

Letter of intent – NFDI4Agri**1 Binding letter of intent as advance notification or non-binding letter of intent**

<input checked="" type="checkbox"/>	Binding letter of intent (required as advance notification for proposals in 2020)
<input type="checkbox"/>	Non-binding letter of intent (anticipated submission in 2021)

2 Formal details**Planned name of the consortium**

NFDI for Agricultural Sciences

Acronym of the planned consortium

NFDI4Agri

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3 Objectives, work programme and research environment

3.1 Research area of the proposed consortium (according to the DFG classification system):

https://www.dfg.de/download/pdf/dfg_im_profil/gremien/fachkollegien/amtsperiode_2020_2023/fachsystematik_fachkollegien_amtsperiode_2020-2023.pdf)

The NFDI4Agri subject orientation corresponds to the DFG review board “207 Agriculture, Forestry and Veterinary Medicine”.

3.2 Concise summary of the planned consortium’s main objectives and task areas

NFDI4Agri aims at making agricultural research data findable, accessible, interoperable, reusable (FAIR) and, moreover, open. NFDI4Agri meets the needs, respects the feedback of the agricultural research community and sets up a flexible, interoperable and scalable data infrastructure connecting existing repositories thus making publicly funded and yet isolated research data interdisciplinarily and sustainably available. Educational responsibilities are assumed by knowledge transfer to the next generation of agronomists. Research data quality must be assured by domain-specific measures of data quality control and curation systems. Privacy and ethical standards will be developed, striking a fair balance between the interests of authors and users of agricultural data, including concepts for handling sensitive data. The goals will be implemented in six task areas.

Task area 1: NFDI4Agri Secretariat

TA1 is responsible for consortium coordination and support. It will develop a cooperation agreement and integrate the Governance4Agri within the overarching NFDI governance. TA1 is responsible for allocating the funds to the co-applicants and the proper use of the funds including monitoring the implementation of the developed use cases. The spokesperson represents the consortium externally and is responsible in particular for cooperation with the other consortia and NFDI bodies. TA1 also supports the web presence to present the consortium and a personalized area supporting cooperation within the consortium.

Task area 2: Agricultural Community

TA2 involves the agricultural community by i) raising awareness of the NFDI4Agri activities, ii) getting feedback on its actions and plans (e.g. by surveys), iii) implementing and disseminating concepts and services. TA2 will primarily address scientists via professional societies and agricultural faculties and it will develop measures to involve other stakeholders, i.e., farmers and consultants (“knowledge transfer”). Dissemination and outreach through “training and other supporting services” will be developed. Additionally, TA2 will develop faculty curricula, training material and e-learning tools, a dissemination model through data stewardship.

Task area 3: Data Fitness for Use in Agricultural Research

TA3 focuses on the definition of domain-specific criteria of data quality and quality levels and procedures for quality assurance (QA) to facilitate information. This may address the data's fitness for use, e.g. for machine learning approaches in deep phenotyping of plants and farm animals, extreme weather index calculations or animal health data. Current research data infrastructures do not satisfactorily support searching for data that meet task-specific requirements. TA3 will establish a discussion forum with agronomists, machine learning-, and modelling experts, who produce and reuse agricultural research data, to identify common tasks and requirements, and develop appropriate data quality criteria. Domain specific and transferable QA methods and recommendations will be defined to deal with common practices of data curation and as guidelines for future agricultural research projects, e.g., a web-based quality feedback and review system with appropriate visualizations of the data and its qualities.

Task area 4: Standards and Interoperability - Making Agronomic Data FAIR

TA4 aims at identifying and providing standards and interfaces for the development of an interoperable agricultural research data infrastructure. Key foundations for data integration, interoperability and reuse are common open standards, persistent unique identifiers and domain-specific thesauri. TA4 will establish standards-based interoperability layers for extended data exchange between agronomic data providers. Domain-specific and standardized methods, interfaces, metadata schemas and ontologies must be mapped and/or aligned. Workflows and technical instructions will be developed that enable collaborative data curation and annotation. This includes methodologies for capturing metadata and provenance in real time for analysis and processing steps to enable assessment of fitness-for-use in given contexts. The compliance of annotation pipelines will be evaluated by a GO FAIR implementation matrix.

