduce CO_2 and N_2O emissions during the project's crediting period. The impact of these activities is measured through a combination of modeling and default equations. Each field's project activities undergo a thorough review to ensure they meet all requirements and pass additionality checks.

There is no REDD+ component to the project, and the project is not located within a jurisdiction covered by any jurisdictional REDD+ program.

1.12 Project Location

The project activity is implemented in the Republic of Lithuania.

Country: The Republic of Lithuania

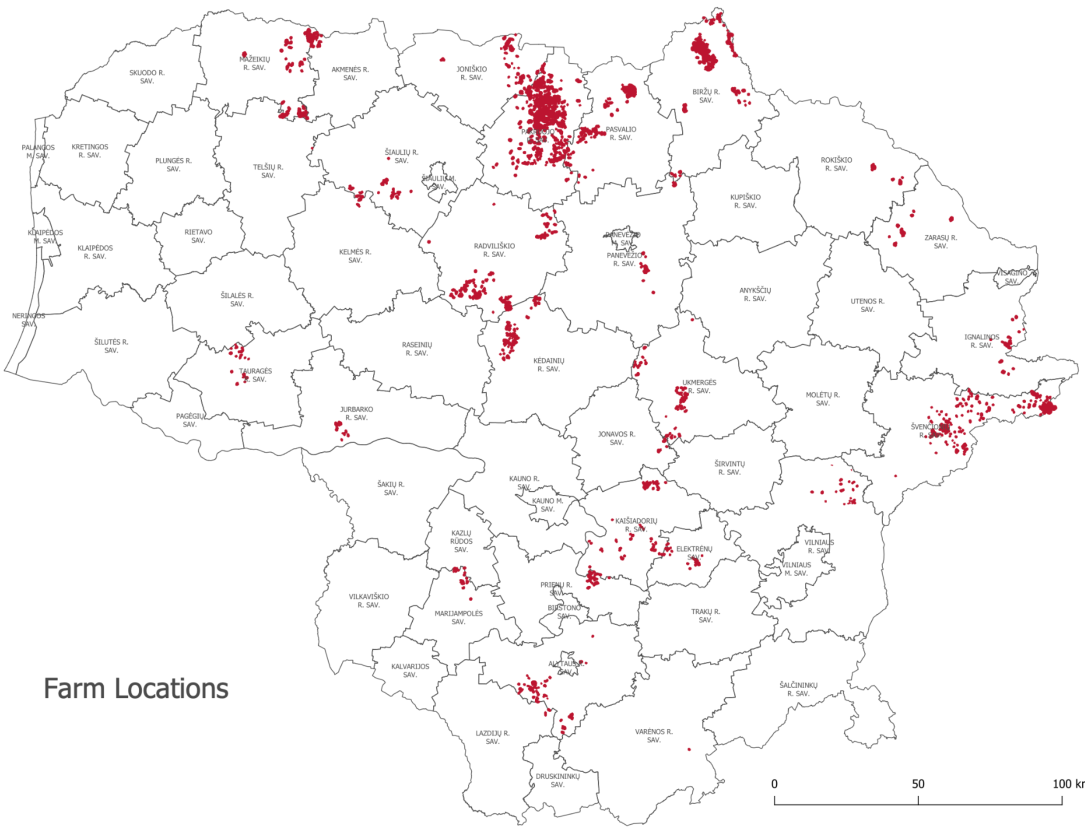
Grouped Project Location: The Republic of Lithuania is divided into 10 major counties and 60 municipalities. The instances of The Carbon Farming Program of Lithuania activities are located across the country in 9 counties.

[5] Chahal, Inderjot & Vyn, Richard & Mayers, Danielle & Van Eerd, Laura. (2020). Cumulative impact of cover crops on soil carbon sequestration and profitability in a temperate humid climate. Scientific Reports. 10. 13381. 10.1038/s41598-020-70224-6.

Picture. 4. Geographic locations of the project activities.

The project activity is being implemented within the geographical area of the Republic of Lithuania, the Baltic Sea region of Eastern Europe. The surface area of Lithuania is 65 300 km² with a population of 2.8 million people. Lithuania is known as an agricultural state with 33.77% of arable lands. Farmlands under annual cash crops, as reported by the state statistical department, constitute ca. 2.2 million ha[6]. The KML files of the fields will be provided in the individual project documentation during validation. The program is designed in accordance with the format of a grouped project; thus, new growers/farmers whose activities meet the eligibility criteria can subscribe to the program from any region of Lithuania up until the verification process is initiated. As the project moves forward, new tasks are included and organized. Initially, 60 farms with different land shapes, totaling 15,000 hectares, have been enrolled in the project. At the end of the monitoring period on August 31, 2023, the total area of the GHG removal project had increased to approximately 21,045 hectares of land, owned by 74 different farmers, grouped into 39 family farms across the country.

[6] https://osp.stat.gov.lt/lietuvos-aplinka-zeme-ukis-ir-energetika-2020/zemes-ukis/augalininkyste



Picture 5. Red spots identify the distribution of project instances in the counties within the political border of the Republic of Lithuania

County	Total county area (ha)	Arable land use in the county (ha)	Total Farms area in the county (ha)	Percentage of total project area in the county %
Šiauliai county	853 728	414 000	10 053	2.42%
Vilnius county	972 981	204 700	2 609	1.27%
Panevėžys county	787 827	356 700	4 457	1.24%
Telšiai county	434 926	150 400	1 075	0.71%
Utena county	719 136	113 900	559	0.49%
Alytus county	541 779	101 400	385	0.37%
Kaunas county	808 651	337 400	1 259	0.37%

County	Total county area (ha)	Arable land use in the county (ha)	Total Farms area in the county (ha)	Percentage of total project area in the county %
Taurage county	440 828	134 800	321	0.24%
Marijampole county	446 519	229 200	122	0.05%

Table 1. Territorial coverage of the project area according to participants' location

There are currently 74 farmers enrolled in the first project instance and they are grouped into 39 family farms and/or agriculture cooperatives. The total area of these farms is 21,045 hectares.

Farm ID/ Project Activities	Area of the farm enrolled in the project (ha)	Reduced Tillage 0-10 (No till/ Strip Till/ Discing/ Blades)	Residue Retention on the fields	Reduction of Synthetic Fertilizers	Application of organic fertilizers (manures/ compost)	Crop Rotation	Cover crops/ intercropping
01AA	202.42	x	x			x	x
02AMAC	173.56	x				x	x
03AS	351.21	x	x	x		x	x
04CAB	452.04	x	x			x	
05CD	260.08	x			x	x	
06DG	171.21	x	x			x	x
07DK	114.89	x	x			x	x
08DR	130.15	x			x	x	
09EGRU	111.05	x	x	x		x	
10GJ	637.87	x	x	x		x	
11JUS	162.08	x	x			x	x
12KRAK	393.05	x			x	x	x
13KUR	1994.44	x	x	x	x	x	x

Farm ID/ Project Activities	Area of the farm enrolled in the project (ha)	Reduced Tillage 0-10 (No till/ Strip Till/ Discing/ Blades)	Residue Retention on the fields	Reduction of Synthetic Fertilizers	Application of organic fertilizers (manures/ compost)	Crop Rotation	Cover crops/ intercropping
14SMZ	210.51	x	x			x	x
15PCH	346.85	x	x	x		x	
16PEL/ ROB	829	x			x	x	x
17RGRU	151.42	x	x			x	x
18VAS	490.16	x	x			x	x
19VV	471.96	x	x			x	x
20GG	203.38	x	x			x	x
21ML	28.12	x	x			x	x
22SMG	156.48	x				x	x
23GAL	122.85	x	x			x	x
24RM	164.89	x	x			x	x
25VS	142.74	x	x	x		x	
26GGA	538.85	x	x			x	x
27PSC	159.18	x	x	x	x	x	x
28KUB	1597.76		x			x	
29POS	2055.98		x	x		x	
30RUD	565.82	x				x	
31SUS	606.72	x	x			x	x
32LG	3803.4	x			x	x	
33AGR	176.66	x	x			x	
34AMB	364.13	x	x			x	x
35BAR	115.54	x	x			x	
36PUP	239.43	x	x			x	x

Farm ID/ Project Activities	Area of the farm enrolled in the project (ha)	Reduced Tillage 0-10 (No till/ Strip Till/ Discing/ Blades)	Residue Retention on the fields	Reduction of Synthetic Fertilizers	Application of organic fertilizers (manures/ compost)	Crop Rotation	Cover crops/ intercropping
37LAGRO	2213.89	x	x		x	x	x
38AGR	135	x	x			x	

Table 2. Family-wise acreage area distribution categorized for the project

1.13 Conditions Prior to Project Initiation

Conditions	Descriptions
Climate	The country's climate is transitional between the marine climate of Western Europe and the continental climate found further east. As a result, moist air masses of Atlantic origin predominate, alternating with Eurasian continental air and, rarely, colder Arctic air or air of southern tropical origin.[7] Lithuania is located in the Central part of the European continent and the northern part of the temperate climate zone. The specific granularity of climatic regions in Lithuania is divided into four types[8]; all regions are characterized by different climatic conditions influenced by local topography and distance from the Baltic Sea. The average temperature in January, the coldest month, is around 20°F (about -5°C), while July, the hottest month, has an average temperature of about 60°F (about 17°C). Average annual rainfall often exceeds 30 inches (about 800 mm), decreasing inland. Precipitation peaks in August, except in the sea, where it peaks two to three months later.[9]

[7] Lithuania | History, Population, Flag, Map, Capital, Currency, & Facts | Britannica
[8] Akstinas, Vytautas. (2017). COHESION OF STATISTICAL DOWNSCALING METHODS AND PROJECTIONS OF METEOROLOGICAL PARAMETERS OVER LITHUANIA.
[9] Lithuania | History, Population, Flag, Map, Capital, Currency, & Facts | Britannica

Conditions	Descriptions
	The project instances are mainly concentrated in the Middle Lowlands climatic region. The project will not affect the prevailing climatic conditions of individual locations, therefore the present and prior climatic conditions of the project are the same.
Topography	The topography of Lithuania is mainly flat. The elevation is observed to be in the southeastern part of the country. Lithuania's terrain is an alternation of moderate lowlands and highlands. The lowland, consisting of glacial lake clays and boulder-studded loams, stretches in a wide band across the country from north to south; some portions of it are heavily waterlogged. The elevated Baltic Highlands, adjacent to the central lowland, thrust into the eastern and southeastern portions of the country; their rumpled glacial relief includes a host of small hills and numerous small lakes. The Švenčioniai and the Ašmena highlands—the latter containing Mount Juozapinė, at 957 feet (292 meters) above sea level the highest point in Lithuania—are located in the extreme east and southeast.[10] The project does not involve any alteration of existing topography; therefore the present and prior topography of the project are the same.
Hydrology	The rivers of Lithuania are typical lowland rivers that have slow and meandering characteristics with wide valleys. Due to abundant rainfall, the river network in the country is dense. On average, 0.99 km of rivers flow per 1 km² of territory. However, the rivers are not evenly distributed. The highest densities are found in the Samogitian Plateau, where it rains more frequently, and in northern Lithuania, where the clay soil does not allow water to flow underground. The lowest densities are found in southeastern Lithuania, where the soil is rich in sand and rainwater seeps into the ground quickly. Almost 70% (about 49,600 km²) of Lithuania's territory is drained by the Neman River and its tributaries. Five other watersheds are small and close to the border: Mūša-Nemunėlis (Lielupe; 8,976 km²), Venta (5,140 km²), Daugava (1,857 km²), small rivers emptying into the Baltic Sea (2,523 km²) and Pregolya (54 km²). In

[10] Lithuania | History, Population, Flag, Map, Capital, Currency, & Facts | Britannica

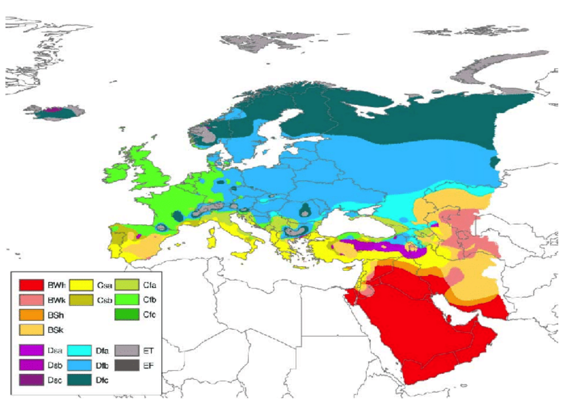
Conditions	Descriptions
	winter, all rivers freeze. In spring, most rivers overflow their banks due to melting snow and ice. The number of rivers and streams over 3 km long has been calculated very accurately – 4,418,758 rivers over 10 km long. Lithuania has 21 rivers over 100 kilometers (62 miles) long.[11] A striking feature of the Lithuanian landscape is the presence of about 3,000 lakes, mainly in the east and southeast.[12] The project does not involve any alteration of existing hydrology; therefore the present and prior hydrology of the project are the same.
Soils	Lithuanian soils range from sands to heavy clays. In the northwest, the soil is either loamy or sandy (and sometimes marshy) and is quite heavily podzolized or leached out. In the central region, weakly podzolized loamy peats predominate, and it is there that the most fertile, and hence most cultivated, soils are found. In the southeast, there are sandy soils, somewhat loamy and moderately podzolized. Sandy soils cover one-fourth of Lithuania, and most of these are blanketed by woodlands.[13] There are 12 major groups of soils in Lithuania: Regosols (RG); Leptosols (LP); Cambisols (CM) occupy 13%; Luvisols (LV) occupy 27%; Planosols (PL) and Albeluvisols (AB) occupy nearly 30%; Arenosols (AR) -12%; Podzols (PZ) - 11%; Gleysoils (GL) 18% and Histosols (HS) - 5,3%; Fluvisols (FL); Anthroposols (AT). The agricultural soils in Lithuania are facing degradation and erosion due to heavy production, conventional management, and the excessive application of synthetic fertilizers, herbicides, and pesticides. As a result, the soil and underground waters have become contaminated with disproportionate nitrogen, and runoffs and leaching are causing harm to the Baltic Sea water quality. This, in turn, promotes acidification and dead zones and is harming the sea biodiversity. Additionally, there are negative consequences on the soil structure and quality. The project will not have any adverse effects on soil structure and quality.

[11] About: List of rivers of Lithuania (dbpedia.org)
[12] Lithuania \| History, Population, Flag, Map, Capital, Currency, & Facts \| Britannica
[13] Lithuania \| History, Population, Flag, Map, Capital, Currency, & Facts \| Britannica

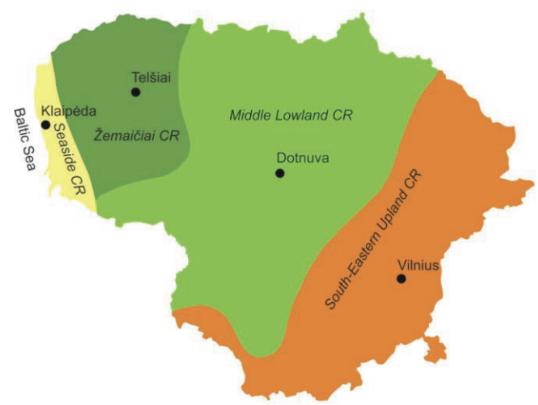
Conditions	Descriptions
Relevant historical conditions	The general trend in Lithuania over the past 5 decades has been to increase the area of forest and built-up land and decrease the area of productive land, grassland/ pasture, wetlands, and other land uses[14]. The area ratios of all land uses, except agricultural land, have changed relatively steadily over the past five decades; however, trends in the development of productive land and grasslands changed their trajectory around 1990 and again around 2005.[15] The proposed project does not involve any changes in the land use, therefore the present and prior land-use type of the project area is the same.
Type of vegetation	The vegetation of Lithuania is divided into three distinct regions. In the maritime regions, you can find an abundance of pine forests growing along the coastline. As well as, wild rye and a variety of shrubs growing on the dunes. Spruce is common in the elevated eastern region. The central area is characterized by large oak trees, with birch groves in the northern part, as well as distinctive groves of black alder and aspen. Pine forests predominate in the south. Indeed, about a third of the country is forested, and about another fifth is grassland. Swamps and marshes make up only a small percentage of the total territory.[16] The project does not involve any introduction of foreign vegetation within the project area; therefore the present and prior vegetation of the project are the same.
Ecosystems	Lithuanian ecosystems include natural and semi-natural (forests, bogs, wetlands, meadows), and anthropogenic (agrarian and urban) ecosystems[17]. Lithuania is mainly characterized by two main types of ecosystems, viz., agroecosystem and forest ecosystem. Agroecosystem accounts for 56.1% of the country's area, followed by the forest ecosystem accounting for 37.2% of the land area. However,

[14] Daiva Jukneliené & Vaiva Kazanavičiūtė & Jolanta Valčiukienė & Virginija Atkocevičienė & Gintautas Mozgeris. (2021, February 2). Spatiotemporal patterns of land-use changes in Lithuania. Economics and Finance Research | IDEAS/RePEc. https://ideas.repec.org/a/gam/jlands/v10y2021i6p619-d571845.html
[15] Mozgeris, G.; Jukneliené, D. Modeling Future Land Use Development: A Lithuanian Case. *Land* **2021**, *10*, 360.
[16] Lithuania | History, Population, Flag, Map, Capital, Currency, & Facts | Britannica
[17] Main Details (cbd.int)

Conditions	Descriptions
	Lithuania has a relatively lower proportion of urban areas (4%), rivers and lakes (1.7%), wetland ecosystems (0.7%), and moors (0.1%).[18] Regarding the network of protected areas, forests account for the largest part, accounting for 65.2% of the area of protected areas. Agro-ecosystems account for 24.7% of the protected area, reflecting the importance of conservation and management of agricultural landscapes for biodiversity. Rivers and lakes account for 6% of the protected area, highlighting the importance of protecting nature in the aquatic environment. Wetlands make up 2.5% of protected areas, while urban areas make up 1.5% and fossil wastelands 0.2%.[19] The project will not have any adverse effects on the ecosystem.

