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ACRONYMS LIST

ICT	Information & Communication Technologies
KNIME	Konstanz Information Miner
OWL	Web Ontology Language
RDF	Resource Description Framework
SAI	Statistical Algorithms Importer
SKOS	Simple Knowledge Organization System
VRE	Virtual Research Environment
WMS	Workflow Management System

EXECUTIVE SUMMARY

The present deliverable aims to summarise the project's advancements achieved during the third and final year of its execution. Its target audience comprises representatives of external interested research communities as well as the general public. As a consequence, the AGINFRA PLUS Annual Public Report does not scrutinize on the technical and implementation details of the infrastructure or the research and scientific particularities faced by each of the communities involved in the project. Rather, the report aims to concisely communicate the AGINFRA PLUS vision and ambition, and succinctly discuss on the technical choices and the rationale behind them.

This document summarizes the core advancements of project activities, particularly focusing on the definition, delivery and validation of four demonstration scenarios that correspond to the initial project objectives. In addition, a high-level conclusion of the technical and engaged community advancements is presented, towards the final establishment of the AGINFRA PLUS proposed e-infrastructure. Finally, key engagement and outreach activities are summarized, along with pointers on the AGINFRA PLUS sustainability roadmap and future recommendations.

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1 INTRODUCTION

AGINFRA PLUS is a 36-month Research and Innovation action, supported by the European Commission through the H2020 Research and Innovation programme, under grand agreement no. 731001.

AGINFRA PLUS aspires to provide a sustainable channel addressing adjacent but not fully connected user communities around Food & Agriculture, by exploiting core European e-infrastructures such as EGI.eu, OpenAIRE, EUDAT and D4Science.

To this end, the project develops, extends and provides the necessary specifications and components for allowing the rapid and intuitive development of variegating data analysis workflows, where the functionalities for data storage and indexing, algorithm execution, results visualization and deployment are provided by specialized services utilizing European large-scale, cloud-based infrastructural assets.

Furthermore, AGINFRA PLUS aspires to establish a framework facilitating the transparent documentation, exploitation and publication of research assets (datasets, mathematical models, software components results and publications) within the infrastructure, in order to enable their reuse and repurposing from the wider research community.

Thus, the vision of AGINFRA PLUS project is to develop a common technical infrastructure that could initially serve three user communities (namely, Agro-climatic and Economic Modelling, Food Safety & Risk Assessment and Food Security) and it could be evolved to an AGINFRA food cloud demonstrator that will be positioned as the European Open Science Cloud (EOSC) agri-food thematic cloud. This is expected to be achieved by (i) implementing the e-infrastructure roadmap for open science in agriculture and food, which is currently being developed by the H2020 EINFRA foresight project, namely eROSA (http://www.erosa.aginfra.eu/) and (ii) by setting the ground (i.e. developing a pipeline of mature use cases) for potential future pilots in larger scale aiming to address all stages across the food value chain.

2 AGINFRA PLUS SOFTWARE DEMONSTRATORS

During the reporting period, the project consortium elaborated further on the project's specific use cases. Based on their advancements, it selected four (4) demonstration scenarios as the complete, fine-tuned AGINFRA PLUS Software Demonstrators. These demonstrators were picked to show how selected software tools and services produced by AGINFRA PLUS, together with relevant data sources and algorithm implementations, may support scientists and other key scientific personas in ways that were not possible before the project.
Supporting validation materials and guidelines have been prepared to support the validation of the AGINFRA PLUS Software Demonstrators. This gave the opportunity to user community partners to mobilise their networks and organise online events (in the form of webinars) that actually involved the audience in evaluating the demonstration scenarios and tools presented to them. In this way, the project managed to increase its targeted indicators, both in terms of event participation and completion of online evaluation questionnaires.
Each software demonstrator and validation results achieved is briefly presented in the following sections.

2.1 DISTRIBUTED SIMULATION OF ARABLE CROPS AT FARM FIELD SCALE

2.1.1 Description

Defined and led by Wageningen University & Research (WUR), this demonstration scenario is based on the adaption of the WOFOST simulation model on the D4Science infrastructure, to perform crop growth simulations at scale using the underlying computation cluster and the AgroDataCube API to fetch data for arable crop parcels in the Netherlands. Leveraging on relevant technology produced by project activities, it also allows users to explore results in a customized Visualisation Dashboard and to publish and annotate produced results as open science assets.

