Regenerating soils for climate and farmers

[December 2021]

Pilot Year 1 Report

Activities and results of the use cases, M1 – M12

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Executive summary

The main aim of WP5 is to study 5 different pilot sites across Europe and another one in Kenya, capturing different operating environments, in which the functionality of the platform and its services will be tested, verified and demonstrated.

Also, in these areas, the farmers will become familiar with the use and the advantages that this platform can provide, including demonstration and supporting services. Regarding the partners involved in WP5, 11 out of a total of 14 partners are participating in this WP (Table 1 in red). The leader of WP5 is the Hellenic Agricultural Organization "ELGO".

Table1. With red the partners are involved in WP5.

Name	Abbreviation	Organization type	Country
1. GILab DOO Beograd (coordinator)	GILab	SME	Serbia
2. SatAgro	SatAgro	SME	Poland
3. One Carbon World Fund	OCW	Non-profit organisation	UK
4. European Environment Bureau	EEB	NGO	Belgium
5. Linking Environment and Farming	LEAF	NGO	UK
6. Game and Wildlife Conservation Trust	GWCT	Research organisation	UK
7. Agricultural University of Athens	AUA	Research organisation	Greece
8. Hellenic Agricultural Organization	DEMETER ELGO	Research organisation	Greece
9. Planet Lab Gmbh	Planet	Large company	German
10. EnvirometriX	ENMX	SME	the Netherlands
11. Farrington Oils ltd.	FrOils	SME	UK
12. Arthur's Legal	ARL	SME	the Netherlands
13. Lancashire County Council	LCC	Public authority	UK
14. Udruženje Poljoprivrednika Opštine Ruma	UPOR	Association AgriCoop	Serbia

The overall objective is to provide several varied real-world operational contexts, in which to test and co-develop AgriCaptureCO2 iterations together with end-users:

- To define operational plans for each case study
- To provide trainings and workshops to participating farmers
- To iteratively the test AgriCaptureCO2 platform and its services with end-users across several case studies and to collect feedback to drive improvements
- To define evaluation methodology, and to evaluate the case studies each year to improve the next

This report documents the activities conducted by the project's use cases in year 1, and assesses performance in line with KPIs. Best-practices and room-for-improvement will be identified, on which basis the use case plans for the successive year will be re-examined.

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List of abbreviations

GNSS	Global Navigation Satellite System
EU	European Union
JRC	Joint Research Centre of the European Union
KPI	Key Performance Indicator
IoT	Internet of Things
IPCC	Intergovernmental Panel on Climate Change
UK	United Kingdom
UN	United Nations
WP	Work Package

1 Introduction

The PILOT report provides a description of the activities that were undertaken as a part of WP5 in this year: January to December 2021. We seek to provide a comprehensive overview, with a balance between detail and brevity. At the same time, we seek to assess results, progress and direction, identifying challenges/opportunities, lessons learned/best practices, and to reflect on any changes that will be implemented in the successive year.

A similar report (of a similar format) will also be drafted at the end of year 2 (month 24) and the end of year 3 (month 36) to provide an overview of WP5 activities in these periods of time.

These reports are highly complementary to the technical reports. It should be noted that the technical reports do not fully coincide with the PILOT reports; the latter two PILOT reports correspond to the latter technical report, while the current document corresponds to the first technical report.

To avoid repetition, the technical report provides a top-down assessment of the work conducted in the work package, while the current report provides a bottom-up assessment. As such, this document provides a greater amount of details on the level of the individual use cases, reporting but also reflecting on progress. The use case operational plans defined in Deliverable 2.5 are a reference point.

The rest of this chapter provides a "narrative" overview of the effort in the first year, including a discussion of "new" AgriCaptureCO2 use cases. Chapter 2 provides a description following "preparatory" activities in WP5 (roughly T5.1-T5.3, although some have and will have continuous activities which are not preparatory per se), with details for each use case. Chapter 3 provides an overview of implementation activities and evaluates progress. Finally, Chapter 4 provides conclusions.

Walkthrough through the overall effort

The requirements for WP5 in the first year were significant and critical to implementation of the use cases across the project duration, seeking to detail and "kick-start" activities. There was a front-heavy effort, requiring coordination across the project, to ensure that use case participants had a good understanding of the technology being developed and other activities of the project, on which basis they could set their goals and their activities. At the same time, use cases had to implement activities to initiate the use cases. An excerpt of the GANTT chart for AgriCaptureCO2 WP5 is shown in the figure below.

Figure 1: Gantt chart for WP5 in year 1 showing the timing of the different tasks and their respective deliverables.

Firstly, this required building off proposal level use case concepts to define detailed goals, and draft and operational plan with regards to how they would be achieved (Task 5.1). Use cases chose representative farmers and representative fields, and ensured that there was a good understanding of the project activities and their role. Each use case also defined key performance indicators and milestones that correspond to the operational plan, that would simplify WP management and tracking of progress/impact.

At the same time, each use case defined a baseline from which we would measure "progress" with regards to emissions mitigation. Each use case defined what its individual baseline would entail, including the following:

- Quantity the carbon in the soil for fields which were selected as test farms.
- The footprint of greenhouse gas emissions of a farm, agri-business owning the fields, public bodies owning public land, or other organisations relevant to the use case.

This former is required for all use cases and involved a soil campaign, which was only partially completed due to several reasons discussed below. The latter was optional up to the discretion of the value it had for each use case, involved an emissions "audit" performed by OCW. OCW uses their proprietary "toolkit" based on the Greenhouse Gas Protocol Corporate Accounting and Reporting Standard, developed by World Resources Institute and the World Business Council for Sustainable Development, which is fully aligned on emissions standards used by the IPCC and by extension the UN.

Also starting in M1, GWCT together with use case partners defined the scope of training activities to be held in the project. Overall, the partners recognised that there is a "common thread" with regards to the approach to regenerative agriculture, which is a valuable training subject itself, but that each use case also has practical aspects that relate to their different farming systems. As such, GWCT has set-out to create general training material to be available to all inside and outside the project (and to be promoted through the European Regenerative Agriculture Community), to be hosted digitally on the

AgriCaptureCO2 infoportal. This was recognised as a longer-term ambition and has continued throughout the year. In the first few months, GWCT provided use case partners with support to define their outreach and training for farmers included in the use cases.

In turn, starting in month 4, the implementation of the use cases began on the basis of the operational plans defined in Task 5.1. Although the use case leaders had a large degree of autonomy to implement use cases, we implemented a support and oversight system wherein the WP5 lead, ELGO, could measure progress on the basis of the timeplans and milestones of the operational plans. In month 11, the use cases were asked to provide an overview of their activities based on a template prepared by ELGO. The template follows all the activities, and assesses progress according to timeplans, milestones and KPIs.

Close coordination with other Work Packages

In addition, WP5 partners coordinated with WP3 to provide users to complete user needs, and with WP2 to identify and pursue engagement targets. Similarly, there was close collaboration with WP5, for some use cases, to gauge the feasibility and desirability of carbon credit certification for the use case. Finally, interaction with WP6 was bidirectional to support a coordinated dissemination effort.

Synthesis of WP5 activities in the first year

In summary, although the use cases were defined at proposal level, the first four months provided a chance to reassess assumptions, to tailor the use case activities and ambitions in a rapidly evolving domain, and to provide actionable use case plans to serve as both a guide and a benchmark.

New use cases defined

AgriCaptureCO2 has had an open approach to defining new use cases for the project. Although these are called "use cases" just like those defined at the proposal stage, they are of a much smaller size, scope and ambition than the former (i.e. with a less exploratory and more pre-commercial testing approach) and are focused around a strong and clear business case.

The advantages we recognise are:

- Additional input for technical activities of the project, involving user needs and feedback from testing sessions from different contexts not covered by the original use cases;
- Additional input for business assessment and planning activities, similar in rationale as described above; and
- An opportunity to establish business links with interested organisations that can be leveraged after the project to convert them to paying customers

On the other hand, the benefits of their involvement have to weighted with regards to the additional effort entailed in WP3, WP4 and WP5. As such, by their nature, they are of a more limited scope and focus as described above.

We have already included one additional use case, and are exploring a second one.

At the beginning of the project, OCW defined a use case in Kenya involving the country's large flower producing industry. The use case strongly builds on an existing business relationship between OCW and the growers, which are customers for its carbon accounting and zero-emissions certification programme.

As such, OCW contributed to defining an operational plan for the use case and has implemented to plan for the first year.

The involvement of the use case does not require additional effort for OCW as it builds from an existing close relationship between OCW and its long-term clients. It is also highly synergistic with OCW's role and its effort under WP4, with the overall aim to measure soil carbon sequestration and make use of it to offset unavoidable emissions of the organisations: i.e. also called "insetting", to replace current purchases of *externally* produced carbon credits to offset unavoidable emissions.

In addition, since late November, GILAB is exploring the potential to include a use case in Portugal through collaboration with a local organization promoting regenerative agriculture which is seeking to establish its own carbon credit certification programme. The collaboration will be created through a Memorandum of Understanding (a general template has been prepared for this purpose by ARL, a law firm). In turn, we will define a "operational plan" to define the roles and responsibilities of each party and ensure that we can forsee efforts and benefits for the project.

2 Setting up and launching AgriCaptureCO2 use cases

2.1 Developing a plan

In Task 5.1, the partners for each use case developed and detailed the activities that they would implement as part of the project. This builds from the initial concepts presented in the proposal and the Grant Agreement, seeking to provide a concrete plan of action.

It is important to mention that use cases used this opportunity to reflect on their concepts, reassess their assumptions, explore any changes in their contexts since the use case concepts were initially defined, and further explore their contexts for relevant opportunities that were not identified earlier. As such, the plans sought to "improve" and "detail" the use cases as they were described in the Grant Agreement.

Some use cases proposed certain changes to their approach, process or goals and discussed the changes with the ELGO (WP lead) and GILAB (coordinator). For example, GILAB expanded the scope of the Serbian use case to include interaction with TAMIS Institute (has experimental farm with multi-decade regenerative agriculture fields) and 100P+ (a sustainable agriculture farmer group). Similarly, certain adjustments were required when the use case was defined in greater detail; for example, ELGO chose farms from across the study area to ensure representation of different soils and micro-climates, which (due to small farm size) made their approach to use unmanned aerial vehicles (UAVs) for in-situ measurements less appropriate.

The result of this activity was presented in Deliverable 5.1, using a template provided by ELGO.

The use case plans act as a point of reference for guidance and for evaluation of use cases, but are not strictly definitive per se. There is a degree of flexibility for further changes which can improve the use case and help navigate opportunities and challenges as they arise, to be proposed to and discussed with WP5 leader (and the coordinator if appropriate). In fact, use cases are encouraged to reflect upon and improve their plans during annual evaluation, reassessing the content of the "multi-year plan" for the year ahead.

This flexibility has already brought some changes in the use cases after the use case plans were defined. For example, SatAgro recognised an opportunity later in the year to include TerraNostra in the Polish use case. TerraNostra is a new organisation in Poland established to support regenerative farmers with regards to production and marketing (similar to

LEAF's role in the UK). On the other hand, LEAF has decided not to directly explore carbon credit schemes for UK farmers under its own umbrella (an internal organisational decision to avoid carbon credits), with this effort within AgriCaptureCO2 shifted to OCW's activities in WP4.

In the rest of this subchapter we provide an overview of the use cases, integrating any changes that may have been defined after the use case plans were completed.

Use case #1: Sustainable Olive Oil in Greece (Crete)

Mediterranean areas will feel the heat of climate change more than other place in Europe, with the largest increase in temperature and decrease in rainfall. Mediterranean agriculture, including olive cultivation, must adapt to new challenges that affect local water, energy and ecosystems.

On the island of Crete in Greece, agriculture is already the largest user of water. Working with two farmer cooperatives and their olive mills, ELGO researchers will:

- Advance a new regenerative approach to cultivating olives, protecting soil while ensuring efficient use of water and other inputs.
- Develop and market a low-emissions olive oil brand, rewarding regenerative farmers and motivate new adopters.

Use case #2: Nutrient & soil management on Europe's large farms in Poland

The Polish AgricaptureCO2 use case represent the scenario of post-PGR land management. The post-WW2 policy of agricultural collectivization during the Stalinist regime period has made a clear mark on the Polish agricultural landscape. While generally large-scale collectivization failed to take root in Poland, in this period a number of State Agricultural Farms, or PGRs (Państwowe Gospodarstwo Rolne) were created, a form of collective farming in the People's Republic of Poland, and for some time these farms came to control approximately 10% of Poland's arable land. Nowadays, the managers of this agricultural land, have a tangible impact on the whole sector, and some of them count amongst the leaders of innovation, who are in a position to influence other agronomers.

The focus of the Polish use case is on a private company, Top Farms Głubczyce (TFG), which is a branch of the pan-European holding Spearhead International. TFG has a long-term land lease contract from the government's Agricultural Property Agency. As much as 2 830 ha out of 10 620 ha were earmarked for a Reg Agri project. In this context, especially the limited budget for soil sampling, the involvement of the second farm, initially also selected for the pilot, OHZZ (Breeding Centre for Pedigree Animals) Chodeczek, a partly State-owned company (1 800 ha), has been scaled down to a consulting role, which with time is hoped to evolve into a commercial contract.

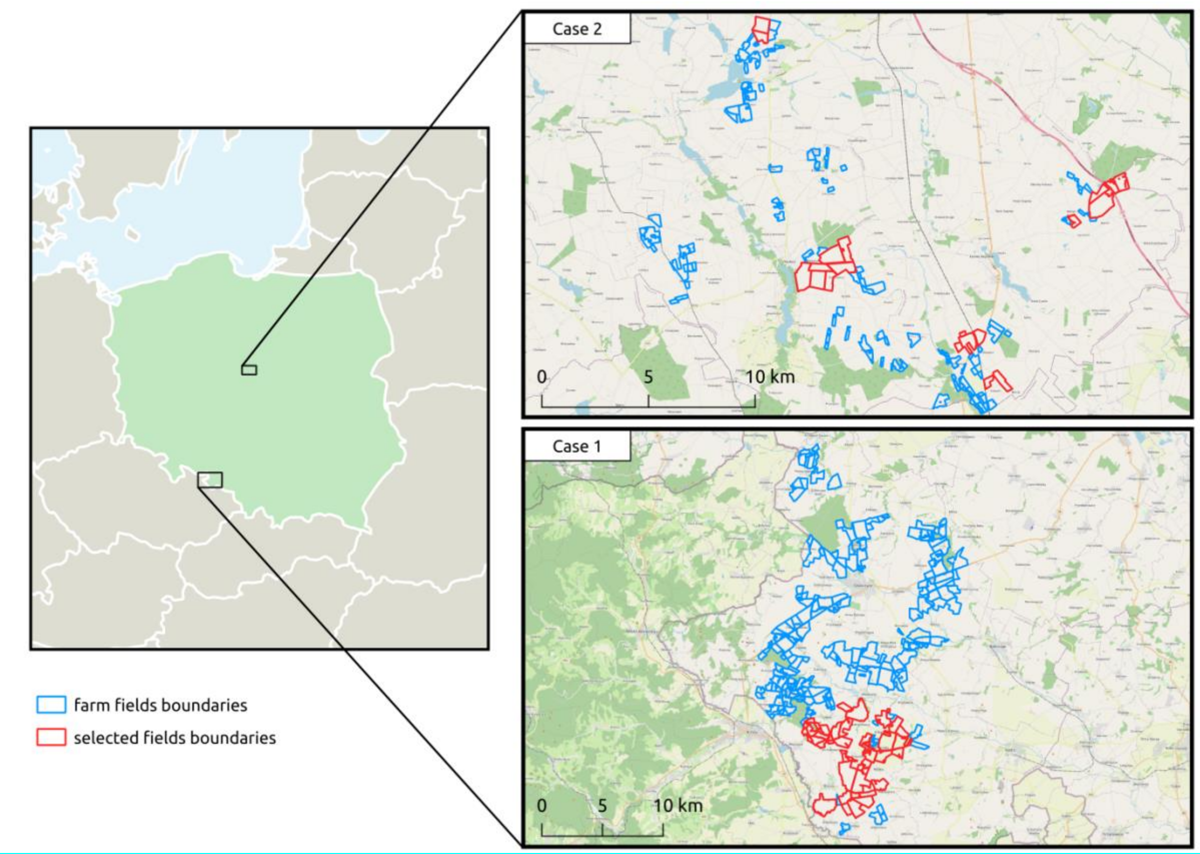


Figure 2. Localisation of the two farms which form the AgricaptureCO2 Case Study in Poland.

Case 1: Top Farms Głubczyce (2 830 ha out of 10 620 ha earmarked for the study), Case 2: OHZZ Chodeczek (760 out of 1 800 ha earmarked for the study).

The motivation to conduct a case study with the above companies was threefold.

First, the two farms are already using the SatAgro platform as a mean to implement various aspects of precision agriculture. Their experience with satellite-informed crop management, combined with the size of the land and individual crop fields they manage, places them well as testing grounds for various methods of regenerative agriculture support which involves satellite monitoring. Together these factors increase the likelihood that these farms will successfully adopt the new reg agri-oriented tools implemented on the SatAgro platform within the scope of AgricaptureCO2.

Second, these farms are particularly open to innovation and have a proven track record in this regard. Top Farms Głubczyce has for many years been a well-recognised regional trend-setter in agronomy, while OHZZ Chodeczek has vigorously engaged with new approaches to agronomy since the change in management a few years ago.

Third, the two cases represent significant potential for scale-up, as they are parts of their respective networks of farms, managed by the before mentioned Spearhead International in the case of Top Farms Głubczyce, and Krajowy Ośrodek Wsparcia Rolnictwa (National Support Centre for Agriculture) in the case of OHZZ Chodeczek. Altogether the size, visibility and networks of these entities hold a promise of a potentially large impact as a climate mitigation measure.

Use case #3: Scaling certified-regenerative businesses in the UK

A sustainable farm is suited to its specific context. It provides continuous benefits for the environment and society, and economic viability for the farmer.

LEAF has supported and promoted this site-specific approach for 30 years, and certifies farms practicing Integrated Farm Management with the LEAF Marque. Farrington’s Oils in Northamptonshire (UK) is both a LEAF-certified business and LEAF demonstration farm.

We know that the decision to change and transform a farming system is a difficult one. The use case plan envisioned leveraging AgriCaptureCO_2 to support farmers in their own transition journey with:

- AgriCaptureCO_2 data-driven decision-support tools.
- Explore a short-term compensation scheme for regenerative practices based on carbon credits.
- Peer-to-peer knowledge exchange as well as learning opportunities.

There has been no change to the overall objective: to increase scalability of the LEAF Marque, to lower costs for farmers and increase simplicity, and to support new-comers has not changed. However, the scope of activities has been widened to the entire body of LEAF farmers, both current and perspective. As such, the use case is focusing on improving the overall certification system, through:

- A greater focus on the potential of the “validate” service for use as a part of the LEAF marque certification process.
- Wider involvement of existing LEAF-certified farmers to explore user needs for the support tool.

