



D6.7 COLLABORATION WITH EU PROJECTS AND INITIATIVES (3)

Project: Monitoring of Environmental Practices for Sustainable Agriculture Supported by Earth Observation

Acronym: ENVISION



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Responsible Author	Vassilis Spitadakis (ETAM)		
Contributions from	Ifigeneia Tsioutsia (Agroapps), Manolis Tsantakis (ETAM), ITC		

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1 Executive summary

ENVISION has established connections with a group of 16 (so far) relevant projects by carrying out introductory online meetings with projects' presentations and initial discussions and exchange of views. The fields of potential collaboration include joint meetings, events and activities, formal provision of advice, exchange of information, joint use of European Commission services and cooperation regarding the projects' available communication channels. Depending on the nature of the projects, their progress, discussion results to different outcomes, from becoming a lighthouse customer to sharing open outputs, exchanging knowledge and expertise, as well as joining dissemination forces into several activities.

Several meetings and other activities took place in the last period, as well as brought new projects in the collaboration network, such as AgriBit, CALLISTO, Space4Green and The Great project. Finally, a 3-hour clustering event has been organized titled: "Solutions to Support the Current and Future Needs of CAP Monitoring and Agriculture Sustainability in General", together with the projects AgriBIT, CALLISTO, SPACE4GREEN and VITIGEOSS. The event highlighted the tangible outcomes in respect to services and best practices delivered and assessed through several European projects, keeping insight to future actions, vision, and prospects.

This document, namely D6.7 "Collaboration with EU projects and initiatives (3) is the update of the second version on the initially reported activities in D6.5 "Collaboration with EU projects and initiatives (2)" to further elaborate on the solutions derived from the projects and the ways to foster collaboration and communication among ENVISION and other projects.

2 Introduction

The "terms of reference" for the present deliverable are clearly described in the project proposal as follows:

ENVISION has to "...establish the necessary liaison connections with the most prominent EU projects, agricultural related projects funded under the same call, as well as with the e-shape project. Through this task, a review and mapping of ICT solutions and EO based services derived from these projects will be conducted (in collaboration with WP2, Task 2.1) in order to evaluate how these products could contribute to ENVISION, which are the main ENVISION's strengths and how complementary these solutions are with regards to ENVISION".

In the previous deliverables the work carried out concerned the specification of methods of potential collaboration, a general overview of the relevant projects, and the reporting on these contacts that took place. New connections were established during the most recent period; now, the number of connected projects has grown to sixteen (16) that led to activities, mainly meetings and information exchange. All projects and activities with established connection with ENVISION are listed in the Annex.

The collaboration evolved, relevant actions were performed and now the plan for the next months is focus on the closing activities with most of the connected projects. This document summarizes all the actions performed during the project period so far (M1-M34) for the already established projects (Section 3) and the new connections that were established (Section 4) within M20-M34.

3 Actions with established liaison and connections

The present chapter summarizes on the activities that took place between ENVISION and the other projects, in the M1-M20 period and formed the plan for further actions to follow.



The University of Reading, ENVISION team and the ARMIINES e-shape team took the initiative to meet to exchange knowledge, experiences and to understand the different requirements of the co-production of services. Several scheduled meetings took place, while an exchange of project deliverables and relevant to the task documents (i.e. research publications) have been helpful and supportive in understanding each other's tasks and objectives. The main topic of discussion was how the two teams could work together in developing a standardized approach (protocol) to effectively record information derived from workshops with the aim to efficiently produce user stories or relevant tools that would meet the needs of the two projects as well as the developers. The University of Reading has benefited from the early discussions with the e-shape team in respect to the challenges associated with a multicultural and diverse group of stakeholders with different needs and levels of services developed. The discussions with ARMINES was about the need to effectively engage all partners during the co-production phase of the project and therefore, good practices and challenges of the e-shape project have been shared. ARMINES provided access to co-design workshop material in Athens, as well as to the public deliverables D2.1, D2.2, D2.3 of the e-shape project. The two teams have agreed to meet frequently to share experiences, knowledge and good practices.



EO4AGRI was a Coordination and Support Action (CSA) project, therefore not many technical details were exchanged from the earth observation point of view. Nonetheless, the colleague from EO4AGRI, Mr Karel Charvat, mentioned a clear gap in the projects, applications and directions of the EO based agriculture monitoring status quo. Specifically, the green deal priorities are not as strongly integrated into the current EO based monitoring actions, including the CAP monitoring. The farm to fork and biodiversity dimensions of the Green deal, together with the concept of digital twin earth and the Destination Earth initiative need to reframe and redefine the EO based agriculture monitoring actions. Regarding the list of potential collaborations, Mr Karel Charvat proposed that we add the theme of standardization.



