SRIA section	C-R&I-A No in Call Announcement
3.1 Data technologies and data management	
3.1.2 Data integration and quality	
Develop a data acquisition and a re-use framework supported by semantic Integration. This should have the capacity to receive and manage data and information from multiple data sources and on different scales, e.g European, EU, national data sets and approaches, as well as to provide mechanisms to allow efficient selection and reception of data by the entities and/or tools that will make use of them.	**1.1**
Define innovative approaches to link existing (and new) databases and computing capacities to carry out data technological analyses and the development of data-based solutions in an efficient way, in terms of both energy and time and where necessary use (if available, an existing) data storage system that supports the storage and classification of data and allows fast and efficient exploration of the data.	**1.2**
Elaborate schemes to enhance data interoperability (e.g. across countries as well as in B2B, B2G and G2B settings) especially to achieve/generate Europe-wide reference and training data sets, taking due account of, and ensuring complementarity with, ongoing and planned initiatives such as the Common European Data Spaces or actions which may result from the Data Governance Act and the Data Act.	**1.3**
Develop and provide reference data sets of high quality and “non-discriminatory” datasets for different scales to enable agricultural data capitalization and to adopt non-discriminatory algorithms and techniques especially as basis for the elaboration of reliable AI-based solutions in the long-term that permit autonomous decisions at different temporal and spatial scales.	**1.4**
Develop and use a standardized metadata scheme, and ontologies and meta-language for data querying taking into consideration existing and evolving systems as well as tool(s) for (semi-)automated quality checks, e.g. statistics, gap analyses, outliers, plausibility checks.	**1.5**
Boost data re-usability by agricultural stakeholders through the development and establishment of domain-specific measures of data quality control, the creation of customized data “fitness for use” and “fitness for purpose” concepts, addressing different data quality dimensions, such as integrity, completeness, consistency and accuracy, and defining requirements for different levels of “data fitness for use”.	**1.6**
Develop a multi-layer geospatial data tool compatible with geo network-based systems and providing a powerful Application Programming Interface (API) for data users compatible with commonly used open-source graph query language, such REST, GraphQL and SparqQL systems.	**1.7**
Develop innovative approaches towards context-based data curation standards and empower curated small data. Standard curation of small data sets by experts will improve data accuracy and usability for the agricultural and farming models and digital innovations. The application of small data methodologies will permit the elaboration of data-based systems that do not require extensive data to train but can nevertheless offer valuable insight to stakeholders.	**1.8**

Improve data granularity and precision by the combination of existing agricultural and farming systems with innovative smart systems and devices, including newer sensor and sensor networks and edge computing to tackle operational decisions in near real-time.	**1.9**
Develop error processing and quantifying methods incorporated into predictions, projections and in-situ computations (edge analytics) to minimize the cascading error transference across systems and computations and to avoid unintended large impacts on the end decisions.	**1.10**
Develop innovative models or transfer functions to increase data granularity (e.g., from field to sub-field levels, or higher temporal resolutions) to increase the data fitness-for-use.	**1.11**
Develop data-based solutions serving private/commercial and public interests using data of high quality and high information value in the field of operation of this partnership.	**1.12**
Develop innovative procedures to aggregate sensitive data (e.g. farming data) with minimal loss of quality while withholding sensitive information as much as possible.	**1.13**
Establish a system to monitor the functionality and the product evolution of the implemented and described tools and systems.	**1.14**
3.1.3 Data marketplaces and cooperatives in agriculture	
Design and deploy a Service Cloud to develop and test basic, standardized services. This includes steps toward the development of a "network of data-hubs" initially serving R&I purposes of the partnership, especially the gathering of training data for AI applications (see Section 3.1.4). The Service Cloud may be further developed for sharing data and services to provide a new data exploitation service ecosystem where integrated data is enriched by re-usable, modular services. The definition of semantics for data and for functions is done under consideration of the evolution of the Common European Agriculture Data Space (Section 4.2).	**1.15**