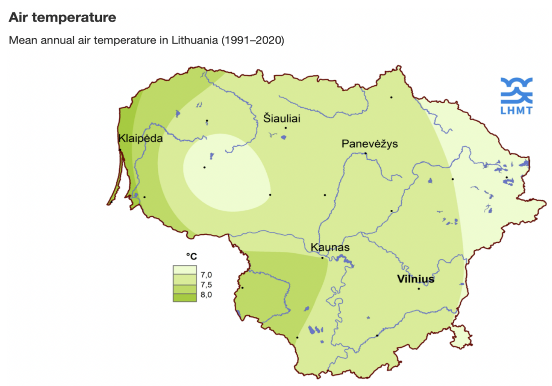


Picture 6. Climatic Zones of the European Continent

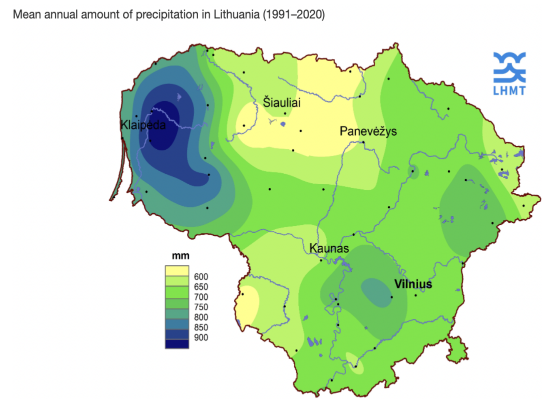


Picture 7. Lithuanian Climatic Regions

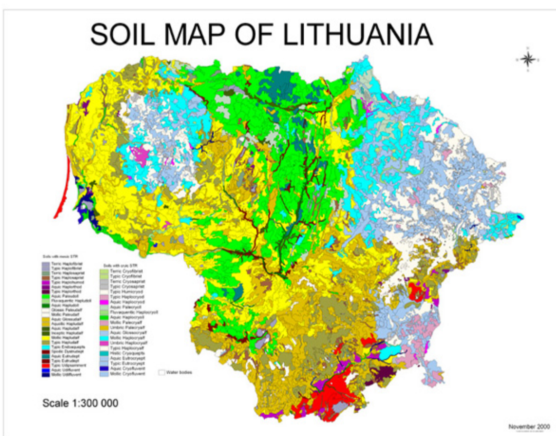
[18] Lithuania. Site. https://biodiversity.europa.eu/countries/lithuania#:~:text=Lithuania%20is%20predominantly%20characterised%20by,37.2%25%20of%20the%20land%20area.
[19] Lithuania. Site. https://biodiversity.europa.eu/countries/lithuania#:~:text=Lithuania%20is%20predominantly%20characterised%20by,37.2%25%20of%20the%20land%20area.



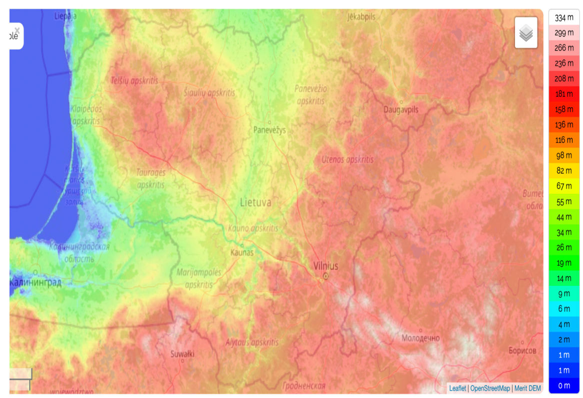
Picture 8. Mean Annual Air Temperature



Picture 9. Mean Annual Precipitation



Picture 10. Soil Type Distribution



Picture 11. Topography of Lithuania[20]

The detailed baseline scenario of the project is described in Section 3.4.

1.14 Compliance with Laws, Statutes, and Other Regulatory Frameworks

The Carbon Farming Program of Lithuania is designed to implement improved agricultural land management practices in compliance with relevant national legislation and regulations within the Republic of Lithuania and the European Union. The following laws or regulations are considered in the project activity:

[20] https://en-gb.topographic-map.com/maps/d95/Lithuania/

- The law of "Protection of the environment and use of natural resources"[21]. It regulates the protection of the environment and use of natural resources, implementation of measures for the prevention of environmental damage. Additionally, it outlines actions to ensure the prompt control, containment, removal, or other management of pollutants and/or other factors causing ecological damage and the application of measures for the restoration of the environment.
- Law on Financial Instruments for Climate Change Management of the Republic of Lithuania[22]. It stipulates the rights, duties and liability of the persons engaged in the economic activities resulting in greenhouse gas emissions and the remit of state institutions and agencies.
- "Strategic Plan for Lithuanian Agriculture and Rural Development 2023–2027"[23]. It aims for the sustainable development of Lithuania's agriculture and food sector, while contributing to environmental and climate objectives.

Currently no laws or regulations prevent the continuation of the practices prior to the project activity. Moreover, following the European Union's objective to be climate-neutral by 2050[24], the government promotes incentive programs, so-called eco schemes, for sustainability and ecological farming[25]. However, these programs do not attract many participants due to a lack of professional support. The subsidies are paid for actions rather than results; therefore, eco schemes do not show a definite shift towards sustainability or ecology in agriculture. The European Court of Auditors found out[26], that most of the European Union Common Agricultural Policy (CAP) mitigation measures "have a low potential to mitigate climate change. The CAP rarely finances measures with high climate mitigation potential". That creates a potential for additional efforts and initiatives by private market participants.

Carbon farming is one of the European Union's priorities as a way to the Net Zero, which is supposed to be implemented in 2028, but due to many uncertainties in regulations, it is not clear how it will work. As it is stated in EU Carbon Farming technical guidelines, voluntary carbon farming projects can go along with compliance if any are implemented[27]. VCS carbon scheme is not recognized under EU ETS. The project proponent has contracted a legal team to identify, monitor, and advise any applicable regulations during the project.

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[21] https://e-seimas.lrs.lt/portal/legalAct/lt/TAD/TAIS.2493/asr
[22] https://e-seimas.lrs.lt/portal/legalAct/lt/TAD/TAIS.349514/asr
[23] https://zum.lrv.lt/uploads/zum/documents/files/LT_versija/Veiklos_sritys/Bendroji_zemes_ukio_politika/PATVIRTINTAS_LT%20strateginis%20planas_2022_11_21.pdf
[24] The European Climate Law - https://eur-lex.europa.eu/legal-content/EN/TXT/?uri=CELEX:32021R1119
[25] https://www.nma.lt/index.php/support/rural-development-programme-2014-2020/6721
[26] https://www.eca.europa.eu/Lists/ECADocuments/SR21_16/SR_CAP-and-Climate_EN.pdf
[27] https://ec.europa.eu/clima/eu-action/forests-and-agriculture/sustainable-carbon-cycles/carbon-farming_en

1.15 Participation under Other GHG Programs

1.15.1 Projects Registered (or seeking registration) under Other GHG Program(s)

The project, or any of its project components, has not been registered or is not seeking registration under any other GHG programs

1.15.2 Projects Rejected by Other GHG Programs

The project has not been rejected by any other GHG programs.

1.16 Other Forms of Credit

1.16.1 Emissions Trading Programs and Other Binding Limits

The project does not reduce GHG emissions from activities that are included in an emissions trading program or any other mechanism that includes GHG allowance trading.

Lithuania is part of the compliance emission trade scheme of the European Union (ETS), where the agriculture sector does not fall into the category of acquiring emission allowances but is still recognized as one of the highest GHG emission contributors in the country. The direct inclusion of the agriculture sector in an ETS is considered problematic because of the complexity of monitoring and measuring emissions and their reductions at the farm level. There is no legislative restriction for the AFOLU sector to participate in voluntary carbon schemes. Therefore, this project is set to generate net GHG emission reductions/ removals, solely on a voluntary basis.

1.16.2 Other Forms of Environmental Credit

The project is not being utilized to generate any additional environmental credits.

1.17 Sustainable Development Contributions

The Republic of Lithuania's sustainable development priorities are outlined in the National Strategy for Sustainable Development (NSSD) and the 2030 Agenda[28]. Within the economic vision and strategy, a key priority is the restoration and preservation of ecosystems and biodiversity. Additionally, the social plan focuses on enhancing the capacity to adapt to global climate change. This project contributes to both national sustainable development priorities as well as the

[28]https://www.eea.europa.eu/themes/sustainability-transitions/sustainable-development-goals-and-the/country-profiles/lithuania-country-profile-sdgs-and

Sustainable Development Goals (SDGs)[29] set by the European Union and the United Nations. Sustainable agriculture activities play a crucial role in addressing various environmental and social SDGs, as they are interconnected with all 17 of them. However, the project and the IALM practices have a particularly significant influence on the following SDGs:

Social SDGs

SDG Goal 3: Good Health and Well-Being - By adopting sustainable land management practices, farmers can produce crops of higher quality with increased nutritional value. This benefits consumers while also reducing the need for harmful pesticides and fertilizers, ultimately contributing to improved public health and reduced environmental pollution.

SDG Goal 8: Decent work and economic growth - The rural areas of Lithuania are not economically attractive and are gradually vanishing. The project activities and incentives influence decent wages, stable employment, and economic development and can help develop the country's rural areas.

Environmental SDGs

SDG Goal 13: Climate Action - The transition of agriculture towards sustainable farming practices serves as a nature-based solution for mitigating excessive carbon dioxide (CO_2) levels through the biological process of photosynthesis. Carbon is sequestered in the soil in the form of organic carbon, effectively locking away excess emissions in a permanent manner. Soils function as natural carbon sinks, enhancing soil's physical, biological, and chemical properties while reducing emissions resulting from fossil fuel combustion. This transition also addresses issues such as nitrogen oxide emissions from the excessive application of synthetic fertilizers and groundwater pollution due to nitrogen leaching.

SDG Goal 15: Life on Land[30] - The primary tool in agriculture is soil. Soil significantly impacts the climate and ecosystems. The project aims to reduce soil disturbance, synthetic fertilizers, herbicides, and pesticides, improve crop rotation, and incorporate cover crop techniques to restart the natural cycles of soil and water to increase above- and below-ground biodiversity and restore local ecosystems.

[29] Piñeiro, Valeria; Arias, Joaquin; Elverdin, Pablo; Ibáñez, Ana María; Morales Opazo, Cristian; Prager, Steve; and Torero, Máximo. 2021. Achieving sustainable agricultural practices: From incentives to adoption and outcomes. IFPRI Policy Brief February 2021. Washington, DC: International Food Policy Research Institute (IFPRI). https://doi.org/10.2499/9780896294042

[30] Muluneh, M.G. Impact of climate change on biodiversity and food security: a global perspective—a review article. *Agric & Food Secur* 10, 36 (2021). https://doi.org/10.1186/s40066-021-00318-5

1.18 Additional Information Relevant to the Project

Leakage Management

In the context of improved agricultural land management projects, leakage is not occurring due to land management practice changes. The project aims to reduce soil disturbance for carbon storage while still prioritizing the main objective of the sector, which is to maximize food harvest quantities. Keeping agrifood production at the same level within the project boundaries by enhancing soil fertility with good practices will not cause the need for land use change from forests to agriculture or permanent pasture to arable agricultural lands. However, the introduction of manure from external sources (i.e., manure not previously applied in the baseline period) and a decline in productivity may result in leakage.

According to the methodology, IALM projects can result in leakage through new application of manure from outside the project area (i.e., manure applied in the project from outside of the project area, which was not previously applied in the historical baseline period), productivity declines, and/or the displacement of livestock outside of the project boundary.

The project will account for leakage by tracking and reporting required data for

- Leakage from the new Application of Manure from Outside the Project Area
- Leakage from Productivity Declines

Changes will be evaluated on a farm-by-farm basis and then combined at the project level. If there are any significant declines in crop productivity, or an increase in the use of manure from outside the project area, credits granted for the project will be reduced to account for potential sources of leakage. The process for determining leakage will be calculated for every reporting period and will be applied to the total greenhouse gas emissions during that time. Leakage deductions will be assessed from the same greenhouse gas emission pool as uncertainty deductions. However, since grazing is not part of the project, leakage from livestock displacement will not be calculated as it will not have any impact.

Commercially Sensitive Information

By the VCS definition, “Trade secrets, financial, commercial, scientific, technical or other information whose disclosure could reasonably be expected to result in a material financial loss or gain, prejudice the outcome of contractual or other negotiations or otherwise damage or enrich the person or entity to which the information relates” is considered commercially sensitive information. Therefore, financial and technical information related to the contractual agreement between the project proponent and the farmer is considered confidential and commercially sensitive.

Further Information

This section has been omitted in accordance with the VERRA Registration and Issuance Process v4.1 20 January 2022 - §3.1.3 – Pipeline Listing Process.

2 Safeguards

2.1 No Net Harm

The project is designed and implemented to reduce soil erosion, prevent soil degradation, improve farm productivity, contribute to climate change mitigation, generate carbon revenues, enhance biodiversity, and make farms more climate change resilient. Any potential adverse environmental and socio-economic impacts are not expected from the project activity.

2.2 Local Stakeholder Consultation

Local Stakeholders of the project are the farmers and communities of rural areas where the farms are located, i.e., villages and small towns. Farmers are legal holders of ownership and tenants of the instances participating in the project. Therefore, stakeholders' consultation took place at the project planning stage, meeting farmers from various regions and discussing opportunities and possibilities of good agricultural practice implementation, possible barriers, and obstacles. The main project objectives and activities were presented to farmers explaining the scope of the project and its environmental, social, and economic values. A farmers' survey was conducted after the stakeholders' meeting.

The Carbon Farming Program of Lithuania managed by HeavyFinance is entirely voluntary. Participants adhere to improved agricultural practices according to the methodology and agreement with the Project Proponent. All collaborations follow applicable laws, statutes, and labor rights.

Farmers implement agricultural practices on their land, private property, and other property stipulated in the land tenure contract. Surrounding communities or other stakeholders do not have free access or rights to lands on which the project activities occur. Meetings are held directly with farmers on a one-on-one basis, where all project stages are discussed accordingly. The following topics are covered:

- Applicability conditions
- Impact and benefits of regenerative practices

- Voluntary Carbon Scheme
- Risks and mitigation, and Q&A session

The duration of the Stakeholders consultation was around 1.5 - 2 hours.

All concerns and questions from project participants will be directed to Project Development Lead Violeta Gevorkjan via email at violeta@heavyfinance.com or by phone at +37061414446. Technical questions or concerns regarding compliance with program activities should be addressed to Carbon Farming Consultant Laurynas Kaucikas via email at ukis@heavyfinance.com or by telephone at +37069481485. Lithuanian farmers may prefer phone calls over emails due to their fieldwork.

<table>
<tr>
<td>
Picture 12. Field visits to Farm 10GJ in May 2023 farm owner Jolanta Greinienė, as well as visitors and participants Laurynas Kaučikas (Regional Carbon Farming Consultant), Hamada Abdelrahman (Senior Agronomist of the Carbon Program))</td>
<td>
Picture 13. HeavyFinance team, including CEO Laimonas Noreika, Sales Manager Nerijus Rasimavičius, Regional Sales Manager Tomas Gineitis, and Operation Manager Domantas Šiupšinskas, had a meeting with Lithuanian Parliament member Kazys Starkevičius in July 2021 to discuss "Financial Barriers in Sustainable Agriculture."</td>
</tr>
</table>

Picture 14. One-to-one talks with farmers at Lithuanian Convention Event "Ką pasėsi" 2021 October, Kaunas, Lithuania. HeavyFinance representatives Tomas Gineitis and Nerijus Rasimavičius, Farmer Valdas Pupeikis

Violeta Gevorkjan, the HeavyFinance Project Development Lead, has been a keynote speaker at numerous online meetings with farmers since May 2021, including one on March 3, 2022. The events covered information on the benefits, management, and risks of the Carbon Farming Project.

Earlier in the same year, Heavy Finance participated in a consultation with the Ministry of Agriculture of Lithuania to contribute to the National Carbon Farming framework. All the stakeholder consultation related documents will be provided to the VVBs or Verra on a request basis.

2.3 Environmental Impact

The project is not expected to have any significant negative non-GHG environmental impact. The farming practices promoted in the project aim to improve soil health and fertility by implementing adaptable changes. This will help restore the soil carbon losses and reduce excessive emissions caused by conventional agricultural practices used previously.

2.4 Public Comments

When the project is listed on the Verra carbon registry, public comments are welcome for further project management and development improvement. All comments will be reviewed and addressed accordingly.

2.5 AFOLU-Specific Safeguards

1) Stakeholder Identification

The process of stakeholder identification begins with creating a list of all individuals or groups who could potentially influence or be affected by a project. In this case, the village officials were considered key stakeholders and focus groups with the most knowledge about the local farmers. The primary objective of this meeting was to identify project stakeholders and solicit their opinions on the project design as well as assess their willingness to participate.

I. Farmers

All the farmers involved in the project activity have been directly affected by the activities of the project. These farmers signed the agreements with the Project Proponent to ensure the proper development of the project.

The project activity will be greatly beneficial to the local farmers and could only be implemented with the farmers' consent. Therefore, all the farmers within the project area are recognized to be stakeholders in the project.

II.State Department of Agriculture

The State Department of Agriculture supervises the economic, social, and environmental impact of the sector; therefore, project activities were introduced and consulted concerning all possible outcomes, including financial benefits.

Since there are no negative environmental or socioeconomic impacts on the farmers due to the project, the State Department of Agriculture will not restrict the implementation of the project activity. The State Department of Agriculture is identified as a passive stakeholder in the project implementation and will not be considered a stakeholder.

2) Potential Risks and Measures

Considering AFOLU-specific safeguards, it's important to prioritize the conservation of biodiversity, sustainable management of natural resources, prevention and reduction of pollution, responsible pesticide use, and minimizing greenhouse gas emissions. Throughout the development of this carbon project, all relevant local stakeholders were consulted to identify and address any potential risks that could impact the project. As per the analysis, there are no potential risks to the local stakeholders and to the local resources due to the implementation of the project activity.