2.1.2 Validation events

The demonstration scenario described above was evaluated in two distinct events:

- WUR organized a webinar on 19th of December 2019, attracting 133 participants and collecting 42 questionnaires;
- Agroknow organized a workshop at the Department of Natural Resources and Agricultural Engineering of the Agricultural University of Athens on 10th of January 2020, attracting 13 participants and collecting 13 questionnaires.

Through the provided feedback, trial participants tend to agree that using the proposed tools for such a scientific workflow seems to be generally a user-friendly process. They also seem to agree that such a tool is useful and would help them increase their productivity so that they accomplish similar tasks more quickly. However, they seem anxious about the compatibility of the proposed tools with other systems that they use, as well as whether they would get assistance and support within their organizations, when using these tools.

2.2 SHARING AND RUNNING SIMULATIONS OF HARMONIZED FOOD RISK ASSESSMENT MODELS

2.2.1 Description

Defined and led by Bundesinstitut für Risikobewertung (BfR), this demonstration scenario is based on the integration of KNIME-based workflows to support the interactive execution of food risk assessment models and the publishing of their results as open science publications. It also allows user interaction with the model simulation parameters to generate new versions of results, to be published as open science assets.

2.2.1 Validation events

The demonstration scenario described above was evaluated in two distinct events:

- BfR organized a workshop at its premises in Berlin a workshop on 9th of December 2019, attracting 21 participants and collecting 14 questionnaires;
- Agroknow organized a workshop at the Laboratory of Microbiology and Food Biotechnology of the Agricultural University of Athens on 10th of January 2020, attracting 41 participants and collecting 41 questionnaires.

Through the provided feedback, trial participants tend to agree that using the proposed tools for such a scientific workflow seems to be generally a user-friendly process. They also seem to agree that such a tool is useful and would help them increase their productivity so that they accomplish similar tasks more quickly. Furthermore, they did not seem to feel that they lack the necessary resources or knowledge to adopt and use such tools.

2.3 MANAGEMENT, ACCESS & VISUALISATION OF PLANT PHENOTYPING RESOURCES

2.3.1 Description

Defined and led by Institut National de la Recherche Agronomique (INRA), this demonstration scenario is based on the management of existing heterogeneous resources that international plant phenotyping community maintains. Leveraging the data analytics tools of D4Science, but also the Visualisation tools developed, different plant phenotyping resources (such as plant phenotyping images) can be fetched, discovered and visualized. Additional options to explore selecting & publishing new combinations/bundles of phenotyping data as open science assets are included.

2.3.1 Validation events

For the demonstration scenario described above, INRA organized a webinar on 18th of December 2019, attracting 16 participants and collecting 11 questionnaires.
From the provided feedback, trial participants also seem to agree that using the proposed tools for such a scientific workflow seems to be generally a user-friendly process. Nevertheless, they have concerns about whether they would also increase their productivity. Most of them also seem to be reluctant about whether the VREs are compatible with other systems that they use, or whether their organization will offer them assistance while trying to use such tools. They would not hesitate to exploit such tools on their own, but they find the assistance of an expert an important resource.

2.4 THE SMART & EXECUTABLE PAPER FOR AGRICULTURE & FOOD SCIENTISTS

2.4.1 Description

Defined and led by Pensoft Publishers, this demonstration scenario is based on the executable implementations of risk assessment models linked to KNIME-based workflows, that generate simulation results on the fly. It particularly allows authors and/or reviewers generate, select & publish dynamically produced model outcomes as data papers. Other options include linking of paper contents to AGINFRA-powered registries of publications and semantic resources.

2.4.1 Validation events

For the demonstration scenario described above, Agroknow organized a workshop on 8th of January 2020 at the Laboratory of Viticulture of the Agricultural University of Athens, attracting 22 participants and collecting 22 questionnaires.

From the gathered feedback, trial participants again agree that using the proposed tools seems to be a user-friendly process. They also agree that they are useful and would help them increase their productivity so that they accomplish similar tasks more quickly. Nevertheless, most of them seem to not be sure about whether they are going to be compatible with other systems that they use, or if their organization will offer them assistance while trying to use them. It also seems that most of them do not feel confident in exploiting the AGINFRA PLUS tools on their own; they find the assistance of an expert required.