The discussion started with the biodiversity regulation, the CAP pillar 2 as a possible connection between the two projects, as well as the lack of monitoring data to assess the impact of CAP on

biodiversity. Other topics of discussion concerned the possible advice from EUROPABON in interpreting outputs of ENVISION, the potential collaboration in showcasing the EUROPABON feasibility studies, the ENVISION help to EUROPABON in collecting user requirements, the building of a case together, and the advantage that the University of Reading participates in both projects.



ENVISION was invited from NIVA to see their open outputs, code source and tools, as well as provide to them information regarding ENVISION open outputs. NIVA has planned to organize new webinars and ENVISION was encouraged to take part. Moreover, NIVA has a tool called “Technology watchdog” (internal publication for technology) and they asked ENVISION to provide a use case. Lastly, NIVA proposed a joint webinar with all relevant projects (e.g. SEN4CAP, NIVA, ENVISION etc).



A survey being carried out by VITIGEOSS was an immediate field of support of ENVISION to VITIGEOSS. Furthermore, ENVISION provided contact details for wine producers and producers’ organisations. Also, AGROAPPS proposed to answer the VITIGEOSS questionnaire since they have relevant requirements recorded from their own business activity. Discussions brought up the relevance of CAP measures regarding the environment with the wine sector. Also, a discussion was made on possibilities with regards to lighthouse customers to serve both projects. ENVISION also provided the DG AGRI’s list of Certification Bodies and the Paying Agencies operating in Spain. A conference, a common paper, a joint meeting, and social media support were mentioned by the VITIGEOSS Coordinator as possibilities of collaboration. Discussions also concerned the kind of satellite and other data used. Also, a hackathon/datathon was proposed by NOA as a field of cooperation and for creating synergies. Lastly, a new meeting was proposed to take place to discuss, among others, developing together a new potential pilot case of ENVISION focused on vineyards.

VITIGEOSS and ENVISION performed several exchange and sharing activities, that led to the basic specification of an interesting pilot case for ENVISION to explore, focused on vineyards. A list of minimum requirements were identified, comprising of weather, disease management, phenology management and other.



The FIRE project representatives described their “Evangelists programme”. ENVISION’s partners were invited to attend the Fire Forum and asked to disseminate it and this has been fully supported by the ENVISION dissemination team. They also promised to invite ENVISION next year providing a slot. Moreover, they explained their close collaboration with Copa Cogeca. Clustering events of ENVISION and FIRE will be considered in the future. A joint policy session was proposed by AGROAPPS and FIRE accepted that this is a desirable option. Furthermore, the “Evangelist of agriculture” might make a presentation in one of the ENVISION workshops. The projects agreed on mutual support on social media and newsletters, and FIRE asked ENVISION to be a contributor to their work in the field of agriculture.



MEF4CAP team said that they are interested in some of the outputs of ENVISION. Lots of areas were discussed following the MEF4CAP representatives’ questions. These were the Data Cube of ENVISION, the storage and processing activities, the area monitoring ambition, the small parcels monitoring, the satellite images with a perspective 5 to 10 years ahead, the limitations of Sentinels, the possibilities of the geo-tagged photos and UAVs, the satellites’ possibilities for detections of more activities in the future, the open technologies and products, and the in-situ data. MEF4CAP representatives mentioned demonstrations 1 and 4 of their project as a good possibility for cooperation. They expressed their interest to continue the collaboration, share deliverables, and organize joint events.



SEN4CAP team commented about their collaboration with the NIVA project. Moreover, they briefed the ENVISION team about their final events, and they mentioned the availability of plenty of information on their website. Regarding ENVISION, they asked about the business cases and how exactly they are defined. Another question concerned how ENVISION plans to build upon other projects and if ENVISION has started from scratch. Also, they raised a question in regard to the user requirements and the specificities of very small countries. ENVISION proposed a meeting between technical teams of the two projects, as well as the organisation of a webinar and a joint publication. The SEN4CAP team said that they are ready to provide their feedback on anything ENVISION would like to report to them. ENVISION mentioned the problem faced in regard to the download of images that are archived and relevant to this an online meeting was agreed to discuss how they can provide

help. SEN4CAP proposed to the ENVISION team to submit questions on the SEN4CAP forum, as well as they stressed that they are willing to discuss any win-win collaboration. The last topic of discussion was the availability and speed of responses of ESA to requests.



ENVISION and NIVA are sharing their open outputs, code source and tools. Moreover, NIVA asked ENVISION to provide a use case within the so called "Technology watchdog" (internal publication for technology). On September 14, 2021, the two projects had a meeting where the following threads of activities were initiated:

1. Exchange of information regarding both projects.
2. RVO was invited to become ENVISION Lighthouse customer.
3. ENVISION proposed a joint organisation of event.
4. NIVA encouraged ENVISION to provide input to the "watchdog" tool of NIVA.

