Nationale Forschungsdateninfrastruktur (NFDI)

FAIRagro

FAIRagro – FAIR Data Infrastructure for Agrosystems

Sprecher: Prof. Dr. Frank Ewert

FAIRagro Community Workshop
23. Juni 2021

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Ziele des Community Workshop

FAIRagro

- Information / Darstellung FAIRagro als Initiative von NFDI4Agri (wer sind wir ?)
- Information / Vorstellung des Vorhabens (was haben wir vor ?)
- Information / Klärung nächste Schritte (wie geht es weiter ?)
- Feedback / Diskussion

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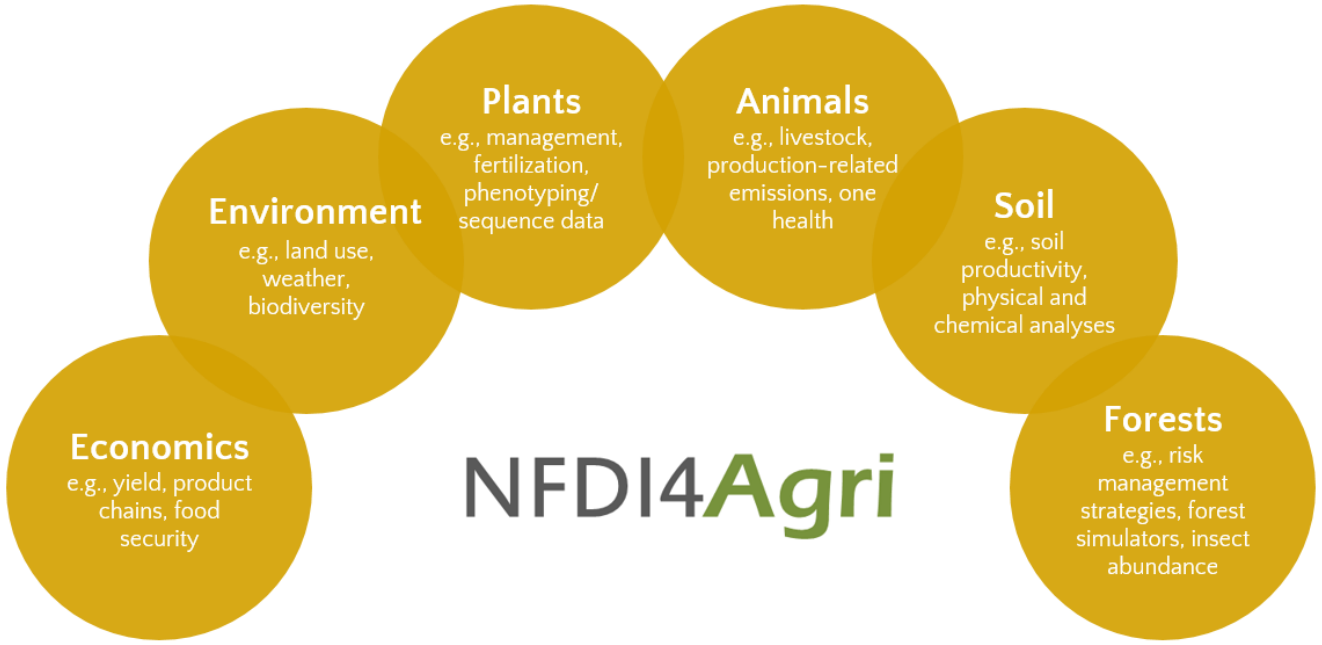
NFDI4Agri ➔ FAIRagro

FAIRagro

NFD4Agri Antrag 2020 eingereicht



Kritikpunkte

- Agrarwissenschaftliche Disziplinen sehr heterogen
- Wenig Vernetzung zwischen Disziplinen
- Keine systemübergreifenden Forschungsfragen über die Breite der agrarwissenschaftlichen Disziplinen
- Fehlender Reifegrad der.Community hinsichtlich der integrierten Forschung zu komplexen Fragestellungen
- NFDI4Agri kann diese Mängel in der Forschungsintegration nicht erbringen

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Abstimmung zum weiteren Vorgehen

Fokussierung auf einen kleineren Bereich mit hohem Reifegrad und guter Integration über Disziplinen

Nukleus „FAIRagro“

Stärkere Einbeziehung der wiss. Community und Betonung der Nutzersicht

Flagship Use Cases

Erfahrungen von FAIRagro zur Integration weiterer Bereiche nutzen

FAIRagro → NFDI4Agri

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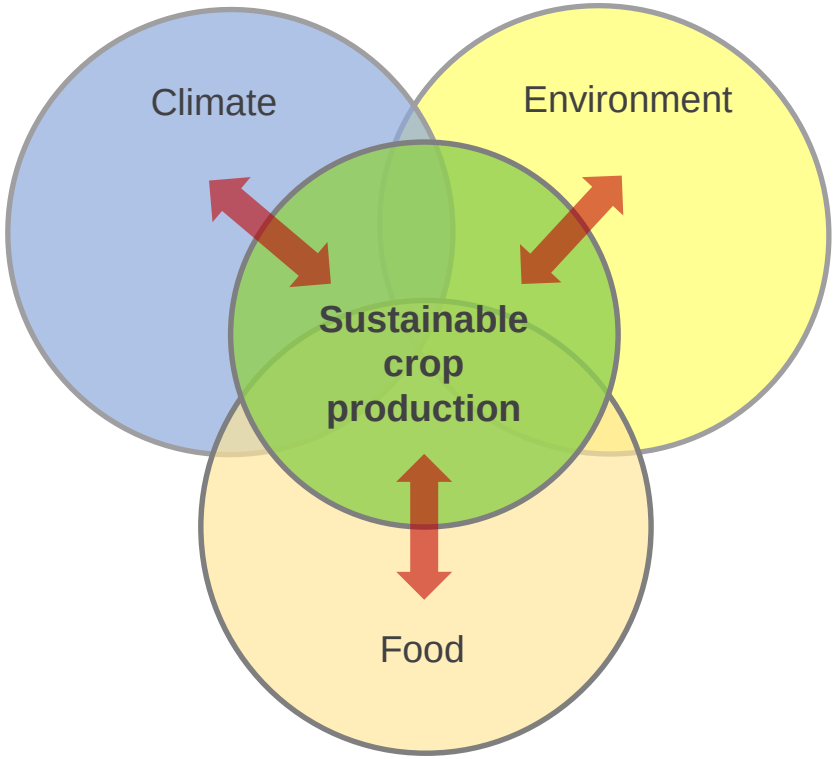
FAIRagro – Agrosystem research / Challenges for sustainable crop production