3 AGINFRA USE CASES ADVANCEMENT

3.1 AGRO-CLIMATIC & ECONOMIC MODELLING

During the reporting period, the agro-climatic and economic modelling community managed to carry out the required development and customization activities for the use-case specific VRE, divided over three pilot phases, each one taking aboard the results and experiences from the previous pilot evaluation(s). Activities included own software development, data preparation and hosting, as well as providing feedback to other work packages for the development and improvement of services towards needs by the user community.
The community also managed to redesign and develop modelling and data I/O components, basic data analytics and visualisation as a preparation to run modelling workflows in the 2nd and 3rd piloting phase, to showcase the AGINFRA PLUS features and advantages to stakeholders from the whole community.
Two evaluations of the developed VRE components were performed to assess the results of the piloting phases with regard to the performance indicators established in the assessment plan. Evaluation feedback has been provided to the other work packages, in the respective ticketing mechanisms of the AGINFRA PLUS VREs.
With the introduction of the respective AGINFRA PLUS Software Demonstrator (presented in 2.1), as an additional part of the 3rd evaluation phase, two validation trials were performed. Attendants were surveyed using a validation survey that was harmonized over the different user communities.

3.2 FOOD SAFETY RISK ASSESSMENT

The food safety risk assessment community aimed at showcasing the application of the AGINFRA PLUS infrastructure to use cases pertaining to the needs of the food safety risk assessment community. This has been accomplished via the establishment of two independent use cases for different communities inside this domain: the “Risk Assessment Knowledge Integration Platform” (RAKIP) community and the Determination and Metrics of Emerging Risk (DEMETER) community.
For each of the communities the following tasks were accomplished:

1. Specification of concrete use cases scenarios for the two selected research areas
2. Carrying out the required technical development and customization activities for the use case specific VREs
3. Development of prototypic data processing workflows exploiting newly developed resources developed within the AGINFRA PLUS project to showcase the AGINFRA PLUS features and advantages to stakeholders from the whole community.
4. Provisioning of relevant content inside the VRE for the supported communities
5. Performing evaluation events with end users and feeding back their comments into the development process of the involved AGINFRA PLUS WPs.

With the introduction of the respective AGINFRA PLUS Software Demonstrator (presented in 2.2), two additional validation trials were organized. Attendants were surveyed using a validation survey that was harmonized over the different user communities.
Last but not least, the food safety risk assessment community was further able to promote the use of AGINFRA PLUS and CNR resources beyond the originally planned scientific communities. Specifically WP6 promoted the use of the VRE technology in the research project ORION that is funded under the H2020 European Joint Programming Initiative (ORIONKnowledgeHub-VRE) and by a group of researchers investigating foodborne disease outbreaks (Global Foodsource Identifier (GFI)-VRE) that was funded under the H2020 COMPARE project.

3.3 FOOD SECURITY

The food security community aimed at showcasing the application of the AGINFRA PLUS infrastructure to the use case of high-throughput phenotyping which should enable to select the plant varieties which are the most adapted to specific environments and to global changes.
In order to accomplish that, the Food Security has been deployed for phenotyping researchers.
The following tasks were accomplished:

1. Identification of general requirements of researchers in the phenotyping community
2. Specification of analytics, semantics and visualization needs
3. Carrying out the required development activities for the Food Security VRE: Enrichment of the open source information system OpenSILEX-PHIS with standard APIs to ease phenotyping data access, development of processing workflows (R, python, Galaxy) to retrieve data and analyse data, development of Rshiny application (discovery application, map of phenotyping platforms)
4. Two evaluations were carried out during this reporting period to assess the results of the pilot phases against the performance indicators set out in the evaluation plan. Two workshops were set up to perform these evaluations. On the basis of these evaluations, feedback was provided to the other project partners in order to make some improvements to some functionalities.

With the introduction of the respective AGINFRA PLUS Software Demonstrator (presented in 2.3), an additional validation trial was carried out. A webinar was provided to the community and participants were surveyed using a harmonized validation survey across the different user communities.

4 AGINFRA PLUS TECHNICAL ADVANCEMENT

4.1 OVERALL APPROACH

During its final year, the project consortium managed to finalize and fine-tune all technology components that were planned as part of the AGINFRA PLUS e-infrastructure. Those were provided through dedicated *Virtual Research Environments (VREs)* that encapsulate all identified, developed and integrated software components in a collaborative environment that allows the setup, execution, monitoring and sharing of research activities and their results.