3) Feedback and Grievance Redress Procedure

The Carbon Farming Program of Lithuania managed by HeavyFinance is entirely voluntary. Farmers are legal holders of ownership and tenants of the instances participating in the project. Therefore, stakeholders' consultation took place at the project's planning stage, meeting farmers from various regions and discussing opportunities and possibilities of good agricultural practice implementation, possible barriers, and obstacles.

Phone numbers of the Project Proponent have been shared with the farmers to receive comments or suggestions from them. The Project Proponent will check on those comments and suggestions regularly.

Neither the Project Proponent nor any other entity involved in project design or implementation have been involved in any form of discrimination or sexual harassment.

3 Application of Methodology

3.1 Title and Reference of Methodology

Title	Improved Agricultural Land Management
Version	2.0
Reference	Approved VCS Methodology VM0042 for Improved Agriculture Land Management
Version Date	30th May 2023
Sectoral Scope	14
Tools Applied	VCS Standard, version 4.4 – 17th January 2023 VCS Program Definitions, v. 4.1 – 15 April 2021 VCS Program Guide, v. 4.1 – 22 January 2022 VERRA Registration & Issuance Process, v. 4.1 – 20 January 2022 AFOLU Non-Permanence Risk Tool, v4.0 – 19 September 2019 VMD0053 Version 2.0 of 22 December 2022 Model Calibration, Validation, and Uncertainty Guidance for the Methodology for Improved Agricultural Land Management.

Table 3. Details of the methodology and tools applied

3.2 Applicability of Methodology

The VCS methodology VM0042 for Improved Agriculture Land Management is applied to a broad range of agricultural management project activities that increase soil organic carbon storage and/or decrease net emissions of CO_2 and N_2O from grower operations compared to the baseline scenario. The Carbon Farming Program of Lithuania is compliant for the project under applicability conditions of methodology as follows:

Criterion	Justification
This methodology applies to a broad range of project activities that increase SOC storage and/or decrease net emissions of CO_2 and N_2O from ALM operations compared to the baseline scenario. The methodology is globally applicable.	The Carbon Farming Program of Lithuania is a comprehensive initiative that generates GHG emission reductions or removals through agricultural land management practices against baseline scenario.
1. Projects must introduce or implement one or more new changes to preexisting ALM practices which: a) Improve fertilizer (organic or inorganic) management b) Improve water management/ irrigation; c) Reduce tillage/improve residue management; d) Improve crop planting and harvesting (e.g., improved agroforestry, crop rotations, cover crops); and/or e) Improve grazing practices.	The project instances implement a set of introduced practices: ● Reduce tillage/improve residue management. ● Improve fertilizer (organic or inorganic) application management. ● Improve crop planting and harvesting (e.g., improved agroforestry, crop rotations, cover crops); Practices of improved agriculture land management should be applied based on a mutual contractual agreement with farmers.
2. Projects that introduce or implement quantitative adjustments (i.e., decrease in fertilizer application rate) must exceed five percent of the preexisting value calculated as the average value over the historical lookback period developed for the baseline schedule of activities.	The proposed project activity is not considering implementation of quantitative adjustments.
3. Project activities must be implemented on land that is either cropland or grassland at the project start date. The land must remain cropland or grassland throughout the project	All Farmlands participating in the program are croplands for the project start date and will remain cropland throughout the crediting period. Grasslands, livestock, and forests are not enrolled in the project.

Criterion	Justification
crediting period except under the following scenarios: a) Introduction of temporary grassland into cropland where it is demonstrated prior to the project start date and to the addition of new project activity instances that the integration of forage crops (e.g., annual/perennial grasses , legumes) into annual crops is part of a planned, long term ALM system (e.g., integrated crop livestock system). Project proponents must provide documentation of the long term management plans covering the duration of the project that describe proposed practices crops and expected benefits and outcomes of integrated grassland cropland management ; or b) A one-time conversion from grassland to cropland or vice versa where it is demonstrated, prior to project validation, that project lands in the baseline scenario are degraded and the introduction of improved land use change practices would significantly improve soil health. Project proponents must provide documentation demonstrating that lands are degraded at the start of the project and degradation will continue in the baseline scenario due to the presence of degradation drivers or pressures in the baseline scenario. See Appendix 2 for procedures on how to propose this type of land use change.	
4. Empirical or process-based models used to estimate stock change/emissions via Quantification Approach 1 must be: a) Publicly available, though not necessarily free of charge, from a reputable and recognized source (e.g., the model developer's website, IPCC or government agency). Sufficient conceptual documentation of inputs, outputs and information on how the model functionally represents SOC dynamics must be accessible to the public.	Discussed in Table 6 (Project Modeling Applicability) below.

Criterion	Justification
b) Shown in peer-reviewed scientific studies to successfully simulate changes in SOC and trace gas emissions resulting from the changes in ALM practices included in the project description; c) Able to support repetition of the project model simulations. This includes clear versioning of the model used in the project and stable software support, as well as fully reported sources and values for all parameters used with the project version of the model. Where multiple sets of parameter values are used in the project, clearly identify the sources of varying parameter sets and how they were applied to estimate stock change/emissions in the project. Acceptable sources include peer-reviewed literature and statements from appropriate expert groups that demonstrate evidence of expertise with the model via authorship of peer-reviewed model publications or authorship of reports for entities supporting climate-smart agriculture. These sources must describe the datasets and statistical processes used to set parameter values; d) Validated per datasets and procedures detailed in Section 5.2 of VMD0053 Model Calibration and Validation Guidance for the Methodology for Improved Agricultural Land Management. Model prediction error must be calculated using datasets as described in Section 5.2.5 of VMD0053 and must use the same parameters or sets of parameters applied to estimate stock change/emissions in the project; and e) Using the same model version in the baseline and project scenarios. Further, the same parameters/parameter sets must be used in the baseline and project scenarios. Model input data must be derived following guidance in Table 6 and Table 8. Model	

Criterion	Justification
uncertainty must be quantified following guidance in Section 8.6. Models may be recalibrated or revised based on new data, or a new model may be applied, provided the above requirements are met.	
5. The project area has not been cleared of native ecosystems within the 10-year period immediately prior to the project start date.	The project area has not been cleared of native ecosystems. The Land Use Change of participating instances did not appear. The croplands were arable lands for more than 10 years prior to the project implementation. Satellite imagery validation has been run prior to the enrollment of individual instances to the project. Also, information from the national land management database has been derived.
6. The project activity is not expected to cause a sustained reduction in productivity of greater than 5 percent, as demonstrated by peer reviewed and/or published studies on the activity in the region or a comparable region.	None of the applied activities are expected to have a sustained reduction greater than 5%. The objective of IALM is to enrich the soil with organic carbon, which in turn results in improved plant growth and crop yield, provided that the IALM is applied in the correct manner. The monitoring activity of the project shall consider and compare the annual change in productivity. If the productivity should have declined because of implemented practices and not any other external circumstances, potential emissions reductions and/or removals shall not be included in the quantification of the program's benefits.
7. The project activity does not involve biochar application . Biochar may be applied as a soil amendment in the project area provided that the total organic carbon content of the biochar applied is subtracted from the estimated SOC stock change in the project scenario at each verification event.	The farmlands under the program do not involve the application of biochar.
8. The project activities do not occur on a wetland. This condition does not exclude crops subject to artificial flooding where it is demonstrated that	None of the project farmlands are situated on the wetlands. The histosols soil type is excluded from sampling and quantification of soil organic carbon. The soil type

Criterion	Justification
crop cultivation does not impact the hydrology of any nearby wetlands.	distribution map is used to delineate and stratify the land. The croplands participating in the project are self-irrigated and do not apply artificial irrigation or flooding methods.

Table 4. Project Applicability Conditions

Measure and Model Quantification Approach 1 is applied to quantify emission reductions and removals resulting from improved agricultural land management practices, and Quantification Approach 3 is used to calculate CO_2 flux from fossil fuel combustion and N_2O from inorganic fertilizers excluding CH_4 fluxes.

Quantification approaches chosen for the project emission pools.

GHG/ Pool	Source	Quantification Approach 1: Measure and Model*	Quantification Approach 2: Measure and Remeasure	Quantification Approach 3: Default
CO_2	Soil organic carbon	X		
	Fossil fuel			X
N_2O	Use of nitrogen fertilizers			X
	Use of nitrogen-fixing species			X
	Manure deposition[31]			X

Table 5. Quantification approaches by the project GHG source

[31] If such appears in the baseline and project scenario.

Measure and Model Quantification Approach 1 is applied to quantify emission reductions and removals resulting from improved agricultural land management practices, and Quantification Approach 3 to calculate CO_2 flux from fossil fuel combustion and N_2O from inorganic fertilizers. CH_4 fluxes are excluded.

The project complies with the additional applicability condition for model application:

Criteria	Description
1. Publicly- Available	The project uses the Rothamsted Carbon Model - RothC model[32] program to model historical and future soil carbon fluxes. This model is publicly available and has been used in scientific studies to simulate soil organic carbon fluxes, has been calibrated and validated according to the project climate zone and tested with data from various native and managed systems.
2. Shown in peer-reviewed scientific studies to successfully simulate changes in soil organic carbon and trace gas emissions resulting from changes in agricultural management included in the project description;	The RothC program for soil carbon simulation is not only recommended by the FAO but is also widely utilized in scientific research[33]. Additionally to the modeling program, for accuracy purposes, a GIS approach will be employed for quantifying and mapping carbon sink and stock values[34]. This approach will facilitate the correlation between actual soil sampling and modeling, thereby minimizing errors and reducing uncertainty.
3. Able to support repetition of the project model simulations. This includes clear versioning of the model used in the project, stable software support of that version, as well as fully reported sources and values for all parameters used in the project version of the model. Where multiple sets of parameter values are	The models support a repetition of the simulation. Parameter values used in the project as well as in the baseline scenarios: ● Are clearly identified and include acceptable sources of the parameters. ● Include a description of the application to

[32] https://www.rothamsted.ac.uk/sites/default/files/RothC_guide_WIN.pdf
[33]Francaviglia, Rosa & Baffi, Claudio & Nassisi, Antonio & Cassinari, Chiara & Farina, Roberta. (2013). Use of the Roth C model to simulate soil organic carbon dynamics on a silty-loam inceptisol in Northern Italy under different fertilization practices. EQA - International Journal of Environmental Quality. 11. 17-28. 10.6092/issn.2281-4485/4085.
[34] Xuesong Zhang, Roberto C. Izaurralde, David H. Manowitz, Ritvik Sahajpal, Tristram O. West, Allison M. Thomson, Min Xu, Kaiguang Zhao, Stephen D. LeDuc, Jimmy R. Williams, Regional scale cropland carbon budgets: Evaluating a geospatial agricultural modeling system using inventory data, Environmental Modelling & Software Volume 63, 2015, Pages 199-216, ISSN 1364-8152, https://doi.org/10.1016/j.envsoft.2014.10.005

Criteria	Description
used in the project, full reporting includes identifying the sources of varying parameter sets as well as how they were applied to estimate stock change/emissions in the project. Acceptable sources include peer-reviewed literature and statements from appropriate expert groups (i.e., that can demonstrate evidence of expertise with the model via authorship on peer-reviewed model publications or authorship of reports for entities supporting climate-smart agriculture, such as FAO or a comparable organization) and must describe the data sets and statistical processes used to set parameter values (i.e. the parameterization or calibration procedure);	estimate the stock change/emissions in the project and the statistical processes. The scientific team is working with The Carbon Farming Program of Lithuania report to describe the datasets and statistical approaches used to set parameter values (i.e., the parameterization or calibration procedure).
4. Validated per datasets and procedures detailed in VMD0053 "Model Calibration and Validation Guidance for the Methodology for Improved Agricultural Land Management," where the model prediction error is calculated using datasets as detailed in the same module and is using the same parameters or sets of parameters applied to estimate stock change/emissions in the project.	The soil carbon modeling program and GIS-based approach will illustrate their compliance with the criteria specified in VMD0053 and their alignment with practical soil sampling.

Table 6. Project Modeling Applicability

3.3 Project Boundary

The Carbon Farming Program of Lithuania project boundaries are the GHG sources, sinks and reservoirs (SSR) that are relevant to the project and baseline scenarios. The project involves more than one project activity where the primary and significant secondary effects of GHG SSR from baseline and project activities are identified to assess the project boundary.

Source/Sinks/Reservoirs	Included?	Justification/Explanation
Aboveground woody biomass	No	Not included in the project boundary
Aboveground non-woody biomass	No	Carbon pool is not included because it is not subject to significant changes or potential changes are transient in nature
Belowground woody biomass	No	Carbon pool is not included because it is not subject to significant changes or potential changes are transient in nature
Belowground non-woody biomass	No	Carbon pool is not included because it is not subject to significant changes or potential changes are transient in nature
Dead wood	No	Carbon pool is not included because it is not subject to significant changes or potential changes are transient in nature
Litter	No	Carbon pool is not included because it is not subject to significant changes or potential changes are transient in nature
Soil organic carbon	Yes	Included in the project boundary as CO_2 is a major carbon pool affected by the project activity, that is expected to increase in the project scenario
Wood products	No	Carbon pool is optional for IALM project methodologies, and it is excluded from the project boundary

Table 7. Selected carbon pools in the baseline and project scenario

The following table shows the GHG sources that are considered in the project boundary for both the baseline and project scenarios. The selected Sources of GHGs are listed in the table below:

Source		Gas	Included?	Justification/Explanation
Baseline	Soil organic carbon	CO_2	Yes	This is the primary source of emission removals that the project is aiming to achieve. Quantified as a stock change in the pool, rather than an emissions source. The managed adoption of IALM or an improved agriculture approach has an overall net impact on the SOC pool.
		CH_4	No	Not applicable as per VM0042 version 2.0
		N_2O	No	Not applicable as per VM0042 version 2.0
		Other	No	Not applicable as per VM0042 version 2.0
	Fossil fuels	CO_2	Yes	Defined as a GHG source. Included in the project. Sources of fossil fuel emissions are vehicles (mobile sources, such as trucks and tractors) and mechanical equipment required by the ALM activity.
		CH_4	No	Not applicable as per VM0042 version 2.0
		N_2O	No	Not applicable as per VM0042 version 2.0
		Other	No	Not applicable as per VM0042 version 2.0
	Liming	CO_2	No	Not included. The activity does not occur in the baseline scenario.
		CH_4	No	Not applicable as per VM0042 version 2.0
		N_2O	No	Not applicable as per VM0042 version 2.0
		Other	No	Not applicable as per VM0042 version 2.0
	Use of nitrogen fertilizers	CO_2	No	Not applicable as per VM0042 version 2.0
		CH_4	No	Not applicable as per VM0042 version 2.0
		N_2O	Yes	The project area is subject to nitrogen fertilization in the baseline scenario.
		Other	No	Not applicable as per VM0042 version 2.0
	Use of nitrogen-fixing species	CO_2	No	Not applicable as per VM0042 version 2.0
		CH_4	No	Not applicable as per VM0042 version 2.0
		N_2O	Yes	The project area is subject to nitrogen-fixing species in the project scenario. The impact on emissions is insignificant but has been taken into consideration nonetheless.
		Other	No	Not applicable as per VM0042 version 2.0

Source		Gas	Included?	Justification/Explanation
	Manure deposition	CO_2	No	Not applicable as per VM0042 version 2.0
		CH_4	No	There is no livestock present in the project or baseline scenario.
		N_20	No	There is no livestock present in the project or baseline scenario.
		Other	No	Not applicable as per VM0042 version 2.0
Project	Soil organic carbon	CO_2	Yes	This is the primary source of emission removals that the project is aiming to achieve. Quantified as a stock change in the pool, rather than an emissions source. The managed adoption of IALM or an improved agriculture approach has an overall net impact on the SOC pool.
		CH_4	No	Not applicable as per VM0042 version 2.0
		N_2O	No	Not applicable as per VM0042 version 2.0
		Other	No	Not applicable as per VM0042 version 2.0
	Fossil fuels	CO_2	Yes	Defined as a GHG source. Included in the project. Sources of fossil fuel emissions are vehicles (mobile sources, such as trucks and tractors) and mechanical equipment required by the ALM activity.
		CH_4	No	Not applicable as per VM0042 version 2.0
		N_2O	No	Not applicable as per VM0042 version 2.0
		Other	No	Not applicable as per VM0042 version 2.0
	Liming	CO_2	No	Not included. The activity does not occur in the project scenario.
		CH_4	No	Not applicable as per VM0042 version 2.0
		N_2O	No	Not applicable as per VM0042 version 2.0
		Other	No	Not applicable as per VM0042 version 2.0
	Use of nitrogen fertilizers	CO_2	No	Not applicable as per VM0042 version 2.0
		CH_4	No	Not applicable as per VM0042 version 2.0
		N_2O	Yes	Farmers involved in the project activity will reduce the use of nitrogen fertilizers.
		Other	No	Not applicable as per VM0042 version 2.0
	Use of nitrogen-fi	CO_2	No	Not applicable as per VM0042 version 2.0

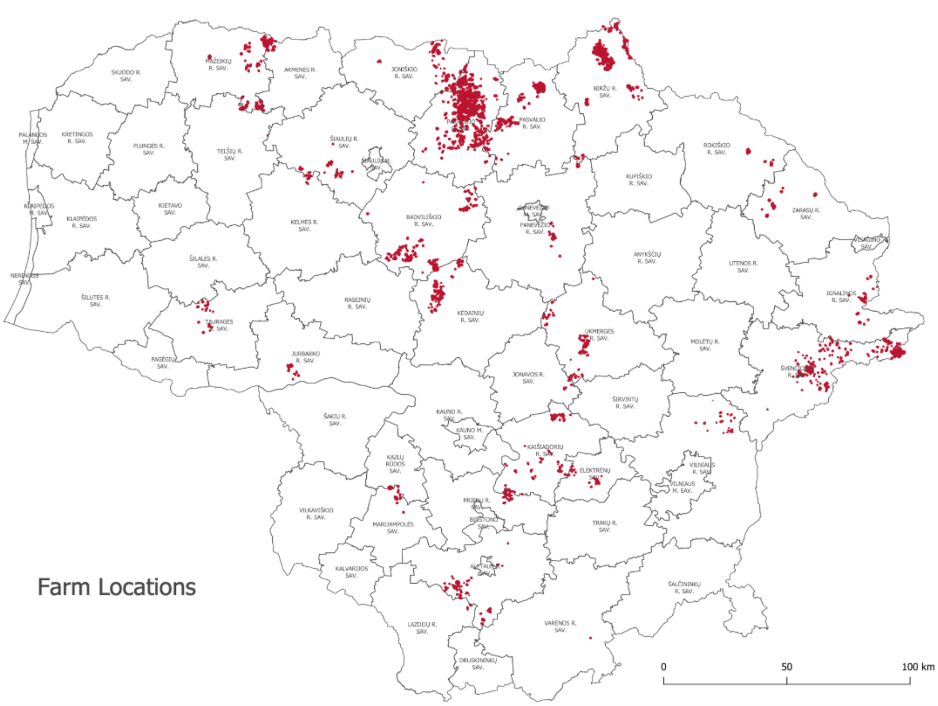
Source		Gas	Included?	Justification/Explanation
	xing species	CH_4	No	Not applicable as per VM0042 version 2.0
		N_2O	Yes	The project area is subject to nitrogen-fixing species in the project scenario The impact on emissions is insignificant, but has been taken into consideration nonetheless.
		Other	No	Not applicable as per VM0042 version 2.0
	Manure deposition	CO_2	No	Not applicable as per VM0042 version 2.0
		CH_4	No	There is no livestock present in the project or baseline scenario.
		N_20	No	There is no livestock present in the project or baseline scenario.
		Other	No	Not applicable as per VM0042 version 2.0

If the GHG increase caused by project emissions or the carbon stock decrease in carbon pools is less than 5% of the total net reduction in anthropogenic GHG emissions and removals resulting from the project, these sources can be considered *de minimis* and will not be taken into account.