FAIRagro

- Food and agriculture relevant to all Sustainable Development Goals
- Crop production is the most essential part of food and agriculture
- Sustainable crop production needs to meet SDGs.
- Particular important are interactions with climate, the environemnt and the food system



Modified after JPI FACCE Strategic Research Agenda, 2020

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FAIRagro

➢ Targets for future production systems (EU)

2030 Targets for sustainable food production

Reduce by 50% the overall use and risk of **chemical pesticides** and reduce use by 50% of more hazardous **pesticides**

Reduce **nutrient losses** by at least 50% while ensuring no deterioration in soil fertility; this will reduce use of **fertilisers** by at least 20 %

Reduce sales of **antimicrobials** for farmed animals by 50%

Achieve at least 25% of the EU's agricultural land under **organic farming** and a significant increase in **organic aquaculture**

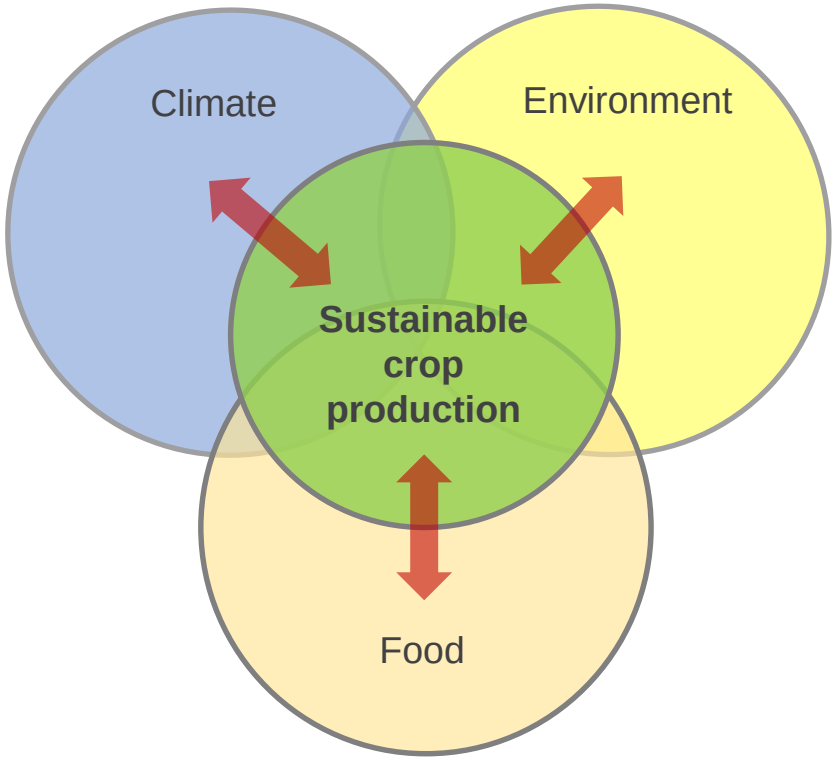
Concrete challenges:

- Climate change and adaptation/mitigation
- Pesticide reduction
- Improved resource use (water, nutrients, land, soil)
- SDG compliant agrosystems of the future

Sustainable crop production – challenges across scales

FAIRagro

➢ Challenges at different scale



Modified after JPI FACCE Strategic Research Agenda, 2020

...	
Region	Susainable agricultural sectors and food system
Landscape	Susainable agricultural landscape ➔ provision of ecosystem services and biodiversity
Cropping system/Field	Susainable crop production and farming systems ➔ reduced environemntal impacts and improved resource use efficiency
Plant/crop	Crops with improved yield and yield variability for site- (soil, climate) and management-specific conditions ➔ understanding G x E x M
...	

