

## **CADS - Carbon Agri Data Space**

A service for the assessment of the carbon footprint of agricultural products and tools for sound agrotechnological and management decisions



## CO2 Emissions, Carbon Measurement and Estimation **CADS - Carbon Agri Data Space**

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**PROINT PROJECTEN  
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**Trusty S.r.l. Società Benefit**

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**DIHs:**

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## **Challenge & Context**

Carbon, that's a word on everyone's lips - it is the basic building block of all living things on the planet, and yet when too much is liberated into its gaseous form, carbon dioxide it has the capacity to warm the atmosphere to dangerous levels. The Intergovernmental Panel on Climate Change has, in its 6th

Assessment Report, confirmed that without further deep reductions in emissions we are on track to exceed 1.5 degrees of global warming, and the potential to devastate the complex planetary systems upon which all life relies.

A keyway to address this ongoing challenge is not only through reducing carbon emissions, but also to restore the balance of carbon in the atmosphere through sequestering carbon dioxide thanks to ecological cycles. And the subject is hot in agriculture. It is both one of the sectors that emits the most greenhouse gases, but also the one that has the greatest potential to store carbon in its simplest form, - in the soil. It is a sad paradox that the atmosphere contains too much carbon while the soil lacks it. Carbon measurement tools, models and monitoring methods are being developed. Labels and certification frameworks are emerging such as the EU Digital Passport and Sustainable Product Initiative. Compliance based and voluntary carbon markets are growing in maturity and new avenues for seeing carbon as a valuable resource are emerging.

In addition, one of the biggest challenges in agriculture today is the use of heterogeneous data for smart farming technologies, improving soil fertility, food quality, and reducing the impact of agricultural technologies on climate change.

Today, numerous sources of data are collected and not leveraged as much as they could be. Potential applications are huge, such as decision-support tools considering not only scientific recommendation but also information about the experience of using various agricultural additives for specific climatic and environmental conditions.

Carbon measurement and estimation are promising applications to improve the existing systems, but also to provide new value streams for the farmers.

Downstream users (post-farm gate) include product manufacturers and retailers, cities and regulatory bodies who have a range of data needs according to their role in the value chain.

The impending EU Digital Product Passport will set minimum requirements for information availability for value chains, but do we know what downstream users want, and can we create a framework where they can meet the range of requirements across different country-based regulatory regimes in multiple value chains simultaneously?

## Solution

The idea is a service for the assessment of the carbon footprint of agricultural products in the process of growing as well as tools for sound adjustment of agro-technological, organisational and management decisions by food producers. Thanks to a data sharing ecosystem, we will provide the opportunity for farmers (through data service providers interacting with the decentralised data sharing infrastructure powered by i4Trust Dataspace), to leverage the use of the data they already produce, combined with other data sources such as external and open data (soil data, weather, crop data... depending on the countries and associated open data that differs). It will provide them with tools that will help the farmers to come up with tangible proof of their carbon impact. Also, dedicated stakeholders of the ecosystem will find go-to market opportunities for these proofs, bringing back value for the whole ecosystem.

The calculations will be made possible with the AgriModel tool for carbon equivalent calculations based on verified algorithms that were developed by BIOINVEST-AGRO research group.

The go-to market gateway will provide users with the roadmap to identify their data needs for specific product development in the value chain (beyond farm gate). At the end of the experiment, we will consider the impact and potential for interoperability of the data with new and emerging market mechanisms, such as Digital Product Passports.

To develop the roadmap, we will conduct detailed engagement across the value chain in five countries – drawing on a panel of experts and working with a cross-section of critical stakeholders. Farmers need to know and understand how to engage with the wider value chains, without having to be experts in these value chains. For carbon negative materials to be mainstreamed into the circular and bioeconomy, a pull factor needs to be present to disrupt existing supply chains. A key element to this is the relevant data and its bona fides: data transparency, validation and suitability and interoperability.