Task area 5: Agronomic Data and Infrastructure Services

TA5 provides long-term preserved research data in an interoperable and scalable infrastructures of (i) repositories and (ii) infrastructure services. Repositories are used for the persistent deposition and publication of research data and documents. Infrastructure services include elements necessary for the interoperable and sustainable operation of repositories under FAIR criteria, covering technical interfaces, documentation, consulting and operational monitoring. Actions will be derived to upgrade repositories on a technical and conceptual level. The iterative establishment of a common access point to the distributed infrastructures will be implemented. This will be aligned with the use cases to enable early feedback from the community. Along these technical tasks, concepts for ensuring service quality, technical support and metrics for operational monitoring will be developed and transferred to a long-term operating model.

Task area 6: Legal, Ethical and Organizational Aspects

Agricultural data is often collected on and/or pertains to private land, particularly farms, and farm animals. It is often spatially explicit, identifiable from contextual information that must be provided for reusability. Privacy requirements are essential for data publication and access, ensuring open data access and intellectual property rights of data providers. TA6 analyses the privacy framework for agricultural data with spatial reference and develops guidelines for data access that cannot be reliably anonymized. It moderates a participatory process to develop best practice guidelines for researchers, data centers/repositories and institutional data contacts, taking into account research ethics, legal advice, organizational aspects, and the experience and best practices in other disciplines, particularly social and economic sciences.

3.3 Brief description of the proposed use of existing infrastructures, tools and services that are essential in order to fulfil the planned consortium's objectives

One main objective of NFDI4Agri is to make existing, distributed and disciplinary infrastructures interoperable for agricultural research data and connect them into a superordinate exploration platform. We propose to start with 18 well-established repositories, databases and information systems provided by the NFDI4Agri co-applicant institutions. They will be used as pilot infrastructures to build interdisciplinary components upon and to provide heterogeneous data to harmonize within the project. The used infrastructures cover the wide range of agricultural research disciplines. Examples are the standard electronic system **TSN** from FLI for registration of all notifiable animal diseases and also for reportable animal diseases; **FarmPheno** from FBN, which provides data in the context of farm animal performance, health, and welfare in cattle and pig; **FLOPO** from SGN, as a knowledge base of morphological traits and phenotype data text-mined from floras, monographies and thematic databases; **GBIS/I**, as an Information System of the IPK ex-situ collection for crop and wild relatives, providing passport data and primary evaluation data; the **BonaRes Repository** from ZALF, as the central repository for national soil-agricultural research data; **PlabiPD** from FZJ with data from plant genomic, transcriptomic and ontology for crops; and the **National Soil & Forest Inventories** (Thünen), which include federal inventories with datasets for agricultural and forest areas (soil parameters, forest status and forest production potential).

Additionally to domain-specific services, general life-science related infrastructures like **LIVIVO**, a search engine for literature and information, and **SemLookP**, a repository for ontologies and terminologies, from ZB MED will be interconnected. As building blocks for future infrastructures state-of-the-art technologies will be used: **e!DAL** as an open infrastructure to store on-site research files and integrate them into data publishing; **AGROVOC**, a large SKOS standard based multilingual agricultural thesaurus, using Linked Data technologies for annotation and

indexing; Research Data Management Organizer (**RDMO**); The OSGeo based Thünen Institute Scientific Data Repository (**TISDAR**) as an open-source application stack to provide OGC conformant data repositories with focus on spatial data for researchers. Additionally, educational and consulting services will be integrated, i.e. **Data Privacy Law Support** (FIZ Karlsruhe) and **Awareness Building Long-Term Archiving** (ZB MED).

These together provide a baseline service and data infrastructure which covers the wide range of research fields of the consortium. From there we will work towards a fairification of those services and infrastructures.

3.4 Interfaces to other proposed NFDI consortia: brief description of existing agreements for collaboration and/or plans for future collaboration

NFDI4Agri data, infrastructures, services and co-spokespersons are involved in the work of other consortia with regard to active and planned cooperation opportunities. Agricultural sciences are part of the life sciences (**NFDI4Life** Umbrella) and have therefore close links to **NFDI4Microbiota**, **NFDI4Health** and **NFDI4BioDiversity**. **DataPlant** considers fundamental plant research, so that a cross-link at an early stage is important. Explicit geospatial reference is an essential characteristic of agricultural science research data, so that cross-domain cooperation with **NFDI4Earth** is established in this respect. As social science and agronomic data are generated and reused in agricultural research, cooperation with **KonsortSWD** were initiated. As a relevant intersection in the field of animal health, immune response patterns helps understanding infection dynamics and mammalian host defence. Therefore, a collaboration with the **NFDI4Immuno** consortium, in which relevant institutions from the fields of animal health are working, is intended.