LEAF has decided not to proceed with exploring a farm-based carbon-credit scheme in the UK, the activities of which are fully taken over by OCW as a "test case" in WP4.

Use case #4: Managing public lands to meet net neutrality goals in the UK

Lancashire County has 1.4 million inhabitants and covers 3.000 km2 in the Western UK. Like many local, regional and national governments, Lancashire has committed to carbon neutrality. It aims to achieve this feat by 2030.

Using AgriCaptureCO2, Lancashire will explore how land under public ownership can be used to maximize carbon sequestration, and the associated costs from different options. This will include management options for former landfill sites, former collieries, and other reclaimed sites. It also includes making maximum use of garden waste and forestry waste arisings processing to contribute to soil health through the production of compost.

Use case #5: Promoting sustainable agriculture without public subsidies in Serbia

Every year, burning residual crop stubble contributes to low air quality in South-Eastern Europe. Other intensive agricultural practices common in the region (deep tillage, blanket applications of pesticide, large doses of fertilizers, and others) also result in damage to waterways, biodiversity, and air quality. Legal limitations do exist but are not effectively enforced.

Small networks of farmers experimenting with regenerative practices provide the seeds to grow a new regenerative approach in the region.

Working with these networks and their knowledge, GILAB and UPOR will support interested farmers to make the change to regenerative practices. AgriCaptureCO2 provides decision-support tools and access to voluntary carbon credit markets.

Use case #6: Climate-proofing flower production in Kenya

The horticultural sector, specifically flower production, provides Kenya's second largest export after tea.

Horticulture is particularly sensitive to the impacts of climate change due to high-water demand and strict temperature requirements.

Involving the whole supply chain for cut flowers, AgriCaptureCO2 will provide a clear path to building resilience, reducing emissions and increasing revenue from carbon credits for farmers in Kenya. Building from a representative sample, we will scale to offer opportunities to a critical mass of producers.

2.2 Establishing a baseline

There were two types of baselines that AgriCaptureCO2 sought to establish: (i) the level of soil organic carbon in a soil before certain regenerative agricultural practices are implemented, to measure changes over the duration of the project; (ii) to measure the emissions of a farm, organisation or value chain (depending on the use case).

For all of the use cases, the first of these is essential and is key to testing the *Quantify* service being developed in WP3. It was based on a soil sampling campaign that was coordinated with WP3, making use of the alpha version of the *Quantify* service to pinpoint exactly where to take soil samples.

The soil campaign was coordinated together with WP3 across all use cases. ENMX defined a soil sampling protocol (based on the methodology used by JRC for LUCAS soil campaigns every couple of years) and the sampling standards (on the basis of ISO 18400-205:2018). Using the *Quantify* service, WP3 assessed fields and defined points with the highest uncertainty for which a soil sample would improve results. In turn, they used a phone app to guide the sampling team across the fields to each point.

However, there were two major challenges that were encountered. Firstly, laboratories in the UK had different analytical standards that did not include the ISO standard. Secondly, the campaign started to explore the option to in situ spectrometry instruments in situ (i.e. instruments that collect data on the field itself to provide measurements and do not require collecting soil and sending it in to a lab). The team examined several options and extensively exchanged with Stenon in Germany (the preferred option); ENMX even performed a physical visit to discuss use of their instruments. The consortium decided not to use this option due to several concerns:

- Around the price offered,
- The instruments were calibrated for a limited scope of soil organic carbon and soil types (which did not cover all the instances in the project),
- Concerns related to their internal use of data collected and data governance of the farmer, and

- The fact that they only provide processed and not raw data.

However, this option created a delay in the timing of the campaign to the point where it was not feasible for colder climates (Poland and Serbia). For farms in these two sites, samples will be taken in early spring 2022. SatAgro collected data from recent soil samples conducted in the test sites in Poland. Although this will provide the project with a shorter timespan for which to measure changes in soil organic carbon, the fact that both of these locations have subzero temperatures for most of the winter season imply that there will be little change in between sampling in autumn 2021 and spring 2022.

It should be mentioned that the project recognises the significant advantages to cost and user-friendliness from using in situ sensors. As such, it will continue its assessment of available instruments and offer one or several sensors for the soil campaigns in successive years. WP3 has decided that a mixture of different sensors and laboratory analyses are required (even for a single sample) to establish the feasibility of using sensors to provide accurate measurements of soil properties. Similarly, it was established that the process of soil sampling has to be improved, making it simpler for a farmer to find the exact spot pin-pointed by the *Quantify* service and to know how to sample.

The second baseline activity was *optional* as it would depend on the specific context of the use case, and whether it was relevant for a farm, organisation or value chain to have its emissions audited. Overall, all use cases made use of this possibility except for the use case in Serbia, for which it was considered not relevant. A total of 25 farms, agri-businesses and public bodies were audited. OCW provided each case study with a specific list of inputs and outputs required to quantify the climate impact relevant to the organisations included in the use case. Use case leads collected required data from stakeholders in the use case, and provided it to OCW. OCW assessed all data to calculate their emissions footprint. The results of the assessment as well as recommendations about how to reduce current emissions was provide through personalised reports for each farm/agri-business/public body which participated. An overview of the results is presented in the table below.

The emissions baseline will be used for insetting in all use cases. For the Greek use case, the carbon sequestered on the farm level will apply to the carbon emitted further down in the value chain, during processing, shipping, etc.

Table 1. Overview of baseline emission footprint calculations for farms, agri-businesses and public bodies included in AgriCaptureCO2 use cases.

		Absolute Emissions			Relative Emissions			
Pilot Name	Site/Organisation Name	kgCO2e	Metric	Units	kgCO2e	Measurement Period		Notes
Crete Farms	EU1 - EVAGGELINAKIS IOANNIS-PRATIKOU-2.02	1.1	0.34	Ha	3.29	1/1/2020	12/31/2020	1 year measured
Crete Farms	EU2 - EVAGGELINAKIS IOANNIS-2.03-SOXORO	0.9	0.20	Ha	4.72	1/1/2020	12/31/2020	1 year measured
Crete Farms	EU3 - LEMBIDAKI MARIA-1.01-SFAKIANOU	13.9	0.75	Ha	18.51	1/1/2020	12/31/2020	1 year measured
Crete Farms	EU4 - LEMBIDAKI MARIA-1.02-KRITSOTI	5.0	0.57	Ha	8.78	1/1/2020	12/31/2020	1 year measured
Crete Farms	EU5 - LEMBIDAKI MARIA-1.03-NEROLAKKOS	18.8	1.35	Ha	13.89	1/1/2020	12/31/2020	1 year measured
Crete Farms	EU6 - LEMBIDAKI MARIA-1.04-MPAMPOURA	8.5	0.79	Ha	10.82	1/1/2020	12/31/2020	1 year measured
Crete Farms	EU7 - MASTORAKIS DIMITRIOS-2.01-MOIRA TZANI	0.4	0.20	Ha	2.25	1/1/2020	12/31/2020	1 year measured
Crete Farms	EU8 - MASTORAKIS DIMITRIOS-2.05-AGIOS NIKOLAOS	0.4	0.20	Ha	2.14	1/1/2020	12/31/2020	1 year measured
Crete Farms	EU9 - SYSKAKIS NIKOLAOS -2.04-KSERIZOMA	1.0	0.20	Ha	4.87	1/1/2020	12/31/2020	1 year measured
Crete Farms	EU10 - TZORTZI OURANIA-1.05-PERA MERA	3.2	0.50	Ha	6.42	1/1/2020	12/31/2020	1 year measured
		tCO2e	Metric	Units	tCO2e	Measurement Period		Notes
Kenya	Tambuzi	2700.31	22.0	Ha	122.74	11/1/2019	10/31/2020	2 years measured
Kenya	Flamingo Horticulture	172219.5	808.5	Mn Stems	213.01	1/1/2020	12/31/2020	2 years measured
		tCO2e	Metric	Units	tCO2e	Measurement Period		Notes
UK	Farrington Oils	483.65	290.0	Ha	1.67	10/1/2019	31/09/2020	2 years measured
		tCO2e	Metric	Units	tCO2e	Measurement Period		Notes
Poland	Top Farms	61062.1	8000.0	Ha	7.63	1/1/2020	12/31/2020	1 year measured (area tbc)
		tCO2e	Metric	Units	tCO2e	Measurement Period		Notes
LCC	Preston City Council	2705.7	69,688	m2	0.04	4/1/2019	3/31/2020	1 year measured
LCC	Ribble Valley BC	5655.1	250	Employees	22.62	4/1/2019	3/31/2020	1 year measured
LCC	Rossendale BC	2054.2	166	Employees	12.37	4/1/2019	3/31/2020	1 year measured
LCC	South Ribble	2644.5	301	Employees	8.80	4/1/2019	3/31/2020	1 year measured
LCC	West Lancashire BC	4478.6	491	Employees	9.12	4/1/2019	3/31/2020	2 years measured
LCC	Pendle Council	3019.2	236	Employees	12.79	4/1/2019	3/31/2020	2 years measured
LCC	Hyndburn	2625.5	268	Employees	9.80	4/1/2018	3/31/2018	2 years measured
LCC	Blackburn and Darwen Borough Council	20678.9	2,134	Employees	10.80	4/1/2019	3/31/2020	1 year measured
LCC	Wyre Council	6432.3	37,137	£'000 Income	0.17	4/1/2019	3/31/2020	3 years measured
LCC	Lancaster City Council	4216.7	Metric not provided			4/1/2019	3/31/2020	3 years measured
LCC	Fylde Council	5183.7	12,021	m2	0.43	1/1/2019	3/31/2020	1 year measured
LCC	Blackpool Council	Data not provided within the timeframe - this does not impact the objectives and outcomes of WP5.						
LCC	Burnley Council							
LCC	Chorley Council							
Dropbox Link	https://www.dropbox.com/scl/fi/uurwil4vixdx1lx6yg2l/WP5-Use-Case-Baseline-Summary_11.11.21.xlsx?dl=0&rlkey=tclenuhtis3m4ozrp5713l9m							
IMPORTANT NOTES								
Please note that each case may have included or excluded different measurement activities as such comparability between each case is not practical								
As a minimum each case includes Scope 1 and 2 emissions and to a varying extent Scope 3 emissions as defined under the GHG Protocol								
This summary only provides detail of the most recent emissions report - a further breakdown of re-measurements can be provided in due course								

It should be mentioned that the UK use case led by LCC did not perform a soil campaign. The use case has certain specificities stemming from the fact that its business case revolves around public bodies. The use case operational plan defines that emission footprints would be taken in the first year, and that the test sites (with different treatments) would be established in the second year once the license on public land currently used for agriculture expires and the land is repurposed for an experiment of different treatments for the project. LCC chose to delay the soil campaign until the plots are vacated by their current tenants. In turn, these results will be used to determine a plan for public land management, and will be communicated to other Country Councils in England to support their climate-action plans.

The subsections below provide further details on baseline activities for each use case.

Use case 1: Greece

For the case study in Crete, 10 farms were selected in Eastern Crete as an area that faces the most acute issues with water availability, low amounts of SOC, and salt water intrusion – and thus would have the largest need and benefit for the potential of regenerative practices to improve natural resource management.

10 parcels/farms were selected to capture all the different olive cultivation characteristics in the extended area of Eastern Crete, covering about 0.2 ha each one, for which historical data (regarding the practices and monitoring parameters) already exists from previous research and the oLIVE-CLIMA project funded under the LIFE programme.

The farm types and family owned in which "traditional" production practices are used for the production of olives.

In all the selected farms (Figure 2), regenerative agriculture practices such as no-tillage, proper pruning, proper weed management (weed mowing), and proper plant protection have been applied. Based on the parcels historical data, OCW has calculated emissions for each parcel regarding the already applied practices and for 2020.

Figure 3. The ten olive parcels/farms (Yellow marks and red polygons) included for the use case in Crete, Greece.

Based on these baseline emissions, for each parcel separately, the already (historical) applied practices should be redesigned in order to achieve lower emissions and promote regenerative agriculture. Redesign means that, based on the already known emissions the scientific team of ELGO will support and advise farmers to follow appropriate practices minimizing these values.

The Following Tables 1, 2 depict the CO2 emissions for the 10 farms in Crete for the carbon footprint measurement period 2021. Also, in the same figures the total sum values are presented.

Table 2. Carbon footprint measurement for the parcels 1-5 included in the use case in Crete, Greece, from 1 Jan. 2020 to 31 Dec. 2020.

EU1 - EVAGGELINAKIS IOANNIS-PRATIKOU-2.02	tCO_2e	EU2 - EVAGGELINAKIS IOANNIS-2.03-SOXORO	tCO_2e	EU3 - LEMBIDAKI MARIA-1.01-SFAKIANOU	tCO_2e	EU4 - LEMBIDAKI MARIA-1.02-KRITSOTI	tCO_2e	EU5 - LEMBIDAKI MARIA-1.03-NEROLAKKOS	tCO_2e
Olive Farm - Equipment - Diesel	50,92	Olive Farm - Equipment - Diesel	38,19	Olive Farm - Equipment - Diesel	101,84	Olive Farm - Equipment - Diesel	17,82	Olive Farm - Equipment - Diesel	127,30
Olive Farm - Equipment - Diesel	12,20	Olive Farm - Equipment - Diesel	9,15	Olive Farm - Equipment - Diesel	24,41	Olive Farm - Equipment - Diesel	4,27	Olive Farm - Equipment - Diesel	30,51
Olive Farm - Vehicles - Petrol	86,72	Olive Farm - Vehicles - Petrol	97,56	Olive Farm - Vehicles - Petrol	216,80	Olive Farm - Vehicles - Petrol	173,44	Olive Farm - Vehicles - Petrol	238,48
Olive Farm - Vehicles - Petrol	23,74	Olive Farm - Vehicles - Petrol	26,70	Olive Farm - Vehicles - Petrol	59,34	Olive Farm - Vehicles - Petrol	47,48	Olive Farm - Vehicles - Petrol	65,28
Olive Farm - Water Use (Irrigation)	52,98	Olive Farm - Water Use (Irrigation)	37,84	Olive Farm - Water Use (Irrigation)	1926,40	Olive Farm - Water Use (Irrigation)	381,84	Olive Farm - Water Use (Irrigation)	2786,40
Olive Farm - Waste Management	8,95	Olive Farm - Waste Management	6,40	Olive Farm - Waste Management	79,62	Olive Farm - Outbound Deliveries (third party)	7,70	Olive Farm - Waste Management	55,98
Olive Farm - Outbound Deliveries (third party)	3,54	Olive Farm - Outbound Deliveries (third party)	2,77	Olive Farm - Outbound Deliveries (third party)	36,98	Olive Farm - Outbound Deliveries (third party)	1,86	Olive Farm - Outbound Deliveries (third party)	231,11
Olive Farm - Outbound Deliveries (third party)	0,85	Olive Farm - Outbound Deliveries (third party)	0,67	Olive Farm - Outbound Deliveries (third party)	8,92	Olive Farm - Material Use - Clothing	468,51	Olive Farm - Outbound Deliveries (third party)	55,74
Olive Farm - Material Use - Clothing	427,61	Olive Farm - Material Use - Clothing	334,65	Olive Farm - Material Use - Clothing	1115,50	Olive Farm - Material Use - Plastics	311,63	Olive Farm - Material Use - Clothing	2788,75
Olive Farm - Material Use - Plastics	124,65	Olive Farm - Material Use - Plastics	124,65	Olive Farm - Material Use - Plastics	311,63	Olive Farm - Pesticides	3098,92	Olive Farm - Material Use - Plastics	311,63
Olive Farm - Fertilizers	11,61	Olive Farm - Fertilizers	8,29	Olive Farm - Pesticides	7196,32	Olive Farm - Electricity	353,51	Olive Farm - Pesticides	11496,56
				Olive Farm - Electricity	2071,35	Olive Farm - Electricity	37,32	Olive Farm - Electricity	317,61
Olive Mill - Electricity	3,91	Olive Mill - Electricity	3,06	Olive Farm - Electricity	218,70	Olive Farm - Electricity	76,66	Olive Farm - Electricity	33,53
Olive Mill - Electricity	0,41	Olive Mill - Electricity	0,32	Olive Farm - Electricity	449,18	Olive Farm - Electricity	1,57	Olive Farm - Electricity	68,87
Olive Mill - Electricity	0,85	Olive Mill - Electricity	0,66	Olive Farm - Electricity	9,17			Olive Farm - Electricity	1,41
Olive Mill - Electricity	0,02	Olive Mill - Electricity	0,01			Olive Mill - Water Supply	0,39		
Olive Mill - Refrigerant Use	43,33	Olive Mill - Refrigerant Use	43,33	Olive Mill - Water Supply	0,93	Olive Mill - Waste Water Treatment	0,27		
Olive Mill - Vehicles - Diesel	0,29	Olive Mill - Vehicles - Diesel	0,23	Olive Mill - Waste Water Treatment	0,64	Olive Mill - Waste (Pomace)	0,00	Olive Mill - Water Supply	2,32
Olive Mill - Vehicles - Diesel	0,07	Olive Mill - Vehicles - Diesel	0,05	Olive Mill - Waste (Pomace)	0,00	Olive Mill - Core Delivery 1	3,08	Olive Mill - Waste Water Treatment	1,59
Olive Mill - Water Supply	158,24	Olive Mill - Water Supply	123,84	Olive Mill - Core Delivery 1	7,40	Olive Mill - Core Delivery 1	0,74	Olive Mill - Waste (Pomace)	0,00
Olive Mill - Waste Water Treatment	107,47	Olive Mill - Waste Water Treatment	84,11	Olive Mill - Core Delivery 1	1,78	Olive Mill - Electricity	14,38	Olive Mill - Core Delivery 1	18,49
Olive Mill - Waste (Pomace)	0,00	Olive Mill - Waste (Pomace)	0,00	Olive Mill - Electricity	34,52	Olive Mill - Electricity	1,52	Olive Mill - Core Delivery 1	4,46
Olive Mill - Core Delivery 1	0,57	Olive Mill - Core Delivery 1	0,44	Olive Mill - Electricity	3,65	Olive Mill - Electricity	3,12	Olive Mill - Electricity	86,31
Olive Mill - Core Delivery 1	0,14	Olive Mill - Core Delivery 1	0,11	Olive Mill - Electricity	7,49	Olive Mill - Electricity	0,06	Olive Mill - Electricity	9,11
				Olive Mill - Electricity	0,15			Olive Mill - Electricity	18,72
								Olive Mill - Electricity	0,38
Totals Summary									
Size of Farm (Ha)	**0,34**		**0,20**		**0,75**		**0,57**		**1,35**
Total tCO_2 Absolute	**1,12**		**0,94**		**13,88**		**5,01**		**18,75**
Total tCO_2 Relative per Ha	**3,29**		**4,72**		**18,51**		**8,78**		**13,89**

Table 3. Carbon footprint measurement for the parcels 6-10 included in the use case in Crete, Greece, from 1 Jan. 2020 to 31 Dec. 2020.