The resulted collaboration both on technical and content issues, went as follows:

- RVO was warmly welcomed to become ENVISION Lighthouse customer (from the perspective of RVO as Paying agency).
- NIVA provided information about the "watchdog" tool of NIVA
- The two projects exchanged information related to use-cases and their tangible outcomes

The two projects also decided to work together on communication and dissemination activities. A joint organisation of an event has been proposed, that should be common for the two projects and could possibly invite also other projects. Consequent communications among the two projects were integrated within the ENVISION workshop for the Lighthouse Customers and the clustering event that took place in February 2022. Further in detail:

- NIVA joined the ENVISION workshop for the identified Lighthouse Customers (Paying agencies and Certification bodies)
- NIVA participated in the ENVISION clustering event.

Finally, the two projects decided to share regular updates and invitations (events, workshops, ...) and find possible collaborations as the projects evolve.



DIONE shared with ENVISION information about their project through a workshop¹ that took place online November 25th, 2021 at 10:00 CET.




WIKIFARMER (<https://wikifarmer.com/>) is not a project, but an international collaboration activity. It has been characterized as “The Wikipedia of farming” by FAO. More specifically, it is a worldwide collaboration with the mission of empowering and educating farmers across the world. In 2021, WIKIFARMER helped more than 4.000.000 users to be informed on agricultural topics and by 2023 this number will multiply, as the platform will be available in 10 more languages. Actually, WIKIFARMER is the greatest user generated online farming library. Its mission is to help all farmers across the globe to find valuable information regarding their existing or potential crops and livestock. Through the information it provides, it aims to give practical solutions to farmers. Contributions can be provided from professional or amateur farmers, beekeepers, gardeners and professors sharing their knowledge and best practices. Users can submit a new article, edit an existing article, add pictures or videos, request a new article, ask a question about a related issue, or just browse through hundreds of pages with valuable information. On the 1st of March 2022, a Strategic Partnership Associate at WIKIFARMER reached out ENVISION about a possible collaboration between ENVISION and WIKIFARMER. A meeting will be organised in due course, so that to define the type of information that could be disseminated by ENVISION to wider farmer community through the WIKIFARMER. *ENVISION disseminated its results through WIKIFARMER to wider audience.*



Open-IACS is a project made up of a group of Paying Agencies, research experts and an HPC group with high experience. Open-IACS general objective is to support the generation, aggregation and cross-border reuse of open datasets, increase the capabilities of HPC (High Performance Computing) and the data capabilities of the European data infrastructure, and promote the use of HPC and data across

¹ <https://dione-project.eu/wp-content/uploads/2021/10/DIONE-Workshop-%E2%80%93-Agenda-2.pdf>

borders in the public interest. The two projects need to have a bilateral meeting so that to discuss and share experience in respect to computation infrastructure and datasets.



Earth Observation services in support of agriculture and Common Agricultural Policy

Wednesday,
February 9th, 2022
9:00-12:00 CET

Registration
<https://us06web.zoom.us/j/869366>

- Welcome and Introduction speeches**
 - Introduction speech by the DG-AGRI representative
 - Tangible outcomes from European projects - Six European projects will present tangible outcomes related to Earth Observation monitoring: ENVISION, NIVA, e-shape, DIONE, BEACON, EO-WIDGET
- CAP monitoring - direct payments monitoring**
 - Earth Observation solutions for CAP monitoring, their lessons learned, expectations and future plans will be presented by Paying Agencies from Slovenia, Lithuania, Denmark, Estonia, Spain
- Earth Observation services for agriculture**
 - Service providers, EV ILVO, AgroApps, INRAe, NOA, Geoville Austria will present Earth Observation services for agriculture, to be used by Paying Agencies, Certification Bodies, developers, farmers and farming organisations.
- Final thoughts and future outlook**
 - Looking into the future of Earth Observation for CAP and agriculture, presented by European Space Agency (ESA)

Project ENVISION has received funding from the European Union's Horizon 2020 research and innovation programme under grant agreement No 869366

On the 9th of February 2022, a 3-hour clustering event has been organised titled: “Earth Observation services in support of agriculture and Common Agricultural Policies”. The event was done by ENVISION and NIVA with a collaboration of e-shape, DIONE, BEACON and EO-WIDGET which were all brought together. The Clustering event aimed to connect and explore future collaboration possibilities of European projects dealing with Earth Observation technologies for monitoring farm management activities with regards to sustainability, in compliance with the CAP’s agri-environmental objectives, as well as further enhancing their visibility.