Spatial Boundary

The spatial boundaries of the project area consist of the croplands located within the legal border of the Republic of Lithuania in Joniskis, Birzai, Radviliskis, Kaisiadorys, and Svencionys, Alytus, Mazeikiai, Panevezys, Pasvalys counties.

The KML file is provided with the specific geographical location of each instance participating in the project that defines the spatial boundaries. The individual approach for carbon stock estimation has been applied based on the criteria of management practices, geographical locations, topography, and soil type distribution.



Farm Locations

Picture 15. Red spots identify the distribution of project instances in the counties within the political border of the Republic of Lithuania

3.4 Baseline Scenario

The baseline scenario serves as a point of reference for the project activity. It outlines a hypothetical situation that would have likely occurred if there had been no efforts to mitigate climate change. The baseline scenario is utilized in estimating baseline emissions. Estimation of the baseline scenario, in this case, is the continuation of pre-project agricultural management practices. For each sample unit (i.e., for each farm) in the initial set of farmers enrolled in the project, techniques applied in the baseline scenario are determined by a historical lookback period of 3 years before the project start date of 1st of May 2020, in order to produce an annual schedule of activities repeated over the first baseline period. For the new instances included in the project after the project start date, the baseline is considered a 3-year lookback from the date of inclusion. Baseline emission/stock is then modeled using Quantification Approach 1.

The baseline scenario takes into account the types of crops and agricultural practices in each instance within the project area during the historical lookback period i.e., 2017, 2018, and 2019. To measure the reduction and removal of GHG, the performance of the project activities is compared to that of the baseline scenario for each farm respectively. The assessment of agricultural practices will span a minimum of three years, utilizing both qualitative and quantitative data as outlined in Table 4 of the VM0042 v2.0 methodology.

The baseline shall be updated every ten years following Section 3.8 of the VCS Requirements on renewal of baselines. The procedure for updating the baseline shall be done regarding Section 9.3 of the applied methodology. The baseline estimates for calculating carbon removals across the landscape will be re-evaluated at an interval of every 10 years from the project start date to reflect changing environmental and socio-economic scenarios. The baseline re-evaluation includes the procedures available at the time of re-evaluation.

<table>
<tr><th>Agricultural management practices</th><th>Qualitative</th><th>Quantitative</th></tr>
<tr><td>Crop planting and harvesting</td><td>Winter Wheat
Summer Wheat
Winter Rapeseed
Summer Rapeseed
Winter Barley
Summer Barley
Winter Rye</td><td><table><tr><th>Type of crop</th><th>Plant date</th><th>Harvest date</th></tr><tr><td>Winter Wheat</td><td>September</td><td>July (next year)</td></tr></table></td></tr>
</table>

<table>
<tr><th>Agricultural management practices</th><th>Qualitative</th><th>Quantitative</th></tr>
<tr><td></td><td>Summer Rye
Oats
Corn
Buckwheat
Peas/ Beans</td><td>
<table>
<tr><td>Summer Wheat</td><td>April/May</td><td>August (next year)</td></tr>
<tr><td>Winter Rapeseed</td><td>August</td><td>August (next year)</td></tr>
<tr><td>Summer Rapeseed</td><td>April</td><td>August/September (same year)</td></tr>
<tr><td>Winter Barley</td><td>September</td><td>July (next year)</td></tr>
<tr><td>Summer Barley</td><td>April/May</td><td>August (same year)</td></tr>
<tr><td>Winter Rye</td><td>September</td><td>July
(next year)</td></tr>
<tr><td>Summer Rye</td><td>April/ May</td><td>August/September (same year)</td></tr>
<tr><td>Oats</td><td>April/ May</td><td>August/September (same year)</td></tr>
<tr><td>Corn</td><td>May</td><td>September/ October
(same year)</td></tr>
<tr><td>Buckwheat</td><td>April/ May</td><td>August
(same year)</td></tr>
<tr><td>Peas/ Beans</td><td>March</td><td>August/ September
(same year)</td></tr>
</table>
</td></tr>
<tr><td>Nitrogen fertilizer application</td><td>Synthetic N fertilizer</td><td>N application rate - 450 kg/ha</td></tr>
<tr><td>Tillage and/or residue management</td><td>Conventional tillage and crop residue removal</td><td>Crop residue removal - 90%
Depth of tillage - 30cm +</td></tr>
</table>

Agricultural management practices	Qualitative	Quantitative
Water management/ irrigation	Irrigation: Yes Flooding: No	Irrigation rate: rain-fed irrigation (as per the natural climatic conditions of Lithuania)
Grazing practices	Not applicable	Not applicable

Table 9. The qualitative information of agricultural management practices

3.5 Additionality

The methodology VM0042 uses a project method for the demonstration of additionality. It is critical that the emission reductions achieved in The Carbon Farming Program of Lithuania are additional to the baseline, meaning they would not be achieved under business-as-usual conditions. The project activity aims to showcase a reduction and avoidance of GHG emissions that exceed what would have occurred under normal circumstances without the aid of incentives from the voluntary carbon markets. This serves as an additional demonstration of the project's impact.

Demonstration of regulatory surplus in accordance with the VCS Methodology Requirements and demonstrating the following steps:

Step1: Regulatory surplus

By the definition of VCS program v4.4, the Project Proponent has to demonstrate that the project activities are not mandated by any law, statute, or other regulatory frameworks, or for UNFCCC non-Annex I countries, any systematically enforced law, statute, or other regulatory frameworks. Lithuania is a member of the European Union, where the primary agricultural policy is the Common Agricultural Policy (CAP). Since 2009, farmers who receive direct support payments have been obligated to adhere to Good Agricultural and Environmental Conditions guidelines. These rules establish minimum requirements for soil cover, and land management practices to control erosion. This includes a prohibition on residue burning but is not limited to removal for commercial use. Generally, these standards are voluntary, and farmers who comply receive subsidies from the National Paying Agency (NMA). Agricultural practices currently follow the existing legislation, and there are no restrictions on implementing improved agricultural land management regenerative and sustainable practices as done by the project. The project activities go beyond legal requirements and meet regulatory surplus, making it an addition without hindering "business-as-usual."

Step 2: Identify institutional barriers that would prevent implementation of a change in pre-existing ALM practices

There are significant barriers that would prevent the implementation of improved agricultural land management practices

- **Barriers associated with technology**: In the Lithuanian region, traditional (common) practices which are less technologically advanced have been conducted by farmers for many years. The improved agricultural land management practices have a very low market share[35], since farmers lack technical knowledge of reduced fertilizers input required for the improved agricultural land management activities, and they also lack technical knowledge of techniques to be applied in the new activities, such as how to reduce tillage or implement conservation tillage, how to improve residue management and how to improve water management, etc.[36].

  Therefore, prior to the implementation of the proposed Project, farmers could not change their practices since they don't have the technologies for the new practices involved in the proposed Project. In the proposed Project activity, the Project Proponent will conduct training for the farmers and will provide continuous technical support during the project lifetime. Hence, the change of the practices would not occur without the intervention of the Project Proponent and the resulting revenue from the sale of VCUs.

- **Barriers associated with Investment:**

  According to the European Investment Bank Report "Financial needs in the agriculture and agri-food sectors in Lithuania"[37], access to financing is considered a major obstacle for one-quarter of the Lithuanian farmers. 25% of the respondents considered access to loans for investments, and 23% considered access to loans for working capital, as problematic. This is significantly higher than for other EU 24 countries and signals that Lithuanian farmers experience rather strong difficulties in accessing financing. However, the biggest issue outlined by the Lithuanian farmers was the costs of production, followed by low selling prices, both of which are an indication of the squeezed profits experienced by the agriculture sector. Additionally, almost one-third of Lithuanian farmers considered access to market outlets to be problematic, whilst 25% found access to land an issue.

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[35] Challenges and problems of agricultural land use changes in Lithuania according to territorial planning documents: Case of Vilnius district municipality - ScienceDirect

[36] Institutional barriers to organic farming in Central and Eastern European countries of the Baltic Sea region (diva-portal.org)

[37] financial_needs_agriculture_agrifood_sectors_Lithuania.pdf (fi-compass.eu)

In the proposed Project activity, the Project Proponent will provide financing solutions to the farmers via which farmers may then use these loans across the board, including the financing of the purchase of used farming equipment, land, and/or used as working capital.

- **Other Barriers:**

According to a study conducted by Drozdz et al.[38], Lithuanian small-scale farmers are reluctant to accept the changes in the agricultural practices. This can be a barrier to adopting new technologies and techniques, even if they have the potential to improve productivity and sustainability. Different studies have been conducted to investigate the reasons behind the reluctance. One of the major reasons behind this barrier will be a lack of access to information about improved agricultural practices. This can make it difficult for farmers to learn about new practices and to make informed decisions about whether or not to adopt them.

The intervention of the Project Proponent in applying for project validation under the VCS program will help overcome the barriers in that:

- The Project Proponent imparts agricultural knowledge and promotes technologies to households of each of the farm families involved in the project.
- Revenues from the sale of VCUs, after deducting the operation and management costs, will be distributed to local farming households, hence motivating them to continuously adopt conservational agricultural practices.

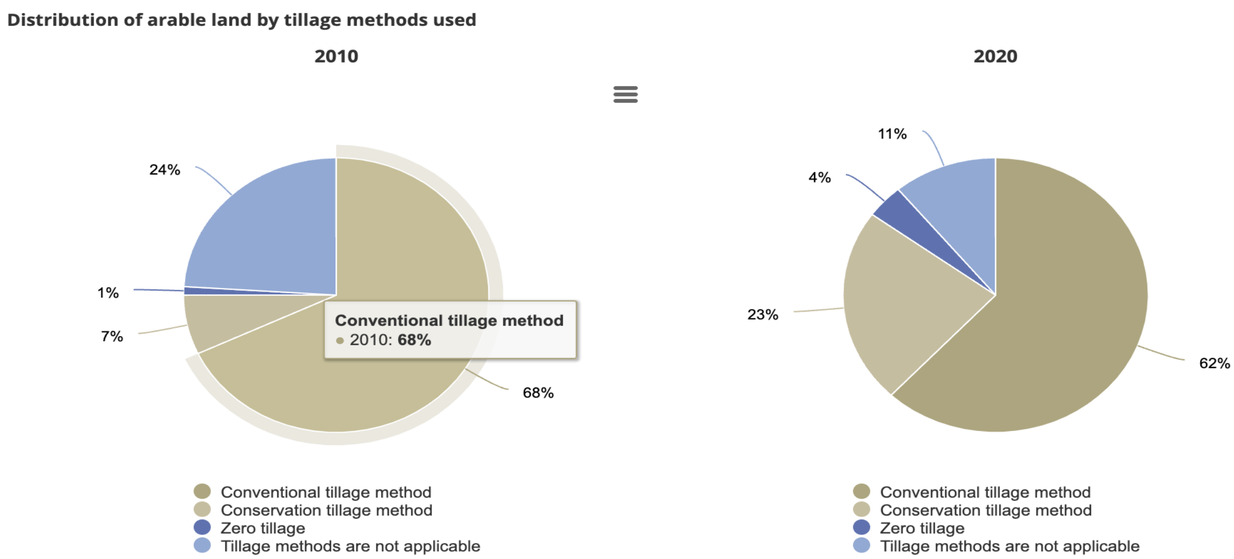
Step 3: Demonstrate that adoption of the suite of proposed project activities is not common practice

The Carbon Farming Program of Lithuania participants adopt a set of activities that are not a common practice in each region included within the project spatial boundary. Common practice is defined as an adoption rate greater than 20% as VM0042, V2.0 methodology.

According to the results of the Agriculture Census 2020[39], the total agricultural area is 2,914,000 ha, where 2,175,900 ha of land are dedicated to crop production. There is no granular data for the regions of Lithuania; therefore, the official statistics of the whole country is taken into consideration to calculate the project-level activity adoption rate. The common practice (Conventional Farming) refers to the predominant practices in the geographical region, as determined by the highest degree to which those practices have penetrated the market.

[38] Jolanta Drozdz (sciprofiles.com)
[39] https://osp.stat.gov.lt/zus2020-rezultatai/zemes-ukio-augalu-paseliai

Conventional farming is a common practice within the national boundary of Republic of Lithuania, it covered 62% of land in 2020, that includes use of synthetic fertilizers, herbicides, pesticides, and intensive soil tillage. The lack of finance, knowledge of sustainable land management, and the high risks of the transition period justify the continuation of business-as-usual and a very slow transition towards adoption of regenerative agricultural practice in the Lithuanian region.



Picture 16. Tillage methods in Lithuania

According to the Ministry of Agriculture of Lithuania, no-till practice is applied on 79,900 ha of all arable land. A total of 162,409 ha of arable land are dedicated to organic farming[40], making up only 7.46 % of total agricultural land in Lithuania. The crop rotation practice is not compulsory but recommended and supported by governmental subsidies.

Project activity description	Area (ha) of adopted project activity in the region[41]	Existed adoption rate of project activity in the region[42]
No-Till method	79 900	3.67%
Conservational tillage method (Definition of Lithuanian Statistics Department - Conservation tillage (no plowing) — tillage	521 200	24.13%

[40] https://osp.stat.gov.lt/statistiniu-rodikliu-analize?theme=all?hash=1d059999-c212-4fde-836f-6c37d5cf5484#/
[41] https://osp.stat.gov.lt/zus2020-rezultatai/zemes-ukio-gamybos-metodai-ir-drekinimas
[42] Region is referred to the project physical boundary i.e., all territory of Lithuania

Project activity description	Area (ha) of adopted project activity in the region[41]	Existed adoption rate of project activity in the region[42]
method usually means no plowing when part (at least 30 percent) of crop residues are left on the soil surface for erosion control and moisture preservation (e.g., the hoeing of soil without a mouldboard plow or other conservation tillage methods).		
Precision Fertilization	No data available	No data available
Organic farming agricultural production based on the use of natural processes and no use of synthetic fertilizers	162 409	7.46%
Cover crops (planted after harvest but not later than 15th of September. Cover crops are not qualifying for grazing or hay)[43] (calculated according to paid out subsidies per ha)	35 820	1.65%
Plant Residue management residue retention over the winter season for erosion and moisture control)	75 400	3.47%

Table 10. Adoption of activities analysis in the region

According to VM0042, V2.0 methodology section 7, Project Proponent may include areas where more than one project activity is implemented on the same land (e.g., reduced tillage plus cover crops). Evidence on existing adoption rates for the combined (two or more) activities should be used to calculate the weighted average adoption rate of the proposed combined activities. Where evidence on existing adoption rates for the combined activities is not available, the Project Proponent may multiply the existing adoption rates (i.e., pre-project) of the individual activities to estimate the combined activity adoption rate. For example, with a statewide existing adoption rate of 40 percent for reduced tillage and 10 percent for cover-cropping, the adoption rate to be applied in Equation (1) for lands combining (stacking) these two activities would be 4 percent (i.e., 0.4 ×0.1 = 0.04).