EU6 - LEMBIDAKI MARIA-1.04-MPAMPOURA	tCO_2e	EU7 - MASTORAKIS DIMITRIOS-2.01-MOIRA TZANI	tCO_2e	EU8 - MASTORAKIS DIMITRIOS-2.05-AGIOS NIKOLAOS	tCO_2e	EU9 - SYSKAKIS NIKOLAOS -2.04-KSERIZOMA	tCO_2e	EU10 - TZORTZI OURANIA-1.05-PERA MERA	tCO_2e
Olive Farm - Equipment - Diesel	50,92	Olive Farm - Equipment - Diesel	5,09	Olive Farm - Equipment - Diesel	10,18	Olive Farm - Equipment - Diesel	28,01	Olive Farm - Equipment - Diesel	38,19
Olive Farm - Equipment - Diesel	12,20	Olive Farm - Equipment - Diesel	1,22	Olive Farm - Equipment - Diesel	2,44	Olive Farm - Equipment - Diesel	6,71	Olive Farm - Equipment - Diesel	9,15
Olive Farm - Vehicles - Petrol	151,76	Olive Farm - Vehicles - Petrol	21,68	Olive Farm - Vehicles - Petrol	54,2	Olive Farm - Vehicles - Petrol	86,72	Olive Farm - Vehicles - Petrol	130,08
Olive Farm - Vehicles - Petrol	41,54	Olive Farm - Vehicles - Petrol	5,93	Olive Farm - Vehicles - Petrol	14,84	Olive Farm - Vehicles - Petrol	23,74	Olive Farm - Vehicles - Petrol	35,61
Olive Farm - Water Use (Irrigation)	309,60	Olive Farm - Outbound Deliveries (third party)	0,62	Olive Farm - Outbound Deliveries (third party)	1,85	Olive Farm - Waste Management	7,21	Olive Farm - Fertilizers	86,49
Olive Farm - Waste Management	32,00	Olive Farm - Outbound Deliveries (third party)	0,15	Olive Farm - Outbound Deliveries (third party)	0,45	Olive Farm - Water (Irrigation)	37,84	Olive Farm - Fertilizers	115,06
Olive Farm - Outbound Deliveries (third party)	40,06	Olive Farm - Material Use - Clothing	178,48	Olive Farm - Material Use - Clothing	111,55	Olive Farm - Outbound Deliveries (third party)	3,08	Olive Farm - Fertilizers	23,66
Olive Farm - Outbound Deliveries (third party)	9,66	Olive Farm - Material Use - Plastics	124,65	Olive Farm - Material Use - Plastics	124,65	Olive Farm - Outbound Deliveries (third party)	0,74	Olive Farm - Outbound Deliveries (third party)	11,09
Olive Farm - Material Use - Clothing	1204,74	Olive Farm - Fertilizers	44,35	Olive Farm - Fertilizers	44,35	Olive Farm - Material Use - Clothing	379,27	Olive Farm - Outbound Deliveries (third party)	2,68
Olive Farm - Material Use - Plastics	311,63	Olive Farm - Fertilizers	59,00	Olive Farm - Fertilizers	59	Olive Farm - Material Use - Plastics	124,65	Olive Farm - Material Use - Clothing	736,23
Olive Farm - Pesticides	5900,98	Olive Mill - Water Supply	0,15					Olive Farm - Material Use - Plastics	186,98
Olive Farm - Electricity	317,61	Olive Mill - Waste Water Treatment	0,11	Olive Mill - Water Supply	0,09	Olive Mill - Electricity	3,40	Olive Farm - Waste Management	12,47
Olive Farm - Electricity	33,53	Olive Mill - Waste (Pomace)	0,00	Olive Mill - Waste Water Treatment	0,06	Olive Mill - Electricity	0,36	Olive Farm - Pesticides	1327,37
Olive Farm - Electricity	68,87	Olive Mill - Core Delivery 1	0,06	Olive Mill - Waste (Pomace)	0	Olive Mill - Electricity	0,74	Olive Mill - Electricity	6,79
Olive Farm - Electricity	1,41	Olive Mill - Core Delivery 1	0,01	Olive Mill - Core Delivery 1	0,04	Olive Mill - Electricity	0,02	Olive Mill - Electricity	0,72
		Olive Mill - Electricity	5,75	Olive Mill - Core Delivery 1	0,01	Olive Mill - Refrigerant	39,00	Olive Mill - Electricity	1,47
		Olive Mill - Electricity	0,61	Olive Mill - Electricity	3,45	Olive Mill - Vehicle - Diesel	0,25	Olive Mill - Electricity	0,03
Olive Mill - Water Supply	1,01	Olive Mill - Electricity	1,25	Olive Mill - Electricity	0,36	Olive Mill - Vehicle - Diesel	0,06	Olive Mill - Refrigerant	39,00
Olive Mill - Waste Water Treatment	0,69	Olive Mill - Electricity	0,03	Olive Mill - Electricity	0,75	Olive Mill - Waste (Pomace)	0,00	Olive Mill - Water Supply	275,20
Olive Mill - Waste (Pomace)	0,00			Olive Mill - Electricity	0,02	Olive Mill - Core Delivery 1	0,49	Olive Mill - Waste Water Treatment	169,92
Olive Mill - Core Delivery 1	8,01					Olive Mill - Core Delivery 1	0,12	Olive Mill - Waste (Pomace)	0,00
Olive Mill - Core Delivery 1	1,93					Olive Mill - Water Supply	137,60	Olive Mill - Core Delivery 1	0,99
Olive Mill - Electricity	37,40					Olive Mill - Waste Water Treatment	93,46	Olive Mill - Core Delivery 1	0,24
Olive Mill - Electricity	3,95								
Olive Mill - Electricity	8,11								
Olive Mill - Electricity	0,17								
Totals Summary									
	0,79		0,20		0,20		0,20		0,50
	8,55		0,45		0,43		0,97		3,21
	10,82		2,25		2,14		4,87		6,42

The soil sampling points were proposed by ENMX based on uncertainty-guided sampling strategy where SOC samples are distributed proportionally to the probability of initial prediction errors exceeding the threshold error. The final sampling plan in the study area of Crete includes 2 sampling campaigns of 30 points for each campaign. The spatial distribution of the points is shown in Figure 3 For these points the measurements that will take place are described in Table 4. The measurements will take place at 3 soil depths (0-20 cm), (20-50 cm) and below of 50 cm soil depth.

Also, with regards to the parameter “Effects of soil salinity”, the original plan was to monitor saline irrigation parcels/frequency, before and after irrigation period. A small modification was made that will concern a) measurements in all 10 fields - not only in irrigated areas - and b) measurements in order to be more representative to be done after the irrigation period (accumulation of salts more important).

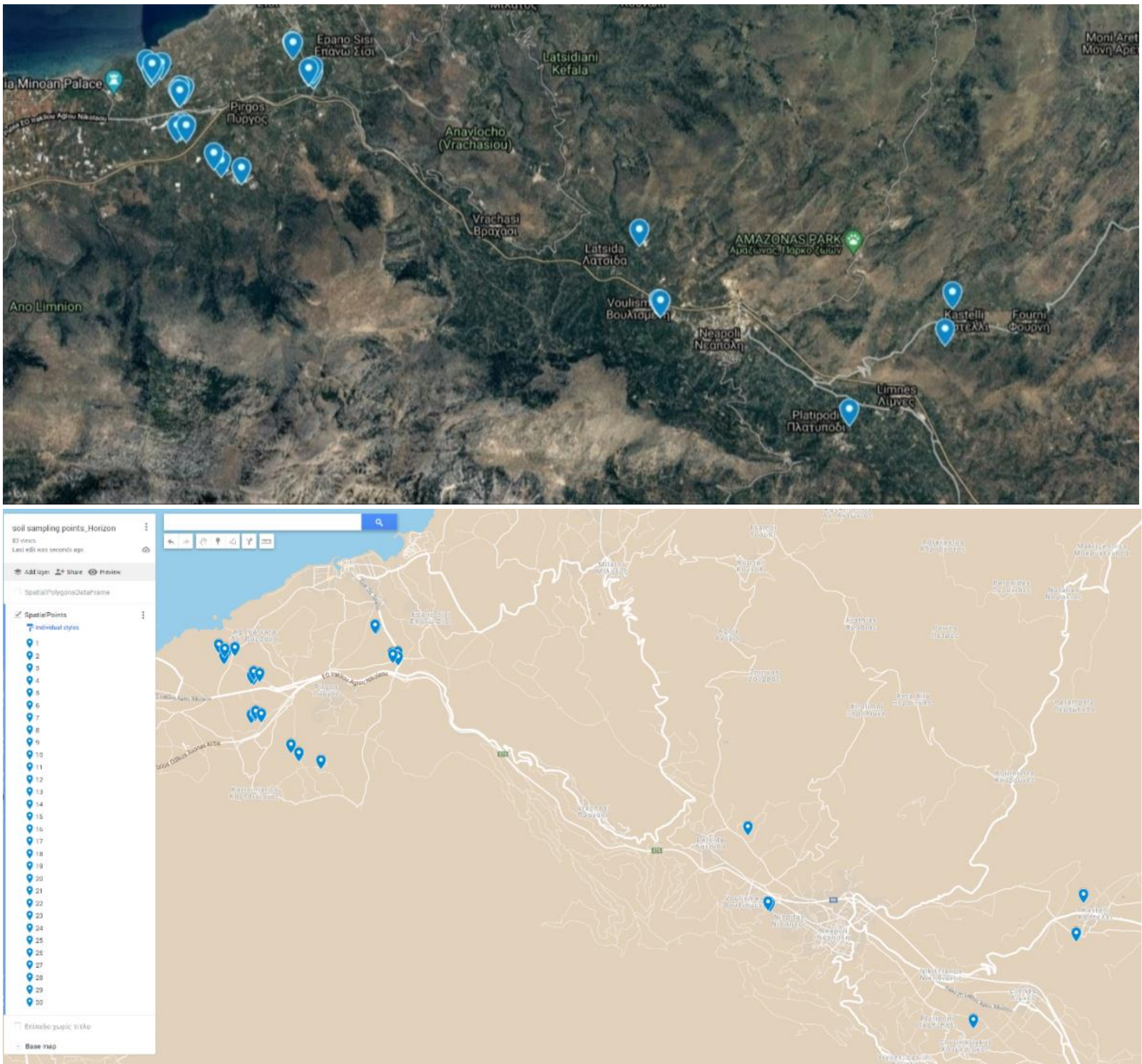


Figure 4. Spatial distribution of the 30 sampling points.

Table 4. Measurements and observations that will take place in each soil sampling point (Greek case study).

code	description	iso.code
id.sample_uuid_c	Sample ID best based on the UUID;	
id.sample_local_c	Local ID used for the local laboratory;	ISO 25177:2019
observation.date.begin_iso.8601_yyyy.mm.dd	Observation date begin (ISO8601; https://en.wikipedia.org/wiki/ISO_8601);	ISO 8601
observation.date.end_iso.8601_yyyy.mm.dd	Observation date end;	ISO 8601
location.address_utf8_txt	Location address as Street and number, Local postcode, Town, County, State,	ISO 25177:2019
location.method_any_c	Location method e.g. GPS;	ISO 25177:2019
surveyor.title_utf8_txt	Field surveyor title or organization;	ISO 25177:2019
surveyor.contact_ietf_email	Field surveyor contact email;	ISO 25177:2019
longitude_wgs84_dd	Site WGS84 longitude;	ISO 19116:2019
latitude_wgs84_dd	Site WGS84 latitude;	ISO 19116:2019
location.error_any_m	Approximate location error in m;	ISO 19116:2019
land.use_fao_c	Land use system based on the FAO guidelines for soil description;	ISO 25177:2019
crop.type_fao_c	Crop type based on the FAO guidelines for soil description;	ISO 25177:2019
management.type_agric_c	Management type based on the AgriCapture classification system;	ISO 25177:2019
human.influence_fao_c	Human influence based on FAO guidelines for soil description;	ISO 25177:2019
vegetation.type_fao_c	Vegetation cover based on FAO guidelines for soil description;	ISO 25177:2019
grass.cover_fao_apct	Grass cover area in percent;	ISO 25177:2019
rock.outcrops_fao_apct	Rock outcrops area in percent;	ISO 25177:2019
drainage_fao_c	Drainage class based on FAO guidelines for soil description;	ISO 25177:2019
location.photo_any_url	Photograph of the location where the sample has been taken;	ISO 25177:2019
sample.photo_any_url	Photograph of the sample / mini-pit or similar;	ISO 25177:2019
layer.sequence_usda_uint16	Layer sequence e.g. 1;	ISO 25177:2019
layer.type_usda_c	Layer type e.g. "LUCAS top-soil";	ISO 25177:2019
layer.upper.depth_usda_cm	Layer upper depth in cm;	ISO 25177:2019
layer.lower.depth_usda_cm	Layer lower depth in cm;	ISO 25177:2019
layer.texture_usda_c	Layer field-estimated texture-by-hand class based on the USDA system;	ISO 25177:2019
layer.fragments_usda_c	Visible fragments content volumetric	ISO 25177:2019
sand.tot_11277.2020_wpct	Total laboratory-estimated sand 0.05 to 2.0 mm particle diameter;	ISO 11277:2020
silt.tot_11277.2020_wpct	Total laboratory-estimated silt 0.002 to 0.05 mm particle size;	ISO 11277:2020
clay.tot_11277.2020_wpct	Total clay is the soil separate with <0.002 mm particle diameter;	ISO 11277:2020
wpg2_iso.11277.2020_wpct	The gravimetric percentage of greater than 2 mm diameter particles reported on a whole soil base;	ISO 11277:2020
bd.dry_iso.11272.2017_gcm3	Bulk density, <2mm fraction, dry is the weight per unit volume of the <2 mm fraction, with volume measured in lal	ISO 11272:2017
c.tot_iso.10694.1995_wpct	Total carbon is a measure of all organic and inorganic carbon, including that found in carbonate minerals weight	ISO 10694:1995
n.tot_iso.13878.1998_wpct	Total nitrogen is a measure of all organic and inorganic nitrogen, including that found in nitrogen minerals weight	ISO 13878:1998
oc_iso.10694.1995_wpct	Organic carbon based on dry combustion weight percent;	ISO 10694:1995
ph.h2o_iso.10390.1994_index	The pH, 1:1 soil-water suspension is the pH of a sample measured in distilled water at a 1:1 soil:solution ratio;	ISO 10390:1994

The final sampling plan was determined during November 2021, while the same month field workers were trained about the soil sampling implementation process (on how and where to sample, the instruments to be used). Also, the scientific team of ELGO presented the registration application forms/data to the field workers for completion.

Figure 5. Field workers were trained about the soil sampling implementation process.

The first soil sampling campaign will be contacted during the months December 2021 and January 2022. In turn, the soil samplings will be delivered in the soil analysis laboratory of ELGO. The results of analysis will be entered to the soil lab forms so they are available to the whole project at once.

Use case 2: Poland

Top Farms Głubczyce is located in southern Poland (Opolskie voivodship), near the border with Czechia. This region has some of the best arable land in Poland. The company focuses on the production of cereals, rape, potatoes, sugar beets and milk. Every year TFG produces circa 40 thousand tonnes of cereal, 6 thousand tonnes of rape, 10 thousand tonnes of sweet corn, 50 thousand tonnes of sugar beets and 35 thousand tonnes of potatoes for sale. The company is also one of the largest milk producers in Poland, with a herd of 2 500 milk cows, producing more than 22 million litres of milk per year.

Together with One Carbon World (OCW), and in a formal agreement with the Polish branch of Spearhead International, an assessment of TFG's carbon footprint has been completed in October. It revealed that among core emissions categories, which constitute 85 % of the footprint, the majority is linked to the use of synthetic fertilisers (63.29% of the core emissions), while the second most important category are livestock emissions (15% of the core emissions). This shows that precision agriculture, the specialty of SatAgro, has a high potential to reduce the company's carbon footprint.

As for GHG removals through regenerative practices, it was assessed that TFG since a few years has been increasingly adopting some of them (in particular cover crops and reduced tillage), recognising both the opportunity for better food and environment quality, and for gaining advantage in markets driven by increasingly environment-aware consumers. These efforts have been assisted by the TerraNostra Foundation, an entity closely linked with all Top Farms' operations (circa 30 000 ha), whose mission is to promote and certify so called "biologisation of the soil" which in a large part overlap with regenerative agriculture. In particular, Terra Nostra created the "Code 5C", the components of which are described in the table below. For SatAgro, a case-specific challenge has been to align the goals of AgricaptureCO2 with the ones of TerraNostra, and to design a formula which works for all partners involved and can be scaled up at least at the country level.

A key aspect of the baseline, which is linked to GHG removals, is the assessment of the soil carbon pool. At the time the methods for soil sampling were finalised, proceeding with the sampling was very risky due to deteriorating weather and increasing likelihood of soil freezing. For this reason, the sampling campaign has been scheduled for the end of winter (February / March 2022). An advantage of this situation is that SatAgro will have an additional time to explore sampling location scheme options. The initial location of the samples is shown in figure below.