The event showcased a wide range of services and best practices delivered through these European projects. The event was introduced by DG-AGRI. The tangible outcomes from the six (6) European projects (ENVISION, NIVA, e-shape, DIONE, BEACON, EO-WIDGE) were presented, related to EO monitoring. Paying Agencies from 5 countries (Slovenia, Lithuania, Denmark, Estonia, Spain) with different agriculture activity features and patterns, presented EO solutions for CAP monitoring, the main lessons learned as well as the expectations derived and their plans onwards to further exploit the Earth Observatory technology solutions. Last but not least, service providers (such as EV ILVO, AgroApps, INRAe, NOA and Geoville Austria) presented EO services for agriculture, to be used by Payment Agencies, Certification Bodies, developers, farmers and farming organisation. Valuable discussions and opinion exchange took place, framing also the closing presentation made by the European Space Agency (ESA) in respect to the visionary outlook on Earth Observation for CAP and agriculture. The agenda, the recording and presentations are available on the ENVISION website².

²<https://envision-h2020.eu/earth-observation-services-in-support-of-agriculture-and-commonagricultural-policy/>

4 New Projects in ENVISION Collaboration Network

The newly connected projects include AgriBIT, SPACE4GREEN and the GREAT project. Through formal communications forms as well as discussions the projects exchanged with ENVISION information about their activities, so that to identify the ways so that to be mutually useful. A list with brief descriptions of these new connections is found below.



The goal of AgriBIT is to improve the agriculture chain by delivering higher precision, more accurate and continuously available Precision Agriculture services, combining GNSS, and more specifically new high precision Galileo positioning and augmentation services like EGNOS, Earth Observation (EO) information with on-field and on-machine sensors and actuators, Artificial Intelligence (AI) technologies and expert agricultural knowledge.

The overall objective of AgriBIT is to deliver a range of customisable and modular solutions suitable for various types of agricultural uses and brands of crops through six defined objectives:

- Market and needs analysis
- Higher precision location services
- Affordable, European source, high precision Galileo and EGNOS GNSS receiver
- Bundle of PA services for farmers and farm advisors
- Strategy for services uptake
- Open service-oriented platform

AgriBIT includes an "20"-month piloting phase in peach production (Greece), tomato fields (Portugal) and vineyards (Italy), whose goal is not only to evaluate the adaptation of its services to user needs, but also create impact in key agricultural sectors.



The overall goal of SPACE4GREEN is to propose a technological solution that enables a trusted platform among stakeholders of different natures for the automated certification that activity occurs or a thing is in a location at a certain point in time, without requiring a third-party human certification. Therefore, the approach of the project utilised emerging technologies with increasing market adoption such as the DLT (Distributed Ledger Technology), more specifically blockchain. SPACE4GREEN is born as a response to the needed adoption of EGNSS solutions in mass market and within professional stakeholders, under the topic HORIZON-EUSPA-2021-SPACE-02-53. EU considers them key enablers of the current and future digital age contributing to the competitiveness of the European GNSS industry and to the maximization of public benefits. An iterative and user-driven approach is followed to achieve the high-level standards of quality expected during the execution phase and after its finalization.



The GREAT project, funded by the Digital Europe program, aims to establish the Green Deal Data Space Foundation and its Community of Practice which builds on both the European Green Deal and the EU's Strategy for Data. The project will deliver a roadmap for implementing and deploying the Green Deal Data Space, an infrastructure that will allow data providers and initiatives to openly share their data to tackle climate change in a multidisciplinary manner. With the launch of Common European data spaces, the European data strategy aims to create a single market for data, where data can flow within the EU and across sectors, for the benefit of the citizens and the planet Earth. The key pillars supporting the development of the roadmap:

- Architecture - Blueprint reference architecture.
- Governance - Data governance framework in line with innovative business cases.
- Datasets - Inventory of high value datasets that will enable the monitoring of the European Union's Green Deal policies.
- Community - Strong and cohesive Community of Practice representing all the stakeholders' landscape that contribute, co-design and validate at all stages of the project.

5 The 2nd Clustering event

These new circles of collaboration, together with the established links with other projects, led to the 2nd Clustering Event that took place on the 30th of June 2023. The new event was titled “Solutions to Support the Current and Future Needs of CAP Monitoring and Agriculture Sustainability in General”, and it was organised by ENVISION together with the projects AgriBIT, CALLISTO, SPACE4GREEN and VITIGEOSS. EUROGEO Activity Group also participated to present thoughts and vision for the future of EO and GEOSS to enhance CAP.