[43] https://www.nma.lt/index.php/naujienos/ismokos-uz-tarpinius-paselius-jau-ukininku-saskaitose/45764

Equation 1 as per VM0042 v2.0:

AR=((EA_{a1}×PA_{a1})+(EA_{a2}×PA_{a2}) +⋯+ (EA_{ay}×PA_{ay}) -------- (VCS PD Equation 1)

And:

$$PA_{a1} = \frac{Area_{a1}}{Area_{a1} + Area_{a2} + ... + Area_{ay}}$$

$$PA_{a2} = \frac{Area_{a2}}{Area_{a1} + Area_{a2} + ... + Area_{ay}}$$

$$PA_{ay} = \frac{Area_{ay}}{Area_{a1} + Area_{a2} + ... + Area_{ay}}$$

Where,

AR	=	Weighted average adoption rate in the region
EA_{ay}	=	Existing adoption rate of proposed project activity *ay*in the region(%)
PA_{ay}	=	Ratio of proposed project-level adoption of activity *ay* relative to proposed project-level adoption of all activities in the region
$Area_{ay}$	=	Area of proposed project-level adoption of activity *ay* in the region (hectares)
ay	=	1, …, *ay* proposed project activities ranked by area covered in the region, where 1 = largest area covered

Proposed project activities or set of proposed project activities	**Existed adoption rate of proposed project activities or set of proposed project activities in the region**
1. Reduced tillage (any type of tillage of soil disturbance 0- 10cm No-Till/Strip-till/Minimal till) 2. Crop rotation 3. Plant residue retention	0.83%

Proposed project activities or set of proposed project activities	Existed adoption rate of proposed project activities or set of proposed project activities in the region
1. Reduced tillage (any type of tillage with soil disturbance less than 10cm No-Till/Strip -till/Minimal till) 2. Reduced synthetic fertilizers	No data available
1. Reduced tillage (any type of tillage with soil disturbance less than 10cm No-Till/Strip -till/Minimal till) 2. Organic fertilizer application (considered as organic farming)	1.79%
1. Reduced tillage (any type of tillage with soil disturbance less than 10cm No-Till/Strip -till/Minimal till) 2. Cover crops and intercropping	0.4%

Table 12. The proposed set of project activities

Comparing information from Table 11 and Table 12, based on regional data from the Lithuania Ministry of Agriculture and Statistics Department[44] and National Paying Agency (NMA), only the set of proposed project activities falls within the common practice threshold of 20%. Farmers participating in the project adopt a package of the practices, and crop rotation or tillage is never the sole practice, thus guaranteeing that the weighted average adoption rate is less than 20% and each enrolled farm meets the common practice assessment requirements.

Steps 1–3 are satisfied, the proposed project activity is additional. With the existence of adoption barriers, regulatory surplus, and the proposed project activities not being common practice, this project meets all requirements for additionality.

3.6 Methodology Deviations

This section has been omitted in accordance with the VERRA Registration and Issuance Process v4.1 20 January 2022 - §3.1.3 – Pipeline Listing Process.

[44] https://osp.stat.gov.lt/zus2020-rezultatai/zemes-ukio-gamybos-metodai-ir-drekinimas

4 Quantification of GHG Emission Reductions and Removals

4.1 Baseline Emissions

Baseline emissions and removals refer to the level of greenhouse gas (GHG) emissions from identified sources and sinks in Table 6. by the pre-project. It is a reference point against which project emission reductions or changes are measured. Determining baseline emissions is crucial for establishing emissions reduction targets, evaluating the effectiveness of mitigation strategies, and tracking progress in reducing emissions over time.

Ex ante emissions due to inorganic fertilizer use, and fossil fuel combustion are estimated, emissions from residue burning and methane are not applicable or insignificant. Baseline removal by the change in soil organic carbon (SOC) is assumed to be zero in pre-project activities.

4.1.1 Soil organic carbon stocks

The baseline is modeled for each sample unit. The model serves to project stock change resulting from the schedule of agricultural management activities taking place in the baseline scenario.

Soil organic carbon stocks are estimated under Quantification approach 1, using Equation 6 below as per VM0042 v2.0:

Equation 6 as per VM0042 v2.0:

$SOC_{bsl,i,t} = ʆ\,(SOC_{bsl,i,t})$ -------- (VCS PD Equation 2)

Where:

$SOC_{bsl,i,t}$	=	Carbon stocks in the soil organic carbon pool in the baseline scenario for sample unit i at the end of period t; tCO_2e/unit area
$ʆ(SOC_{bsl,i,t})$	=	Modeled soil organic carbon stocks in the baseline scenario for sample unit i at the end of period t; tCO_2e/unit area
i	=	Sample unit

Equation 40 as per VM0042 v2.0, the net difference between a conventional management practice (baseline scenario) and a regenerative management practice (project scenario) over an experimental period.

$$\Delta CO2_{soil_t} = \sum_{i=1}^{n}(((\overline{SOC_{wp,i,t-1}} - \overline{SOC_{wp,i,t-1}}) - (\overline{SOC_{bsl,i,t}} - \overline{SOC_{bsl,i,t-1}})\times 44/12)\times A_i$$ ------ (VCS PD Equation 3)

Where,

$\overline{SOC_{wp,i,t}}$	=	Areal mean carbon stocks in the SOC pool in the project scenario for sample unit *I* at the end of year *t*(t CO_2e/ha)
$\overline{SOC_{wp,i,t-1}}$	=	Areal mean carbon stocks in the SOC pool in the project scenario for sample unit *I* at the end of year *t*−1(t CO_2e/ha)
$\overline{SOC_{bsl,i,t}}$	=	Areal mean carbon stocks in the SOC pool in the baseline scenario for sample unit *I* at the end of year *t*(t CO_2e/ha)
$\overline{SOC_{bsl,i,t-1}}$	=	Areal mean carbon stocks in the SOC pool in the baseline scenario for sample unit *I* at the end of year *t*− 1(t CO_2e/ha)

The project uses the Rothamsted Carbon Model - RothC model[45] program to model historical and future soil carbon fluxes. This model is publicly available and has been used in scientific studies to simulate soil organic carbon fluxes, has been calibrated and validated according to the project climate zone and tested with data from various native and managed systems. Thus, this ex-ante analysis does not separately calculate baseline and project CO_2 emissions or removals due to changes in soil organic carbon stocks but rather directly estimates net emission reductions or removals.

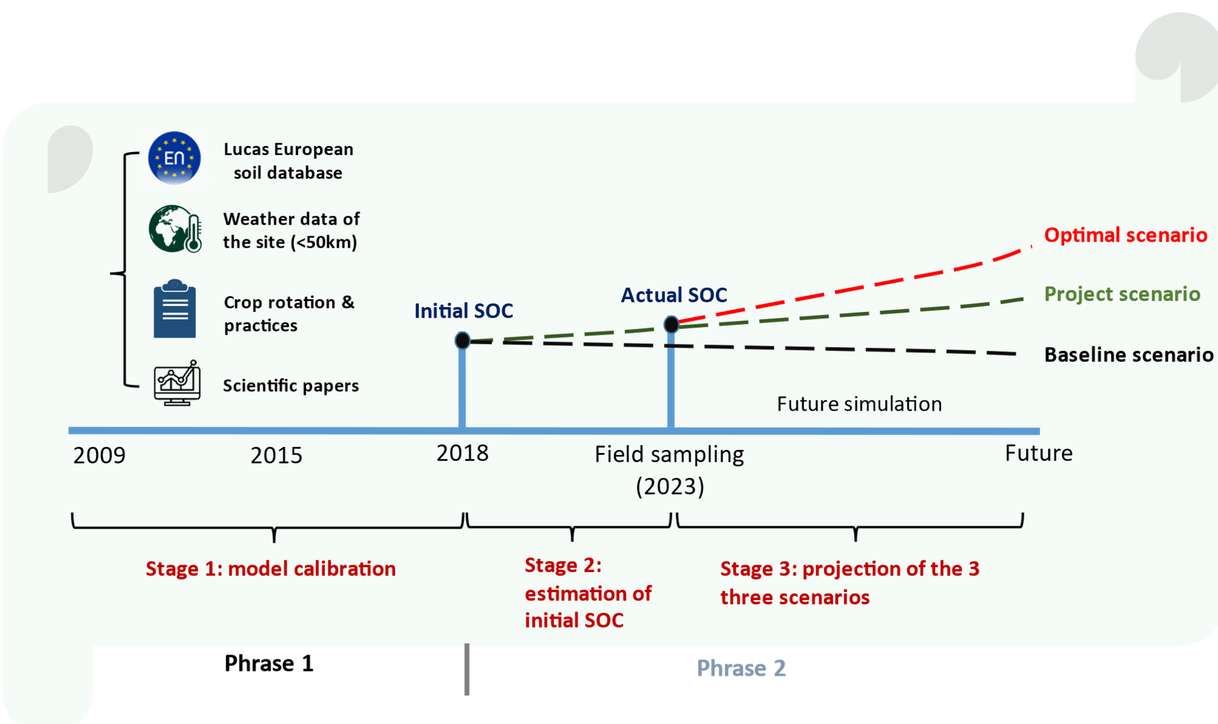
Considering the absence of soil analysis data for 2020, the Project Proponent has opted for a model-based retroactive approach. This enabled us to compute the initial soil carbon contents and estimate the total soil carbon removed within the project. The process entails simulating distinct carbon pools for both the baseline and project scenarios. In our project evaluations, the RothC model was applied to assess the progression of soil organic carbon for both baseline and projection scenarios.

Picture 17 presents the general roadmap of the implementation of the VM0042 methodology (v2.0) in the project. The project is structured into three primary operational phases. The initial phase revolves around the calibration and validation of the RothC model. During this stage, the Project

[45] https://www.rothamsted.ac.uk/sites/default/files/RothC_guide_WIN.pdf

Proponent has gathered data spanning from 2015 to 2018 concerning the Lucas database for agricultural soils in Lithuania. Additionally, the Project Proponent collected information about agricultural practices, such as the type and timing of plantations, along with harvest volumes. Meteorological data from observatories within a 50 km radius of these investigated locations were also incorporated. With this dataset in hand, the Project Proponent fine-tuned the parameters of the RothC model to suit the climatic conditions of the two primary climate zones in Lithuania.

The subsequent phase encompassed the determination of the baseline's initial soil carbon content. For the project area, the compiled agricultural management, and climatic data spanning from 2020 to 2023. This phase involved collecting and analyzing data related to agricultural practices, as well as meteorological conditions within the project area. In 2023, an extensive field sampling was executed across the entirety of the project area. This was accomplished through the implementation of a random sampling strategy, which was devised following the stratification we had previously established. By fine-tuning the calibrated model, the Project Proponent employed inverse simulation to compute the initial soil organic carbon (SOC) content within the project area for the baseline year of 2020.



Picture 17. Framework of SOC modeling

In the third phase, leveraging the previously determined initial SOC content, the Project Proponent has calculated the carbon removals occurring in the soils within the project for both the baseline and project scenarios.

4.1.2 Carbon Dioxide Emissions from Fossil Fuel Combustion

Carbon dioxide emissions from fossil fuel combustion are quantified in the baseline scenario under Quantification approach 3, using equation 7 below as per VM0042 v2.0.

Equation 7 as per VM0042 v2.0:

$$\overline{CO_2\_ff_{bsl,lt}} = (\sum_{J=1}^{J} EFF_{bsl,j,i,t})/A_i$$ ------ (VCS PD Equation 4)

Where,

$\overline{CO_2\_ff_{bsl,lt}}$	=	Areal mean carbon dioxide emissions from fossil fuel combustion in the baseline scenario for sample unit *l* in year *t* (tCO_2e/ha)
$EFF_{bsl,j,i,t}$	=	Carbon dioxide emissions from fossil fuel combustion in the baseline scenario in vehicle/equipment type *j* for sample unit *l* in year *t* (tCO_2e)
Ai	=	Area of sample unit *i* (ha)
J	=	Type of fossil fuel (diesel)

The parameter $EFF_{bsl,j,i,t}$ is estimated using the equation 8:

Equation 8 as per VM0042 v2.0:

$$EFF_{bsl,j,i,t} = FFC_{bsl,j,i,t} \times EF_{CO2,j}$$ ------ (VCS PD Equation 5)

Where,

$FFC_{bsl,j,i,t}$	=	Consumption of fossil fuel type *j* for sample unit *i* in year *t* (liters)
$EF_{CO2,j}$	=	Emission factor for combustion of fossil fuel type *j* ($tCO2_e$/liter)

4.1.3 Nitrous Oxide Emissions from Nitrogen Fertilizers and Nitrogen-Fixing Species

Nitrous oxide emissions due to nitrification/denitrification include direct and indirect emissions from nitrogen fertilizers. Nitrous oxide emissions due to nitrogen fertilizers use are quantified in the baseline scenario under Quantification Approach 3 and Equations 17 below as per VM0042 v2.0.

Equation 17 as per VM0042 v2.0:

$N2O\_soil_{bsl,i,t} = N2O\_fert_{bsl,i.t} + N2O\_md_{bsl,i,t} + N2O\_Nfix_{bsl,i,t}$ ------ (VCS PD Equation 6)

Where,

$N2O\_soil_{bsl,i,t}$	=	Nitrous oxide emissions due to fertilizer use in the baseline scenario for sample unit I in year t, tCO_2e/unit area
$N2O\_fert_{bsl,i.t}$	=	Direct nitrous oxide emissions due to fertilizer use in the baseline scenario for sample unit I in year t, tCO_2e/unit area
$N2O\_md_{bsl,i,t}$	=	Indirect nitrous oxide emissions due to fertilizer use in the baseline scenario for sample unit I in year t, tCO_2e/unit area
$N2O\_Nfix_{bsl,i,t}$	=	Sample unit

Nitrous oxide emissions due to nitrogen inputs to soils in the baseline scenario have considered the component for $N2O\_fert_{bsl,i.t}$ and $N2O\_Nfix_{bsl,i,t}$ only. Since there is no livestock present in the project or baseline scenario, direct nitrous oxide emissions due to fertilizer use have not been considered.

4.1.3.1 Nitrous Oxide Emissions Due To Fertilizer Use

Under Quantification Approach 3, direct and indirect nitrous oxide emissions due to fertilizer use in the baseline scenario are quantified using Equation 18 as per VM0042 v2.0.

Equation 18 as per VM0042 v2.0:

$N2O\_fertbsl,i,t = N2O\_fert_{bsl,direct,i,t} + N2O\_fert_{bsl,indirect,i,t}$ ------ (VCS PD Equation 7)

Where,

$N2O\_fert_{bsl,direct,i,t}$	=	Direct nitrous oxide emissions due to fertilizer use in the baseline scenario for sample unit i in year t (t CO_2e/ha)
$N2O\_fert_{bsl,indirect,i,t}$	=	Indirect nitrous oxide emissions due to fertilizer use in the baseline scenario for sample unit i in year t (t CO_2e/ha)

Direct nitrous oxide emissions due to fertilizer use in the baseline scenario are quantified using Equations 19 as per VM0042 v2.0.

Equation 19 as per VM0042 v2.0:

$\overline{N2O\_fert}_{bsl,direct,i,t} = ((FSN_{bsl,i,t} + FON_{bsl,i,t}) \times EF_{Ndirect} \times 44/28 \times GWP_{N2O})/A_i$ ------ (VCS PD Equation 8)

Where,

$\overline{N2O\_fert}_{bsl,direct,i,t}$	=	Areal mean direct nitrous oxide emissions due to fertilizer use in the baseline scenario for sample unit i in year t (t CO_2e/ha)
$FSN_{bsl,i,t}$	=	Synthetic N fertilizer applied to sample unit i in year t in the baseline scenario (t N)
$FON_{bsl,i,t}$	=	Organic N fertilizer applied to sample unit i in year t in the baseline scenario (t N)
$EF_{Ndirect}$	=	Emission factor for nitrous oxide emissions from N additions from synthetic fertilizers, organic amendments and crop residues (t N_2O-N/ t N applied)
44/28	=	Molar mass ratio of N_2O to N applied to convert N_2O-N emissions to N_2O emissions

Baseline emissions from Synthetic N fertilizer are quantified using Equations 20 as per VM0042 v2.0.

Equation 20 as per VM0042 v2.0:

$FSN_{bsl,i,t} = \sum_{SF} M_{bsl,SF,i,t} \times NC_{SF}$ ------ (VCS PD Equation 9)

Where,

$M_{bsl,SF,i,t}$	=	Mass of N containing synthetic fertilizer type SF applied to sample unit i in year t in the baseline scenario t fertilizer
NC_{SF}	=	N content of synthetic fertilizer type SF (t N/ t fertilizer)
SF	=	Synthetic N fertilizer type

Baseline emissions from Organic N fertilizer applied are quantified using Equations 21 as per VM0042 v2.0.

Equation 21 as per VM0042 v2.0:

$FSN_{bsl,i,t} = \sum_{OF} M_{bsl,OF,i,t} \times NC_{OF}$ ------ (VCS PD Equation 10)

Where,

$M_{bsl,OF,i,t}$	=	Mass of N containing organic fertilizer type OF applied to sample unit i in year t in the baseline scenario t fertilizer

NC_{OF}	=	N content of organic fertilizer type OF (t N/ t fertilizer)
OF	=	Organic N fertilizer type

Indirect nitrous oxide emissions due to fertilizer use in the baseline scenario are quantified using Equations 22 as per VM0042 v2.0.

Equation 22 as per VM0042 v2.0:

$\overline{N2O\_fert_{bsl,indirect,i,t}}$ = $(N2O\_fertbsl{,}volat{,}i{,}t + N2O\_fertbsl{,}leach{,}i{,}t)/Ai$ ------ (VCS PD Equation 11)

Where,

$\overline{N2O\_fert_{bsl,indirect,i,t}}$	=	Areal mean indirect nitrous oxide emissions due to fertilizer use in the baseline scenario for sample unit i in year t (t CO_2e/ ha)
$N2O\_fertbsl{,}volat{,}i{,}t$	=	Indirect nitrous oxide emissions produced from atmospheric deposition of N volatilized due to fertilizer use in the baseline scenario in sample unit i in year t (t CO_2e)
$N2O\_fertbsl{,}leach{,}i{,}t$	=	Indirect nitrous oxide emissions produced from leaching and runoff of N, in regions where leaching and runoff occurs, due to fertilizer use in the baseline scenario in sample unit i in year t (t CO_2e)

Baseline indirect nitrous oxide emissions produced from atmospheric deposition of N volatilized due to fertilizer use are quantified using Equations 23 as per VM0042 v2.0.