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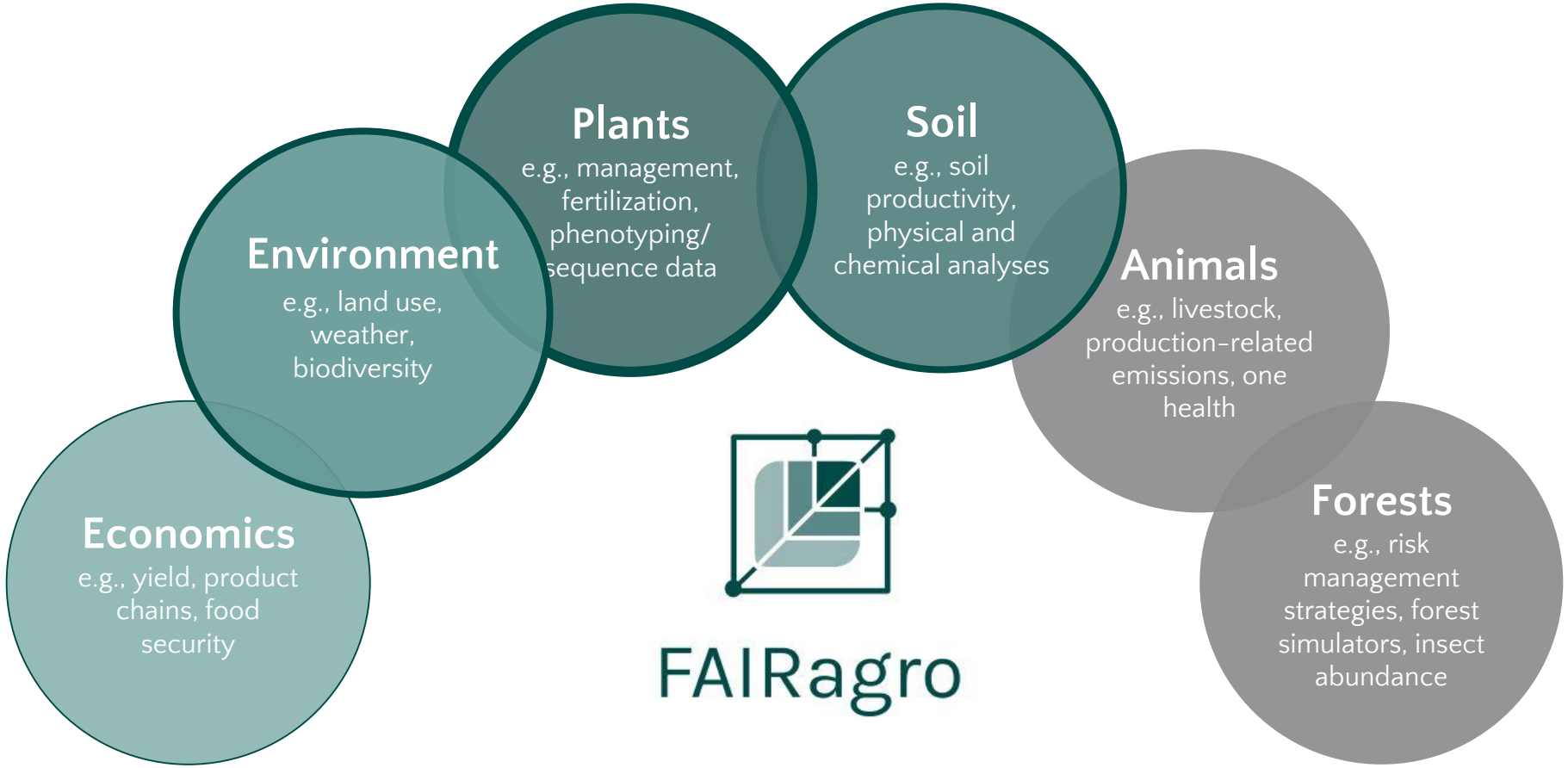
FAIRagro – Agrosystems related research areas

FAIRagro



Time series | Geo data | Farming 4.0 | Sensitive data | Legacy data

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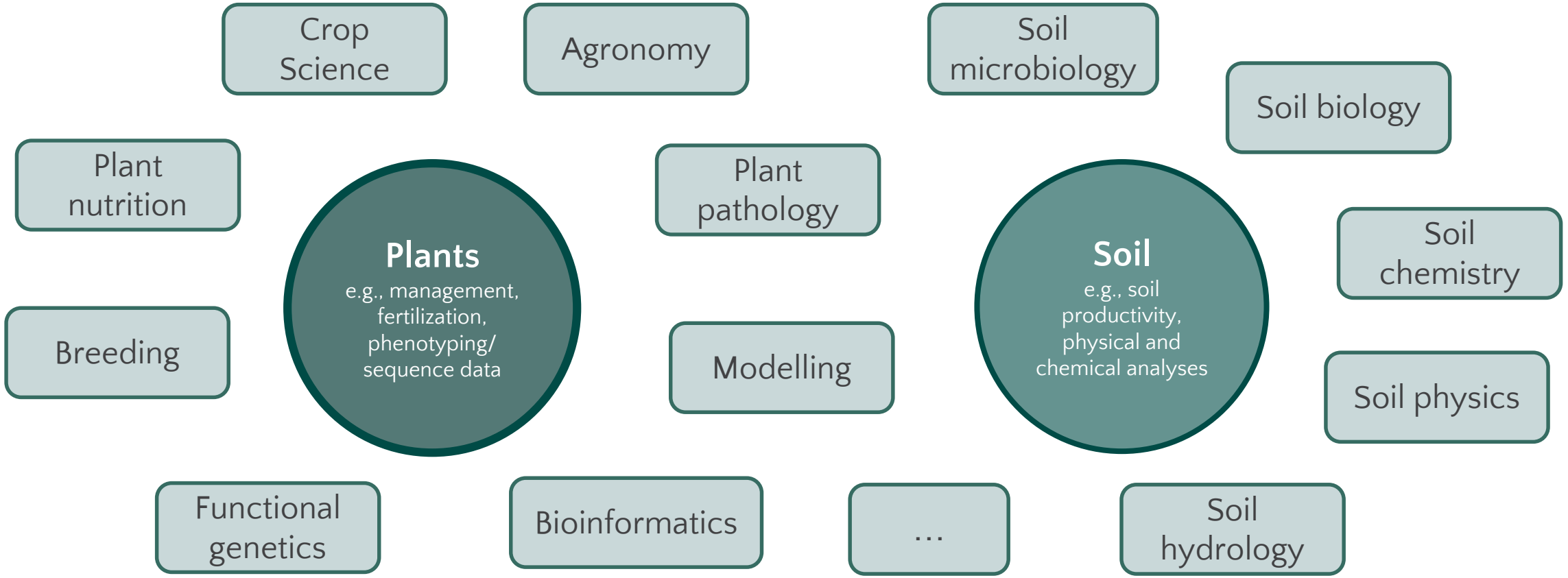
FAIRagro – Selected related disciplines



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FAIRagro – Selected related disciplines and scales