Develop an innovative "pay as you go" system, where services or data published in addition to free data-based solutions of the partnership can be offered as free or paid versions, enabling third parties to capitalize on partnership products.	**1.16**
Develop and probe reward mechanisms for data sharing to encourage an increase in data sharing. It includes the development of approaches to assess the value of data and the consideration of the "common good" principle considering the variety of business and governance models relevant in the context of agricultural data such as cooperatives, contractors, investments needed for the generation and storage of data as well as their use potential and returns in form of advice.	**1.17**
Develop innovative solutions to increase the discoverability and composability of services to be easily found and used by end-users or third-party companies.	**1.18**
Develop innovative approaches to data payment services adapted to the users' needs, so that the end-user only pays for what they are really using.	**1.19**
3.1.4 Applications of AI techniques	

Identify key (reference/ training) data sets to strengthen AI capabilities in agriculture, including data from existing and planned satellites, VHR imagery as well as sensor data generated in the context of precision farming. This should be done in alignment with relevant European and other initiatives on data sharing including Copernicus, national assets, Horizon Europe, EuroGEO, and the Common European Data Spaces.	**1.20**
Capitalize historical satellite data to extract useful features such as vegetation- and water-related indices, e.g. the Normalized Difference Vegetation Index (NDVI) and Normalized Difference Water Index (NDWI), to train AI models e.g. for yield prediction, disease and stress identification in farms.	**1.21**
Develop innovative solutions to overcome challenges inherent to privacy laws by using satellite imagery data.	**1.22**
Develop innovative AI-based approaches handling heterogeneous data, fuzzy and ambiguous information e.g. in the context of sensors, search algorithms, as well as in the generation of relevant indicators.	**1.23**
Develop data governance procedures, tools, and instruments for clarifying and guaranteeing data ownership and privacy in sharing farming data.	**1.24**
Develop or contribute to the development of digital twins of farms and of relevant natural environments for agricultural applications. These can be used for short- and medium-term simulations and predictions building on various types of data in synergy with other EU level initiatives.	**1.25**
Develop innovative approaches to strengthen the use and uptake of AI applications in agriculture considering an assessment of the practical barriers that hamper the transformation of this sector compared to other sectors, e.g. trust in AI. In this context, the use of careful application and evaluation loops will be an asset (see also Section 4.3).	**1.26**
3.2 Data-based solutions for sustainable agriculture	
3.2.1 Enhancing functionality of and generating input for decision support systems including FMIS	
Develop data layers, algorithms and data-based solutions founded on multiple sources, including private and public ones, allowing for innovative FMIS services that build on (Europe-wide) datasets to close market gaps in the provision of decision-making support.	**2.1**
Extrapolate farm-generated sensor data, capitalizing it for a wider farming community through combination with satellite (and other) data and the application of data technologies.	**2.2**
Explore the opportunities from new satellite imagery and new ground sensors (including substrate analysis) for data-based solutions as input to DSS and FMIS.	**2.3**
Take stock of existing FMIS and their uptake by farmers and analyse their strengths and weaknesses in supporting sustainable agricultural production and compliance and performance documentation (in B2G settings) as well as of gaps in service provision (including in low-cost solutions) to augment the sustainability of agricultural production, enhance competitiveness and working conditions under consideration of G2B data sharing opportunities.	**2.4**
Enhance interoperability and switchability options for FMIS users.	**2.5**
Develop innovative multi-criteria simulation modules for transparent decision-making support, allowing for priority and objective setting by the end-user (e.g. farmer) under consideration of the existing FMIS landscape. Results should allow e.g. testing of different scenarios and different parameters (e.g. economic, environmental and social impacts) and include innovative approaches to overcome the complexity barrier of data platforms and enhance trust in data analytics by fostering user-friendliness.	**2.6**