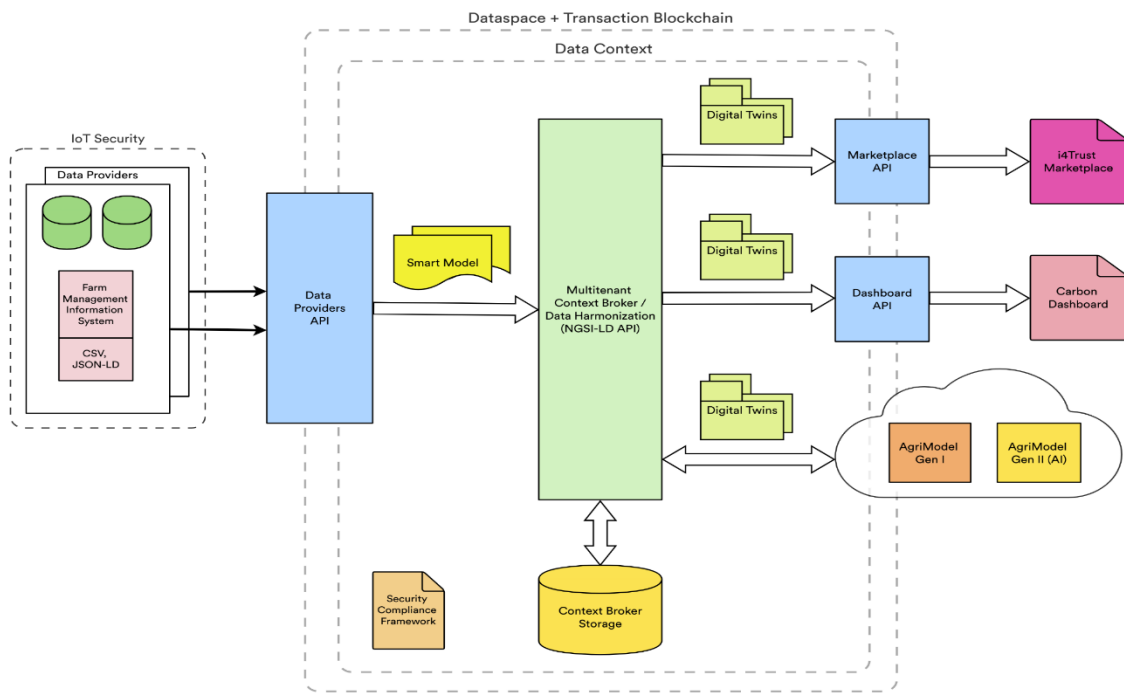
The general solution will be drawn up and deployed using infrastructure and support of EOSC DIH and ØKP4 subcontractor facilities. EOSC DIH is an international and multi-partner cooperation that supports companies in easily accessing the digital technologies and services offered by the European Open Science Cloud (EOSC). BIOINVEST-AGRO will adapt for data experiment their Cloud model for Carbon Footprint assessment in crop growing and agri food value chains (EOSC DIH AgriFootprint pilot supported under the EOSC Future and collaborating projects) supported by EOSC Services and Cloud infrastructure.

## **How it works**

In the scope of the described solution implementation, our goal for the experiment is to build the first European data sharing ecosystem dedicated to carbon measurement, monitoring and estimation in agriculture. We leverage our combined expertise from data gatherers and providers, data sharing infrastructure builders and carbon modelling experts.

By leveraging existing farming data from pilot farms in Spain, Ukraine, Italy, Greece and France we are going to build a scalable infrastructure dedicated to carbon measurement and monitoring across European farms. Farmers (data owners) are not directly involved as members of the consortium, they will be involved through presented data service providers. The general scheme of the experiment with focus on the participants roles described below:

To reduce organisational and technical costs, make it easier for FMIS (Farm Management Information Systems that are data service providers and data service consumers), and also to ensure coherence within the Data Space, our architecture is designed around decentralised data sharing intermediary that will provide the infrastructure components for everybody in a plug & play fashion. The data intermediary routes the data, delivers it reliably to the destinations, and provides event registering and monitoring. This data space is a federation of services, where services and governance work together as follows:



First, the data owners will make sure that they are compliant with the domain model proposed by BIOINVEST-AGRO built on top of the context broker, to make sure that their data will be usable by the carbon model. Second, they will need to share farming practices data available in their platforms to the carbon model. To do that, each data owner has a dedicated tenant in the operating instance of the FIWARE Orion Context Broker within the one-stop-shop data sharing intermediary, which provides access to specific data like geolocation for fields, measurement data received directly from fields, practices data such as crop rotation, fuel consumption, fertilizers, plant protection products, yields, etc.