FAIRagro

…

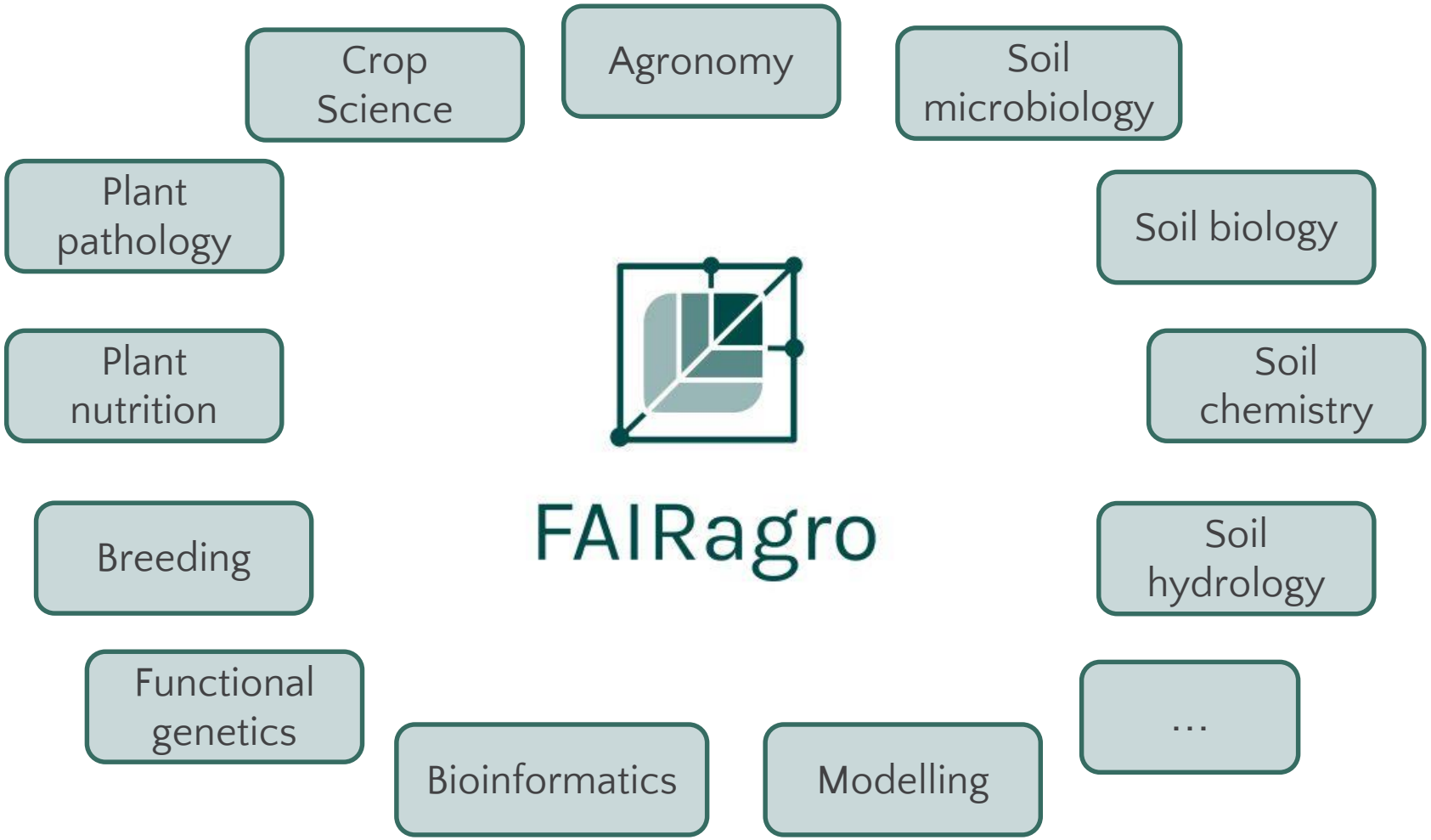
Region

Landscape

Cropping system / field

Plant/crop

…



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FAIRagro – Selected related disciplines and scales ➔ Agrosystem domain