Develop innovative ways (e.g. public incentives, open-data-services, research infrastructures) to increase the profit of using data technologies for DSS and FMIS applications (see also Section 4.3).	**2.7**
Develop business models which clearly demonstrate the value of services in ROI terms e.g. through apps that easily calculate savings in operating costs (e.g. water, fertilizer, pesticide) and environmental impacts on short-, medium- and long-term. The added value of farm data sharing is to be reflected.	**2.8**
3.2.2 Farm modelling systems	
Take stock of existing modelling approaches and assess their strengths and weaknesses and suitability for the work of the partnership.	**2.9**
Enhance existing and develop novel forecasting and prediction approaches/methodologies (e.g. on extreme weather events, pest, yield) suitable for cross-border usages under consideration of strengthened data capacities.	**2.10**
Enhance existing and develop novel modelling approaches to estimate the environmental impacts of agricultural production following "whole farm" and "landscape" approaches to account e.g. for the effects of agro-ecological approaches and farm structures.	**2.11**
Develop novel farm modelling approaches extending, where possible, existing ones (e.g. phenology, pest, yield, protein content, water, nutritional status) for the farmer to use for an optimal farming practice based on real-life testing and trial farms, eventually in cooperation with existing and evolving living labs.	**2.12**
Based on the novel data-based solutions available, enhance capacities to use farm modelling in support of designing agri-environmental measures, responding to current and predicted policy needs.	**2.13**
3.2.3 Assessment of farm performance	
Identify thematic areas where farm metrics are needed and which can be well addressed through novel data-based solutions on both farm/production level, considering the environmental and socio-economic parameters for monitoring transformation towards increased resilience.	**2.14**
Develop ambitious farm performance targets, taking into account economic, environmental and social aspects, including creating a baseline and selecting parameters to assess and monitor. An example could be the assessment of farm performance in terms of sustainability, including carbon emissions and storage, accounting for the diversity of farm types across Europe and for different policy objectives.	**2.15**
Develop approaches for displaying farm performance and discussing trade-offs, following a Multi-Criteria Decision analysis (MCDA)-based approach and presenting the underlying data in a transparent way in order to foster the use of data-technology based farm-level KPI's.	**2.16**
Identify technical and social obstacles in data collection and data exchange on-farms and issues that hamper benchmarking between farms (see also Section 3.1.3).	**2.17**
Identify and possibly develop a long-term funding and maintenance strategy for the indicators to ensure sustainability (see Section 4.1).	**2.18**
3.2.4 Data-based solutions for addressing environmental challenges, incl. climate change mitigation, biodiversity, water, and soil	

Based on the mapping of existing decision-making support portfolio available to farmers and the extent to which environmental concerns are taken into consideration, assess the particular needs in the provision of data-based solutions for decision-making support to increase farms' environmental performance.	**2.19**
Develop innovative data-based solutions to support the design (e.g. through prescription maps) and the management (e.g. irrigation, fertilization) of precision cropping systems (including grassland) by taking into consideration short- and long-term production approaches and effects, leaching and GHG emission forecast maps and field variability in terms of productivity and product quality, by integrating high-resolution remotely sensed data, proximal smart sensors and crop models, as well as market data for inputs, such as energy and fertilisers, and outputs.	**2.20**
Develop innovative, data-based solutions and software to support precision farming techniques to bridge crop and pasture site-specific yield gaps (e.g. based on e.g. high-resolution satellite data, novel satellite and sensor data); this could be achieved e.g. through precision integrated weed, pest and disease management or grazing management contributing to stabilize crop and pasture yields across years.	**2.21**
Develop innovative, integrated (e.g. satellite + IoT) data-based solutions to support the identification of agricultural areas (at farm and field scale) most suitable to biodiversity conservation and/or pollinators' feeding with respect to productive areas.	**2.22**
Develop novel data-based solutions and software to couple sensors for the continuous monitoring of soil, soil moisture, and soil water parameters (e.g. nitrate concentration, salinity) to support water, fertilization and pest and disease management at sub-parcel level under consideration of overall farm-structures, using the potential of such solutions to also serve reporting and control purposes in B2G settings.	**2.23**