Equation 23 as per VM0042 v2.0:

$N2O\_fertbsl{,}volat{,}i{,}t$=[($FSNbsl{,}i{,}t$×$FracGASF{,}l{,}S$)+($FONbsl{,}i{,}t$×$FracGASM{,}l{,}S$)]×$EFNvolat$×44/28×$GWPN2O$ ------ (VCS PD Equation 12)

Where,

$FracGASF{,}l{,}S$	=	Fraction of all synthetic N added to soils that volatilizes as NH3 and NOx for manure management system S and livestock type l dimensionless

$FracGASM,l,S$	=	Fraction of all organic N added to soils and N in manure and urine deposited on soils that volatilized as NH 3 and NOx for manure management system S and livestock type l dimensionless
$EFNvolat$	=	Emission factor for nitrous oxide emissions from atmospheric deposition of N on soils and water surfaces (t N_2O-N/(t NH_3-N + NOx-N volatilized))

Baseline indirect nitrous oxide emissions produced from leaching and runoff of N, in regions where leaching and runoff occurs, due to fertilizer use are quantified using Equations 24 as per VM0042 v2.0.

Equation 24 as per VM0042 v2.0:

$N2O\_fertbsl,leach,i,t = (FSNbsl,i,t+FONbsl,i,t)×Frac_{LEACH,l,S}×EFNleach×4428×GWPN2O$ ------ (VCS PD Equation 13)

Where,

$Frac_{LEACH,l,S}$	=	Fraction of N (synthetic or organic) added to soils and in manure and urine deposited on soils that is lost through leaching and runoff, in regions where leaching and runoff occurs, for manure management system *S*and livestock type *l* (dimensionless)
$EFNleach$	=	Emission factor for nitrous oxide emissions from leaching and runoff (t N_2O-N/t N leached and runoff)

4.1.3.2 Nitrous Oxide Emissions from Nitrogen-Fixing Species

Nitrous oxide emissions due to the use of N fixing species included in the project boundary are

quantified in the baseline scenario under Quantification Approach 3 using Equation 25 and Equation 26 as per VM0042 v2.0.

Equation 25 as per VM0042 v2.0:

$\overline{N2O\_Nfix_{bsl,i,t}} = (FCR,bsl,i,t×EFNdirect×4428×GWPN2O)/Ai$ ------ (VCS PD Equation 14)

Where

$\overline{N2O\_Nfix}_{bsl,i,t}$ = Areal mean nitrous oxide emissions from crop residues due to the use of N-fixing species in the baseline scenario for sample unit *i* in year *t* (t CO_2e/ha)

$F_{CR,bsl,i,t}$ = Amount of N in N-fixing species (above-and belowground) returned to soils in the baseline scenario for sample unit *I* in year *t* (t N)

Equation 26 as per VM0042 v2.0:

$$FCR,bsl,i,t = \sum_{g=1}^{G} MB_{g,bsl,i,t} \times N_{content,g}$$ ------ (VCS PD Equation 15)

Where,

$MB_{g,bsl,i,t}$ = Annual dry matter(above-and belowground)of N-fixing species *g* returned to soils for sample unit *I* in year *t*(t dm)

$N_{content,g}$ = Fraction of N in dry matter for N-fixing species *g*(t N/t dm)

g = Type of N-fixing species

4.2 Project Emissions

As per the applied methodology, stock change/emissions resulting from agricultural management activities taking place in the project scenario are modeled using Quantification Approach 1. The estimation of emissions of CO_2, and N_2O in the project scenario from included sources must follow approaches provided in Table 5 and using the same equations as in section 4.1.

According to the VM0042 v2.0 methodology, for all equations, the subscript *bsl* must be substituted by *wp* to make clear that the relevant values are being quantified for the project scenario. Accordingly, this has been followed in the current project scenario.

Quantification Approach 1 is applied for the estimation of emissions from soil organic carbon stocks only. For the ex-ante estimates of soil carbon removals of the project, estimates from the Rothamsted Carbon Model – RothC model will be used. For the ex-ante estimates of N_2O and CO_2 emissions from Nitrogen fertilizer and Nitrogen fixing species, and fossil fuels respectively, the data used in the estimation is derived from the project design.

4.3 Leakage

Improved agricultural land management practices can result in leakage through new application of manure from outside the project area (i.e., manure applied in the project from outside of the project area, that was not previously applied in the historical baseline period), productivity declines, and/ or the displacement of livestock outside of the project boundary.

The Carbon Farming Program of Lithuania takes into account the measurement of leakage emissions that may result from the displacement of pre-project activities unless they are considered to be of minimal significance. The program involves the implementation of new organic amendments, such as manure, compost, or biosolids, in the project area that were not used in the past. If the implementation of project activities leads to a decline in productivity, measures must be taken to ensure that this does not happen. Furthermore, the Project Proponent will monitor the manure used in the project, if new manure, compost, or biosolids from outside of the project area would be applied in the project, the leakage would be calculated to align with section 8.4.1 of VM0042 version 2.0.

The Project Proponent will evaluate the leakage from the productivity declines every 10 years as required, and should crop productivity decline. The Project Proponent will follow the steps defined in section 8.4.3 of VM0042 version 2.0 to isolate the productivity decline, if any, and exclude certain crops or activities from future credits.

Since no grazing livestock are involved in the project, leakage emissions from livestock displacement will not be included in the project.

Thus, there are no leakage emissions caused by the project activity. Should leakage emissions caused by the project activity occur during the crediting period, the leakage emissions shall be accounted for as per section 8.4 of the VM0042 version 2.0.

4.4 Net GHG Emission Reductions and Removals

As per the applied methodology, net GHG emission reductions are quantified using Equation 37 as per VM0042 v2.0.

$$E_{red,t} = \Delta CO2\_ff_t + \Delta CO2\_lime_t + \Delta CH4\_ent_t + \Delta CH4\_md_t + \Delta CH4\_bb_t + (\Delta CH4\_soil_t \times (1 - UNC_{t,CH4\_soil})) + (\Delta N2O\_soil_t \times (1 - UNC_{t,N2O\_soil})) + \Delta N2O\_bb_t$$ ------ (VCS PD Equation 16)

Where,

$E_{red,t}$	=	Estimated net GHG emissions reductions in year *t* (t CO_2e)

$\Delta CO2\_ff_t$	=	Total carbon dioxide emission reductions from fossil fuel combustion in year *t* (t CO_2e)
$\Delta CO2\_lime_t$	=	Total carbon dioxide emission reductions from liming in year *t* (tCO_2e)
$\Delta CH4\_ent_t$	=	Total methane emission reductions from livestock enteric fermentation in year *t* (t CO_2e)
$\Delta CH4\_md_t$	=	Total methane emission reductions from manure deposition in year *t* (t CO_2e)
$\Delta CH4\_bb_t$	=	Total methane emission reductions from avoided or reduced biomass burning in year *t* (t CO2e)
$\Delta CH4\_soil_t$	=	Total methane emission reductions from increasing uptake into the SOC pool in year *t* (t CO_2e)
$UNC_{t,CH4\_soil}$	=	Uncertainty deduction in year *t* when using Quantification Approach 1to model methane emission reductions from increasing uptake into the SOC pool (fraction between 0 and 1)
$\Delta N2O\_soil_t$	=	Total nitrous oxide emission reductions from nitrification/denitrification in year *t* (t CO_2e)
$UNC_{t,N2O\_soil}$	=	Uncertainty deduction in year *t* when using Quantification Approach 1to model nitrous oxide emission reductions from nitrification/ denitrification (fraction between 0 and 1)
$\Delta N2O\_bb_t$	=	Total nitrous oxide emission reductions from avoided or reduced biomass burning in year *t* (t CO_2e)

Net GHG emission reductions and removals are quantified using Equation 38 as per VM0042 v2.0.

$E_{rem,t}$ = (($\Delta CO2_{soilt}$ – $LE_{OA,t}$ – $LE_{BR,t}$) x (1 – $UN_{Ct,CO2}$)) + $\Delta C_{TREE,t}$ + $\Delta C_{SHRUB,t}$ ------
(VCS PD Equation 17)

Where:

$E_{rem,t}$	=	Estimated net GHG emissions removals in year t (t CO_2e)
$\Delta CO2\_soilt$	=	Total carbon dioxide emission removals from increasing the SOC pool in year t (t CO_2e)
$LE_{BR,t}$	=	Leakage emissions from the diversion of manure or crop residues from baseline energy applications in year t (t CO_2e)
$\Delta C_{Tree,t}$	=	Total carbon dioxide emission removals from increasing tree biomass in year t (t CO_2e)
$\Delta C_{SHRUB,t}$	=	Total carbon dioxide emission removals from increasing shrub biomass in year t (t CO_2e)
$UN_{Ct,CO2}$	=	Uncertainty deduction in year t associated with modeling or measuring SOC stock changes (fraction between 0 and 1)

Net GHG emission reductions and removals are quantified as per equation 39 of VM0042 v2.0 methodology:

$ERR_t = E_{red,t} + E_{rem,t}$ ------ (VCS PD Equation 17)

Where:

ERR_t	=	Estimated net GHG emissions reductions and removals in year *t* (t CO_2e)
$E_{red,t}$	=	Estimated net GHG emissions reductions in year *t* (t CO_2e)
$E_{rem,t}$	=	Estimated net GHG emissions removals in year *t* (t CO_2e)

To calculate the Net GHG (Greenhouse Gas) emissions reductions and removals, using the following guidelines of VM0042 as stated in Section 8.5:

4.4.1 Carbon dioxide emission reductions and removals

Carbon dioxide emission reductions from fossil fuel combustion are quantified as per equation 41 of the VM0042 v2.0 methodology:

$$\Delta CO2_{ff_t} = \sum_{i=1}^{n} (\overline{CO2\_ff_{bsl,i,t}} - \overline{CO2\_ff_{wp,i,t}}) \times A_i$$ ------ (VCS PD Equation 18)

Where

$\Delta CO2\_ff_t$	=	Areal mean carbon dioxide emissions from fossil fuel combustion in the project scenario for sample unit i in year t (t CO_2e/ha)

- Carbon dioxide emission removals by enhancing the SOC pool for the project area

Carbon dioxide emission reductions from the soil organic carbon pool for sample unit i in year t

are quantified for Quantification Approach 1 as per equation 40 of the VM0042 v2.0 methodology

$$\Delta CO2_{soil_t} = \sum_{i=1}^{n} (((\overline{SOC_{wp,i,t-1}} - \overline{SOC_{wp,i,t-1}}) - (\overline{SOC_{bsl,i,t}} - \overline{SOC_{bsl,i,t-1}}) \times 44/12) \times A_i$$

Where,

$\overline{SOC_{wp,i,t}}$	=	Areal mean carbon stocks in the SOC pool in the project scenario for sample unit *I* at the end of year *t* (t CO_2e /ha)
$\overline{SOC_{wp,i,t-1}}$	=	Areal mean carbon stocks in the SOC pool in the project scenario for sample unit *I* at the end of year *t*−1(t CO_2e/ha)
$\overline{SOC_{bsl,i,t}}$	=	Areal mean carbon stocks in the SOC pool in the baseline scenario for sample unit *I* at the end of year *t* (t CO_2e/ha)
$\overline{SOC_{bsl,i,t-1}}$	=	Areal mean carbon stocks in the SOC pool in the baseline scenario for sample unit *I* at the end of year *t*− 1(t CO_2e/ha)

4.4.2 Nitrous oxide emission reductions

Nitrous oxide emission reductions from nitrification/denitrification are quantified as:

$$\Delta N2O\_soil_t = \sum_{i=1}^{n} (\overline{N2O\_soil_{bsl,i,t}} - \overline{N2O_{soil_{wp,i,t}}}) \times A_i$$ ------ (VCS PD Equation 19)

Where,

$\overline{N2O\_soil}_{bsl,i,t}$ = Areal mean nitrous oxide emissions from nitrogen inputs to soils in the baseline scenario for sample unit *I* in year *t* (t CO_2e/ha)

$\overline{N2O\_soil}_{wp,i,t}$ = Areal mean nitrous oxide emissions from nitrogen inputs to soils in the project scenario for sample unit *I* in year *t* (t CO_2e/ha)

4.4.3 Uncertainty

The Model Prediction Error (MPE) method is a statistical technique for estimating the uncertainty in a model's predictions. It works by comparing the model's predictions to the actual values of the output variable. The difference between the predictions and the actual values is called the prediction error. The MPE is then calculated as the average of the squared prediction errors.

The VMD0053 guidelines are a set of best practices for developing and using predictive models. Guidelines recommend the use of the MPE method for estimating uncertainty because it is a simple and effective technique that can be used with a variety of models.

The estimated value of the uncertainty with respect to SOC stocks will then be sequentially aggregated with the known model uncertainty. This means that the uncertainty estimates will be updated as new data becomes available. This helps to ensure that the uncertainty estimates are always up-to-date and accurate.

4.4.4 Ex-ante Emissions

The ex-ante calculation (estimate) of baseline emissions/removals, project emissions/removals, leakage emissions and net GHG emission reductions and removals are listed in the table below:

Year	Estimated baseline emissions or removals	Estimated project emissions	Estimated project removals	Estimated leakage emissions	Estimated net GHG emission reductions or removals
	(t CO_2-eq)	(t CO_2-eq)	(t CO_2-eq)	(t CO_2-eq)	(t CO_2-eq)
01-May-2020 – 31-December-2020	9,290	6,772	22,935	0	25,453
01-January-2021 – 31-December-2021	21,079	15,973	52,552	0	57,658
01-January-2022 – 31-December-2022	23,213	18,439	63,339	0	68,112
01-January-2023 – 31-December-2023	23,346	19,260	63,555	0	67,641

Year	Estimated baseline emissions or removals	Estimated project emissions	Estimated project removals	Estimated leakage emissions	Estimated net GHG emission reductions or removals
	($t\ CO_2$-eq)	($t\ CO_2$-eq)	($t\ CO_2$-eq)	($t\ CO_2$-eq)	($t\ CO_2$-eq)
01-January-2024 – 31-December-2024	23,346	17,789	72,029	0	77,587
01-January-2025 – 31-December-2025	23,346	16,451	72,029	0	78,924
01-January-2026 – 31-December-2026	23,346	15,234	72,029	0	80,142
01-January-2027 – 31-December-2027	23,346	14,125	72,029	0	81,2450
01-January-2028 – 31-December-2028	23,346	13,115	72,029	0	82,260
01-January-2029 – 31-December-2029	23,346	12,194	72,029	0	83,181
01-January-2030 – 31-December-2030	23,346	11,353	72,029	0	84,022
01-January-2031 – 31-December-2031	23,346	10,586	72,029	0	84,790
01-January-2032 – 31-December-2032	23,346	9,883	72,029	0	85,492
01-January-2033 – 31-December-2033	23,346	9,241	72,029	0	86,134
01-January-2034 – 31-December-2034	23,346	8,652	72,029	0	86,723
01-January-2035 – 31-December-2035	23,346	8,112	72,029	0	87,263
01-January-2036 – 31-December-2036	23,346	7,616	72,029	0	87,759
01-January-2037 – 31-December-2037	23,346	7,161	72,029	0	88,214
01-January-2038 – 31-December-2038	23,346	6,741	72,029	0	88,634
01-January-2039 – 31-December-2039	23,346	6,355	72,029	0	89,020
01-January-2040 – 30-April-2040	7,739	1,989	23,878	0	29,629
Total	458,205	237,041	1,378,725	0	1,599,888

5 MONITORING

5.1 Data and Parameters Available at Validation

All data and parameters relevant to the implemented activities that are listed in section 9.1 of the methodology VM0042 will be available at the validation process.

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	The adoption rate is calculated for each component activity in the first project instance
Justification of choice of data or description of measurement methods and procedures applied	As per the applied methodology, weighted average adoption rates
Purpose of Data	Common practice assessment for additionality
Comments	None

Data / Parameter	*EAay*
Data unit	Percent
Description	Adoption rate of the y most common (by area covered) proposed project activities 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.

Value applied	Conditional on data source
Justification of choice of data or description of measurement methods and procedures applied	Most common existing adoption rates within the project boundary are used
Purpose of Data	Common practice assessment
Comments	None

Data / Parameter	A_0
Data unit	Unit Area (in hectares)
Description	Project Area
Source of data	Farm records/ survey and project activity commitments
Value applied	The project area within the first project instance is 21,045 hectares
Justification of choice of data or description of measurement methods and procedures applied	Delineation of the project area using the individual contracts with the farmers that has been further verified via GIS mapping
Purpose of Data	Calculation of baseline and project emissions using VCS PD equation
Comments	Individual farmlands as per the individual contracts with the farmers have been added to estimate the project area.