FAIRagro

…

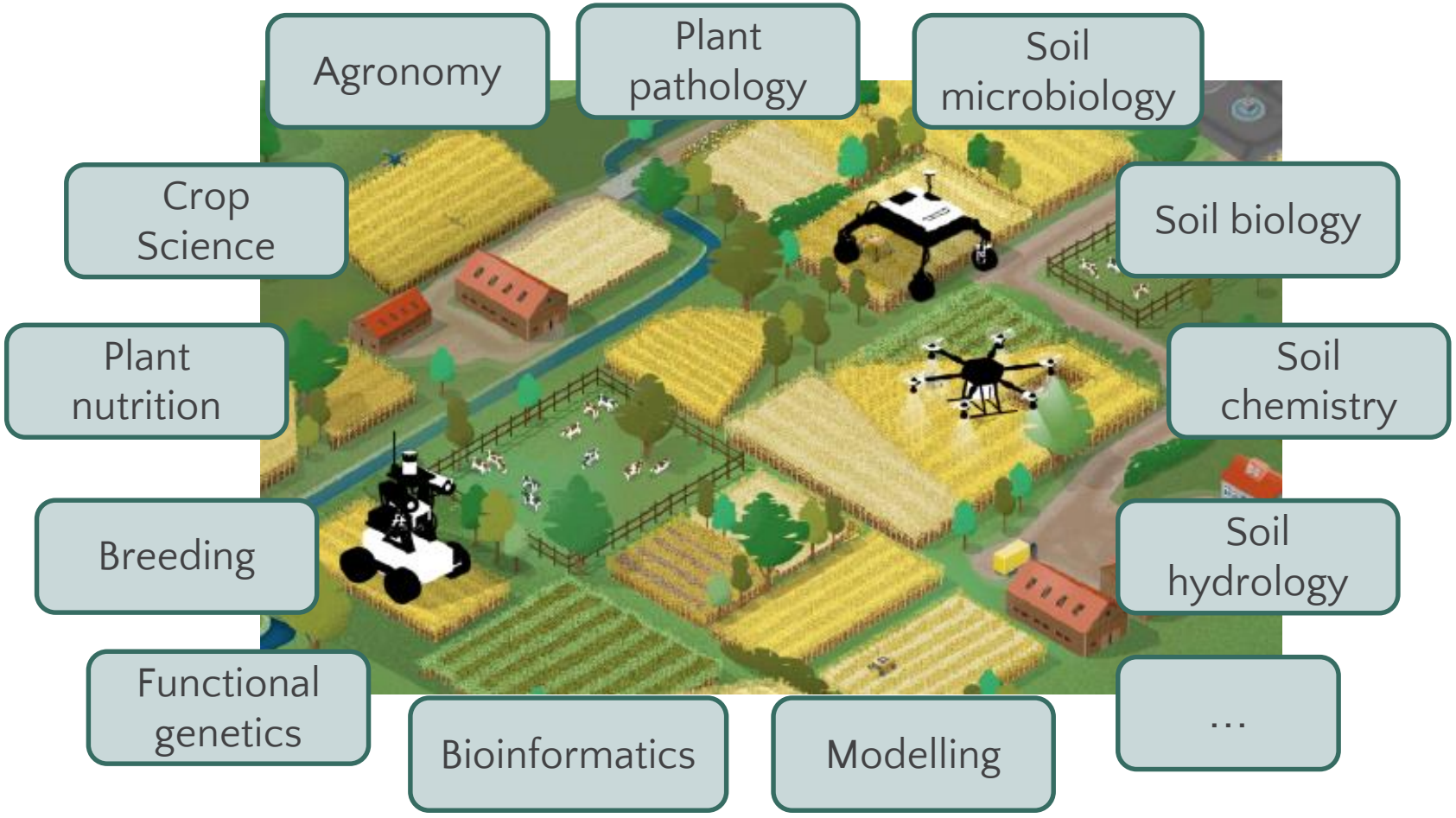
Region

Landscape

Cropping system / field

Plant/crop

…



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FAIRagro – Use Cases

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...

Region

Landscape

Cropping system/Field

Plant/crop

...

UC2, Assessing tradeoffs for optimal crop nitrogen management

UC3, Learning from incomplete data

UC6, Towards integrated potato modelling with fully connected information systems

UC4, Streamlining pest and disease data to advance integrated pest management (IPM)

UC5,Non-invasive phenotyping with autonomous robots

UC1, Exploiting genotype × location × year × management interactions for sustainable crop production

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RDM challenges

FAIRagro

- Many disciplinary and institutional infrastructures
- Restricted access to research data
- Hard to find
- Low interoperability
- Heterogeneous standards (metadata, ontologies)
- Inconsistent regulations on the subsequent use of data
- Handling of sensitive data

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FAIRagro aims and ambitions

FAIRagro

➔ Overall aims:

- Develop research data infrastructure for a research area (Agrosystems Research)
- Build community of data providers and users

➔ Ambitions

- Develop next gen data infrastructures to enhance (integrated) research on relevant problems to advance sustainable crop production
- Demonstrate progress for research
  - Integration across disciplines
  - Bridging of scales
- Pull RDM activities into other agricultural fields
- Address key challenges for RDM

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FAIRagro – key characeristics (agrosystems nucleus)

FAIRagro

- Many disciplines involved
- Primary production (food security), resource degradation, ESS, Biodiversity are key challenges
- Can build on comprehensive research projects
- Can build on excising data, infrastructures and platforms
- Link to new technologies (robotics, sensing, big data, modelling)
- Larger national and international efforts consortia (PhenoRob, patchCROP, MACSUR, AgMIP, DSSAT, Bonares, DAKIS, …)

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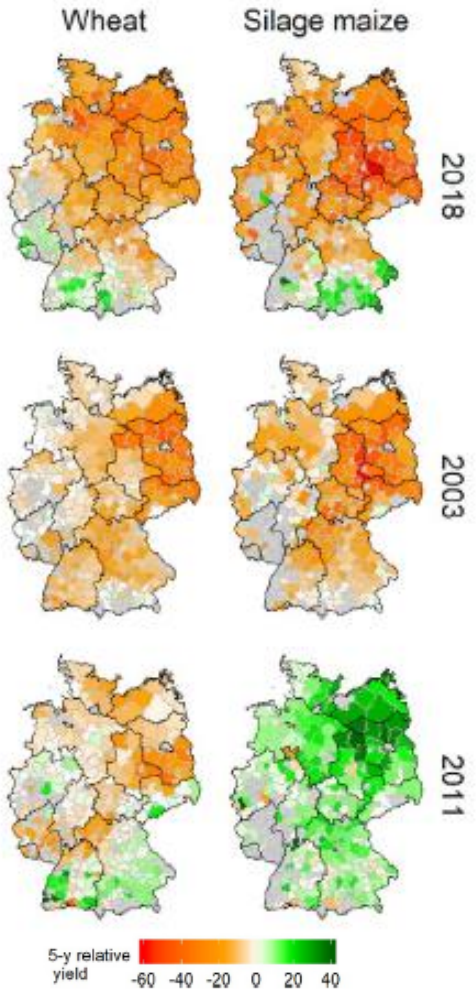
FAIRagro – available (sensitive) data, examples