Develop data-based services based on data from robot, autonomous vehicles and IoT technologies equipped with sensors and AI-based applications to support the geo-referenced 24/7 early detection of plant pests and diseases or weeds to minimize the use of agro-chemicals, while increasing their effectiveness either for crops and the open fields.	**2.24**
Enhance research infrastructures based on long-term observations and long-term agronomic experiments for the assessment of the impact of cropping systems on soil health and soil carbon dynamics and the improvement of soil C model forecast capacity, including the design and recording of carbon farming schemes.	**2.25**
3.2.5 Strategies and technologies for climate change adaptation in the agricultural sector	
Develop data-based solutions for livestock and cropping systems to adjust production to become more resilient towards climate change on the long-, medium-, and short term under consideration of the overall sustainability performance and competitiveness of farms, climate adaptation, mitigation and sustainable development.	**2.26**
Building on lessons from effects of climate change in other biogeographic regions, taking into account the concept of zonation, long-term time series agri-environmental data (including yield data, phenology data), and climate prediction models, develop decision support tools supporting farmers to adjust production to prevent negative effects of climate change on agricultural production.	**2.27**

Enhance high-throughput phenotyping technologies and research infrastructures for climate adaptation of crop systems (e.g. drought resistance, salinity, waterlogging).	**2.28**
Develop innovative transformational strategic approaches for tailored data-based decision support systems for resilient agriculture for short-, medium-, and long-term time horizons. These should go beyond resource use efficiency, and address biodiversity conservation, soil protection and climate change adaptation, building on (novel) approaches to assess the short-, medium-, and long-term impacts of climate change.	**2.29**
3.3 Data-based solutions for policy-making	
Identify data needs for the monitoring and evaluation for the implementation and development of current and future agricultural policies, considering a wide range of (indicative) agri-environmental parameters. Where applicable, data needs of related policy fields, such as environmental and climate policies, might be considered.	**3.1**
Take stock and compare existing indicators and approaches to monitor policy implementation and impacts and of the (practical) experiences gained with their application.	**3.2**
Develop innovative data-based solutions through the application of data technologies and supply and/or develop indicators that facilitate a common approach across Member States (and candidate countries) in assessing the performance of agricultural policies. This may include the generation of homogenous EU-/Europe-wide reference data sets, e.g. IACS-based reference data-sets and data-based solutions.	**3.3**
Develop innovative approaches to monitor agri-environmental conditions and the implementation of policy measures (including “good agri-environmental conditions” as part of conditionality under the CAP), and production patterns following a consistent approach in the medium- and long-term.	**3.4**
Develop approaches to extend the application of the Area Monitoring System (AMS) including for the assessment of more eligibility conditions through the use of new input data sources, the use of novel satellites and sensors and data analysis techniques, while acknowledging the opportunities of privately operated sensors and B2G data sharing.	**3.5**
Develop new methodologies to monitor policy performance and compliance building on public and private data and with the ambition to reduce or minimize administrative burdens.	**3.6**
Develop proposals for data-based solutions supporting design, implementation, monitoring and evaluation of the future CAP, ensuring “baseline data” availability including MCDA (Multi-Criteria Decision Analysis) based applications.	**3.7**
Develop innovative data-based solutions supplementing Member States’ efforts in the provision of FaST services to farmers (see also Section 3.2.1).	**3.8**
Explore the opportunities from new satellite imagery and other sources, such as new ground sensors, drones and substrate analysis, for policy monitoring and implementation.	**3.9**

Generate Europe-wide data-based solutions through the upscaling of (precision) farming data generated on farms. This could be done by combining it with other sources of data, e.g. satellite data, and will allow the data to be utilized at a much larger scale in a more systemic way.	**3.10**