The event followed and expanded the connection among European projects dealing with Earth Observation technologies for monitoring farm management activities with regards to sustainability in compliance with CAP, towards further activating collaboration and complementarity. The event highlighted the tangible outcomes (showing actual demos of several application) in respect to services and best practices delivered and assessed through several European projects, keeping insight to future actions, vision and prospects. 59 participants attended the meeting, according to the agenda presented in the figure below:



SOLUTIONS TO SUPPORT THE CURRENT AND FUTURE NEEDS OF CAP MONITORING & AGRICULTURE SUSTAINABILITY IN GENERAL; PRESENTATIONS & DISCUSSION

CLUSTERING EVENT

 **FRIDAY, 30/6/2023**

 **10:00-12:00 CEST**

 **REGISTRATION LINK**

<https://us06web.zoom.us/join/zoom/register/7ZYr-demugz0sHdDvBODyp0JZY0Q5hz-mqF4>

OBJECTIVES

This 2nd Clustering event follows and expands the connection among European projects dealing with Earth Observation technologies for monitoring farm management activities with regards to sustainability in compliance with CAP, towards further activating collaboration and complementarity. The event will highlight the tangible outcomes in respect to services and best practices delivered and assessed through several European projects, keeping insight to future actions, vision and prospects.

10:00-10:30 Welcome & Introduction speech (Vasilis Spitadakis, ETAM SA)

Introduction
to the European projects and
their objectives
in relation to EO monitoring &
agriculture sustainability

- **ENVISION:** Ifigeneia-Maria Tsioutsia, AgroApps
- **AgriBIT:** Giuseppe Vella, Engineering
- **CALLISTO:** Dafni Delioglani, Draxis
- **SPACE4GREEN:** Juan Pablo Garcia, Integrasy
- **VITIGEOSS:** Raimon Fabregat, Eurecat

10:30-11:50 Tangible outcomes from European projects

Monitoring Multiple Environmental and Climate requirements of CAP

ENVISION, Aušrius Kučinskas, Head of Direct Support Control Unit, National Paying Agency of Lithuania

GNSS enablers that evolve the farm advisory services to move into efficient Precise Agriculture services

AgriBIT, Michael Voskakis, Software Engineer, Agenso

CALLISTO: Towards exhaustive CAP monitoring

CALLISTO, George Choumos, NOA

Sustainable aware industry through a certifiable Environmental Sustainability calculator

SPACE4GREEN, Emanuel Lekakis, Head of Agriculture Unit, AgroApps

Presentation of the AgriBIT services platform

AgriBIT, Tommaso Nicoletti, Software Engineer, Engineering

Blockchain and GNSS as traceable solutions that ease and automate the process for managing the CAP from farmers to Public Authorities

SPACE4GREEN, César Díaz, CAAND

Presentation of VITIGEOSS solution

VITIGEOSS, Ernesto Batsidas, ELEAF

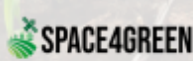
11:50-12:10 Looking into the future of EO for CAP and agriculture


Advancing Agriculture: The future of EO and GEOSS data in enhancing CAP

EuroGEO Agriculture Action Group – Stylianos Kotsopoulos

Discussion and Closing Remarks

Moderated by Vasilis Spitadakis, ETAM SA



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ANNEX I - The ENVISION network of projects



FIRE

FIRE's main objective is to unleash the potential that EO can bring to society by boosting the innovativeness, productivity and competitiveness of businesses. It promotes the adoption of EO solutions in various sectors and among them agriculture. FIRE is the first initiative fully dedicated to bringing actors from key commercial sectors together, outlining the perspectives of their market and using these insights to shape a strategic roadmap for the EO downstream sector. The project is going to establish a user community in agriculture (and other sectors) and a dedicated "EO Evangelist" programme to promote the adoption of EO solutions. Open dialogue with the demand side will guide the development, delivery and uptake of EO services. To identify user needs in its focus sectors, FIRE will organise focus group discussions with stakeholders. Two types of events will facilitate the dialogue within the focus sectors, i.e. the Focus Group Events and the Fire-Forum that will take place twice within the 3-year duration of the project. Moreover, to reach these stakeholders, the FIRE project will partner with Sector Leads that represent the sector and its value chain. COPA-COGECA is the Sector Lead for agriculture and will leverage its network towards improving the adoption of EO solutions. <https://fire-forum.eu/> [start date 12/2019, end date 11/2022].



NEXTLAND

The focus of NextLand regarding the use of EO services in agriculture is on the support to irrigation, crop planning optimization, early stress and anomaly detection, improved crop monitoring and yield prediction. The project is going to develop on a single platform 15 co-created, innovative and operational land management services (e.g. biomass production, crop phenology, crop type classification, crop water needs, anomaly detection, evapotranspiration, soil moisture, vegetation indexes, vegetation water content) based on GEOSS and Copernicus data to strengthen the value chain of the agricultural (and forestry) sector. These commercial midstream EO based services will be offered under a common service delivery platform. <https://ec-nextland.eu/> [start date 6/2020, end date 5/2023].