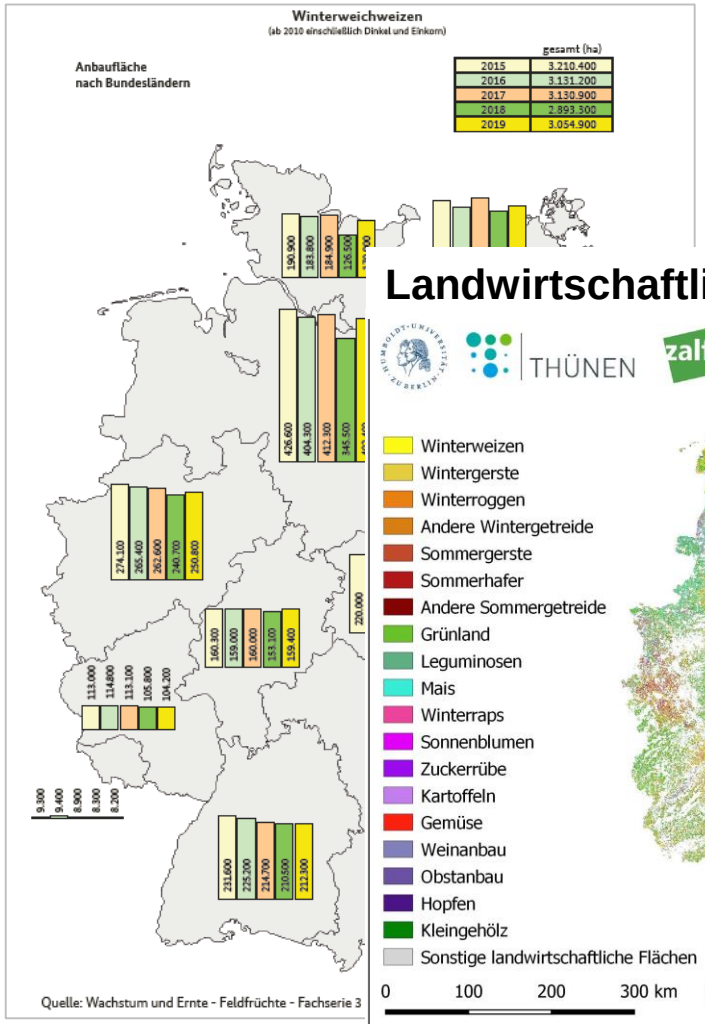
FAIRagro

Ertragskarten

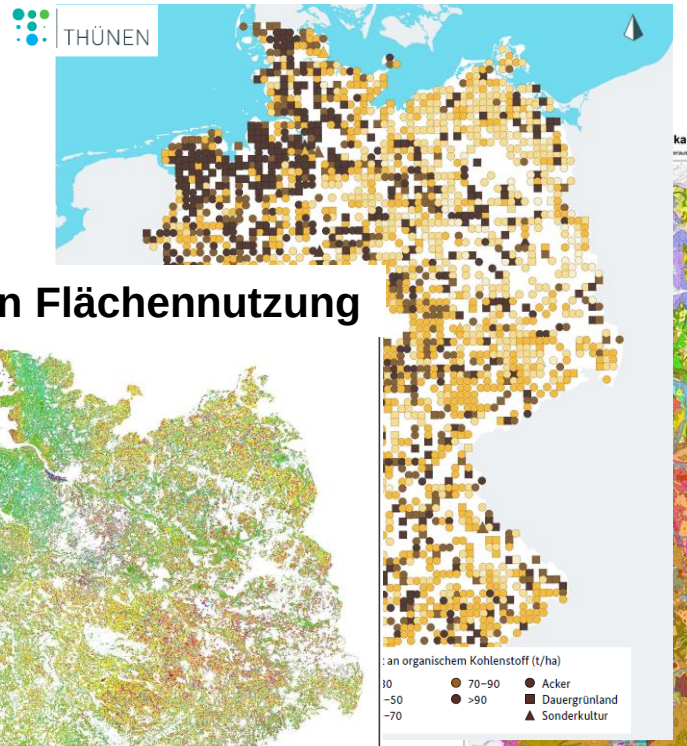


Webber et al., 2020

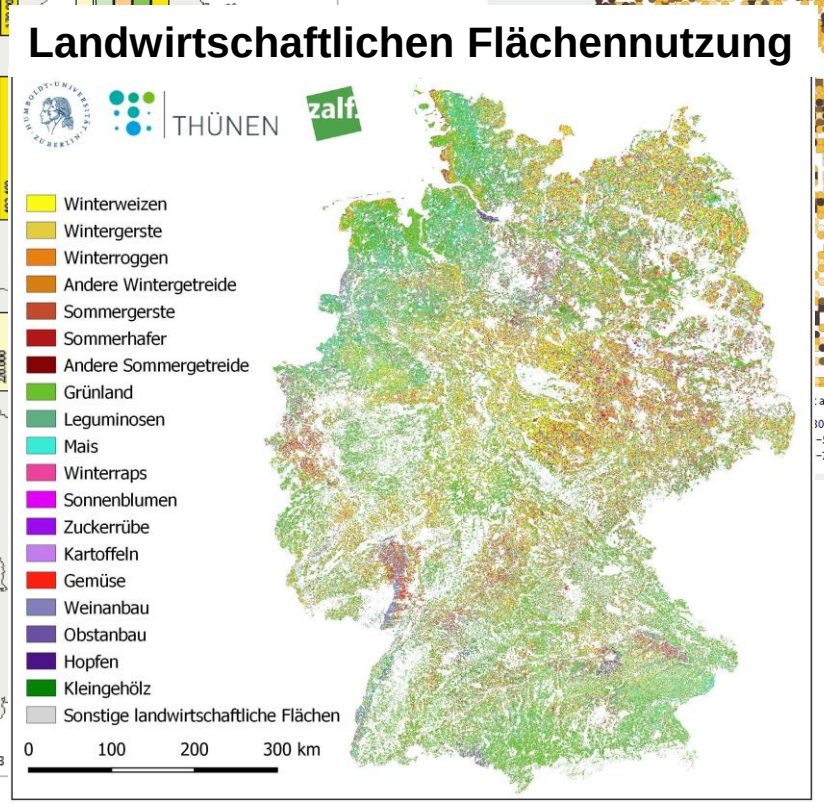
Beschreibende Sortenlisten



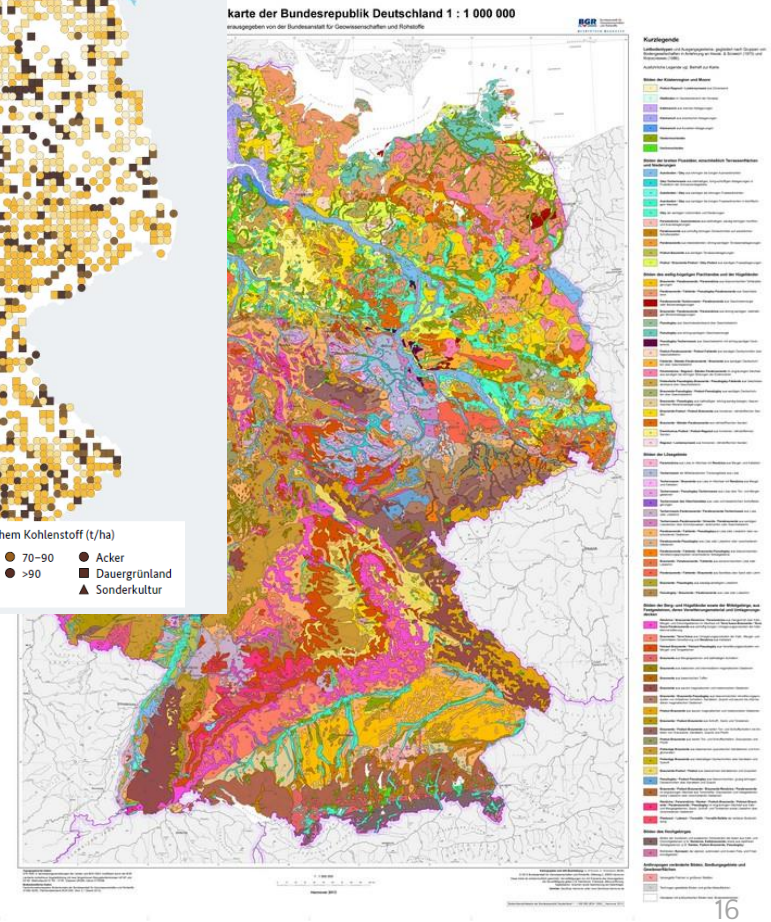
Vorrat an organischen Kohlenstoff



Landwirtschaftlichen Flächennutzung



Bodenkarten (BÜK100)



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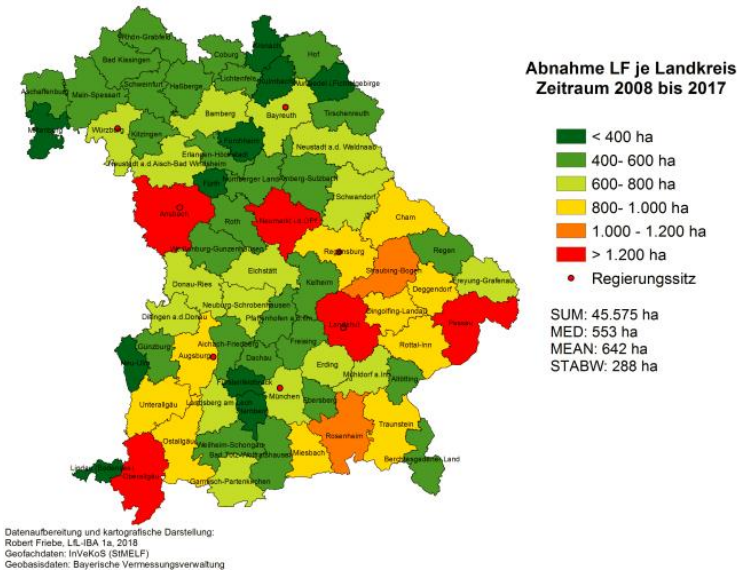
FAIRagro – available (sensitive) data, examples

InVeKoS - Integriertes Verwaltungs- und Kontrollsystem



https://www.lfl.bayern.de/iba/agrarstruktur/181760/index.php

Betriebsdaten (Beispiel, Farm accountancy data network, FADN)

https://ec.europa.eu/info/food-farming-fisheries/farming/facts-and-figures/farms-farming-and-innovation/structures-and-economics/economics/fadn_en

Bundes- und Landessortenversuche

https://www.bundessortenversuch.de