Farmers through their Data owners push their data - (files in csv or json-ld for example) in a FTP server or push API, to make them available to the Context Broker. The access to the Context Broker is protected by Kong API Gateway with integrated iShare plugin, implementing Policy Enforcement Point Proxy and Policy Decision Point functions. Kong integrated with iShare Satellite server for checking the participants trusted list and uses Keyrock as the local authorization registry. The access policies based on iShare specifications which are issued for the different Farm Management Information System providers, after acquisition of the service offerings on the marketplace, are

stored in an instance of the FIWARE KeyRock component implementing Authorisation Registry functions. When there is a request by a farmer against Kong API Gateway, it will check the policies at the Authorisation Registry based on iShare specifications.

The Carbon web-dashboard interface is provided by Trusty. It will be used by Farmers to consult their Carbon-related information dashboards, to compare each other if they want, to be given specific advice. Farmers will use their login using their identities generated by the data sharing intermediary, based on iShare policies and specifications and OpenID Connect technology.

## **Benefits & Impact**

CADS benefits and impact are mainly concentrated to the next main points:

- The solution is important to the companies and society in general as carbon measurement and estimation are promising applications to improve the existing systems, but also to provide new value streams for the farmers and key stakeholders active in the supply food chain.
- Thanks to a data sharing ecosystem, farmers will be offered an opportunity (through data service providers interacting with the decentralised data sharing infrastructure powered by i4Trust Dataspace), to leverage the use of the data they already produce, combined with other data sources such as external and open data (soil data, weather, crop data... depending on the countries and associated open data that differs).
- It will provide farmers the benefit of using tools that will help them to come up with tangible proof of their carbon impact.
- The impact is that data will be eventually transparent, valid and interoperable.
- Also, key stakeholders of the ecosystem will find go-to market opportunities for these proofs, bringing back value for the whole ecosystem.
- In addition, users will be provided through a go-to market gateway with the roadmap to identify their data needs for specific product development in the value chain (beyond farm gate).



- The impact foreseen includes potential for interoperability of the data with new and emerging market mechanisms, such as Digital Product Passports. The aforementioned roadmap will trigger an engagement across the value chain in five countries – drawing on a panel of experts and working with a cross-sector of critical stakeholders.
- The project is also supporting Farmers to know and understand how to engage with wider value chains, without having to be experts in these value chains.
- The number of expected users looking at the future will grow at 200 new users annually.
- The number of customers is 10 during the project's duration.
- The number of new potential clients will grow at 200 new customers annually.
- The target groups with the highest impact are Farmers, Stakeholders in Food Supply Chain and Logistics companies.
- In 3 years, an efficiency growth of 30% for each partner is expected as well as 30% increase in sales/revenues for the involved SMEs. The main reason underneath this expected increase is that the SMEs will gain access to the vastly expanding market of carbon estimation / minimization through the expertise created by the project results. The experience gained will set the involved SMEs in a good position in the new and dynamic market and will attract a vast number of new users/customers through the innovative service that will be deployed. In addition, the open shared data space for carbon agri-data will act as a great investment which will be exploited to new projects at national, European and international level.

## **Added value through i4Trust**

The added value through i4Trust is significant. The i4Trust framework acted as a high collaborative environment which supported the project and boosted the development of the CADS' services and final deliverables. I4Trust and its

sustainable ecosystem helped CADS to create its open data space via a trusted, secure, and effective data sharing infrastructure.

In addition, mentoring and coaching activities were excellent and supported the consortium to keep up the pace and reach the project's goals and objectives throughout all the stages and for all the aspects (managerial, implementation and business/sustainability aspects).

The value-adds were a) the supportive infrastructure for implementing the CADS open data sharing platform b) the coaching / mentoring sessions and c) the collaborative ecosystem which allowed knowledge and experience exchange between i4Trust and the projects under implementation.

The i4Trust is the right technology for this and other projects / solutions to come because it serves as a solid basis for new data spaces to be build, share data efficiently and eventually offer innovative solutions and services to the target users, customers and key stakeholders.

## **Next steps**

The next main steps are:

- Evaluation of the provided service by peer experts so as new optimizations to be proposed especially for the web-dashboards.
- A major digital marketing activity to be designed and implemented so as to reach out to new users and customers.

## **References**

- [Linked-In post by I4Trust.](#)
- YouTube Video: "[i4Trust - The Insights Series - Carbon Agri Data Space](#)"

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## Categories

User(s): Farmers, Food Chain Stakeholders, Logistics.

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Do you have questions or want to know more?

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Founding Partners



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