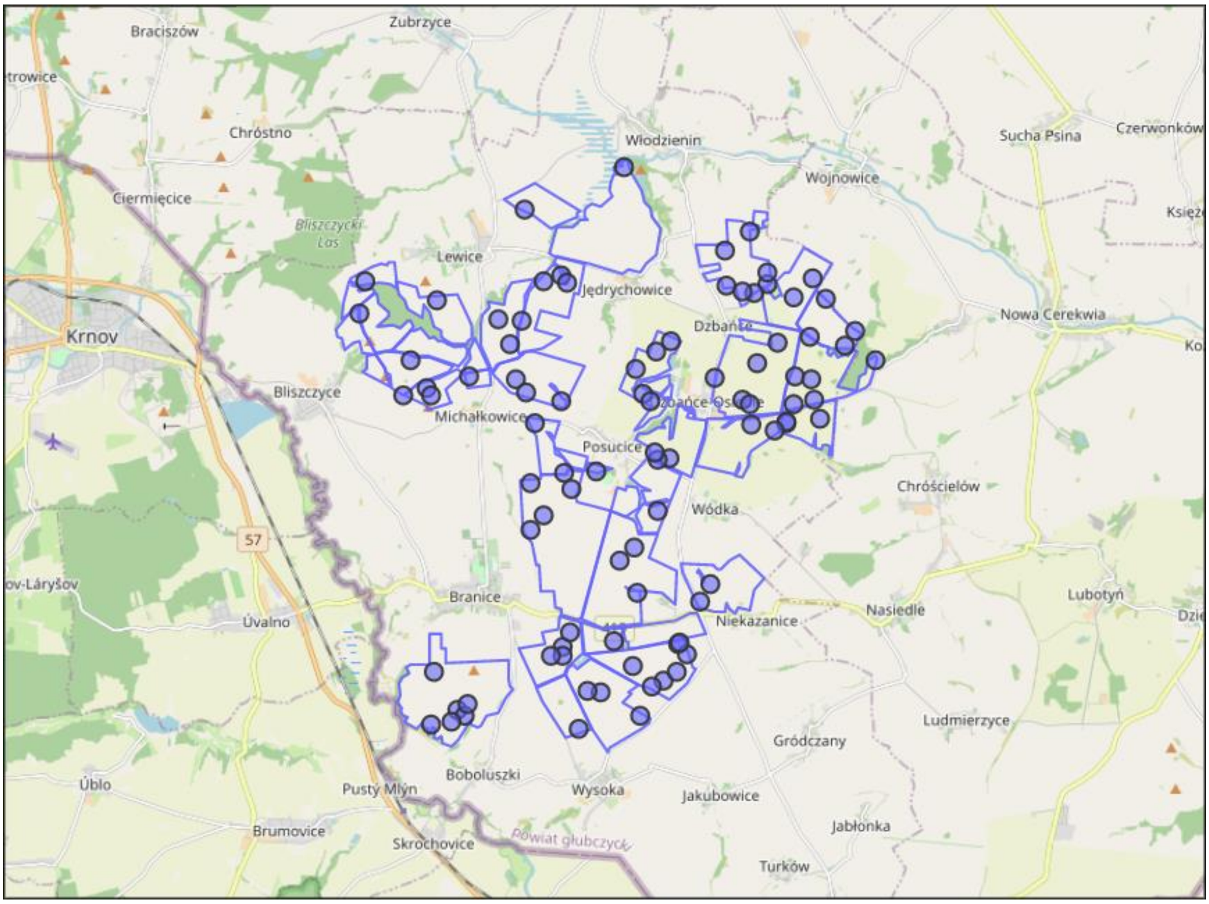


Figure 6. Spatial distribution of the 90 sampling points proposed by Envirometrix in Poland.

Use case 3: UK (certified regenerative agriculture)

The baseline in this use case focuses on the LEAF-certified farm owned and managed by Duncan Farrington, the owner of Farrington's Oils, which supplies the rape seed used to make Farrington's Oils MellowYellow brand oil.

Farrington's Oils is a 0-emissions company certified by OCW for several years. After lowering current emissions, unavoidable emissions are offset by the purchase of carbon credits (United Nations Certified Emission Reductions). The assessment does not take into account the carbon that is sequestered on the farm through its regenerative management choices: increasing soil carbon indicated through traditional soil sampling overtime, maintenance of hedges, and planting of nature areas on the farm. AgriCaptureCO2 aims to provide robust and precise measurement of soil carbon on a regular basis (annual or biannual depending on final costs) to allow for soil carbon sequestration to be leveraged for "in-setting" by the business. This is one of the two businesses cases being assessed in the use case, in addition to using AgriCaptureCO2 services for the LEAF Marque.

The use case built off the existing relationship between Farrington's Oils and OCW to conduct a baseline for the current year. The environmental footprint for 2021 (Scope 3) was conducted as part of the AgriCaptureCO2 project.

The use case also conducted a soil sampling at the geolocations defined by the AgriCaptureCO2 quantify service. The service assessed the polygons for Farrington's Oils farm overlayed on the soil map for Europe developed in WP3, and identified points of the greatest uncertainty, which were pinpointed for assessment.

Figure 7. Photographs from the soil sampling campaign on FrOils farm in the UK. Images taken by Rebecca Davis (LEAF).

The soil sampling in these locations was conducted in line with procedures provided by ENMX. The sampling was conducted with a soil auger, and bagged to be sent to a nearby laboratory.

The app used for geo-positioning proved to be a challenge to find the locations. The sampling team (Farrington's Oils and LEAF) used a combination of the app, phone GNSS data, printed maps, and Duncan's knowledge of his own fields.

Overall, the experience was much akin to a "research project" as opposed to a simple procedure expected in a commercial service. WP3 has committed to improving this process to make it "simple, intuitive and straightforward" by the end of the project, taking significant steps in the next year. In particular, the potential use of in situ spectrometry instruments will be assessed: both the value of the data and the associated costs as part of the business model. This should make a significant contribution to simplification of the process, but must also be complemented by simplification of other steps in the soil sampling process (better guidance on how to sample, clearer directions to reach the spot, etc.).

Use case 4: UK (public bodies)

OCW has audited the local councils of Lancashire County as part of the work to establish baselines.

With some assistance from the County Council, OCW have been able to secure detailed responses from all 14 of the district and unitary councils. OCW have now completed the baseline reports and calculations for 11 of the 14 district and unitary authorities in Lancashire.

In addition, the County Council has commissioned a number of studies during 2021 to identify potential options and strategies in respect of its climate objectives. The findings and implications of these reports will be utilised alongside the OCW reports to identify priorities and options for future action.

We are currently investigating the potential for biochar production from organic materials with the Council's Waste Services team. The County Council is in the process of establishing a new section which will oversee and coordinate the delivery of action to address the climate and biodiversity emergencies.

Use case 5: Serbia

The Serbian use case involved 16 farms and 42 agricultural parcels (fields). Only two farms are State Agriculture Advisory Services with experimental field and others are family-owned farms. They covered the region of north-east part of central Serbia near river Danube in the Autonomous Province of Vojvodina and include all productive soil types. Five farms have never applied any practices of Regenerative Agriculture and others have been practicing Reg Agri for more than seven years e.g. reduced or mulch tillage, no till with proper weed management and proper plant protection. Only one farm is diary production farm. Others are arable crops farms with winter wheat, corn, sunflower and soybean. Only two farms established cover crops in last two years.

Farms covered parts with less precipitation in winter and summer period, wind and water erosion and reduction of organic matter in the soil during the last 65 years by 1.5-3%. The selected farmers are dividing in two groups:

- First group of farmers are the members of the Farmers association of Ruma Municipality (UPOR) with fields where they set on the basic principles of regenerative agricultural practices by comparing it with conventional production named as developing farms.
- Members of the second group are farmers who have been practicing the basics of regenerative agriculture in production for more than seven years named as demonstration farms.

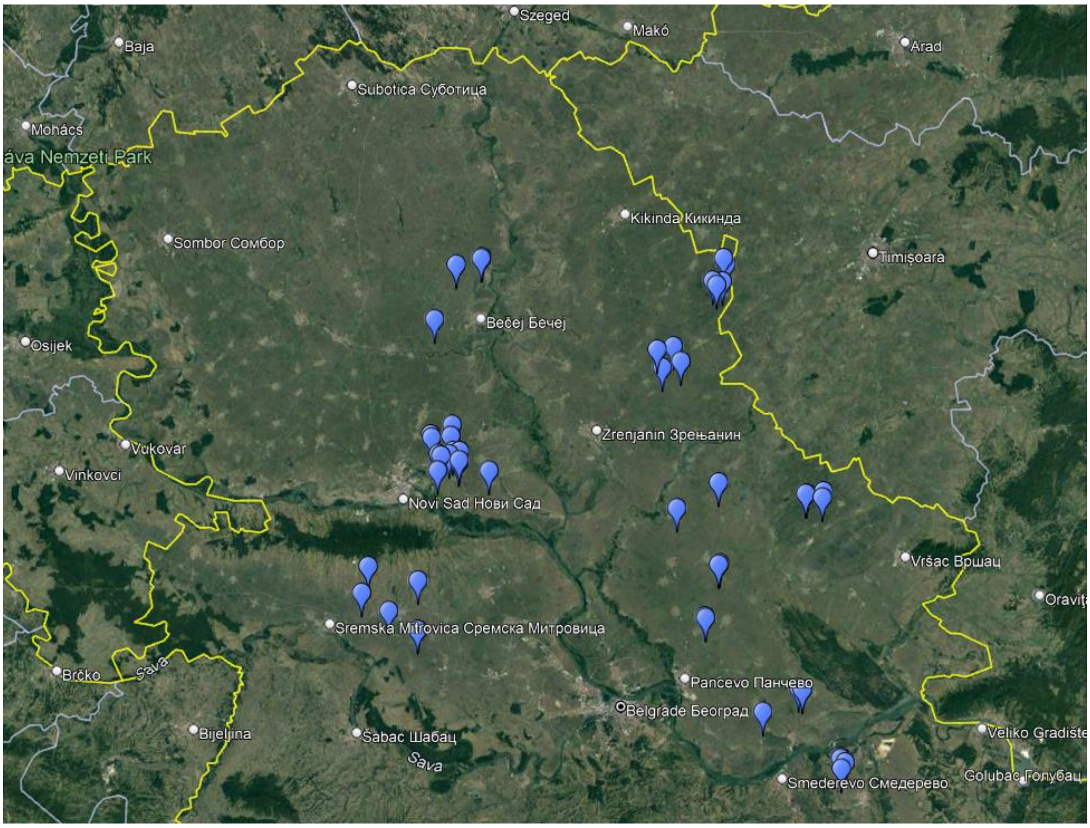


Figure 8. Distribution of the Serbian use case farms.

Blue symbols show parcels' locations.

The baseline scenario in the Serbian use case is based on estimating SOC stock in the use case parcels which will be further monitored throughout the project. As farms are in different starting positions (i.e. some of the farms have the history of regenerative agricultural practices, while the others start with applying regenerative practices during the project) so the starting levels of soil organic carbon stocks at the farms will be compared but also the soil organic carbon dynamics over time will be analysed.

To estimate the soil organic carbon stock at the field level, the AgriCaptureCO2 *Quantify* service was used to determine the optimal locations for soil samples (Figure 7). It is defined based on SOC uncertainty maps derived from pan-European SOC estimation map model. The soil sampling and analysis will follow the methodology defined in the WP3. Soil samples will be taken at a total number of 120 locations during the first campaign that started in December 2021 and will be completed during the first months of 2022, depending on the weather conditions. The second campaign is planned for the third year of the project.

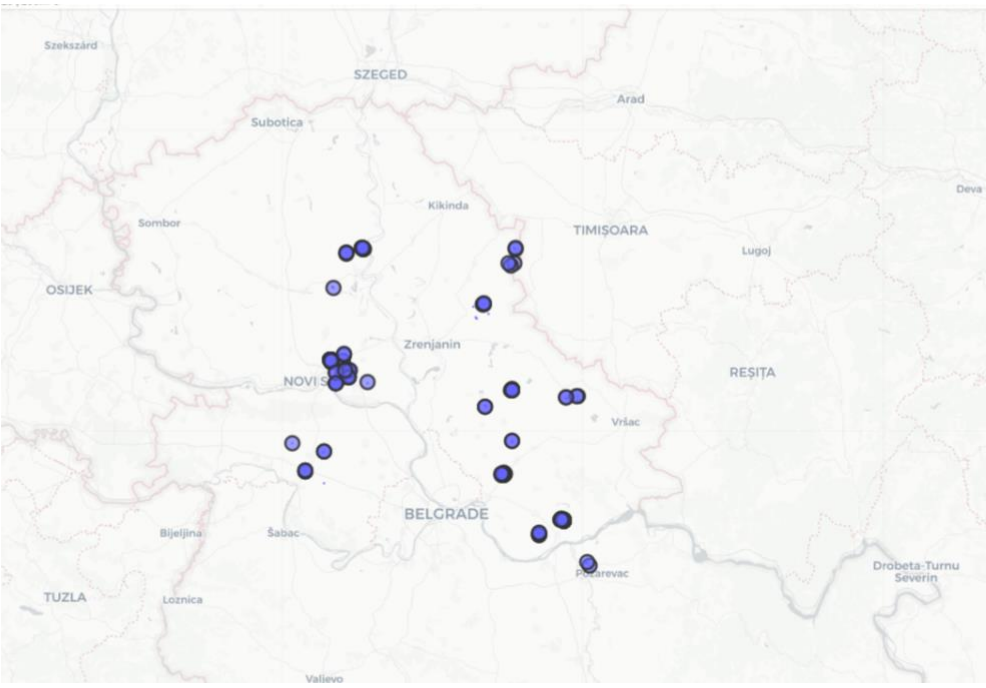


Figure 9. Spatial distribution of the soil sampling points.

Use case 6: Kenya

The baseline in this use case focuses on two agri-businesses/farms in Kenya:

Tambuzi: rose growers with 3 farms located 180km north of Nairobi, within Nyeri, Laikipia and Meru Counties.

Flamingo Horticulture: farms cover a combined total of 1,856 ha. and are located in:

- Siraji – Mount Kenya (Spray Carnations, large headed roses)
- Kingfisher- Naivasha – (Roses, Spray Carnations, Fresh produce)
- Flamingo – Naivasha – (Roses and Fillers)

The carbon footprint assessment has been completed for all Kenya Farms covering Scope 1 – 3 emissions activities under the control of the operational farm and covering the period 2018 – 2020 (baseline and re-measure). The assessment does not take into account the carbon that is sequestered on the farms through its regenerative management choices. AgriCaptureCO2 aims to provide robust and precise measurement of soil carbon on a regular basis (annual or biannual depending on final costs) to allow for soil carbon sequestration to be leveraged for "in-setting" by the business. A screening of regenerative practices that have been implemented or are planned has also been completed. These are being assessed to understand the methodologies that can be used to quantify their impact on SOC.

Soil samples are available annually for the period 2016 - 2020 (Tambuzi) that have been submitted to the laboratory for a complete soil analysis including: organic matter %, CEC, %N and C:N ratio. These analyses are available to incorporate into the AgriCaptureCO2 when required. This annual soil sampling for complete soil analysis will be continued for the duration of the project. Soil sample costs have been provided to AgriCaptureCO2 partners and the Kenya farms are awaiting for sampling costs to be calculated and for points of sampling to be defined.

SHAPE files for each parcel has been provided to support WP3.

2.3 Providing training

Two main activities were differentiated in this task:

- Creating training materials that can be used universally, that promote understanding of the holistic approach that underpins regenerative agriculture. This includes content on a list of specific "regenerative practices" which the project has defined. This is led by GWCT with contributions from several partners.
- Creating bespoke training materials for each use case, depending on new specific practices (e.g. cover crops in Serbia for the majority of use case farmers) or production system (e.g. ELGO's regenerative system for olive production in Crete). GWCT is providing support and expertise as required by each use case. Most use cases include relevant experts that have taken the lead in this regards.

With regards to the first activity, the training materials will be made in an electronic format and hosted on the AgriCaptureCO2 website (infoportal). They will also be promoted as a resource within the European Regenerative Agriculture Community, to ensure larger impact. In addition, use cases can refer farmers to this resource during outreach and dissemination, to allow interested farmers with a basic/no understanding to gain a strong "first step" in understanding the basics and advantages of regenerative agriculture.

With regards to use case-level training, a brief top-down view of the training and workshops implemented in the first year include:

- *Use case 1, Greece*: The first training has implemented in November 2021.
- *Use case 2, Poland*: Training content has been prepared but a training session has not been held. The use case aims to hold joint trainings with TopFarms (corporate farm) and farmers participating under the new TerraNostra initiative.
- *Use case 3, UK 1*: Several online talks have been given to farming and non-farming organisations, and AgriCaptureCO2 was presented during existing trainings at GWCT.
- *Use case 4, UK 2*: One introductory presentation has so far been made to the Lancashire Climate Change Officers Working Group, to share the potential for climate action through public land use management facilitated with AgriCapture.

- *Use case 5, Serbia*: Trainings in small groups were held for (i) farmers with no experience in Reg Agri to implement new measures, and (ii) with farmers with experience to sow and implement cover crops.
- *Use case 6, Kenya*: The companies are already implementing regenerative practice; first training is to be implemented on the AgriCaptureCO2 services pending a presentation prepared with WP3.

A more detailed description of each is provided in the subsections below.

Use case 1: Greece

On 12 Nov., 2021 a training event was held in the premises of Agricultural Cooperative Partnership Mirabello Union S.A. (EAS Mirabello), in Neapoli, Lasithi region. The training was focus on training farmers about taking up regenerative agricultural practices. The total number of the participants was 18 (mainly farmers and processors) and the three trainers.

The participants were informed about this event by email. The email was sent by ELGO. This training was occurred before harvest period to avoid busy periods for farmers.

Since in the first training no services are available, training was focus on agronomic actions, supporting T5.4 to implement regenerative agriculture practices. In this training event the overall goal of the project, the processes, the timeline and work to be completed were clarified. In addition, farmers were informed about what collected data will be used for, the schedule for activities, as well as the channels of communication: how to deliver results, how local point of contact for technical support, results, etc. The overall approach of this training event was to "show rather than teach", including demo-farm tour. Also, for training purposes a comprehensive banner of the project was created (Figure 8).

Finally, the participants were informed about the next steps which includes training to empower farmers and other end-users to use the AgriCaptureCO2 platform and its services. In line with this, test sessions of the platform with end-users will be followed to ensure they are comfortable with the tools. Specifically, during 2022 workshops will be held to inform about the services provides by this project with emphasis in the proper water use in semi-arid environment such as the Crete case study.

Figure 10. Training event on the field in Crete, with an AgriCaptureCO2 banner.

Use case 2: Poland

Conducting of classic workshops with farmers has been brought forward to the Spring of 2022. The pandemic made it practically impossible to organise physical meetings, which are by far preferred. For example, there was an event planned first for a large agro-fair Agroshow (www.agroshow.pl) in September 2021, and then for Polagra-Premiery (www.polagra-premiery.pl) in January 2022. At the later venue SatAgro was supposed to be handed in person a gold medal for a new Profitability module, partly linked to work under AgricaptureCO2. However, both fairs were cancelled at the last moment.

Nevertheless, much time has been spent on mutual training between SatAgro and organisations which will later be involved in a broader information campaign: Terra Nostra foundation, Top Farms Sp. z o.o., OHZZ (Breeding Centre for Pedigree Animals) Chodeczek, Vantage Polska, and BNP Paribas Poland. The latter stakeholder has joined the effort relatively late (in September), but thanks to a set of discussions and internal workshops with SatAgro, with support from One Carbon World, the bank has resolved to supporting regenerative agriculture in Poland.

Use case 3: UK (certified regenerative agriculture)

This use case represents a "mature ecosystem" wherein regenerative agriculture is already being implemented, for which trainings and workshops were not seen as an appropriate instrument for target farmers.

Thus, at the proposal stage (later validated at the Grant Agreement stage), no effort was estimated for Farrington's Oils and LEAF under this task.

Nonetheless, LEAF and Farrington's Oils did contribute to GWCT's effort to develop AgriCaptureCO2 training material, providing important input in this process. Also, GWCT presented an overview of the AgriCaptureCO2 platform during their inhouse regenerative agriculture trainings.