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FAIRagro – comprehensive research projects, data providers and users

FAIRagro

Cluster of Excellence PHENOROB

developing digital technologies

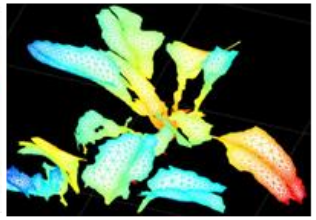
monitoring

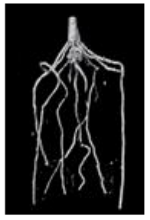
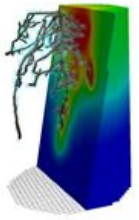
robots

modeling

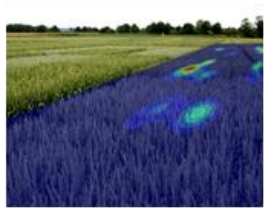
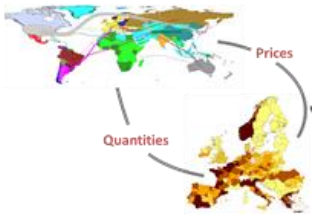
data

understanding plant and soil


non-invasive phenotyping



plant-soil interaction

integrating in environment and economy

assessing, modeling, and optimizing implications

Sustainable crop production

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“Soil as a sustainable resource for the bioeconomy” Research Data

BONARES
Centre for Soil Research

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FAIRagro – excisting (modelling) plattforms