At the end of the third year, a total of 16 VREs have been defined, deployed and operated. Existing VREs are diverse. Some have been created to support project activities (e.g. AGINFRA PLUS to enact intra-project communication and collaboration, AGINFRA PLUS to offer a sandbox to develop, test and run new features) while others have been conceived to serve specific communities and scenarios (e.g. AgroClimaticModeling, RAKIP, FoodSecurity). Among the VREs serving specific communities there are those specifically associated with the three agri-food use cases targeted in the project as well as those serving other communities, communities expressing their interest during the AGINFRA PLUS operation (e.g. ORIONKnowedgeHub, FoodBorneOutbreak, EMPHASIS, NitrogenScrum).

In conjunction with the provided VREs, a considerable amount of software tools has been integrated, pertaining to the three different layers of the proposed e-infrastructure:

- The *Data & Semantics Layer,* which was responsible for providing all the appropriate tools for managing semantic resources (i.e. ontologies, vocabularies and metadata schemas) relevant to the engaged communities, but also services for data management, data linking and discovery.
- The *Processing & Analytics Layer,* which was responsible for the data analytics and processing tools, which provide model and algorithms execution capabilities to the proposed e-infrastructure.
- The *Visualisation and Publishing Layer,* which was responsible for the provision of services satisfying visualization requirements, as well as those related to publication and web-based service creation.

In the case of AGINFRA PLUS, any VRE user can potentially acquire access to tools and services coming from the three layers. This toolset is typically complemented with a number of collaborative features, such as social networking and shared folder (workspace) capabilities. Moreover, every VRE is equipped with a highly customisable Resource Catalogue enacting the VRE designated community to define the typologies of items worth sharing by publishing them into such a catalogue.

Leveraging on the catalogue-driven approach followed by project activities, two major developments were also carried out to highlight the strategic vision of the project. These pertain to the establishment of the *AGINFRA Data Registry* and the *AGINFRA Registry of Semantic Resources*, two API-based web services that serve as a gateway to open data assets in the agri-food scientific domain.

The following sections provide more in-depth details on the technical advancements for each layer in the context of the overall AGINFRA PLUS solution.

4.2 DATA & SEMANTICS LAYER

During the reporting period, the Data & Semantics Layer has been enriched with the integration of ontological engineering technologies. This group includes prominent ontology management (VocBench, YAM++ and WebVOWL) and vocabulary management tools (VocBench, OpenRefine and SKOS Play!). These tools were made available per VRE, depending on the needs of each community. As project activities progressed, a pool of semantic resources was gathered, that later inspired the creation of the *AGINFRA Registry of Semantic Resources*, which provides access to 17 semantic resources (ontologies and

vocabularies, such as GACS, Crop Ontology, FSK-ML) and their underlying classes, concepts and relationships.
In parallel to the ontology engineering activities, a set of data linking tasks and services was proposed, that could be applied to any given scientific workflow, to enable the harvesting of data assets relevant to a given scientific domain, their linking to well-known semantic resources and finally, the improvement of their discoverability through a new semantic discovery service prototyped and tested through project activities. This specification resulted in the introduction of four different services: the AGINFRA Data Harvesting Workflows, the AGINFRA Data Integration API, the AGINFRA Semantic API and the AGINFRA (Semantic) Search API.
A direct application of the above came to life as the *AGINFRA Data Registry*, an API-based web service that indexes over 7,7 million open data records from the agri-food domain, drawn from 8 federated data registries, made semantically discoverable through a front-end search service[1]. At the same time, the Map of the Data Ecosystem[2] was extended to expose its underlying data a new web-service, that was later on harvested by the Data Linking technologies and made available through the AGINFRA Data Registry.

4.3 PROCESSING & ANALYTICS LAYER

During the reporting period, the gCube / D4Science solution for data analytics was extended to serve the needs of WP5-WP7 use cases. This led to the development and release of four new versions of the overall solution. Moreover, new developments made it interoperable with KNIME and Jupyter systems. As part of project activities, DataMiner[3] and the Statistical Algorithm Importer[4] (SAI) enabled users to perform analytics tasks, but also to import their own algorithms and make them available for other users, respectively.

In terms of the operation of the infrastructure in place, several new Virtual Research Environments were introduced (7 VREs). Furthermore, a completely new configuration of the infrastructure supporting the operation of the analytics solution has been designed and implemented leading to two separate clusters (one for the development of algorithms, one for the production version of algorithms).