Use case 4: UK (public bodies)

Project briefings have been provided to the Lancashire Climate Change Officers Working Group which comprises representatives from all 15 Lancashire councils.

The Lancashire use case was raised at the Nordic Biochar Network's 'Biochar for green Cities' webinar in November 2021.

Once the pilots are delivered in early 2022 we will be able to deliver information and experience at training events, particularly those targeted at the local government sector.

Use case 5: Serbia

Activities with farmers during 2021 were the following:

- 3/4/2021: Presenting AgriCaptureCO2 to farmers involved in Project, Conservation/Regenerative Agriculture Presentation.
- 7/6/2021: organised a field visit of 3 farms included in the project near Novi Sad
- 15/6/2021: Field Day, Presenting Soil Condition in 3 conservation tillage practice and conventional – plowing.
- 24/7/2021: SPIT, Agriculture Equipment Meeting, Farmers Association Club 100P+, Presentation: Why C is important in soil? Show of soil condition in 4 tillage systems using excavated soil profiles 0-30 cm deep.

- 23/8/2021: Workshop in Ruma, established trial fields and plow pan detection
- 1/9/2021: Field Day, Presenting soil and soybean plants in 3 conservation tillage practice and conventional – plowing.
- 3-6/9/2021: Farms distribution of cover crops seed and work with farmers.

Figure 11. Workshop with UPOR farmers in Ruma.

Use case 6: Kenya

The first training is to be implemented pending output and support from AgriCaptureCO2 services in WP3. Please note that several regenerative practices specific to the local areas of each of the farm parcels are well understood and have either already been implemented or are under investigation.

3 Implementing AgriCaptureCO2 use cases

The use cases have implemented activities specific to the context, needs and goals of their use cases, in line with the use case plans presented in deliverable 5.1.

Throughout the activities, there is a clear common thread: engaging and involving stakeholders, preparing experimental sites and implementing regenerative agricultural practices in the field. All use cases have coordinated with WP2 (engage the local ecosystem and "plug-in" to the European Regenerative Agricultural Network), WP3 (contribute to co-creation by providing user needs, feedback from first service iteration, etc.), and WP6 (assess and test business hypothesis, provide input for communication materials and make use of them, etc.). Most use cases have also interacted with WP4 (exploring potential for registering carbon credits).

This section goes into detail on each use case to present the activities implemented and the progress. The use case operational plans are the reference from which this is done.

T5.5 did initially attempt to assess progress according to KPIs, but since these are multi-year plans and most indicators are results-based, it is not realistic for the KPIs to be used for measuring whether the use case is proceeding well. The targets will not be significant until the end of the project period. Since the results were qualitative, they are not presented in this document. Nonetheless, the most detailed assessments are presented in the two table below to illustrate the limitations to using KPIs in the first year discussed herein.

On the other hand, milestones, which can be distinguished between years were used to ensure the timeplans were proceeding as originally planned. Each use case description also provides a more detailed discussion of what was accomplished.

Table 5. Key performance indicators for use case 1, Greece.

Indicator	Remarks – Average values of the ten (10) studied farms (period 2021)	Expected Target
Added value to products	The specific Average KPI value is equal to the olive oil production (kg/h) multiply by olive oil price (euro/kg) 580 Kg/ha * 2.6 euro/kg = 1508 euro/ha	+20%
C sequestration per ha	The specific KPI value will have been fulfilled when the first soil sampling campaign will be conducted.	+10%
Water efficiency	Water Use Efficiency WUEI = Y/I [kg/m3] • Y = yield [kg/ha1]	+20%

	• I = Total water volume [m3/ha] The specific Average KPI value is equal to 16.61 Kg/m3	
Fuel use per ha	The specific Average KPI value is equal to 165.82 (liters/ha)	-10%
Effects of soil salinity	Chlorophyll fluorescence analysis has become one of the most powerful and widely used techniques available to plant physiologists and ecophysiologists. The OS-30p+ Chlorophyll Fluorometer is a versatile measuring instrument designed to precisely measure chlorophyll fluorescent parameter Fv/Fm (maximum PSII photochemical efficiency). For most species, the optimal Fv/Fm reading for stress free plants is in the range of 0.790 to 0.840 (Maxwell and Johnson 2000). Increasing salinity, the Fv/Fm is significantly reduced in olive leaves. Specifically, according to literature measurements in olive leaves from no soil salinity treatments indicate Fv/Fm values above 0.800, showing no stress, while leaves from high salinity treatments indicate Fv/Fm values lower than 0.75 showing stress due to NaCl. According to Woo et al., 2008, well-watered plants had RWCs (plant relative water content) of 80–90% and Fv/Fm levels of ~0.800. Under drought/salinity conditions, for RWCs in the range of 20–80%, Fv/Fm varied between 0.700–0.750. Plants experiencing critical levels of water deficiency (RWC of 10–20%) displayed noticeably depressed Fv/Fm levels, in the range of 0.500–0.750. Hence the upper and lower limited values for Fv/Fm levels can be considered between 0.500 and 0.800. In our case, for estimation soil salinity effects after irrigation period of 2021, measurements were performed based on the Portable instrument of plants stress. More specifically, for each of the 10 studied olive grove farms, we select 3 trees that represent the average condition of the trees throughout the olive grove (Figure 7). The average KPI value (Fv/Fm) concerning the effects of soil salinity in olive trees for 2021 is equal to 0.708. This average value indicates a slight negative effect from soil salinity in olive grove farms of the study area.	-20%

Figure 12. Measurements of plants stress in olive grove farms (effects of soil salinity) in Greece.

Table 6. Key performance indicators for Use Case 5.

Indicator	Remarks for 2021	Target
C sequestration per ha	This indicator will be estimated at the end of the project when both soil sampling campaigns are completed. In 2021, the first campaign started, expected to be completed in early 2022.	+10%
Application of fertilizers per ha	Farmers are keeping records on the use of fertilizers in the fields involved in the project. The soil analysis was done on the fields where no Reg Agri practice was applied before the project. The effects will be measured in 2022-2023.	-20%
Fuel use per ha	Farmers are keeping records on the use of fuel in the fields involved in the project. The effects will be measured in 2022-2023.	-10%
Effects on soil quality (OM in top 10 cm, soil moisture)	Farmers shared their experience on soil moisture levels and crop vigour on the Reg Agri fields with comparison to the fields where conventional agriculture is applied. Soil analyses for pH, CaCO3 (%), humus (%), P2O5 and K2O in mg/kg were done for the fields without Reg Agri history. The effects will be measured in 2022-2023.	+15%

Reducing soil compaction	Soil compaction was measured with penetrometer on the fields where no Reg Agri practice was applied before the project. The effects will be measured in 2022-2023.	-10%

3.1 Implementing use case 1: Greece

3.1.1 Summary

Objectives

To apply appropriate/demonstrate actions in order to promote regenerative agricultural practices and reduce emissions (different parts of the whole olive production chain), as well as to provide the necessary inputs, at farm level, for establishment of the AgriCaptureCO2 platform.

AgriCaptureCO2 Support services will be tailored for the needs of olive production in arid areas according to the specific regenerative approach developed by ELGO, for:

- Optimal timing/quantity of irrigation and fertigation, recommendations for reduce risk of pathogens.
- SOC data taken on the fields will be used to generate the SOC map at field level for quantification and monitoring of SOC sequestration.
- Soil moisture data will be visualised through Support service and is relevant for the farmers.
- Meteo data will be also visualised through Support service and is relevant for the farmers.

The data on activities will be used to calibrate and test the Verification service models.

Information for the proposed plan

Based on the historical data of the parcels, baseline greenhouse gas emission values were counted for each parcel regarding the already applied practices. Based on these values, in each of the 10 parcels, the already applied practices should be redesigned in order to achieve lower emissions and promote regenerative agriculture. Redesigning means that the scientific team of ELGO will support and advise farmers to follow appropriate water and soil practices. The regenerative practices applied include:

- Cover crops
- No weed mowing during winter / No soil tillage
- Weed mowing in spring and summer (soil mulching)
- Winter pruning/summer pruning - Shredding of pruning
- Application of organic material (winter period)
- Irrigation according to meteorological and soil moisture data
- Application of fertigation
- Foliar application of fertilizers (in case that is needed)
- Recommendations for plant protection, minimizing the risk for pathogens

ELGO has taken appropriate sampling measurements and made analyses in the selected parcels; it has also set in place the adequate instruments (soil moisture sensors and a meteo-station) that will generate data to be used for the *Support* service, in order to provide advice and support the practices and measures that should be applied from the farmers in their parcels to promote the above mentioned regenerative agricultural practices or/and minimize the emissions and achieve the standards of KPIs, while ensuring their yield at the same time (quantity and quality of the product). For instance, this includes advice for: no tillage, applied soil organic matter at specific dose, applied proper irrigation (amount and rate), proper pest/weed control, etc.

In turn, based on the proposed changes in the applied practices, the emissions and the KPIs will be recorded in each year and for each studied parcel.

Eastern Crete is an area that faces the most acute issues with water availability, low soil organic carbon, and saltwater intrusion. A high priority in this case study is given to the proper irrigation management, as water shortage is a crucial problem for Crete and the Eastern Mediterranean area in general (Kourgialas, 2021). Also, demonstration actions regarding the benefits and the use of the AgriCaptureCO2 Platform with emphasis in sustainable olive oil irrigation and soil management will take place.

In the study area of the eastern part of Crete the only crop included in the use case was olive and the 10 plots were dedicated to this single crop. In eastern Crete, due to water shortage, irrigated orchards are less common that rainfed orchards, and as such proper irrigation and soil management are important actions that could be effectively supported by this project.

The 10 parcels selected reflect the different olive cultivation characteristics in the extended area of \eastern Crete, covering about 0.2 ha each one, for which the historical data (regarding the practices and monitoring parameters) already exists. In the study area 7 out of 10 studied farms are irrigated. Table 7 shows the main characteristics of these farms.

Table 7. The main characteristics of the 10 farms included in the Greek use case.

Farm	GPS Location	Irrigated / rainfed	Parcel area (ha)	Number of Trees
EVAGGELINAKIS IOANNIS-PRATIKOU-2.02	351439, 253750	Irrigated	0.34	60
EVAGGELINAKIS IOANNIS-SOXORO-2.03	351434, 253744	Irrigated	0.20	30
LEMBIDAKI MARIA-SFAKIANOY-1.01	351740, 252959	Irrigated	0.75	189
LEMBIDAKI MARIA-KRITSOTI-1.02	351738, 253002	Irrigated	0.57	129
LEMBIDAKI MARIA-NEROLAKKOS-1.03	351740, 252959	Irrigated	1.35	356
LEMBIDAKI MARIA-MPAMPOURA-1.04	351744, 253002	Irrigated	0.79	200
MASTORAKIS DIMITRIOS-MOIRATZANI-2.01	351540, 253857	Rainfed	0.20	21
MASTORAKIS DIMITRIOS-AGIOS NIKOLAOS-2.05	351406, 253859	Rainfed	0.20	15
SYSKAKIS NIKOLAOS-KSERIZOMA-2.04	351449, 253706	Irrigated	0.20	40
TZORTZI OURANIA	351619, 253654	Rainfed	0.50	78

In many cases, the common/traditional agricultural practices, involving uncontrolled application of large quantities of irrigation water for the perceived maximization of crop yield has lead to:

- The reduction of the quantity of water resources through over-pumping resulting in the lowering of the groundwater levels (groundwater is the main sources of water in the study area), and
- The qualitative degradation of large sections of coastal aquifers due to the pumping induced seawater intrusion (salinization).

The above, combined with climatic instability or change, which, according to global climate models, will strongly affect Mediterranean countries and may lead to the occurrence of periodic droughts of increasing intensity and frequency, desertification and the loss of agricultural-productive soils through erosion. Thus, sustainable management of water resources in agriculture needs to be studied and supported as a part of this project. In line to the above, a list of regenerative agricultural practices that will be applied in this project is presented below.

3.1.2 Main activities and results

During 2021, ELGO installed 7 telemetry soil moisture stations in the irrigated pilot fields of our study (7 out of 10 farms are irrigated), which record in real time the soil moisture, the electrical conductivity as well as the soil temperature.

Detailed information about the sensor's types and the coordinates of the sensors installed as well as photographic material is given below.

Sensor type: TEROS 12 Soil Moisture, Temperature, and Electrical Conductivity (EC)

VWC: % v / v

EC: mS / m (milliseconds per meter)

Temperature: Celsius degrees

The coordinates of the sensors installed in case fields are as follows:

```
Node1   teros12        35°17'31.0"N 25°30'18.9"E, (35.291950, 25.505261)
Node2   teros12        35°17'37.9"N 25°30'02.8"E, (35.293846, 25.500771)
Node3   teros12        35°17'41.3"N 25°29'58.1"E, (35.294810, 25.499457)
Node4   teros12        35°17'43.6"N 25°30'02.2"E, (35.295441, 25.500613)
Node5   teros12        35°14'48.6"N 25°37'06.5"E, (35.246841, 25.618473)
Node6   teros12        35°14'40.0"N 25°37'50.8"E, (35.244441, 25.630783)
Node7   teros12        35°14'34.4"N 25°37'44.3"E, (35.242887, 25.628966)
```

Maintaining water content in the soil at a constant level indicates that irrigation is applied at the rate of water intake from the crop. Experiments have found that a representative depth to monitor soil moisture for mature olive trees is at 0.3 m (Kourgialas et al., 2019).

Thus, our soil moisture sensors were installed at 0.3 m soil depth for each irrigated olive grove. It should be noted that the functionality of soil moisture data loggers in the field are in the process of verification. Based on this, probably the name of the sensors, the recorded time steps, as well as the form of the export data could be changed to be more customised to our needs. Our aim is for the sensors to be in full operational use during this winter period (2021-2022) and surely before the irrigation season of 2022 (April to October). Thus, we will integrate real-time soil moisture data from the soil sensors as part of the *Support* service to offer an efficient irrigation service.

During the non-irrigation period, the data will be received from the sensors every six hours (conserving energy used by the system), while for the irrigation period the data will be received every 2 hours and will be transferred using MQTT protocol via GSM. All data is saved on a database in mySQL relational database management system and in an IoT platform (Thingsboard CE) installed at ELGO. Figure 10 depicts the installing soil moisture sensors as well as the whole telemetry soil moisture station.

Figure 13. Installation of the soil moisture sensors as well as the whole telemetry soil moisture station.

Also, during 2021, a telemetric weather station in the coastal study area was installed by ELGO (Station M1). This station, in combination with the already existing meteorological station (M2) located in the inland study area, can capture adequately the metrological conditions in the whole study area of Eastern Crete (Figure 11).

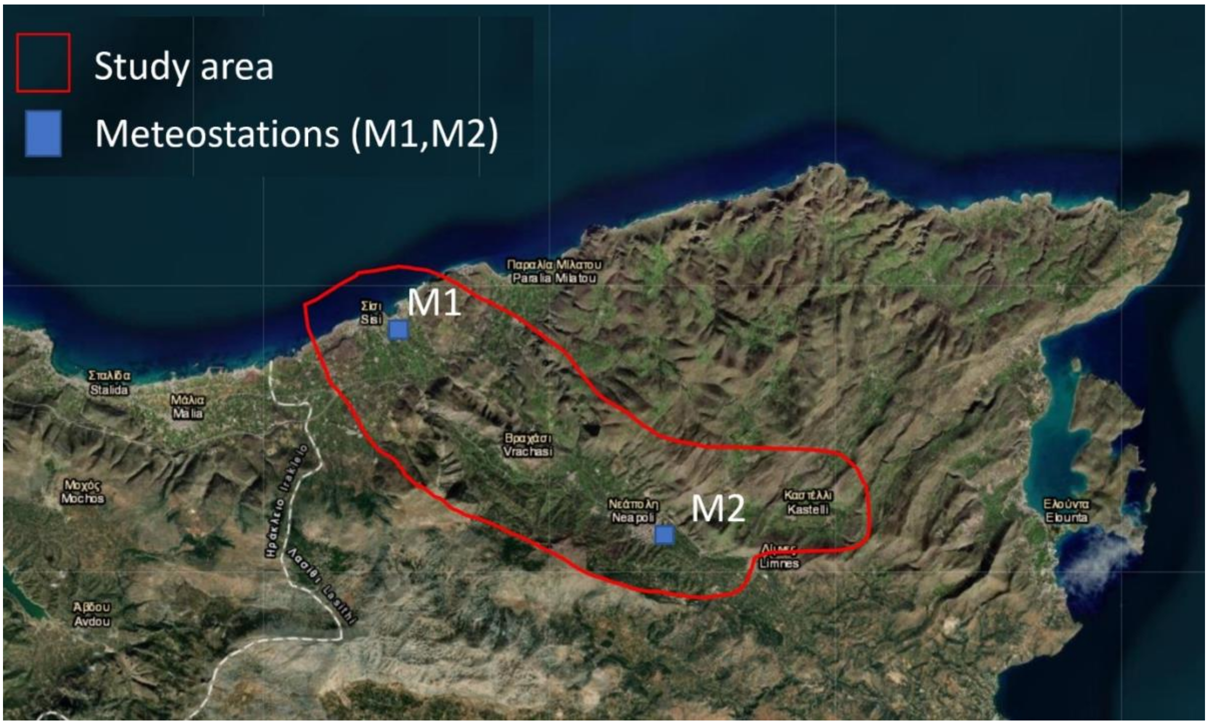
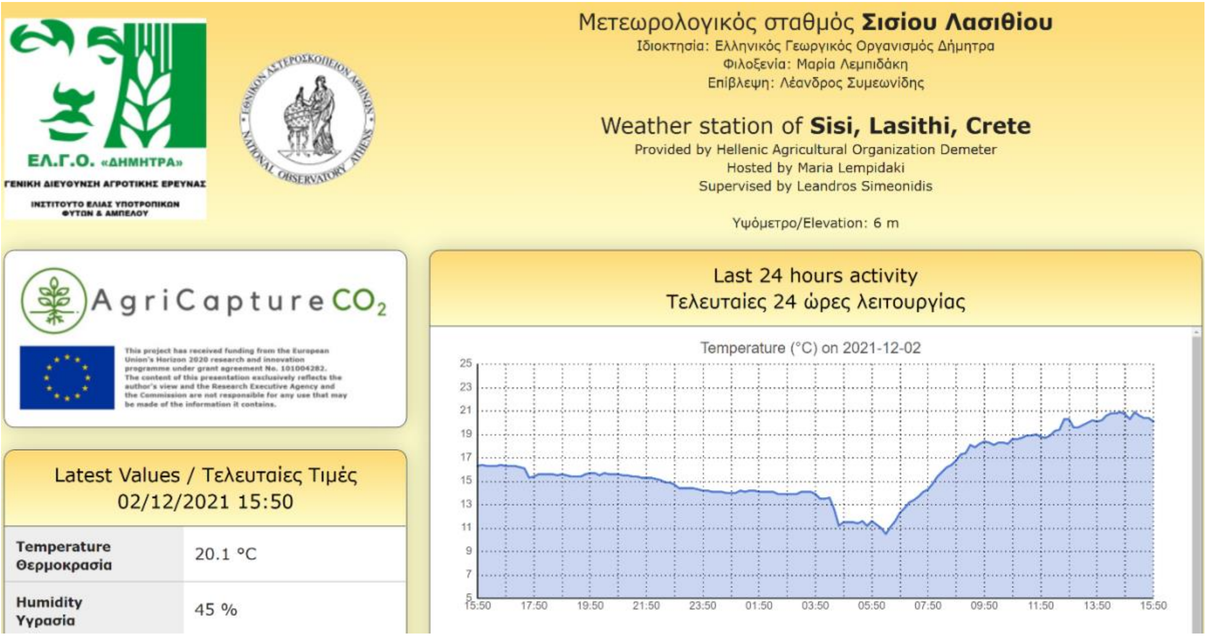


Figure 14. Spatial distribution of the study area in Greece and the meteostations (M1, M2).