The rest of the relevant projects include both running and ended projects.



CALLISTO aims to bridge the gap between Copernicus Data and Information Access Services (DIAS) providers and application end-users through dedicated Artificial Intelligence (AI) solutions. The project will provide an interoperable Big Data platform integrating EO data deriving from the DIAS with crowdsourced, geo-referenced and distributed data from various sources. All data will be served in Mixed Reality environments. Furthermore, CALLISTO will develop an in-season availability of parcel-level crop type information using Sentinel-1 and Sentinel-2 data, aiming to identify, across a large area, parcels that potentially do not comply with CAP rules that are then targeted for inspection during a one-day field survey with Unmanned Aerial Vehicle (UAV). CALLISTO will make use of Deep Learning to perform large-scale parcel-level crop classification and outlier detection for grassland. The trained models will then be loaded on the UAV mounted machine to produce near-real time inference at the edge. Monitoring will be accomplished using the collection and analysis of several types of heterogeneous and large data collections, such as UAV imagery, geo-tagged photos and street-level imagery from vehicles. Artificial Intelligence (AI) technologies will also be involved in the data analysis in order to support EU implementation bodies and policymakers in EU CAP monitoring. <https://callisto-h2020.eu/> [start date 1/2021, end date 12/2023].



CANDELA project was born with the aim of providing services that facilitate and exploit the usage of Copernicus data building on top of the DIAS. Four (4) analytics tools were deployed in CREODIAS: i) Earth Observation data mining for classification and change detection, ii) Deep Learning for change detection on time series for optical and radar Earth observation data, iii) Semantic search and indexation on the output of the Earth observation library and non-image data, iv) Data fusion techniques to merge pre-processed data from various sources. Two out of the four use-cases concerned a) urban expansion and agriculture, aimed at studying the effect of urban expansion on agricultural areas due to the continuous development of human settlements and climate changes, and b) change detection in vineyards, assessing damage level caused by natural hazards. Robust and generic data analytics tools and various remote sensing data sources were used to detect changes of interest and using data analytics tools with remote sensing data in order to quantify the damages caused by natural hazards to vineyards. <https://candela-h2020.eu/> [start date 5/2018, end date 10/2020].



DIONE project is developing a direct payment controlling toolbox for paying agencies to abide by the modernised CAP regulations, involving novel techniques that will improve the capabilities of satellite technology while integrating various data sources (drones, soil sensors and mobile applications). A system developed on a regional or national scale will evaluate the monitored parameters to form evidence-based conclusions regarding eventual environmental impacts on an entire region. DIONE aims to a) capitalize on results of SEN4CAP project that showcased the capability of Sentinel data to monitor the crop diversification rules, b) include in the analysis the so far neglected EFA types (fallow land of all sizes, buffer strips, hedges, trees), by making use of super-resolution technology that improves the 10-20m Sentinel resolution to an improved resolution range (5-10m), c) complement the use of EO data with a system of reliable, ground-based geo-tagged photos captured by the farmers that exploits advances that allow for improved positional accuracy, low-footprint encryption techniques for improved data security and reliability and image detecting manipulation techniques (image forensics), d) implement a green compliance toolbox integrated with the paying agencies' tools. <https://dione-project.eu/> [start date 1/2020, end date 6/2022].





In the frames of a series of major reforms of the CAP, the paying agencies were asked to adopt new working methods, such as the use of remote monitoring mechanisms as a substitute for on-the-spot inspections or the application of EO data to enable payment for performance instead of paying for compliance. The EO4AGRI methodology was a combination of community building, service gap analysis, technology watch, strategic research agenda design and policy recommendations. Its focus was the provision of tools to improve the European capacity on operational agriculture monitoring based on information derived from Copernicus satellite observation data and through the exploitation of associated geospatial and socio-economic information services. Its outcomes were a whiter paper including a policy roadmap, a cooperation framework and a strategic research agenda to provide the European Commission and other authorities with actionable recommendations for improvements on the use of COPENICUS data and services in agriculture, design of future European research programmes and transversal initiatives. <https://eo4agri.eu/> [start date 11/2018, end date 10/2020].





e-shape, a flagship European project, is the largest coordinated effort to highlight operational services in the field of Earth Observation research in Europe and aiming to improve user uptake of Earth Observation data. Numerous cloud-based pilot applications under certain thematic areas address societal challenges, foster entrepreneurship, and support sustainable development. The showcase on Food Security and Sustainable

Agriculture consists of pilots showcasing that Copernicus data sets combined with the necessary in-situ data, weather and soil data can deliver improved information at the global, national and local scale, exploiting the processing infrastructures offered by Copernicus DIAS. The foreseen outcomes include i) sets of algorithms, ii) smart farming products and services, such as crop classification, crop growth indices, dynamic phenology estimation, phenology forecasting, yield estimation and yield damage assessment, iii) an NDVI-based Crop Insurance product, iv) an upgraded platform providing EO-based information to the potato growers and industry, v) means for improved vineyard and orchard decision support systems, and vi) assessment of SDG indicators. <https://e-shape.eu/> [start date 5/2019, end date 4/2023].