4.4 VISUALISATION & PUBLISHING LAYER

During the reporting period, the Visualisation & Publishing layer of the project was enriched with several case-specific visualization services, tools and applications and serve the needs of the three engaged communities. At the same time, the generic visualisation elements in-place were improved and additional ones were delivered. All tools and services were integrated as part of the D4Science infrastructure.
In the publishing domain, new modules and plugins were introduced to incorporate various aspects of the AGINFRA PLUS e-infrastructure in scientific publications. One of the developments resulted in the delivery of the first executable journal (Food Modelling Journal – FMJ), powering the respective AGINFRA PLUS Software Demonstrator described in 2.4.
Last but not least, the existing scientific workflow technologies became more feature-rich during the reporting period, while at the same time being extended with the inclusion of a new workflow-based technology used to power the AGINFRA Data Harvesting Workflow.

[1] https://plus.aginfra.eu/semantic-search

[2] https://map.aginfra.eu

[3] https://gcube.wiki.gcube-system.org/gcube/Data_Mining_Facilities

[4] https://wiki.gcube-system.org/gcube/Statistical_Algorithms_Importer

5 AGINFRA PLUS ENGAGEMENT & OUTREACH

During the last year of the project, part of project activities was focused on engaging open science stakeholders in food and agriculture with the main outcomes of AGINFRA PLUS. The individual tasks resulted in an extensive project and stakeholder list, including important people working in key European and international institutions, representatives of relevant initiatives, representatives from the agrochemical and food industry, as well as representatives from the North American digital and open science community. This has provided us with the capability to generate outreach to more than 170 European projects and 1,020 relevant stakeholders.

5.1 DIGITAL PRESENCE

In the reported period, the project website [5] was used as the main online dissemination channel, promoting and increasing the stakeholders' awareness of project activities. Within it, the project news blog[6] was set up to inform stakeholders about the latest AGINFRA PLUS outputs. In parallel, the project's social media activity was intensified, with content on all five channels used as part of the AGINFRA PLUS dissemination tasks.

At the same time, six (6) digital e-mail campaigns have circulated digital science related news in the form of newsletters. Project-related activities together with other relevant news have been edited in a form that is easy to understand, read and digest.

As part of the project digital presence activities, AGINFRA PLUS has supported eROSA[7] in creating and populating a map of stakeholders and e-infrastructure resources of the digital ecosystem. It has particularly continued to power with data and technology the searchable map of more than 420 organisations and 140 initiatives in the global data ecosystem[8].

5.2 SME ENGAGEMENT

In the reporting period, the project consortium interacted and communicated with 14 SMEs that have shown interest in the AGINFRA PLUS technology, infrastructure and data.

To further boost engagement with the private sector, a dedicated event for ag-tech and food-tech SMEs was organized in Athens, Greece together with Deloitte Greece. The "Agtech Innovators Meetup" took place in December 2019 and has attracted 53 participants representing technology companies, agri-food companies, investors, funds, etc.

Also, during the last running period of the project, a European contest for data science powered startups called "the AGINFRA PLUS Data Science Challenge", attracting six (6) applications from Germany, the Netherlands, Serbia and Greece. The winner of the challenge, BioCos was invited into a hands-on experience of testing a VRE for their computationally intensive tasks.

5.3 LINKS WITH GLOBAL DATA INITIATIVES & NETWORKS

The consortium has been actively involved in various global networks and activities, with some notable examples:

- Interest Group on Agricultural Data (IGAD) of the Research Data Alliance (RDA), with presentations on AGINFRA PLUS and active involvement in working and interest groups (e.g. Agrisemantrics WG, Wheat Data Interoperability WG, Agricultural Data IG, Weather, Climate and Air Quality IG). This involvement has particularly resulted into specific contributions in the Agrisemantics WG that

[5] http://www.plus.aginfra.eu

[6] http://www.plus.aginfra.eu/news

[7] http://erosa.aginfra.eu

[8] http://map.aginfra.eu

Agroknow and INRA experts have been co-chairing, with contributions heavily influenced from relevant work in Data & Semantics Layer of the project.

- Global Open Data for Agriculture and Nutrition (GODAN), among others with active participation in stakeholder engagement and ecosystem mapping activities that have started as part of the Data Ecosystem WG and have continued as part of the eROSA ecosystem map development and population.

5.4 COLLABORATION WITH EUROPEAN AND INTERNATIONAL DIGITAL SCIENCE PROJECTS

During the project's lifetime, the AGINFRA PLUS consortium has communicated and incorporated the developed project's tools and data to several EU and international projects, such as: DIVERSify, BigDataGrapes, CYBELE. e-ROSA, MARS-OP, SmartAgriHubs, The internet of things (IoT), PHENOME, EPPN2020, CGIAR Platform for Big Data in Agriculture, Global Water Pathogen Project (GWPP), Global Open Data for Agriculture and Nutrition (GODAN).