There is a clear intention that NFDI4Agri will cooperate in all consortia mentioned and is open to further consortia. Interfaces and topic areas still have to be clarified in detail.

4 Cross-cutting topics

Please identify cross-cutting topics that are relevant for your consortium and that need to be designed and developed by several or all NFDI consortia.

NFDI4Agri had agreed in August 2019 on the Berlin Declaration of NFDI Cross Cutting Topics (<http://doi.org/10.5281/zenodo.3457213>) and accordingly has identified the following cross-cutting topics as relevant:

1. Collaborative governance and general framework:

- a. Common vision of the NFDI, long term foresight and common strategic planning
- b. Governance & sustainability

- c. Cultural change aka reputation, publication/funding policies and credit systems
- d. Policy advice, consultation and outreach with respect to NFDI
- e. International visibility and networking of NFDI
- f. Human resource management, recruitment, development

2. Community (User) involvement:

- a. User driven adaptive development of NFDI (cross domain use cases)
- b. Training, undergraduate and graduate education, professional development
- c. Stimulating a cultural change of users and providers towards FAIR and open research data

3. Technical infrastructure and concepts:

- a. Research data commons- incl. cloud infrastructures, computing power, Identity and Access Management (IAM) and interfaces between data providers and users across domains
- b. Standardization/harmonisation
 - i. Terminologies, terminology management and services
 - ii. (Meta)data harmonisation, findability
 - iii. Provenance
 - iv. Interoperability across domains
 - v. Common data and metadata standards and encodings (e.g. NFDI core metadata)
 - vi. Persistent unique identifier systems
 - vii. Infrastructures
- c. Quality management and assurance- incl. certification of services (data, software and service quality criteria, evaluation and qualification criteria, qualification and/or certification processes for NFDI service offerings)
- d. Scalability of tools and services

4. Legal and ethical aspects

- a. Legal aspects (licensing, intellectual property rights and data protection & privacy)
- b. Commercial use of data (commercialisation of data)
- c. Ethical aspects of sharing research data and research software
- d. Ethical-legal aspects of managing person-related data for research

Please indicate which of these cross-cutting topics your consortium could contribute to and how.

Most of these cross-cutting topics are dealt with under the aspects of agricultural sciences in the working areas of NFDI4Agri. The generic solutions can be used by other consortia or integrated into overarching issues. Above listed cross-cutting topics are integrated to the work program of the six NFDI4Agri Task areas:

- TA1 - NFDI4Agri Secretariat: 1a, 1b, 1d, 1e
- TA2 - Agricultural Community: 1c, 1d, 2a, 2b, 2c, 3b, 4a, 4c
- TA3 - Data Fitness for Use in Agricultural Research: 1c, 3c
- TA4 - Standards and Interoperability - Making Agronomic Data FAIR: 1c, 3a, 3b, 3d
- TA5 - Agronomic Data and Infrastructure Services: 1c, 2a, 2b, 2c, 3a, 3b, 3c, 3d
- TA6 - Legal, Ethical and Organizational Aspects: 3b, 4a, 4b, 4c, 4d

An overarching contribution can be made, in particular, to the cross-cutting topics 4a “Legal aspects (licensing, intellectual property rights and data protection & privacy)”, 4b “Commercial use of data (commercialisation of data)”, and 4c “Ethical aspects of sharing research data and research software”: The specifics of agricultural data, often collected on and/or pertains to private land, particularly farms, and farm animals are also relevant to some data from earth, environmental, and biodiversity sciences. The resulting privacy requirements are essential, in particular for data publication and accessibility. Furthermore ethical and organizational challenges have to be taken into account. Some of these challenges are similar to those relating to geodata, health data, environmental information and agricultural statistics from government agencies. However, the legal exemptions that govern those do not usually apply to research data. Legal, ethical and practical guidance geared towards the social sciences and economics, in turn, does not usually take the specifics of agricultural data into account. Addressing these issues within NFDI4Agri therefore provides benefits to the NFDI as a whole.