EUROPABON  EUROPABON adopts the approach for the development of coordinated Biodiversity Observation Networks (BONs) from the Group on Earth Observations Biodiversity Observation Network (GEO BON). The approach emphasizes co-design with stakeholders at all stages of the BON development, from assessment of current monitoring to implementation of a new design including new information streams. EUROPABON aims at integrating data streams with models to produce relevant biodiversity indicators for policy and management, assessments and scenarios building on the Essential Biodiversity Variables (EBVs) and Essential Ecosystem Service Variables (EESVs) developed in GEO BON. EUROPABON's mission is to overcome existing data gaps and workflow bottlenecks by designing an EU-wide framework for monitoring biodiversity and ecosystem services. EUROPABON will engage users to identify the data needs of policies and targets aligned with the new European Green Deal. The project will design a new structure for monitoring biodiversity and ecosystem services and model essential variables to integrate different reporting streams, data sources and monitoring strategies. Moreover, it will deliver solid knowledge about the dimensions of biodiversity change across space and time to support decision-making, and will assess existing monitoring efforts, identify user and policy needs, and investigate the feasibility of a European coordination center of monitoring operations. <http://europabon.org/> [start date 12/2020, end date 11/2023].

 **EUXDAT**  EUXDAT proposed an e-Infrastructure which addressed agriculture, land monitoring and energy efficiency for sustainable development as a way to support planning policies. Furthermore, EUXDAT proposed solutions for crops monitoring, improving land use maps, taking better decisions on the crops to exploit in certain types of soil and improving the management of farms in general. As an e-Infrastructure for Large Data Analytics-as-a-Service, aimed at bringing heterogeneous data sources (Copernicus, climate data, sensors data, UAVs data, machinery data, land use data, hydrology data, etc.) together with advanced data analysis tools, which can make use of both Cloud and HPC resources, in order to process huge amounts of data which will be useful for supporting agriculture. EUXDAT platform offers a set of data access connectors to a large number of datasets: Copernicus data (through Mundi web services platform), Open land use map, DEM, Hydrology data and more generally OpenStreetMap datasets, LPIS (Land Parcel Identification System), Climate data (Copernicus CDS), access to Soil maps datasets, private data upload, meteorological data, field sensor data and UAV data. <https://www.euxdat.eu> [start date 11/2017, end date 10/2020].

 **MEF4CAP**  MEF4CAP aims to identify future needs for sustainability information from different stakeholders in the agri-food sector and connect them with technological developments to improve monitoring. The project builds on several other EU level research projects, e.g., satellite innovations from projects such as SEN4CAP to modernise farm level data collection in the scope of FADN and the proposed FSDN. The project is implementing four demonstration cases to explore the potential of new technologies: benefitting from increased digitalisation of financial/administrative processes in the agrifood sector and the voluntary exchange; addressing limitations of Earth Observation addressed with sensor networks at farm level; linking national datasets for broader use in policy evaluation and integrating agri-environmental data for different purposes. One of the cases is exploring solutions to collect information from

different existing sources for the certification and inspection in organic farming. Through these demonstration cases and the assessment of potential and limitations, MEF4CAP will connect future needs with technological opportunities and will contribute to the development of better CAP evaluation frameworks. <https://mef4cap.eu/> [start date 10/2020, end date 9/2023].



The objective of NIVA is to analyse and propose how IACS could be modernised and improved for the new CAP through the use of Earth Observation. NIVA applies the technological innovations from a range of projects including Sen4CAP. Beyond that it aims to improve the farmer performance assessment which is measured through indicators at the farm level. The long-term vision is to move from an annual cycle towards a multi-annual evaluation of agri-environmental and climate measures. From the experience of NIVA so far it is concluded that IACS is very valuable to assess indicators but needs further development in terms of format, accessibility, dynamism of parcels and harmonization to be useful for analysis. Furthermore, data sharing from and towards IACS systems is a key practice for better evaluation. NIVA works in 9 use cases each focusing on a particular aspect of the CAP governing tools. The use case “monitoring agro-environmental indicators” deals with IACS data sharing for impact assessment in the environmental and climate domains. It looks at integrating the IACS data, Earth Observation data from the Sentinel 1 and 2 satellite systems of the Copernicus programme and auxiliary data like soil and weather maps and farmer specific data. <https://www.niva4cap.eu> [start date 6/2019, end date 5/2022].