5.5 EUROPEAN SCIENCE E-INFRASTRUCTURES

AGINFRA PLUS had a very active involvement and contribution to EOSC-related projects. EGI and other partners have been contributing our use cases and software services at projects such as EOSCPilot and EOSC-hub. We have also incorporated the proposed EOSC architecture and Rules of Participation to ensure AGINFRA PLUS follows best practices and can be integrated in the service offerings.
AGINFRA PLUS has also been actively contributing to the community events and actions of all EOSC projects that the EC has been facilitating. More specifically:

- AGINFRA PLUS representatives have participated and contributed to the meeting of over 30 projects contributing to building EOSC through H2020, which took place in Brussels on 9-10 September 2019. This meeting included representatives of the EOSC Executive and Governance Boards, the relevant staff of the European Commission (CNECT.C.1 - eInfrastructure and Science Cloud; RTD.G.4 - Open Science) and the EOSC Secretariat project.
- AGINFRA PLUS representatives have participated and contributed the EOSC Symposium 2019 "Where the EOSC Makers and Shakers Meet", the largest EOSC event of 2019 that took place in Budapest on November 28th & 29th. We have contributed to the session on Health and Food that the EOSC-Life initiative coordinated, talking about the complexity, heterogeneity and dependability that the various food and agriculture-related sciences have with the wider life and health sciences. AGINFRA PLUS representatives also presented at the plenary session on Use Cases about the project's key Software Demonstrators.
- AGINFRA PLUS representatives are actively contributing to the information exchange among EOSC projects and the EOSCSecretariat, the public EOSC Project list webpage (at EOSCsecretariat.eu), and the public page listing deliverables, milestones, and relevant outputs of each EOSC project. AGINFRA PLUS will also participate to one or more volunteer Interest Groups that are going to be set up, including "Service Onboarding & Catalogues of services and research results", "Researcher Engagement and Use cases", "Federating Core", and "Glossary".

Cooperation with the OpenAIRE has been established and an AGINFRA PLUS community within OpenAIRE has been developed (https://beta.aginfra.openaire.eu/) for providing open access to publications, research data and software from several projects related to Agricultural and Food Sciences. Agroknow, UoA and CNR have been regularly updating this community dashboard.

6 RECOMMENDATIONS AND SUSTAINABILITY

In order to further enhance the positioning of the project in the digital science ecosystem, a next version of the "AGINFRA Future Science Recommendations" has been organised as an edited volume. A variety of stakeholders, including all AGINFRA PLUS partners, were invited to contribute to this volume titled "Digital Science Recommendations for Food & Agriculture". External contributors included strategic digital infrastructure initiatives (such as OpenAIRE, the FNH-RI Research Infrastructure for Food, Nutrition and Health, and the METROFOOD Research Infrastructure for promoting metrology in food and nutrition), as well as international stakeholders (such as the University of Guelph, Canada; and the Chinese Academy of Agricultural Sciences).

Regarding sustainability, as project activities progressed towards the end, it has become more clear to the AGINFRA PLUS consortium that in an era of radical digital transformations in the food and agriculture sector, the way in which project outcomes may be positioned and offered to potential users has changed as well. This creates numerous opportunities for the AGINFRA PLUS partners that are interested to continue their investment after the end of the project. However, since not all partners were equally interested in a joint commitment about the way to continue to support and evolve the various project outcomes, it was decided that a select number of partners responsible for the key AGINFRA PLUS technology offerings develop jointly a plan about the future of these offerings. These include:

- **D4Science-powered VREs (CNR)**: existing or new Virtual Research Environments (VREs) that specific communities or organisations may continue using or creating, over the D4Science e-infrastructure.
- **EGI-powered Jupyter Notebooks (EGI)**: existing or new scientific applications that will be using Jupyter Notebooks for interactive data science and scientific computing, over the EGI e-infrastructure.
- **EGI-powered Galaxy Workflows (EGI)**: existing or new scientific workflows that will be executed over Galaxy, over the EGI e-infrastructure.
- **Data Harvesting & Data Linking Services (Agroknow)**: existing or new software applications that will be using the semantic indexing and data lookup services of Agroknow (or request a white-label set up of their own similar service).
- **ARPHA-powered Data Journals (Pensoft)**: existing or new scientific data journals that will be powered by ARPHA.

The provision model, along with the responsible vendors for the above is thoroughly described in the "AGINFRAplus Sustainability Roadmap" (D8.4).