These two stations provide the platform with real time climatological parameters (rainfall, max-min-average temperature, solar radiation, wind speed and direction, air humidity, ET, with a time interval of 10 minutes), informing and supporting an effective irrigation schedule for our farmers ensuring the water saving as well as the olive productivity. Figure 12 depicts the data display environment as well as the recorded data of station M1.



Date	Time	Temp Out	Hi Temp	Low Temp	Out Hum	Dew Pt.	Wind Speed	Wind Dir	Wind Run	Hi Speed	Hi Dir	Wind Chill	Heat Index	THW Index	Bar	Rain	Rain Rate	Solar Rad.	Hi Solar Rad.	UV Index	Hi UV	Heat D-D	Cool D-D	In Temp	In Hum	In Dew	In Heat	ET	In Air Density	Wind Samp	Wind Tx	ISS Recept	Arc. Int.
24/11/21	13:10	19.2	19.2	19.1	76	14.9	6.4	SW	1.07	14.5	NNW	19.2	19.2	16.8	1016.0	0.0	0.0	138	176	1.4	1.7	0.000	0.006	22.0	67	15.6	22.0	0.00	1.1788	225	2	98.4	10
24/11/21	13:20	19.1	19.2	19.1	77	15.0	4.8	SW	0.80	17.7	NNW	19.1	19.1	17.3	1016.0	0.0	0.0	106	120	1.2	1.3	0.000	0.005	21.9	67	15.5	21.9	0.00	1.1793	226	2	98.9	10
24/11/21	13:30	19.1	19.2	19.1	75	14.6	4.8	SW	0.80	19.3	NNW	19.1	19.1	17.3	1016.1	0.0	0.0	77	107	0.8	1.1	0.000	0.005	21.8	67	15.4	21.8	0.00	1.1796	223	2	97.6	10
24/11/21	13:40	18.9	19.1	18.9	76	14.6	4.8	SW	0.80	9.7	W	18.9	18.9	17.2	1016.3	0.0	0.0	54	65	0.3	0.7	0.000	0.004	21.8	67	15.4	21.8	0.00	1.1800	225	2	98.4	10
24/11/21	13:50	18.8	18.9	18.8	75	14.3	4.8	SSW	0.80	9.7	SW	18.8	18.8	17.0	1016.2	0.0	0.0	65	72	0.7	0.7	0.000	0.003	21.7	67	15.3	21.7	0.00	1.1802	225	2	98.4	10
24/11/21	14:00	18.8	18.9	18.8	77	14.7	4.8	SW	0.80	9.7	W	18.8	18.8	17.0	1016.1	0.0	0.0	72	91	0.7	0.9	0.000	0.003	21.7	67	15.3	21.7	0.08	1.1803	225	2	98.4	10
24/11/21	14:10	18.7	18.8	18.7	77	14.6	4.8	SW	0.80	6.4	SW	18.7	18.7	16.9	1016.2	0.0	0.0	101	111	0.9	1.0	0.000	0.003	21.6	67	15.2	21.6	0.00	1.1806	225	2	98.4	10
24/11/21	14:20	18.8	18.8	18.7	75	14.3	3.2	SW	0.53	6.4	WSW	18.8	18.8	17.6	1016.2	0.0	0.0	82	100	0.7	0.8	0.000	0.003	21.6	67	15.2	21.6	0.00	1.1809	225	2	98.4	10
24/11/21	14:30	18.7	18.8	18.6	77	14.6	3.2	SW	0.53	8.0	NNW	18.7	18.7	17.5	1016.2	0.0	0.0	78	84	0.7	0.8	0.000	0.003	21.6	67	15.2	21.6	0.00	1.1808	224	2	98.0	10
24/11/21	14:40	18.4	18.7	18.4	78	14.5	3.2	SW	0.53	6.4	S	18.4	18.4	17.2	1016.2	0.0	0.0	80	102	0.7	0.8	0.000	0.000	21.5	67	15.1	21.5	0.00	1.1810	225	2	98.4	10
24/11/21	14:50	18.3	18.4	18.3	77	14.2	3.2	SW	0.53	8.0	SW	18.3	18.3	17.1	1016.1	0.0	0.0	62	70	0.5	0.6	0.000	0.000	21.5	67	15.1	21.5	0.00	1.1809	224	2	98.0	10
24/11/21	15:00	18.4	18.4	18.3	77	14.3	1.6	SSW	0.27	6.4	SW	18.4	18.4	17.8	1016.2	0.2	0.0	30	42	0.0	0.0	0.000	0.000	21.4	67	15.0	21.4	0.05	1.1825	226	2	98.9	10
24/11/21	15:10	18.4	18.4	18.4	77	14.3	3.2	SW	0.53	6.4	SSW	18.4	18.4	17.3	1016.2	0.0	0.0	21	25	0.0	0.0	0.000	0.000	21.5	67	15.1	21.5	0.00	1.1811	224	2	98.0	10
24/11/21	15:20	18.4	18.4	18.4	76	14.1	3.2	SSW	0.53	8.0	S	18.4	18.4	17.2	1016.2	0.0	0.0	20	25	0.0	0.0	0.000	0.000	21.4	67	15.0	21.4	0.00	1.1825	228	2	99.8	10
24/11/21	15:30	18.4	18.5	18.4	77	14.3	4.8	SW	0.80	8.0	NNW	18.4	18.4	16.6	1016.2	0.0	0.0	25	30	0.0	0.0	0.000	0.000	21.4	67	15.0	21.4	0.00	1.1825	225	2	98.4	10
24/11/21	15:40	18.4	18.4	18.4	76	14.1	4.8	SW	0.80	12.9	WNW	18.4	18.4	16.6	1016.2	0.0	0.0	27	28	0.0	0.0	0.000	0.000	21.4	67	15.0	21.4	0.00	1.1825	225	2	98.4	10
24/11/21	15:50	18.4	18.4	18.3	77	14.3	4.8	SW	0.80	14.5	WSW	18.4	18.4	16.6	1016.1	0.0	0.0	24	30	0.0	0.0	0.000	0.000	21.5	67	15.1	21.5	0.00	1.1809	225	2	98.4	10
24/11/21	16:00	18.4	18.4	18.3	77	14.3	4.8	SW	0.80	8.0	NNW	18.4	18.4	16.7	1016.1	0.0	0.0	41	58	0.0	0.0	0.000	0.000	21.7	67	15.3	21.7	0.03	1.1803	227	2	99.3	10
24/11/21	16:10	18.4	18.4	18.4	76	14.1	3.2	SW	0.53	8.0	NNW	18.4	18.4	17.3	1016.3	0.0	0.0	37	58	0.0	0.0	0.000	0.000	21.7	66	15.1	21.7	0.00	1.1806	225	2	98.4	10
24/11/21	16:20	18.3	18.4	18.3	76	14.0	3.2	SW	0.53	12.9	NNE	18.3	18.3	17.1	1016.3	0.0	0.0	12	19	0.0	0.0	0.000	0.000	21.8	66	15.2	21.8	0.00	1.1802	224	2	98.0	10
24/11/21	16:30	18.3	18.3	18.3	77	14.2	4.8	SW	0.80	12.9	NNW	18.3	18.3	16.5	1016.3	0.0	0.0	12	14	0.0	0.0	0.000	0.000	21.9	66	15.3	21.9	0.00	1.1798	226	2	98.9	10
24/11/21	16:40	18.3	18.3	18.3	76	14.0	4.8	WSW	0.80	16.1	NNW	18.3	18.3	16.5	1016.4	0.0	0.0	8	11	0.0	0.0	0.000	0.000	22.1	66	15.4	22.1	0.00	1.1794	225	2	98.4	10
24/11/21	16:50	18.3	18.3	18.3	75	13.8	4.8	SW	0.80	8.0	SW	18.3	18.3	16.5	1016.5	0.0	0.0	5	7	0.0	0.0	0.000	0.000	22.1	65	15.2	22.1	0.00	1.1796	226	2	98.9	10
24/11/21	17:00	18.3	18.3	18.2	76	14.0	4.8	SW	0.80	19.3	N	18.3	18.3	16.5	1016.5	0.0	0.0	3	5	0.0	0.0	0.000	0.000	22.2	65	15.3	22.2	0.03	1.1794	223	2	97.6	10
24/11/21	17:10	18.2	18.3	18.2	76	13.9	6.4	N	1.07	19.3	N	18.2	18.2	15.8	1016.5	0.0	0.0	0	0	0.0	0.0	0.001	0.000	22.4	64	15.3	22.4	0.00	1.1788	90	2	39.4	10
24/11/21	17:20	18.2	18.2	18.1	73	13.3	6.4	N	1.07	16.1	NNE	18.2	18.2	15.8	1016.5	0.0	0.0	0	0	0.0	0.0	0.001	0.000	22.3	64	15.2	22.3	0.00	1.1792	225	2	98.4	10
24/11/21	17:30	18.2	18.2	18.1	73	13.3	6.4	N	1.07	17.7	NNW	18.2	18.2	15.8	1016.5	0.0	0.0	0	0	0.0	0.0	0.001	0.000	22.3	64	15.2	22.3	0.00	1.1790	225	2	98.4	10
24/11/21	17:40	18.2	18.2	18.1	75	13.7	4.8	SW	0.80	12.9	ENE	18.2	18.2	16.4	1016.4	0.0	0.0	0	0	0.0	0.0	0.001	0.000	22.3	64	15.2	22.3	0.00	1.1789	225	2	98.4	10
24/11/21	17:50	18.2	18.2	18.1	75	13.7	4.8	WSW	0.80	11.3	W	18.2	18.2	16.4	1016.7	0.0	0.0	0	0	0.0	0.0	0.001	0.000	22.5	64	15.3	22.5	0.00	1.1773	223	2	97.6	10
24/11/21	18:00	18.1	18.2	18.0	74	13.4	3.2	SW	0.53	8.0	NNE	18.1	18.1	16.9	1016.7	0.0	0.0	0	0	0.0	0.0	0.002	0.000	22.6	64	15.4	22.6	0.03	1.1769	226	2	98.9	10
24/11/21	18:10	18.1	18.1	18.1	76	13.8	3.2	SW	0.53	6.4	SSE	18.1	18.1	16.9	1016.8	0.0	0.0	0	0	0.0	0.0	0.002	0.000	22.7	63	15.3	22.7	0.00	1.1772	224	2	98.0	10
24/11/21	18:20	18.1	18.1	18.1	76	13.8	4.8	SW	0.80	17.7	NW	18.1	18.1	16.3	1016.8	0.0	0.0	0	0	0.0	0.0	0.002	0.000	22.7	63	15.3	22.7	0.00	1.1772	223	2	97.6	10
24/11/21	18:30	17.9	18.1	17.9	74	13.2	4.8	SW	0.80	8.0	SW	17.9	17.9	16.2	1017.0	0.0	0.0	0	0	0.0	0.0	0.003	0.000	22.8	63	15.4	22.8	0.00	1.1769	219	2	95.8	10
24/11/21	18:40	17.9	18.1	17.9	74	13.2	4.8	WSW	0.80	9.7	W	17.9	17.9	16.2	1017.0	0.0	0.0	0	0	0.0	0.0	0.003	0.000	22.8	63	15.4	22.8	0.00	1.1770	222	2	97.1	10
24/11/21	18:50	17.9	18.0	17.9	74	13.2	4.8	NNW	0.80	12.9	NW	17.9	17.9	16.2	1017.0	0.0	0.0	0	0	0.0	0.0	0.003	0.000	22.7	63	15.3	22.7	0.00	1.1772	221	2	96.7	10
24/11/21	19:00	17.9	18.0	17.9	73	13.0	4.8	NNE	0.80	14.5	N	17.9	17.9	16.2	1017.0	0.0	0.0	0	0	0.0	0.0	0.003	0.000	22.7	63	15.3	22.7	0.03	1.1774	221	2	96.7	10
24/11/21	19:10	18.0	18.0	17.9	75	13.5	4.8	N	0.80	16.1	N	18.0	18.0	16.2	1017.0	0.0	0.0	0	0	0.0	0.0	0.002	0.000	22.7	63	15.3	22.7	0.00	1.1774	224	2	98.0	10
24/11/21	19:20	17.9	18.1	17.9	73	13.0	4.8	WSW	0.80	16.1	N	17.9	17.9	16.2	1017.0	0.0	0.0	0	0	0.0	0.0	0.003	0.000	22.6	63	15.2	22.6	0.00	1.1776	225	2	98.4	10
24/11/21	19:30	18.0	18.1	17.9	74	13.3	6.4	NNW	1.07	17.7	N	18.0	18.0	15.6	1016.9	0.0	0.0	0	0	0.0	0.0	0.002	0.000	22.6	63	15.2	22.6	0.00	1.1775	225	2	98.4	10
24/11/21	19:40	17.9	18.0	17.9	75	13.4	8.0	N	1.33	22.5	N	17.9	17.9	15.0	1016.9	0.0	0.0	0	0	0.0	0.0	0.003	0.000	22.6	63	15.2	22.6	0.00	1.1777	223	2	97.6	10
24/11/21	19:50	17.8	17.9	17.8	74	13.1	6.4	NNW	1.07	17.7	N	17.8	17.8	15.5	1017.0	0.0	0.0	0	0	0.0	0.0	0.004	0.000	22.6	63	15.2	22.6	0.00	1.1779	227	2	99.3	10
24/11/21	20:00	17.8	17.9	17.8	75	13.3	6.4	NNW	1.07	16.1	NW	17.8	17.8	15.5	1017.0	0.0	0.0	0	0	0.0	0.0	0.004	0.000	22.6	63	15.2	22.6	0.03	1.1776	226	2	98.9	10
24/11/21	20:10	17.9	17.9	17.8	73	13.0	4.8	N	0.80	17.7	NNW	17.9	17.9	16.1	1017.0	0.0	0.0	0	0	0.0	0.0	0.003	0.000	22.6	63	15.2	22.6	0.00	1.1776	226	2	98.9	10
24/11/21	20:20	17.9	17.9	17.8	74	13.2	6.4	N	1.07	16.1	N	17.9	17.9	15.5	1017.1	0.0	0.0	0	0	0.0	0.0	0.003	0.000	22.7	63	15.3	22.7	0.00	1.1775	223	2	97.6	10
24/11/21	20:30	17.8	17.9	17.8	77	13.7	6.4	N	1.07	20.9	NE	17.8	17.8	15.5	1017.1	0.0	0.0	0	0	0.0	0.0	0.004	0.000	22.6	63	15.2	22.6	0.00	1.1777	225	2	98.4	10

Figure 15. Data display environment as well as the recorded raw data of meteostation M1 in eastern Crete, Greece.

According to the farm-specific action plans that have been reported in Deliverable 5.1, the list of monitoring actions and their frequency are presented in the first two columns of the following table 6, while the last column represents the progress of each monitoring action taken in 2021.

Table 8. monitoring actions and the progress of each during 2021.

Monitoring parameter or procedure in parcels	Number of samples/monitoring parameters per time	Progress of monitoring actions taken in 2021
Soil moisture monitoring	Telemetric soil moisture system in irrigated parcels / Frequency: Continuous	Telemetric soil moisture systems have already been installed in the irrigated parcels and the soil moisture data are already being recorded.
Soil nutrient content and soil organic matter	Soil sampling at specific locations/ Frequency: Every year	The specific monitoring action will have been fulfilled when the first soil sampling campaign will be conducted.
Leaf nutrient content	One sample for each farm/ Frequency: Every year (Proper leaf sampling period during winder period of each year)	The leaf sampling campaign took place (December 2021) and during the first period of 2022 we will have the results.
Fuel use per ha	Collecting data and feedback from farmers/Frequency: Continuous	The data collection has been done for 2021.
Irrigation water data sets	Collecting data and feedback from irrigated farms/Frequency: During irrigation period	The data collection has been done for the irrigation period of 2021.
Fruit yield (Quality and Quantity of olive oil)	Collecting data and feedback from farmers/Frequency: Every year	Data collection has been done (olive yield for the period 2021)
Multi-spectral UAV imagery	One demonstration survey at the end of the project - Images	No action
Meteorological data sets – telemetric station	Telemetric station / Frequency: Continuous - meteorological parameters	A telemetry meteorological station has already been installed and the climatic conditions are already being recorded.
Effects of Soil Salinity	Monitoring in parcels/ Frequency: after irrigation period - Portable instrument for Measuring plant stress	Measurements have been recorded for the 10 parcels

3.1.3 Progress according to the use case plan

Table 9. Milestones for use case 1.

#	Name	Month	How you know you reached it
1	Baseline definition	5	All trial site parcels defined, shapefiles provided to WP3, historical data provided to OCW
2	Use case operation plan & evaluation methodology	10	Agreement on an operation site plans
3	Informative session with farmers	11, 18, 23	Meetings / Trainings

There were three milestones for 2021, namely definition of baseline, use case operation plan and informative session with farmers. All were successfully achieved.

Regarding the use case plan of activities, the only deviation in schedule is related to soil sampling for establishing the baseline. This activity was delayed to start as of December 2021 because of the plans to rent a soil scanner for estimation of SOC content as an alternative to the conventional soil analysis in laboratory.

3.1.4 Lessons learned and next steps

Lessons learned after first year of implementation:

- Lack of farmers' knowledge about conservation or regenerative practice although most of the practices traditionally used could be already considered as regenerative ones
- Lack of knowledge of innovative practices and adaption of new technologies
- Lack of knowledge about Carbon credits and certification procedure
- Good will of the farmers to accept innovative practices and technologies to increase yield and adapt to climate change effects
- Good communication between the farmers and the science community

Next steps:

- Continue with soil sampling and measuring all soil characteristics
- Continuous exchanges and support to the farmers on the regenerative practices
- All real time monitoring data will be incorporated and ready to be used by the AgriCaptureCO_2 Platform
- Trainings and workshops for second year will become more specific on the outcomes of the project and the way that the farmers could use the platform
- Very close liaison with WP3
- Monitoring crop yield and how regenerative practices were significantly increased the yield
- Exchanges with the other case studies to provide their experiences

3.2 Implementing use case 2: Poland

3.2.1 Summary

Objectives

The overall objective of this case study is to demonstrate implementation of a regenerative agriculture project in a large-scale crop cultivation case, supported by services implemented in the SatAgro platform.