Data / Parameter	$EF_{CO2,j}$
Data unit	t CO_2e/ liter
Description	Emission factor for the type of fossil fuel j (diesel) combusted

Source of data	Volume 2 Chapter 3 Table 3.3.1 (IPCC, 2019)
Value applied	For diesel EF_{CO2} = 0.002886 tCO_2e per liter
Justification of choice of data or description of measurement methods and procedures applied	Volume 2 Chapter 3 Table 3.3.1 (IPCC, 2019)
Purpose of Data	Calculation of baseline and project emissions from VCS PD equation 5
Comments	None

Data / Parameter	$FFC_{bsl,j,i,t}$
Data unit	Liters/ha
Description	Consumption of fossil fuel type *j* (diesel) for sample unit *i* in year *t*
Source of data	Official tax reports on fuel allowance per farm
Value applied	Average: 112.74 l/ha
Justification of choice of data or description of measurement methods and procedures applied	Monitoring of fossil fuel consumption takes place at the farm level. The amount of fossil fuel combustion is eligible for tax allowance, which is determined based on the size of the farm (l/ha)
Purpose of Data	Calculation of baseline and project emissions from VCS PD equation 5
Comments	None

Data / Parameter	$GWPN_2O$

Data unit	tCO_2e / tN_2O
Description	Global warming potential for N_2O
Source of data	IPCC Fifth Assessment Report
Value applied	265
Justification of choice of data or description of measurement methods and procedures applied	VCS Standard v4.4 requires that N_2O must be converted using the 100-year global warming potential derived from the IPCC Fourth Assessment Report.
Purpose of Data	Calculation of baseline and project emissions from VCS PD equation 8
Comments	N/A

Data / Parameter	$EF_{Ndirect}$
Data unit	t N_2O N/t N applied
Description	Emission factor for direct nitrous oxide emissions from N additions from synthetic fertilizers, organic amendments and crop residues
Source of data	Volume 4 Chapter 11 Table 11.1 (IPCC, 2019)
Value applied	0.01
Justification of choice of data or description of measurement methods and procedures applied	The value is determined by the methodology.
Purpose of Data	Calculation of baseline and project emissions from VCS PD equation 8
Comments	Emission factor applicable to N additions from mineral fertilizers, organic amendments and crop residues, and N mineralized from mineral soil as result of loss of soil carbon

Data / Parameter	$Frac_{GASF}$
Data unit	Dimensionless
Description	Fraction of all synthetic N added to soils that volatilizes as NH_3 and NOx
Source of data	Volume 4, Chapter 11, Table 11.3 (IPCC, 2019)
Value applied	0.11
Justification of choice of data or description of measurement methods and procedures applied	Source and value of data are determined by the applied methodology.
Purpose of Data	Calculation of baseline and project emissions
Comments	None

Data / Parameter	$Frac_{GASM}$
Data unit	Dimensionless
Description	Fraction of all organic N added to soils and N in manure and urine deposited on soils that volatilizes as NH_3 and NO_x
Source of data	Volume 4, Chapter 11, Table 11.3 (IPCC, 2019)
Value applied	0.21
Justification of choice of data or description of measurement	Source and value of data are determined by the applied methodology.

methods and procedures applied	
Purpose of Data	Calculation of baseline and project emissions
Comments	None

Data / Parameter	EF_{Nvolat}
Data unit	t N_2O-N /(t NH_3-N + NOx-N volatilized)
Description	Emission factor for nitrous oxide emissions from atmospheric deposition of N on soils and water surfaces
Source of data	Volume 4, Chapter 11, Table 11.3 (IPCC, 2019)
Value applied	0.01
Justification of choice of data or description of measurement methods and procedures applied	Source and value of data are determined by the applied methodology.
Purpose of Data	Calculation of baseline and project emissions
Comments	None

Data / Parameter	$Frac_{LEACH}$
Data unit	t N_2O-N /(t NH_3-N + NOx-N volatilized)
Description	Fraction of N added (synthetic or organic) to soils and N in manure and urine deposited on soils that is lost through leaching and runoff, in regions where leaching and runoff occurs

Source of data	Volume 4, Chapter 11, Table 11.3 (IPCC, 2019)
Value applied	For wet climates or in dry climate regions where irrigation (other than drip irrigation) is used, a value of 0.24 is applied. For dry climates, a value of zero is applied.
Justification of choice of data or description of measurement methods and procedures applied	Source and value of data are determined by the applied methodology.
Purpose of Data	Calculation of baseline and project emissions
Comments	None

Data / Parameter	EF_{Nleach}
Data unit	t N_2O-N / t N leached and runoff
Description	Emission factor for nitrous oxide emissions from leaching and runoff
Source of data	Volume 4, Chapter 11, Table 11.3 (IPCC, 2019)
Value applied	0.011
Justification of choice of data or description of measurement methods and procedures applied	Source and value of data are determined by the applied methodology.
Purpose of Data	Calculation of baseline and project emissions
Comments	None

Data / Parameter	$N_{content,g}$
Data unit	t N/t dm
Description	Fraction of N in dry matter for N-fixing species
Source of data	Volume 4, Chapter 11, Table 11.1 A (new) (IPCC, 2019)
Value applied	Beans and pulses 0.008 AG; 0.008 BG
Justification of choice of data or description of measurement methods and procedures applied	Source and value of data are determined by the applied methodology.
Purpose of Data	Calculation of baseline and project emissions
Comments	None

Data / Parameter	$M_{bsl,SF,i,t}$
Data unit	t fertilizer
Description	Mass of N-containing synthetic fertilizer type SF applied in sample unit i in year t in the baseline scenario
Source of data	Historical management plans are supported by one or more documented pieces of evidence pertaining to the selected sample field and period t = −1 to t = −3 (e.g., management plan, recommendations in writing solicited by the farmer or landowner from an agronomist). Where more than one value is documented in historical management plans (e.g., where a range of application rates are prescribed in written recommendations), the principle of conservativeness must be applied and the value that results in the lowest expected emissions (or highest rate of stock change) in the baseline scenario must be selected.
Value applied	Approximately: 450 kg/ha

Justification of choice of data or description of measurement methods and procedures applied	Information on the rate, timing, and type of fertilizer is provided for each year of the baseline period by each grower during enrollment.
Purpose of Data	Calculation of baseline emissions from VCS PD equation 9
Comments	N/A

Data / Parameter	$M_{bsl,OF,i,t}$
Data unit	t fertilizer/ha
Description	Mass of N-containing organic fertilizer type OF applied in the baseline scenario for sample unit i in year t
Source of data	Historical management plans are supported by one or more documented pieces of evidence pertaining to the selected sample field and period t = −1 to t = −3 (e.g., management plan, recommendations in writing solicited by the farmer or landowner from an agronomist). Where more than one value is documented in historical management plans (e.g., where a range of application rates are prescribed in written recommendations), the principle of conservativeness must be applied, and the value that results in the lowest expected emissions (or highest rate of stock change) in the baseline scenario must be selected.
Value applied	Average: 4 t/ha
Justification of choice of data or description of measurement methods and procedures applied	Information on the rate, timing, and type of fertilizer is provided for each year of the baseline period by each grower during enrollment.
Purpose of Data	Calculation of baseline emissions from VCS PD equation 10

Comments	None

Data / Parameter	$M_{Bg,bsl,i,t}$
Data unit	t dm
Description	Annual aboveground and belowground dry matter of N-fixing species g returned to soils in the baseline scenario for sample unit *i* in year *t*
Source of data	Historical management plans are supported by one or more documented pieces of evidence pertaining to the selected sample field and period t = −1 to t = −3 (e.g., management plan, recommendations in writing solicited by the farmer or landowner from an agronomist). Where more than one value is documented in historical management plans (e.g., where a range of application rates are prescribed in written recommendations), the principle of conservativeness must be applied, and the value that results in the lowest expected emissions (or highest rate of stock change) in the baseline scenario must be selected.
Value applied	/
Justification of choice of data or description of measurement methods and procedures applied	The emissions from N-fixing species are disregarded due to the insignificance of the GHG source. A tool for testing the significance of GHG emissions in A/R CDM project activities (Version 01) was applied[46]to evaluate impact.
Purpose of Data	Calculation of baseline emissions from VCS PD equation 15
Comments	N/A

Data / Parameter	$NC_{bsl,OF,i,t}$
Data unit	t N/t fertilizer

[46] https://cdm.unfccc.int/methodologies/ARmethodologies/tools/ar-am-tool-04-v1.pdf

Description	N content of baseline organic fertilizer applied
Source of data	Peer-reviewed published data may be used.
Value applied	/
Justification of choice of data or description of measurement methods and procedures applied	Default values
Purpose of Data	Calculation of baseline emissions
Comments	N/A

Data / Parameter	$P_{bsl,p}$
Data unit	Output t/ha
Description	Average productivity for product p during the historical look-back period
Source of data	Information on yields/productivity provided by farmer during enrollment
Value applied	/
Justification of choice of data or description of measurement methods and procedures applied	The information on yields/productivity will be compared with the data provided by the local government or the third party to ensure consistency.
Purpose of Data	Determination of baseline productivity for future market leakage analysis
Comments	None

Data / Parameter	$RP_{bsl,p}$
Data unit	Output t/ha
Description	Average regional productivity for product p during the historical look-back period
Source of data	Secondary evidence sources of regional productivity (e.g., peer-reviewed literature, industry associations, international databases, government databases)
Value applied	/
Justification of choice of data or description of measurement methods and procedures applied	Average yield for each crop represented in the project was sourced for years included in the baseline period
Purpose of Data	Determination of baseline productivity ratio for future market leakage analysis
Comments	N/A

5.2 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	Annual
Value applied	/
Monitoring equipment	Not Applicable
QA/QC procedures to be applied	Not Applicable
Purpose of Data	Common Practice Assessment
Calculation method	VM0042 equation 1
Comments	None

Data / Parameter	$Area_{an}$
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	Annual
Value applied	/
Monitoring equipment	Not applicable

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	Not applicable (measured)
Comments	None

Data / Parameter	EA_{an}
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 of the above sources are unavailable, a signed and date attestation statement from a qualified independent local expert.
Description of measurement methods and procedures to be applied	Not applicable
Frequency of monitoring/recording	Annual
Value applied	/
Monitoring equipment	Not applicable
QA/QC procedures to be applied	Not applicable

Purpose of Data	Common practice assessment
Calculation method	Not applicable
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	21,045 ha
Monitoring equipment	GPS or satellite data
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 for VCS PD equation 4, 8, 11 and 14
Calculation method	Not applicable
Comments	None

Data / Parameter	i
Data unit	dimensionless
Description	Sample unit; defined area that is selected for measurement and monitoring, such as a field or stratum;
Source of data	Determined in project area
Description of measurement methods and procedures to be applied	The sample unit is determined 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	/
Monitoring equipment	Not applicable
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
Purpose of Data	Calculation of baseline and project emissions
Calculation method	Not applicable
Comments	None

Data / Parameter	j
Data unit	dimensionless
Description	Type of fossil fuel combusted

Source of data	Determined in sample unit i
Description of measurement methods and procedures to be applied	farm management records will be sourced according to Box 1 VM0042 (v2.0) methodology. Fossil fuel type is determined prior to verification. Diesel will likely be most common
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	/
Monitoring equipment	Not applicable
QA/QC procedures to be applied	The requirements of Box 1 VM0042 (v2.0) methodology will be followed.
Purpose of Data	Calculation of baseline and project emissions
Calculation method	Not applicable
Comments	None

Data / Parameter	g
Data unit	dimensionless
Description	Type of N-fixing species
Source of data	Determined in sample unit i from grower management practice information on cropping activities
Description of measurement methods and procedures to be applied	Farm management records will be sourced according to Box 1 VM0042 (v2.0) methodology. N-fixing species type is determined prior to verification. Beans & Pulses has been taken into consideration.
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	/

Monitoring equipment	Not applicable
QA/QC procedures to be applied	The requirements of Box 1 VM0042 (v2.0) methodology will be followed.
Purpose of Data	Calculation of baseline and project emissions
Calculation method	Not applicable
Comments	Type of N-fixing species

Data / Parameter	SF
Data unit	dimensionless
Description	Type of synthetic N fertilizer
Source of data	Determined in sampled unit i from grower management practice information provided on fertilizer use
Description of measurement methods and procedures to be applied	Farm management records will be sourced according to Box 1 VM0042 (v2.0) methodology. Synthetic fertilizer type is determined prior to verification. Common synthetic fertilizer types include urea
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	/
Monitoring equipment	Not applicable
QA/QC procedures to be applied	The requirements of Box1 VM0042 (v2.0) methodology will be followed.
Purpose of Data	Calculation of baseline and project emissions for VCS PD equation 9
Calculation method	Not applicable
Comments	None

Data / Parameter	OF
Data unit	Dimensionless
Description	Type of organic N fertilizer
Source of data	Determined in sampled unit i from grower management practice information on fertilizer use
Description of measurement methods and procedures to be applied	Farm management records will be sourced according to Box 1 VM0042 (v2.0) methodology. Organic fertilizer type is determined prior to verification. Common organic fertilizer types has been taken into consideration.
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	/
Monitoring equipment	Not applicable
QA/QC procedures to be applied	The requirements of VM0042 (v2.0) methodology will be followed.
Purpose of Data	Calculation of baseline and project emissions for VCS PD equation 10
Calculation method	Not applicable
Comments	None

Data / Parameter	$FFC_{wp,j,i,t}$
Data unit	Liters
Description	Consumption of fossil fuel type j in the project for sample unit i in year t

Source of data	Determined in sample unit i from grower provided management practice information on tillage practices
Description of measurement methods and procedures to be applied	Fossil fuel consumption can be monitored, or the amount of fossil fuel combusted can be estimated using fuel efficiency of the vehicle type and the appropriate unit of use for the selected fuel efficiency Farm management records will be sourced according to Box 1 in VM0042.
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	Average: 115.58 l/ha
Monitoring equipment	Not applicable
QA/QC procedures to be applied	Guidance provided in IPCC, 2003 Chapter 5 or IPCC, 2000 Chapter 8 must be applied
Purpose of Data	Calculation of project emissions
Calculation method	Fuel efficiency factors can be obtained from the Volume 2, Chapter 3 (IPCC, 2019)
Comments	None

Data / Parameter	$Mwp,_{SF,i,t}$
Data unit	t fertilizer
Description	Mass of N containing synthetic fertilizer applied in the project for sample unit i in year t
Source of data	Determined in sampled unit i from grower provided management practice information on fertilizer activities
Description of measurement methods and procedures to be applied	Farm management records will be sourced according to Box 1 in VM0042. Mass of synthetic N fertilizer applied is determined 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	/ It will depend on each individual grower's fertilizer practices in a given year.
Monitoring equipment	Not applicable
QA/QC procedures to be applied	Information will be monitored via direct consultation with, and substantiated with a written form, the farmer or landowner of the sample unit.
Purpose of Data	Calculation of project emissions
Calculation method	Not applicable
Comments	None

Data / Parameter	$Mwp,_{OF,i,t}$
Data unit	t fertilizer
Description	Mass of N containing organic fertilizer applied in the project for sample unit i in year t
Source of data	Determined in sampled unit i from grower provided management practice information on fertilizer activities
Description of measurement methods and procedures to be applied	Farm management records will be sourced according to Box 1 in VM0042. Mass of organic N fertilizer applied is determined 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	/ It will depend on each individual grower's fertilizer practices in a given year.
Monitoring equipment	Not applicable

QA/QC procedures to be applied	Information will be monitored via direct consultation with, and substantiated with a written from, the farmer or landowner of the sample unit.
Purpose of Data	Calculation of project emissions
Calculation method	Not applicable
Comments	None

Data / Parameter	$MBg_{,wp,i,t}$
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 in year t
Source of data	Aboveground and belowground dry matter in N-fixing species g returned to soil may be directly measured, or peer-reviewed published data may be used.
Description of measurement methods and procedures to be applied	See the source 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	/
Monitoring equipment	Not applicable
QA/QC procedures to be applied	Requirements of Box 1 of VM0042 will be followed.
Purpose of Data	Calculation of project emissions
Calculation method	Not applicable
Comments	None

Data / Parameter	LEt
Data unit	tCO2e
Description	Leakage in year t
Source of data	Not applicable
Description of measurement methods and procedures to be applied	Leakage is equal to zero per the applicability conditions and Section 8.4 of this methodology
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	/
Monitoring equipment	Not applicable
QA/QC procedures to be applied	Not applicable
Purpose of Data	Calculation of project emissions
Calculation method	Not applicable
Comments	None

Data / Parameter	∆P
Data unit	Percent
Description	Change in productivity
Source of data	Calculated
Description of measurement methods	Not applicable

and procedures to be applied	
Frequency of monitoring/recording	Every 10 years
Value applied	/
Monitoring equipment	Not applicable
QA/QC procedures to be applied	Not applicable
Purpose of Data	Determination of change in crop productivity for leakage analysis
Calculation method	See Section 8.4.3 in VM0042
Comments	None

Data / Parameter	$P_{wp,p}$
Data unit	Productivity (e.g., kg) per hectare
Description	Average productivity for product p during the project period
Source of data	Farm productivity (e.g., yield) records
Description of measurement methods and procedures to be applied	Measured using locally available technologies (e.g., mobile weighing devices, commercial scales, storage volume measurements, fixed scales, weigh scale tickets, etc.)
Frequency of monitoring/recording	Each growing season
Value applied	/
Monitoring equipment	Not applicable
QA/QC procedures to be applied	Requirements of Box 1 of VM0042 will be followed.

Purpose of Data	Determination of project productivity for market leakage analysis
Calculation method	Not applicable
Comments	None

Data / Parameter	P
Data unit	Categorical variable
Description	Crop product
Source of data	Grower provided management information on cropping practices
Description of measurement methods and procedures to be applied	Not applicable
Frequency of monitoring/recording	Each growing season
Value applied	/
Monitoring equipment	Not applicable
QA/QC procedures to be applied	Not applicable
Purpose of Data	Identification of crop product for market leakage analysis
Calculation method	Not applicable
Comments	None

Data / Parameter	ΔPR

Data unit	Percent
Description	Change in productivity ratio
Source of data	Calculated
Description of measurement methods and procedures to be applied	Not applicable
Frequency of monitoring/recording	Every 10 years
Value applied	/
Monitoring equipment	Not applicable
QA/QC procedures to be applied	Not applicable
Purpose of Data	Determination of change in crop productivity for leakage analysis
Calculation method	See Section 8.4.3 of VM0042
Comments	None

Data / Parameter	$RP_{wp,p}$
Data unit	Unitless
Description	Average regional productivity for product p during the same years as the project period
Source of data	Regional productivity data from government, industry, published, academic or international organization (e.g., FAO) sources.
Description of measurement methods and procedures to be applied	Not applicable

Frequency of monitoring/recording	Every 10 years
Value applied	/
Monitoring equipment	Not applicable
QA/QC procedures to be applied	Not applicable
Purpose of Data	Determination of project productivity ratio for market leakage analysis
Calculation method	Not applicable
Comments	None

Data / Parameter	$Buffer_t$
Data unit	tCO_2e
Description	Number of buffer credits to be contributed to the AFOLU pooled buffer account in year t
Source of data	The number of buffer credits to be contributed to the AFOLU pooled buffer account must be determined by applying the latest version of the VCS AFOLU Non-Permanence Risk Tool
Description of measurement methods and procedures to be applied	Not applicable
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	/
Monitoring equipment	Not applicable
QA/QC procedures to be applied	The number of buffer credits to be contributed to the AFOLU pooled buffer account must be determined by applying the latest version of the VCS AFOLU Non-Permanence Risk Tool

Purpose of Data	Calculation of project emissions
Calculation method	The number of buffer credits to be contributed to the AFOLU pooled buffer account must be determined by applying the latest version of the VCS AFOLU Non-Permanence Risk Tool
Comments	None

Data / Parameter	$fSOC_{bsl,i,t}$
Data unit	t CO2e/unit area
Description	Modeled soil organic carbon stocks pool in the baseline scenario for sample unit i at time t
Source of data	Modeled in the project area
Description of measurement methods and procedures to be applied	Modeled soil organic carbon stocks in the baseline scenario are determined according to the equation: $SOC_{bsl,i,t} = fSOC(Var\ Absl,i,t,\ Var\ Bbsl,i,t\quad)$ Where: SOC_soilbsl,i,t = Modeled soil organic carbon stocks pool in the baseline scenario for sample unit i at time t (t CO2e/unit area) ʆSOC = Model predicting carbon dioxide emissions from the soil organic carbon pool (t CO2e/unit area) $Var\ A_{bsl,i,t}$ = Value of model input variable A in the baseline scenario for sample unit i at time t (units unspecified) $Var\ B_{bsl,i,t}$ = Value of model input variable B in the baseline scenario for sample unit i at time t (units unspecified) Model input variables will be sourced according to Box 1 of the applied methodology VM0042.
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	/

Monitoring equipment	Model
QA/QC procedures to be applied	Standard QA/QC procedures for soil inventory including field data collection and data management must be applied. Use or adaptation of QA/QCs available from published handbooks, such as those published by FAO and available on the FAO Soils Portal, or from the IPCC GPG LULUCF 2003 is recommended.
Purpose of Data	Calculation of Baseline Emissions
Calculation method	RothC Model
Comments	The soil organic carbon stocks at time t=0 are directly measured at t=0 or (back-) modeled to t =0 from measurements collected within +/-5 years of t =0, or determined for t=0 via emerging technologies (e.g., remote sensing) with known uncertainty, and must be used in both the baseline and with- project scenario for the length of the project.