Sen4CAP has been set up by ESA in direct collaboration and on request from DG-Agri, DG-Grow and DG-JRC, to identify and specify EO products and services suitable to increase the efficiency, traceability as well as reducing the costs of the IACS. Moreover, to develop algorithm theoretical basis documents along with open-source code for agricultural EO products based on Sentinel 1 & 2 responding to the user requirements. The project aimed to provide evidence of how Sentinel derived information can support the modernisation and simplification of the CAP in the post 2020 timeframe, and to provide validated algorithms, products, workflows and best practices for agriculture monitoring. Four pilot cases were conducted in 7 Member States, as well as wider tested by Paying Agencies. The project proposed four products to be used by the Paying Agencies: map of crop types, growing vegetation indicators, grassland mowing detection and agricultural practices monitoring. The validation of the Earth Observation (EO) products was done through farmers’ data collected by Paying Agencies and visual interpretation of Planet Very High-Resolution time series. <http://esa-sen4cap.org/> [start date 5/2017, end date 3/2021].



VITIGEOSS integrates and improves existing solutions coupling satellite imagery with in-field sensors to increase the resolution and reliability of satellite information applied to all aspects of viticulture and specific wine-business operations. The main scope of the project is to make use of the potential of EO initiatives for deploying an innovative commercial information solution to optimize sustainable grapevine cultivation via decision support systems (DSS) on phenology, irrigation, fertilization, disease and business and sustainability management. The solution of VITIGEOSS will be proven in three demo sites in Spain, Italy and Portugal, in which will be devoted a pilot vineyard for the project. The VITIGEOSS platform, deployed as a cloud-based Applications Portal, will be the first application offering integrated services for sub-seasonal and seasonal predictions, crop management, disease warnings, business operations and sustainability monitoring. <https://vitigeoss.eu/> [start date 11/2020, end date 2/2024].



The goal of AgriBIT is to improve the agriculture chain by delivering higher precision, more accurate and continuously available Precision Agriculture services, combining GNSS, and more specifically new high precision Galileo positioning and augmentation services like EGNOS, Earth Observation (EO) information with on-field and on-machine sensors and actuators, Artificial Intelligence (AI) technologies and expert agricultural knowledge.

The overall objective of AgriBIT is to deliver a range of customisable and modular solutions suitable for various types of agricultural uses and brands of crops through six defined objectives:

- Market and needs analysis
- Higher precision location services
- Affordable, European source, high precision Galileo and EGNOS GNSS receiver
- Bundle of PA services for farmers and farm advisors
- Strategy for services uptake
- Open service-oriented platform

AgriBIT includes an "20"-month piloting phase in peach production (Greece), tomato fields (Portugal) and vineyards (Italy), whose goal is not only to evaluate the adaptation of its services to user needs, but also create impact in key agricultural sectors.



The overall goal of SPACE4GREEN is to propose a technological solution that enables a trusted platform among stakeholders of different natures for the automated certification that activity occurs or a thing is in a location at a certain point in time, without requiring a third-party human certification. Therefore, the approach of the project utilised emerging technologies with increasing market adoption such as the DLT (Distributed Ledger Technology), more specifically blockchain. SPACE4GREEN is born as a response to the needed adoption of EGNSS solutions in mass market and within professional stakeholders, under the topic HORIZON-EUSPA-2021-SPACE-02-53. EU considers them key enablers of the current and future digital age contributing to the competitiveness of the European GNSS industry and to the maximization of public benefits. An iterative and user-driven approach is followed to achieve the high-level standards of quality expected during the execution phase and after its finalization.



The **GREAT** project, funded by the Digital Europe program, aims to establish the Green Deal Data Space Foundation and its Community of Practice which builds on both the European Green Deal and the EU's Strategy for Data. The project will deliver a **roadmap for implementing and deploying the Green Deal Data Space**, an infrastructure that will allow data providers and initiatives to openly share their data to tackle climate change in a multidisciplinary manner. With the launch of Common European data spaces, the European data strategy aims to create a single market for data, where data can flow within the EU and across sectors, for the benefit of the citizens and the planet Earth. The key pillars supporting the development of the roadmap:

- Architecture - Blueprint reference architecture.
- Governance - Data governance framework in line with innovative business cases.
- Datasets - Inventory of high value datasets that will enable the monitoring of the European Union's Green Deal policies.



- Community - Strong and cohesive Community of Practice representing all the stakeholders landscape that contribute, co-design and validate at all stages of the project.





End of Document



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