To deliver this objective, the specific objectives are:

- To provide the necessary inputs for the establishment of the AgriCaptureCO2 project and platform.
- To co-create the AgriCaptureCO2 platform as an extension of the SatAgro platform.
- To demonstrate the benefits of the AgriCaptureCO2 platform.
- To apply appropriate actions in order to promote regenerative agricultural practices.

Information for the proposed plan

During the course of the year certain themes linked to pilot implementation became more pronounced.

First, the carbon footprint assessment (done by One Carbon World) confirmed that the use of synthetic fertilisers constitutes the largest part (63.29 % of the core emissions). This gives extra weight to efforts linked to the implementation of Variable Rate Application (VRA), which is a specialty of SatAgro, and with which Top Farms Głubczyce already has a lot of experience.

Implementation of VRA is strongly linked with the issue of savings and overall profitability of crop production. Optimising inputs to soil is a win-win situation, which brings the farm extra cash and at the same time improves soil properties, and more broadly, the state of the environment. However, until recently SatAgro had a limited capacity to demonstrate the financial effects of optimising fertiliser use, while it was already apparent that farms make decisions mainly based on financial clues. This has changed with the completion of a new SatAgro module: Profitability.

The key purpose of the new Profitability module is to map profitability (see the figure below) and allow to analyse its two components: costs and revenue, in a spatially-explicit way, and across different timescales. We hypothesise that the tool will open opportunities to assess relationship between costs and revenue in a way that will promote increase in profits by optimising costs (including agrochemical inputs to the soil) rather than maximising them. We will use the pilot to validate this and to implement improvements. Moreover, the tool set the ground for a spatially-explicit accounting of emissions linked to the means of production and this theme will be explored further within AgricaptureCO2.

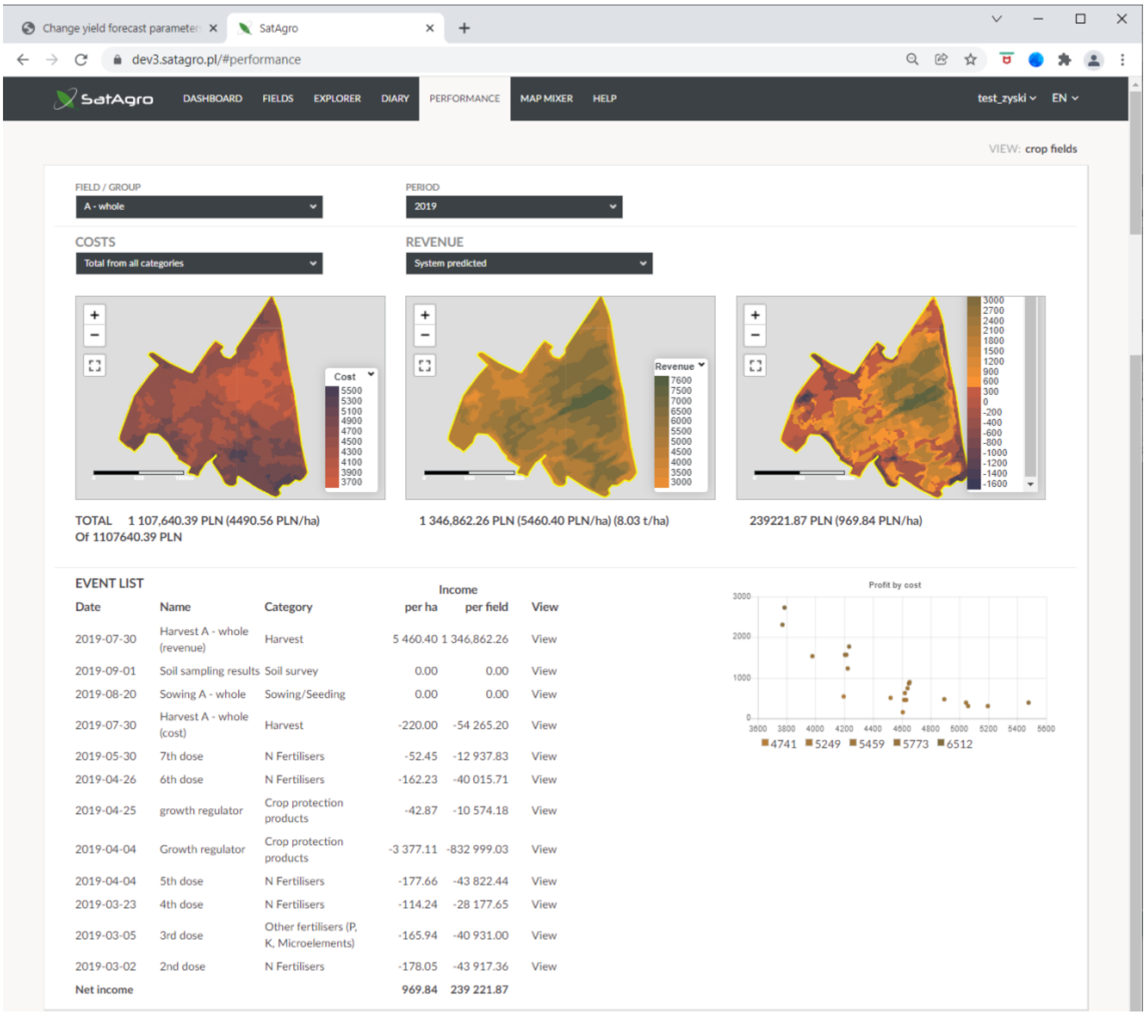


Figure 16. View on the new module of the SatAgro platform: Profitability which focuses on mapping crop profitability. Here, the user-provided spatially uniform value of yield is used in the analysis.

Apart from the reduction of farm emissions theme, described considered above, the second theme is linked to soil regeneration itself. Here, a collaboration has been established with the TerraNostra Foundation, an entity closely linked with all Top Farms' operations (*circa* 30 000 ha), whose mission is to promote and certify so called "biologisation of the soil" which in a large part overlap with the concept of regenerative agriculture. In particular, Terra Nostra created the "Code 5C", the components of which are described in the table below.

Table 10. Components of the "Code 5C" promoted by the Terra Nostra Foundation.

Calcium
Calcium is a key soil nutrient for building soil fertility. It improves pH and in turn also assimilability of nutrients. It also enhances soil structure. For these reasons liming is an important part of soil "biologisation".
Carbon
Carbon, or organic matter, is essential in soil, also enhancing its structure, and in addition increasing water holding capacity, retention of minerals for plants, and protection against pathogens. The major premise of "biologisation" is to increase the amount of organic matter and carbon in the soil.
Cover crops
Covering the soil all year round prevents soil erosion (while the longer roots loosen the soil), inhibits the growth of weeds, and revitalises microorganisms and soil metabolism.
Cultivation
Here the principle "cultivate as little as possible, but as much as necessary" is promoted. The soil is loosened deeply without turning it over and mixed shallowly, which promotes formation of humus rather than oxidation, improves permeability, and preserves living organisms.
Culture
The culture component is about a wider context of crop cultivation. In general, the goal is to promote biodiversity, e.g. through revitalising of ponds, building water retention reservoirs, maintaining mid-field shelterbelts, using rich crop rotations and mixed-species cover crops. Collaboration with naturalists clubs facilitates interventions critical for the survival of protected species, e.g. Montagu's harrier which nests within crop fields.

SatAgro and other AgricaptureCO2 partners intend to further develop the support for TFG in originating a regenerative agriculture project through integration of the specific requirements of this challenge with the ongoing implementation of the Terra Nostra's Code 5C. More specifically, SatAgro embarks on complementing the comprehensive soil assessment done by Terra Nostra with specific tools that support (i) tracking of the overall progression of a regenerative project, (ii) implementation of precision treatments with fertilisers, pesticides (with some role of data from Unmanned Aerial Vehicles), and pH-lowering agents including Enhanced Rock Weathering, as well as (iii) verification of the implementation of cover crops, reduced tillage, widened crop rotation and nature strips.

3.2.2 Main activities and results

To summarise use case implementation, which has been described above, the following set of points can be named as key activities and results:

- Establishing relationships with (i) mother organisation of the key pilot farm: Top Farms Sp. z o.o., and (ii) the Terra Nostra foundation which works closely with it. In addition, (iii) Vantage Polska Sp. z o.o., an agronomy consulting and soil sampling company, already a partner of SatAgro, has been trained and is now included in discussion on the optimal approach to soil sampling, and (iv) the Polish branch of BNP Paribas has also been trained and is committed to support the implementation of regenerative projects in farms.
- Establishing of the baseline for the pilot has been completed, as regards carbon footprint, and the state of play in both the area of GHG reductions and removals.
- The SatAgro platform has been altered to support the pilot, and AgricaptureCO2 in general, in the assessment of crop production profitability and the potential to enhance it. The Profitability module is linked to the specific support in locating nature strips. In addition a number of new functionalities that support Variable Rate Application have been implemented, with some linked to soil sampling support (VRA of nutrients other than Nitrogen).
- The first soil sampling campaign has been designed and will be executed in the Spring of 2022.

The COVID-19 pandemic has affected only the training component of the pilot implementation. As described in chapter 2.3., it was practically impossible to organise physical meetings, which are by far preferred. Nevertheless, regular training with local partners and pilot farms were conducted online. The classic workshops with farmers were brought forward to the Spring of 2022.

3.2.3 Progress according to the use case plan

The milestones for the use case (see table below) were fully achieved in the schedule foreseen for the use case.

#	Name	Month	How you know you reached it
1	Use case kick-off	5	All local authorities have audits and priorities identified by OCW. All trial site parcels defined, shapefiles provided to WP3, historical data provided to OCW
2	Establish a baseline	4	Agreement on an operation site plans

3.2.4 Lessons learned and next steps

Key lessons learned:

1. Soil sampling is a critical component of a regenerative project, and into a large extent determines the costs, as well as the quality of evidence and of the linked carbon reductions. Therefore, any efforts to reduce the costs of soil sampling and improve the quality of inferred information on soil carbon pool and its changes, are of critical importance.
2. Soil regeneration is an important aspect of farming sustainability, but not the only one. Reducing inputs to soil, in particular synthetic fertilisers, can have a dramatic effect on the farm's carbon footprint. This highlights the importance of Variable Rate Application. In a broader context, the assessment of costs, which are tightly linked to emissions, and their relationship with revenue and profit, is another important framework that might help to promote the climate mitigation aspect of the farming sector.
3. Earth Observation is the key element of AgricaptureCO2, which offers stronger evidence and streamlined and cheaper execution of a regenerative project. However, there are other sources of evidence that should be considered for inclusion in the AgricaptureCO2 approach. Notably, agro-machinery, such as spreaders, sprayers and harvesters are increasingly capable to deliver reports and could enhance the overall portfolio of evidence around the regenerative project.

Key next steps

1. Execute the first soil sampling campaign for the Polish pilot.
2. Expand the new Profitability assessment tool to be able to summarise key emissions in a spatially-explicit way.
3. Develop/adjust the methods for an assessment of soil regeneration potential for the territory of Poland.

4. Finalise the definition of partnerships and regenerative agriculture offer for the territory of Poland.

3.3 Implementing use case 3: UK (certified regenerative agriculture)

3.3.1 Summary

Objectives

The overall objective of this case study is to addresses cultivation within a regenerative agriculture-related certification scheme. The case study will define, promote, support, and monitor regenerative agricultural practices in regenerative production that boost nutrient use efficiency, enhances soil health, and ensures productivity. Throughout this use case, peer-to-peer knowledge exchange and learning opportunities will be facilitated and encouraged.

To deliver this objective, the specific objectives are:

- To provide the necessary inputs for the establishment of the AgriCaptureCO2 platform.
- To demonstrate the benefits of the AgriCaptureCO2 platform.
- Deliver activities and opportunities to promote regenerative agricultural practices and/or reduce emissions on farm.
- Develop a portfolio of audio and visual resources to evidence and support the case study.
- Gap analysis of existing LEAF Marque standard with regards to regenerative agricultural practices.

The use case plan specified that practices in rapeseed production would be the focus of the use case, which was expanded to include all arable crops.

Information for the proposed plan

The use case focuses on developing and validating two main business cases:

- Enabling in-setting for agri-processors with 0-emissions certification, such as Farrington Oils. We will accurately quantify the carbon being sequestered in soils used to produce raw material for the agri-processors to enable this amount to be used in environmental footprint calculations of the supply chain (Scope 3). This strongly relies on AgriCaptureCO2's quantify service.
- "Improve" upon processes used for regenerative agriculture certification schemes, such as LEAF's Marque. AgriCaptureCO2 can lower costs, increase transparency and promote simplicity particularly through assessing the potential of the Validate and Support services.

3.3.2 Main activities and results

The use case was planned in detail and benchmarking was conducted. The use case collaborated closely with WP3 to collect/provide user needs (collaborating in particular with GILAB), and to test the alpha version of the platform and to provide initial feedback (Farrington Oils as a farm, LEAF as a regenerative agriculture certification organisation).

We assessed the initial idea to use carbon credits to help support newcomers to regenerative agriculture. However, the difference in timing from when a carbon credit project would start (when the farmer starts to implement practices) to when carbon credits are issued and sold (estimated at 3 years) was identified as a problem for potential beneficiaries in the UK through our consultations. Also, during this period, LEAF's board decided to not directly promote carbon credits as a part of their activities. Thus, we coordinated with OCW to "take over" this activity from the UK use case as a part of WP4. The scope of activities in WP4 was expanded through the Amendment to the Grant Agreement, aiming to generate a "pipeline for carbon credits". This will:

(i) Increase the project's practical knowledge of current methodologies for quantifying soil carbon sequestration for issuing carbon credits,

(ii) Allow for side-by-side testing with AgriCaptureCO2 services (and thus support us to define a better AgriCaptureCO2 methodology), and

(iii) Create the documentation and procedural structure which can in turn make use of the AgriCaptureCO2 methodology once it is complete.

Taking this practical step, OCW is defining the first group of projects by submitting documentation to Verra (the organization managing and operating the Verified Carbon Standard voluntary carbon scheme), which will be in the UK. The documentation can in turn by adapted to submit projects in other use case countries, as relevant for each use case (Poland and Serbia have in particular taken steps in this direction).

As part of benchmarking, we defined the ambitious Scope 3 baseline for the environmental footprint of Farrington Oils. This was done in close collaboration with OCW, collecting data on the bases of invoices paid (fuel and energy), farm and processing machinery, and information collected through a bilateral consultation with OCW.

Although LEAF and Farrington Oils are geographically close, physical meetings were in large part not possible during the first half of the year because of COVID. This required us to make use of teleconferencing tools, but we feel some of the workshops could have been more effective in a physical form.

3.3.3 Progress according to the use case plan

The milestones for the use case (see table below) were fully achieved in the schedule foreseen for the use case.

Table 11. Milestones in year 1 for use case 3.

#	Name	Month	How you know you reached it
1	Baseline definition	5	Shapefiles provided to WP3 (GILAB) and historical data provided to OCW
2	Use case operation plan completed	5	Agreement on an operation plan between LEAF and FrOils, document drafted.

The use case had still not defined specific KPIs in the operational plan as the full scope of activities was still not finalised in details.

As such, we define several KPIs at the present time that will apply for the upcoming two years.

Table 12. Key performance indicators for use case 3.

Result	Indicator	Target
1	Estimated total process cost saving from using Verify service during certification	10-30%
2	Estimated savings for farmers for using Verify service during certification	5-10%

3	Savings for Farrington Oils from insetting instead of purchasing carbon credits	~25%
4	Number of farmers involved in use case activities	100
5	Portion of fields at FrOils quantified for soil carbon in the following years	100%

3.3.4 Lessons learned and next steps

The main lessons learned were:

- The process that AgriCaptureCO2 uses for soil sampling (as part of the Quantify service) must be significantly improved to make it intuitive and user-friendly (even for farmers). Otherwise, there is a significant risk of confusion and wrong sampling which will affect user retention and quality of the service.
- Carbon credits can be leveraged as a financial incentive for new regenerative farmers, but there is a large gap between the understanding and expectations of many farmers and the reality. The difference between the start of a project, and when carbon credits can be issued and sold create the situation that a farmer is not provided with the financial sum when they most need it (during the conversion at the beginning of the process). Also, there is a risk that carbon credits might be less than envisioned, that they are sold at a later date than envisioned, etc. which is borne by the farmer. There are shortcuts that certain competitors seem to be taking, by simplifying the process but this diminishes the veracity of the carbon credit claim (that 1 credit really lowers emissions by 1 ton CO2-e) and thus carries risk in terms of the overall system. AgriCaptureCO2 aims to make use of processes approved by trusted parties, e.g. leading voluntary schemes of Verra, Gold Standard, UNFCCC etc. to avoid this risk. However, it is much less dynamic in the process, and the scheme has to balance reality of a robust process with the incentives it produces for farmers.

In the next year the use case will:

- Coordinate with and involve third party verifiers that work with the LEAF Marque programme to test the AgriCaptureCO2 *Verify* service.
- Work with WP3 to expand the functionalities of the AgriCaptureCO2 Support service to benefit LEAF and other regenerative farmers in the UK climate, coordinating co-creation with LEAF farmers.
- Test one or several spectrometry instruments for in situ soil samples. Assess soil carbon changes between 2021 and 2022.

- Assess the potential value of soil carbon mapping for regenerative farmers in the UK, assessing the information chain in which this data could be exploited (i.e. with agricultural advisers, machinery, etc.).

3.4 Implementing use case 4: UK (public bodies)

3.4.1 Summary

Objectives

The overall objective of this case study is to use AgriCaptureCO2 to assess various management options for public lands and inform an actionable plan to achieve climate neutrality of Lancashire County by 2030.

To deliver this objective, the specific objectives are:

- To undertake baseline Carbon audits of the 14 district and unitary authorities in Lancashire.
- To identify options for each local authority to achieve carbon neutrality.
- To identify opportunities for the AgriCaptureCO2 Platform to deliver these options on public land, or through the actions of public authorities.
- To investigate the opportunities for green waste and the arisings from arboricultural and forestry works collected by public authorities to be utilised to increase the carbon content of soils on public sector land, and to apply these at a site level.
- To provide the necessary inputs, at site level, for the establishment of the AgriCaptureCO2 Platform and also, demonstrate actions regarding the benefits and the use of the AgriCaptureCO2 Platform under different management regimes.