Data / Parameter	$SOC_{bsl,i,t}$
Data unit	t CO2e/unit area
Description	Areal average soil organic carbon stocks in the baseline scenario for sample unit i in year t
Source of data	Modeled or measured in the project area
Description of measurement methods and procedures to be applied	See $ƒSOC_{bsl,i,t}$ 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	/
Monitoring equipment	Model
QA/QC procedures to be applied	Standard QA/QC procedures for soil inventory including field data collection and data management must be applied. Use or adaptation of QA/QCs available from published handbooks, such as those published

	by FAO and available on the FAO Soils Portal, or from the IPCC GPG LULUCF 2003 is recommended.
Purpose of Data	Calculation of baseline emissions
Calculation method	RothC Model
Comments	The soil organic carbon stocks at time t=0 are directly measured at t=0 or (back-) modeled to t =0 from measurements collected within +/-5 years of t =0, or determined for t=0 via emerging technologies (e.g., remote sensing) with known uncertainty, and must be used in both the baseline and with- project scenario for the length of the project.

Data / Parameter	SOCbsl,i,t-1
Data unit	t CO2e/unit area
Description	Areal average soil organic carbon stocks in the baseline scenario for sample unit i in year t-1
Source of data	Modeled or measured in the project area
Description of measurement methods and procedures to be applied	See $ƒSOC_{bsl,i,t}$ 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	/
Monitoring equipment	Model
QA/QC procedures to be applied	Standard QA/QC procedures for soil inventory including field data collection and data management must be applied. Use or adaptation of QA/QCs available from published handbooks, such as those published by FAO and available on the FAO Soils Portal, or from the IPCC GPG LULUCF 2003 is recommended.
Purpose of Data	Calculation of baseline emissions
Calculation method	RothC Model

Comments	The soil organic carbon stocks at time t=0 are directly measured at t=0 or (back-) modeled to t =0 from measurements collected within +/-5 years of t =0, or determined for t=0 via emerging technologies (e.g., remote sensing) with known uncertainty, and must be used in both the baseline and with- project scenario for the length of the project.

Data / Parameter	SOCwp,i,t
Data unit	t CO2e/unit area
Description	Areal average soil organic carbon stocks in the project scenario for sample unit i in year t
Source of data	Modeled or measured in the project area
Description of measurement methods and procedures to be applied	Modeled soil organic carbon stocks in the project scenario are determined according to the equation: $SOC\text{wp,i,t} = fSOC(Var\ Awp,i,t, Var\ Bwp,i,t)$ Where: SOC_soilwp,i,t = Modeled soil organic carbon stocks pool in the project scenario for sample unit i at time t (t CO2e/unit area) ƒSOC = Model predicting carbon dioxide emissions from the soil organic carbon pool (t CO2e/unit area) Var Awp,i,t = Value of model input variable A in the project scenario for sample unit i at time t (units unspecified) Var Bwp,i,t = Value of model input variable B in the project scenario for sample unit i at time t (units unspecified) Model input variables will be sourced according to Box 1 of the applied methodology VM0042. Measured soil organic carbon must be determined from samples collected from sample plots located within each sample unit. All organic material (e.g., living plants, crop residue) must be cleared

	from the soil surface prior to soil sampling. Soil must be sampled to a minimum depth of 30 cm. Soil organic carbon stocks must be estimated from measurements of both soil organic carbon content and bulk density taken at the same time at the project start and re-measured every 5 years or less. Geographic locations of intended sampling points must be established prior to sampling. The location of both the intended sampling point and the actual sampling point must be recorded. If multiple cores are composed to create a single sample, these cores must all be from the same depth and be fully homogenized prior to subsampling. Soils must be shipped within 5 days of collection and should be kept cool until shipping. Sampling and measurement procedure will follow the national standards.
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	/
Monitoring equipment	Model
QA/QC procedures to be applied	Standard QA/QC procedures for soil inventory including field data collection and data management must be applied. Use or adaptation of QA/QCs available from published handbooks, such as those published by FAO and available on the FAO Soils Portal, or from the IPCC GPG LULUCF 2003 is recommended.
Purpose of Data	Calculation of project emissions
Calculation method	Refer to description of measurement
Comments	The soil organic carbon stocks at time t=0 are directly measured at t=0 or (back-) modeled to t =0 from measurements collected within +/-5 years of t =0, or determined for t=0 via emerging technologies (e.g., remote sensing) with known uncertainty, and must be used in both the baseline and with- project scenario for the length of the project. Soil organic carbon stocks in the project scenario for sample unit i must be reported every 5 years or less. Where re-measurement of soil organic carbon stocks indicates lower stocks than previously estimated by modeling, procedures in the most current version of the VCS Registration and Issuance Process for loss or reversal events are followed, as appropriate.

Data / Parameter	SOCwp,i,t-1
Data unit	t CO2e/unit area
Description	Areal average soil organic carbon stocks in the project scenario for sample unit i in year t-1
Source of data	Modeled or measured in the project area
Description of measurement methods and procedures to be applied	See $ƒSOC_{wp,i,t}$ 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	/
Monitoring equipment	Model
QA/QC procedures to be applied	Standard QA/QC procedures for soil inventory including field data collection and data management must be applied. Use or adaptation of QA/QCs available from published handbooks, such as those published by FAO and available on the FAO Soils Portal, or from the IPCC GPG LULUCF 2003 is recommended.
Purpose of Data	Calculation of project emissions
Calculation method	/
Comments	None

Data / Parameter	$\overline{\Delta \bullet}, t$ and $\bullet t$
Data unit	t CO2e/unit area
Description	Average emission reductions from pool or source •, or stock of pool •, in year t
Source of data	Calculated from modeled or calculated values in the project area

Description of measurement methods and procedures to be applied	Not applicable.
Frequency of monitoring/recording	Calculations and recording must be conducted at least every five y ears, or prior to each verification event if less than five years
Value applied	/
Monitoring equipment	Not applicable
QA/QC procedures to be applied	Not applicable
Purpose of Data	Calculation of emission reductions
Calculation method	/
Comments	None

5.3 Monitoring Plan

5.3.1 Operation and Management Structure

A monitoring group will be established by Project Proponent to carry out the monitoring work. The structure of the monitoring group is as follows:

Roles	Responsibilities
Project Manager	Responsible for overall project management, including developing and managing the project plan, budget, and schedule, and ensuring that the project is executed in accordance with the QA/QC Plan.
Data Collection and Measurement Specialist	Responsible for collecting and measuring GHG emissions data, including the use of appropriate equipment and tools and ensuring that the data is accurate and reliable.
Data Processing Specialist	Responsible for processing, analysing, and reporting GHG emissions data, including the use of appropriate software and tools and ensuring that the data is accurate and complete.
Auditing and Assessment Specialist	Responsible for conducting internal and external audits and assessments of the GHG emissions data and reporting processes, including the preparation of audit reports and recommendations for improvement.
Continuous Improvement Specialist	Responsible for reviewing the QA/QC Plan and identifying opportunities for continuous improvement of the GHG project processes and procedures.
Training and Awareness Specialist	Responsible for developing and delivering training and awareness programs for project personnel, including training on the GHG project processes, procedures, and data collection, measurement, and reporting methods.

A Monitoring Manual will be provided to each member of the monitoring team with a specific explanation to make sure they fully understand all monitoring processes and issues.

5.3.2 Monitoring process

5.3.2.1 Definition of the accounting boundary of the project

As per the VM0042 methodology (version 2.0), the project area A_0 is measured prior to the validation.

The KML file delineating the project boundary and project area will be saved and
uploaded as required by the VCS. The accounting boundary of the project is defined as the aggregation of all the enrolled farmers' fields. Only those project fields which are enrolled in the project and cultivated according to the practices adopted in the description are accounted for the valid and reliable boundary and area of the project. A cultivation logbook will be recorded and

maintained by each household enrolled in the project. The cultivation logbook will record all the necessary parameters related to the cultivation practice i.e.,

- Land preparation date
- Sowing date
- Fertilizer information
- Irrigation information
- Tillage information
- Crop information
- Crop yield
- Crop rotation information etc.

The Project Proponent shall record each household involved in the project and establish farmers' database. In the database, each household has a unique ID, their name, location and area of their lands, the date of the agreement with the Project Proponent, and the starting date of changing the cultivation practice should be clearly stated in the database. In order to determine whether the project fields belong to accounting project boundary, farmers 'compliance with project cultivation practices shall be monitored in a sampled way on the basis of the farmers' database, and "Standard for sampling and surveys for CDM project activities and programme of activities (version 9.0)" shall be followed.

If the actual accounting boundary and area is different from the project area at validation, the actual boundary and area will be used in the calculation.

5.3.2.2 Monitoring of the Implementation

The Project Proponent will prepare the project implementation plan and the actual implementation will be recorded in the farmers' cultivation logbooks.

5.3.2.3 Monitor Frequency

The monitoring of the project implementation will take place at least every five years after the project registration to ensure the continuity of the benefits. Periodic verification and quantitative monitoring of the project will take place every five years.

5.3.2.4 Sampling design and stratification

As per the applied methodology, Quantification Approach 1 will be used in the project to estimate the changes in SOC in the project scenario and baseline scenario. There are seven dominant soil types prevailing in the project area. Due to variability of soil properties, stratifying the project area into homogeneous strata defined by the variations observed in a particular variable (X). The X can represent any feature that displays variability across the project area, such as soil type, soil texture, soil carbon density, or the density of woody biomass per unit area. The process of stratification can significantly enhance the precision of measurements and monitoring efforts in a cost-effective way.

Land use management involves crop pattern, rotations, crop residues management and fertilization.

- Reportedly, common crop rotation used in the project area consists of at least 4 plant species: winter wheat, winter rapeseed, peas and summer barley. More diverse, but less common crop rotations involve the addition of one or more of the following crops: corn, beans, oats, triticale, alfalfa and grass-legume mixes. Monocropping is avoided but there are some rare occasions when winter wheat or rapeseed is monocropped for two seasons in a row.
- Residues of every crop are usually left in the field unless it is a mixed farm and some part of the straw is collected to be used as animal bedding during winter months. It is aged and turned into compost before spreading it back in the fields in autumn. The general practice is to cut and evenly spread the straw onto fields by combine harvester and either direct seed the autumn cereal crop or strip-till sow winter rapeseed. Another option is to first incorporate the straw together with stubble leftovers by stubble ploughing or disking from 3 to 15 cm deep once after harvest and then for the second time just before sowing the autumn crop. Some farms use Trichoderma spp inoculation for better straw decomposition.
- Fertilization programs vary by farm management practices but generally, the most popular forms of synthetic nitrogen sources are KAS-32 (urea-ammonium nitrate), ammonium nitrate and ammonium sulfate for spring fertilization. Mixes of NPK 5/15/30, 16/16/16, and 10/20/26 are used as slow-release fertilization in autumn before sowing. Organic inputs such as digestate, manure slurry, farm manure and compost are also used. Liming is generally used where soil pH is low. Other minerals, boron, manganese, zinc are used in liquid forms and sprayed on crops during vegetative growth. Some farms utilize nitrogen-fixing, phosphorus and potassium-mobilizing bacterial products to lower synthetic fertilizer use.

In summary, based on the survey performed across the project area where the majority of the plots were cropped and managed similarly, therefore, land use and management were not considered a stratification variable.

Similarly, based on topography maps, the slope and slope gradient were in the range, and therefore, this variable was not considered a stratification variable.

Based on available information and data analysis, the stratification variables were: i) agroclimatic zone and ii) soil type. The degree of homogeneity may vary from project to project and may be assessed based on stratum size in the context of the project, the degree of natural variability and the significance of the variability to the project and baseline scenarios.

The number of sampling points per strata depends on the level of variability within strata in the project area, the required levels of precision and resource availability. To sample each strata, the minimum number of sampling points will be determined based on the strata area, soil organic carbon content and the variability of SOC in the strata and in relation to the variability (standard deviation) in the project area. Samples unit number will be calculated based on the pre-sampling results conducted in 2022 April, May, and September. The individual farmer and soil type distribution on the farm stratified the pre-sampling project area. Seven dominant soil types prevailed in the project area, and some showed moderate variability in OC stock results. Histosols soil type is excluded from the project by the methodology, because of its high OC concentration and Planosols type is excluded from the sampling due to the low weight % against the total project area.

Samples are allocated randomly by the GIS program ArcGIS to avoid bias with the specific exclusion criteria, as follows:

- Within a stratum, the sampling locations where soil cores are determined randomly to avoid bias. However, certain areas shall be excluded in grazed lands, such as patches with animal excreta, animal pathways, driveways to enter/leave fields, and very near watering points.
- Topography: Fields with slopes should be eliminated from sampling as a not dominant representative, indicated as “invalid”
- Distance from the spatial borders of other countries: 5km from the border of the Republic of Belarus;
- Points must be allocated 30m from the boundaries of the roads to avoid the ruts and compacted areas by heavy machinery.

The exclusion criteria will be followed in the future as well. Soil samples will be collected from the 0-30 cm layer from different soil units to determine the Soil organic carbon content. Each sample unit within the project area is defined as a square area of 2000 square meters, 45m x 45m. One sample unit has five randomly selected coordinates for core collection. The soil samples will be analyzed as per BS 7755: Section 3.8: 1995 ISO 10694:1995 Soil quality – chemical methods – determination of organic and total carbon after dry combustion (elementary analysis). Sample collection at each selected coordinate will be strictly in line with the applied methodology VM0042.

5.3.2.5 Monitoring of leakage emissions

At the validation stage, no leakage emissions have been considered. During the verification, leakage emissions will be monitored as a part of VM0042 version 2.0 methodology. The average productivity will be monitored and recorded annually. In order to ensure leakage is not occurring, the following steps shall be completed every 10 years as per VM0042, V2.0 methodology:

- **Step 1:** Demonstration that the productivity of each crop product has not declined by more than 5 percent in the project scenario.
- **Step 2:** Determining whether the crop productivity decline was caused by a short-term productivity decrease by repeating the calculation in Step 1 excluding all data inputs from the first three years of project implementation. Where a reduction in productivity of greater than 5 percent is still observed in one or more crop products, further analysis will be done for these crop products as per Step 3.
- **Step 3:** Determining whether the productivity decline is limited to a certain combination of factors by stratifying the analysis by:
    1. Practice change category,
    2. Practice change category combinations,
    3. Crop type,
    4. Soil type, and/or
    5. Climatic zone.

5.3.3 Data Management

The Project Proponent has established data collection, monitoring and evaluation processes of the project GHGs sources and sinks for the model and default equations input related to the quantification of the VCUs.

All data collected as part of monitoring is archived electronically. All information will be stored by the technology department of the Project Proponent and all the materials have a physical copy for backup. And all data collected shall be archived for a period of at least two years after the end of the last crediting period of the project activity.

5.3.4 QA/QC plan

The following QA/QC procedures will be adopted**:**

- All staff will be trained on the monitoring plan before it is implemented, Training will be provided to the staff to guarantee the implementation of the monitoring plan, all the relevant staff are obliged to take the training course before the operation starts.
- A systematic internal review and correction process will be used to ensure quality.
- Technicians will check farmers' logbooks once per season and cross-check the data with experts.
- Data on SOC measurement will be provided by a contracted third party and reviewed by local experts.
- The monitoring process will also be supervised by experts.
- All monitored data will be reviewed by experts.
- If experts find any unusual data, they will provide feedback to technicians and then correct the data themselves. The explanation and justification for the correction will be recorded.
- If the validated monitoring plan cannot be conducted during the following monitoring process due to some reason, an updated monitoring plan should be submitted to VVB during the corresponding verification by indicating the relevant deviation of the original plan and the reason for the deviation.

5.3.5 10-year baseline re-evaluation plan

At the end of the 10 year project crediting period, baseline re-evaluation will be done by the Project Proponent. A basic survey will be done by the Project Proponent and the report will be used as the basis of re-evaluation of the baseline scenario.

5.3.6 Modeling plan

The project will use the model to estimate the net impact of project activities on soil carbon stocks across the project area. The model will be validated as per the procedures outlined in VMD0053, and the corresponding Model Validation Report will be provided during the verification. The Model Validation Report will describe more extensive detail on model calibration, structure/parameters, and uncertainty, as well as all validation datasets employed.