Information for the proposed plan

The councils within Lancashire are responsible for limited areas of land which are currently under active agricultural management and which could be subject to regenerative agricultural practices in the strict sense. We are, however, collectively responsible for substantial areas of open space including: parks, playing fields, school grounds, highway verges and woodlands,

The majority of this land is effectively managed grassland; we need to identify the regenerative agricultural techniques which may be transferrable to these situations and understand how they may be best applied, whilst retain the existing functionality of the land and maximising its potential to contribute to our councils' net zero and biodiversity objectives.

Councils are also responsible for the collection and disposal of domestic waste. Currently much of this waste is burnt or composted thus returning carbon to the atmosphere. In addition, as the Highway authority, the County Council faces a substantial risk from the impacts of Ash dieback disease. Ash is one of our commonest roadside trees, current tree health surveys have identified that over 90% of roadside Ash trees are infected. The County Council is about to embark upon a substantial programme of tree safety works and we will need to efficiently dispose of a significant amount of woody material. We aim to dispose of this material in a way that will not add existing sequestered Carbon to the atmosphere.

We are looking for options which will enable us to effectively capture the Carbon stored in waste and other organic materials which are under our control. We see the production of biochar as a potential route by which this could be achieved, but one which would require substantial investment and a revision of existing operational practices, which requires further investigated.

All of these land management and waste issues are faced by local councils across the UK and beyond, we envisage that out experiences will be of interest and relevance to many of them.

We are also interested in the potential for the compost produced from existing green waste collections, and for biochar, to be utilised on managed grassland and in tree planting schemes to increase carbon capture through incorporation into soil pre-planting, with the potential associated benefits of faster establishment and tree growth and fewer tree failures, resulting in increased carbon sequestration.

In Spring 2022 we will be implementing pilot schemes at two County Council sites:

- Midgeland Farm (37ha), a former landfill site which is now capped and has a periphery of woodland with the central areas managed under grazing licence.
- Chisnall Hall (69ha), a former colliery site which closed, and was restored to woodland and pastureland by the County Council in the 1970s.

Plans are currently being prepared which will see areas of these sites treated with PAS100 compost and biochar (where available). Following treatment three management compartments will be established at each site:

- Treated and tree planted;
- Treated and left unmanaged;
- Treated and returned to grazing management;
- Untreated areas will remain as a control.

Soil sampling will be undertaken prior to scheme implementation and again in subsequent years. We also have access to historic borehole samples for these sites which will be utilized by the project where they are comparable. The trial plots will enable the relative merits of each approach in carbon capture to be assessed. This will permit the capacity of wider council owned land under different management regimes to be determined, and so the potential councils have to contribute to meeting their own net zero objectives through a revised land management regime.

3.4.2 Main activities and results

Securing the input required from all 14 local authorities in the greater Lancashire area has been the largest single achievement in the first year of the project.

Most back-office council staff have been homeworking for much of the first year of the project, there many have been some consequential impacts on speed and ease of delivery of team working and information supply.

3.4.3 Progress according to the use case plan

Table 13. Milestones for use case 4.

#	Name	Month	How you know you reached it
1	Baseline definition	5	All local authorities have audits and priorities identified by OCW. All trial site parcels defined, shapefiles provided to WP3, historical data provided to OCW

2	Use case operation plan & evaluation methodology	10	Agreement on an operation site plans
3	Informative session with farmers	10	Meetings

All milestones have been achieved:

- Responses have been provided to OCW by all 14 local authorities. Baseline calculations and reports have been completed for 11. Burnley, Chorley and Blackpool are outstanding.
- The trial sites at Midgeland Farm and Chisnall Hall have been identified and shapefiles provided. Historic borehole data have been retrieved but are only available in PDF format and need to be re-captured as shapefiles.
- Management plans for the individual trial plots at these sites are in development and will be tailored to the availability of PAS100 compost and biochar available to the project within the management timescales.
- Soil samples will be undertaken in Spring 2022 prior to implementing the management schemes.
- The current grazing licences on the two trial sites will end on 31/03/22. Prior to new licences being agreed meetings will be held with the graziers to explain the project objectives and the revised land management regime.
- Informative sessions have been held with partner authorities (instead of farmers as the more relevant stakeholders in this case study)

3.4.4 Lessons learned and next steps

Lessons learned:

- The UK biochar market is currently not well developed, and climate action plans have to consider feasibility to scale land management options.

The next steps are:

- Plans for the two pilot sites will be finalised in the first quarter of 2022.
- Soil sampling campaign prior to project implementation.
- Implementation of groundworks on the two pilot sites in April/May 2022.
- Collate/compile digital data on council land holdings and current management to inform assessment of potential.

3.5 Pilot #5: The case of Serbia

3.5.1 Summary

Objectives

To promote, support and monitor regenerative agricultural practices in crop production in Serbia (and wider Western Balkans region) in order to enhance soil health, increase farmers' profit, decrease air/soil/water-pollution and improve biodiversity in agricultural landscapes. Thus, to create a model for wider adoption of regenerative agriculture that will be supported by digital decision tools and financial incentives.

To deliver this objective, the specific objectives are:

- To work with farmers to promote new regenerative practices that benefit the environment and the farm.
- To demonstrate actions regarding the benefits and the use of the AgriCaptureCO2 platform.
- To explore and implement novel technology-supported means for value-addition, cost savings, and/or novel revenue streams.

Information for the proposed plan

The regenerative practices being used in the Serbian use case include:

- Cover crops
- No/low soil tillage
- Leaving crop residues

16 farms have been brought on board for the use case, covering 45 fields on a total of 404 ha. The details for each of the farms is presented in the table below (names of the farms has been anonymised for this public report).

Table 14. The main characteristics of the use case farms in Serbia.

Farm	Parcel area (ha)	Regenerative practice	Regenerative practice applied before

RS01	20.00 17.73 10.49	Low till, Cover crop, Leaving crop residues	Yes, except cover crops
RS02	5.70 5.00 3.68	Low till, Cover crop, Leaving crop residues	Yes, except cover crops
RS03	2.70 11.10 4.62	Low till, Cover crop, Leaving crop residues	Yes, all
RS04	42.48 41.80 23.37	Low till, Cover crop, Leaving crop residues	Yes, except cover crops
RS05	4.14 3.14 2.56 2.36	No till, Low till, Cover crop, Leaving crop residues	Yes, except cover crops
RS06	4.62 2.30 7.12 4.00 3.44 39.00	Low till, Cover crop, Leaving crop residues	Yes, except cover crops
RS07	6.58	Low till, Cover crop, Leaving crop residues	Yes, except cover crops
RS08	16.47 11.10	Low till, Cover crop, Leaving crop residues	Yes, except cover crops
RS09	3.19 4.44 4.58 2.92 5.50	Low till, Cover crop, Leaving crop residues	Yes, except cover crops
RS10	31.00 10.00 10.00	Low till, Cover crop, Leaving crop residues	Yes, except cover crops
RS11	1.35 3.27 2.90 1.58	Low till, Cover crop, Leaving crop residues	Yes, all
RS12	2.52	Low till, Cover crop, Leaving crop residues	No
RS13	1.09	Low till, Cover crop, Leaving crop residues	No
RS14	1.35	Low till, Cover crop, Leaving crop residues	No

RS15	1.15 1.15 1.15 0.93	Low till, Cover crop, Leaving crop residues	No
RS16	19.05	Low till, Cover crop, Leaving crop residues	No

3.5.2 Main activities and results

The Association of Farmers of the Municipality of Ruma (UPOR) with 4 farmers and the Agricultural Advisory Service of Ruma are the bearers of the development part of the Project. This means that the principles of regenerative/conservation agriculture are applied for the first time in their fields and in their production, named as Development Group (DG).

Plots with pre-crop winter wheat were selected and divided into two parts which will be pilot (experimental) fields for introducing regenerative/conservation practice for corn or soybean production.

The first part of the field is conventional tillage as plowing and seed bed preparation with a minimum of 3 passes and the second part is minimum tilled field (disking or mulch tilled) with cover crops drilled in September 2021.

The second part will be planting with spring crop in cover crops with or without tillage means we will use some hard harrow or just no-till planting (direct).

All fields have soil analyses with data about pH, CaCO3 (%), humus (%), P2O5 and K2O in mg/kg. It is important to measure nitrogen content in soil in spring to decrease nitrogen, phosphorus and potassium fertiliser applications. The presence of plow pan on the fields was checked using penetrometer after winter wheat harvest.

The regenerative/conservation practice group of farmers is another group that has already applied these practices from 5 to 15 years and does not till: they are referred to as the In Practice Group (IPC). They had winter wheat, soybean and corn on their fields in 2021. This group has 10 farmers and also includes the experimental fields of the Agriculture Advisory Service, Pancevo; the latter builds from 15 years of experimental work assessing four tillage systems on 4 fields (2 hectares each). They also sowed cover crops as the first group (DG). On cover crops they will be planting corn or soybean in no till planting and compare with another part with minimum tilled or no tilled practice. One of the farmers in the group is a 100% no till farmer.

For the needs of the project, seeds for cover crops were purchased. Tillage mix KEVE was chosen, which consists of: 74% Horse beans, 24% spring Black oats and 2% Phacelia. All crops are spring varieties and freeze over the winter. Their function is to produce biomass, protect top soils and provide nitrogen fixation. The seeds were provided for 2 hectares for 10 farms and for 4 hectares for 2 farms (they have large fields in the project).

Details of monitoring the results in the test fields is presented in the table below.

Table 15. Monitoring parameters and details for the use case in Serbia.

Monitoring parameter or procedure in parcels	Number of samples/monitoring parameters per time	Progress of monitoring actions taken in 2021
Soil moisture monitoring	Soil samples taken on experimental field with long term 4 different tillage systems/ Frequency: Every 10 days through vegetation period of crop. Alternative, a survey can be conducted to collect the feedback from farmers regarding their own experience.	A survey was conducted in the group of farmers that have been applying Reg Agri practices for several years
Soil nutrient content	Soil sampling at specific locations, depth 0-5 cm; 5-10 cm; 10-20cm and 20-30 cm/ Frequency: Every year after harvest	Group of farmers that started with Reg Agri during the project conducted soil analysis on experimental fields.
Soil organic matter	Soil sampling at specific locations according to AgriCaptureCO2 methodology. First campaign will be conducted in 2021-2022 and the second campaign in 2023	Locations for soil sampling are defined. The sampling campaign started in December 2021
Efficiency of cover crop mix	Soil sampling at specific locations. Available N for next crop as N-NO_3 , from 0-90 cm Frequency: Every year	Group of farmers that started with Reg Agri during the project conducted soil sampling on experimental fields.
Coverage harvest residues and management	Measuring for each registered field/ Frequency: Every year after harvest	Farmers involved in the project estimated the residues coverage in % for the registered fields
Soil compaction	Measuring for each registered field/ Frequency: Every year before and after crop production	Farmers involved in the project estimated the soil compaction for the registered fields.
Yield	Measuring for each registered field/ Frequency: Every year in harvest	Farmers involved in the project provided data for the registered fields.
Fuel use per ha	Collecting data and feedback from farmers/Frequency: Continuous	Farmers involved in the project estimated fuel consumption

Application of fertilizers	Records of types and quantities of applied fertilizers/ Frequency: Continuous	Farmers provided data on the application of fertilizers in 2021
Meteorological data sets	Ground stations and local data estimation with DailyMeteo model / Frequency: Continuous	The data is generated for 2021

Figure 17. Checking the presence of plow pan on field using penetrometer after winter wheat harvest on a farm used in the use case in Serbia.

Figure 18. Reduced tillage (discing) and crop residues left on the soil, use case 5 in Serbia.

Figure 19. Cover crops in the early stage on the use case in Serbia.

3.5.3 Progress according to the use case plan

Table 16. Milestones for use case 5.

#	Name	Month	How you know you reached it
1	Baseline definition	5	All parcels defined, shapefiles provided to WP3, historical data provided to OCW
2	Use case operation plan & evaluation methodology	5	Agreement on an operation plan
3	Informative session with farmers	7, 19, 30	Trainings

There were three milestones for 2021, namely definition of baseline, use case operation plan and informative session with farmers. All were successfully achieved.

Regarding the use case plan of activities, the only deviation in schedule is related to soil sampling for establishing the baseline. This activity was delayed for December because of the plans to rent a soil scanner for estimation of SOC content as an alternative to the conventional soil analysis in laboratory. The other reason for the delay was due to the search for the licensed laboratory in Serbia that uses SOC content methodology according to the required ISO standard.

3.5.4 Lessons learned and next steps

Conclusions for Development Group:

- Cautious acceptance of changes in the production practice
- Non-existence of government support of subsidies and fear of the extra costs
- Lack of knowledge about conservation or regenerative practice
- Closed and conservative agriculture science without research in this area or research results not accessible to farmers
- Acceptance of cover crops and intermediate crops as regular practices
- Insufficient trust and negligence in data entry when using digital platforms and applications that help monitoring agricultural production

Conclusions for In Practice Group:

- Lack of knowledge about Carbon credits and certification procedure
- Acceptance of cover crops and intermediate crops as regular practices
- Insufficient trust and negligence in data entry when using digital platforms and applications that help monitor agricultural production
- Insufficient will to form a regenerative agriculture association by farmers

Next steps:

- Measuring N content in soil
- Measuring soil organic content
- Filling out a production cost checklist
- Monitoring crop growth in the first group of farmers
- Continued workshops
- If soil conditions and precipitation allow monitoring of moisture content on plots in Ruma and Pancevo
- Re-sowing of cover crops by some farmers depending on the pre-crop
- Farmer tour to regenerative farms in Vojvodina
- Visits between project participants

3.6 Use case 6: Kenya

3.6.1 Summary

Objectives

The overall objective is to bring together regenerative interventions, Earth Observation technology and approved carbon credit certification methodology to generate a robust and streamlined approach to reduced emissions and increased carbon credit yields for farmers that adopt "better agricultural practices". This will boost water use efficiency, enhance soil health, ensure

productivity, and improve resilience against climate change. Thus, to create a certified methodology that applies an integrated model of sustainable flower cultivation supported by digital decision tools and financial incentives, to be disseminated across Kenya.

To deliver this objective, the specific objectives are:

- To provide the necessary inputs for the establishment of the AgriCaptureCO2 platform.
- To demonstrate the benefits of the AgriCaptureCO2 platform.
- Bring together 3 areas of regenerative farming interventions, Earth Observation and methodology that will enable access to the carbon markets by farmers.
- To apply appropriate actions to promote and achieve compensation for applied regenerative interventions and/or reduced emissions at farm level or in different parts of the whole production chain - Farm Level, processor and retailer.
- Methodology development and certification.

Information for the proposed plan

There is a significant number of practices, both agronomic and practical, that have been taken to minimize emissions, environmental impact, and on farm costs. These practices include (list is indicative for the sake of brevity):

- Optimise & reduce synthetic fertiliser - regular SMN sampling and analysis, real time scanning of crop canopy and chlorophyl density. Application of fertigation/foliar application of fertilisers.
- Optimise & reduce synthetic agrichemical inputs.
- Reduced tillage/no-till.
- Reduce & alleviate compaction - CTF farming/low ground pressure tyres/reduce weight of machinery.
- Crop Residue Retention – Improve Residue Management/Soil Mulching/Pruning Waste Retention.
- Increase soil Cover & biological diversity – Cover & Catch crops.
- Increase soil Cover & biological diversity – under sowing/companion, double, relay cropping/alley, intercropping.
- Introduction of stockless grass system.

- Integration of grazing livestock/optimisation of grazing systems (Rotational grazing (also known as cell and holistic grazing) / Adaptive multi-paddock grazing (rotational, livestock numbers are adjusted to match available forage as conditions change) / Multi-species grazing / Grazing of agricultural residues post-harvest and cover crops).
- Application of Organic Matter – e.g. Livestock manures (FYM), slurries, digestate, biosolids, water pre-treatment waste and paper pulp.
- Utilise green waste to create PAS 100 compost - Utilise this in a manner that will enhance longer-term Carbon capture.
- Application of Biochar - Stable solid that is rich in carbon.
- Application of Basalt - Enhanced Rock Weathering.
- Habitat Creation to Increase Soil/landscape Biodiversity – eg beetle banks/floristic margins/woodland management/general landscape conservation.
- Agroforestry
- The benefits of farming, catchment and regional collaborations.
- Improve water management/irrigation – Irrigation according to meteorological and soil moisture data. Increase soil water storage.

3.6.2 Main activities and results

The main activities and results in the first year of the use case have been:

- Engage agri-business farms included in the pilot, and ensure that expectations and roles are understood in full.
- Presented the project and platform to potential users.
- SHAPE files for selected fields have been created and sent to WP3 partners.
- Baseline emissions and re-measure has been completed for 2018–2020 via OCW.
- Collect asses and harmonise soil samples taken annually from 2016–2020 with the standards selected in WP3.
- Planning soil campaign for the next year.

The use case was not significantly impacted by COVID-19.

3.6.3 Progress according to the use case plan

There was only one milestone defined for the first year, which was achieved in line with the use case plan.

Table 17. Milestones for use case 6.

#	Name	Month	How you know you reached it
1	Baseline definition	5	All parcels defined, shapefiles provided to WP3, and carbon footprint analysed.

3.6.4 Lessons learned and next steps

The Kenya case will seek to have continued close involvement in WP3 and WP5 in order to support progression of the project.

4 Conclusion

The first year was critical to detail the use cases (direction, goals, activities, KPIs, etc.) and to launch their activities. This created a front-heavy programme where multiple activities that were related to each other had to be balanced (select test farms, develop plan, establish baselines).

In large part, the work of the WP was successful, in the sense that they have achieved progress according to plan and have proved a valuable technical and business test bed for the whole project. There was a successful interaction with other WPs, particularly WP3 which was critical to both WP3 and WP5.

The processes relating to management of the WP (which were developed at the end of the first quarter of the year) have shown to be successful, i.e. it is important for ELGO and GILAB to coordinate and support all use cases with regular contact. This process will be further improved and replicated in the successive year.

There is a significant recognised need to make soil sampling cheaper and easier, and the consortium has started exploring how to make use of spectrometry sensors to this end. In turn, "getting soil sampling right" will also have large consequences for the post-project operations and business development as they directly relate to precision, ease of use, and process costs. The original plan defined at the proposal stage, to use laboratory analyses can clearly be improved upon, as some use case partners have found out through practice.

In the next year, the project will continue experimental work in the field, where relevant. In addition, it must turn its focus to developing and testing business cases for each context – seeking to answer the question as to who will use and pay for AgriCapture services after the project ends (and how do they specifically stand to benefit).

In this sense, the project will also explore the degree to which promotional and engagement efforts (WP2 and WP6) can find synergy with WP5. Continuing closer collaboration with the other WPs is necessary to ensure that the WPs contribute as much as possible to the overall objectives of the project, and indeed to the ambition of the participants and volunteers with which each use case works.

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