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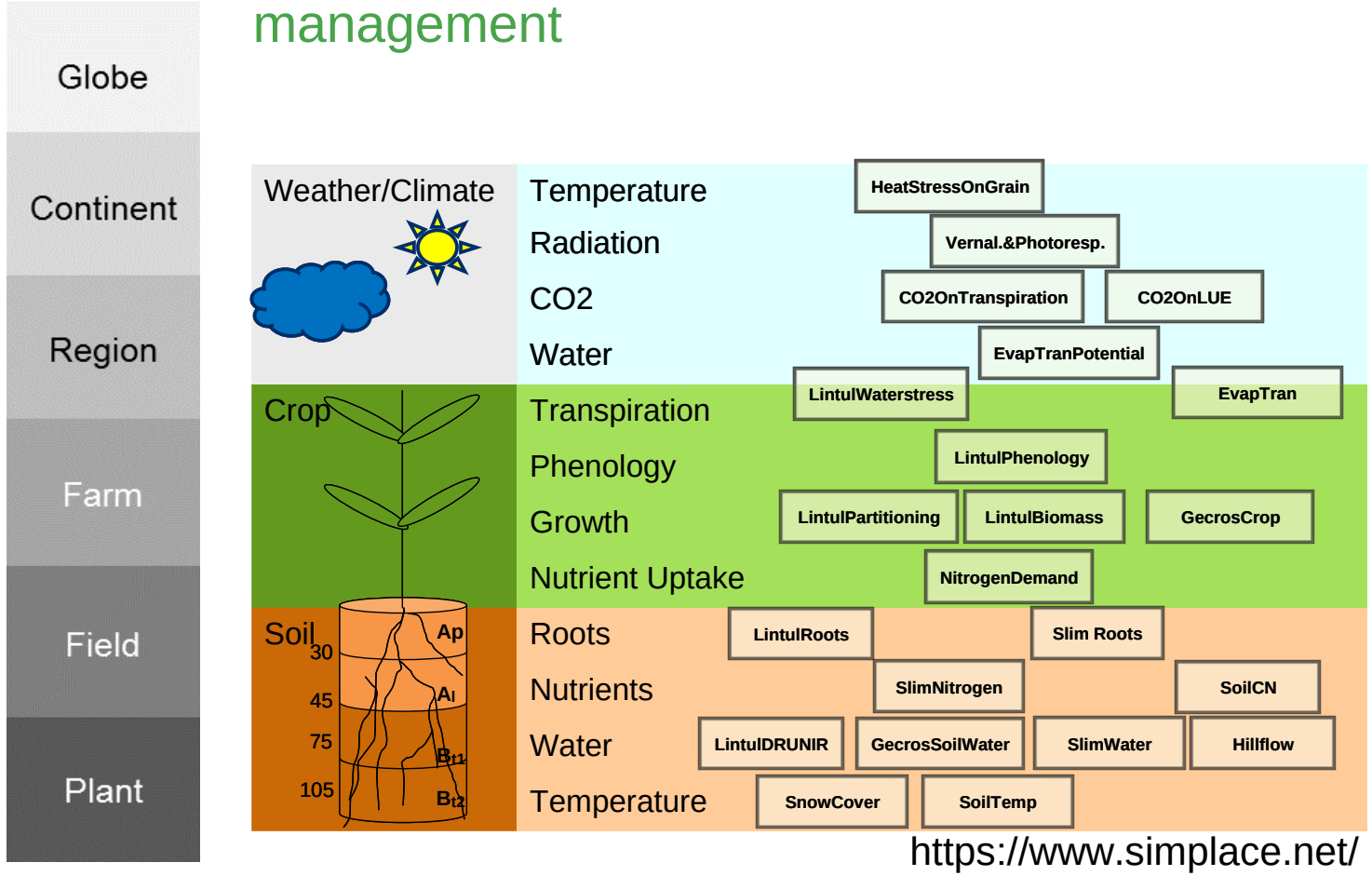
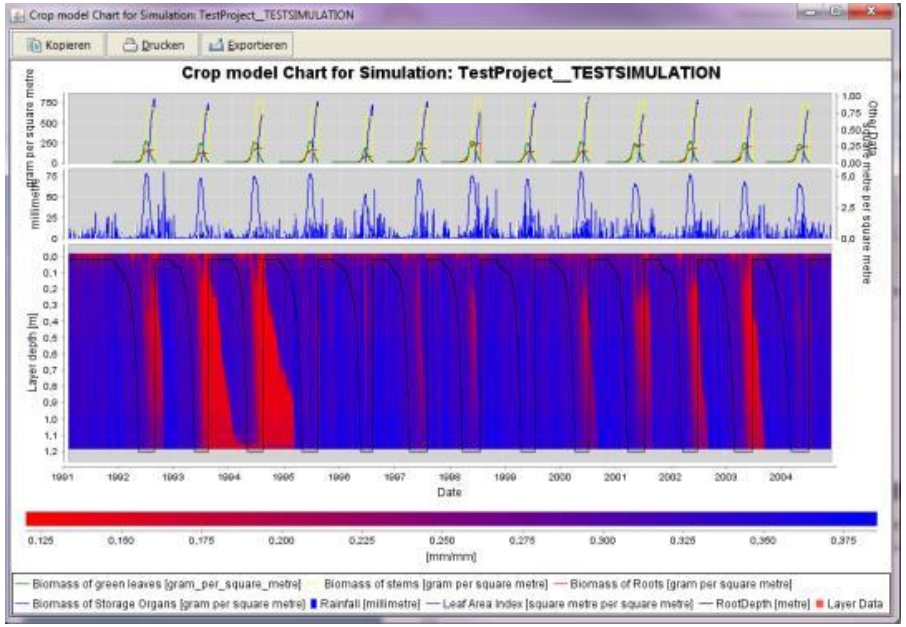
UNIVERSITÄT BONN
Rheinische Friedrich-Wilhelms-Universität Bonn

simplace
modelling framework

flexible SDSS spatial user modelling scientific engineer components impact assessment support decision maker model framework simulation

Scientific Impact assessment and Modelling - Platform for Advanced Crop and Ecosystem management



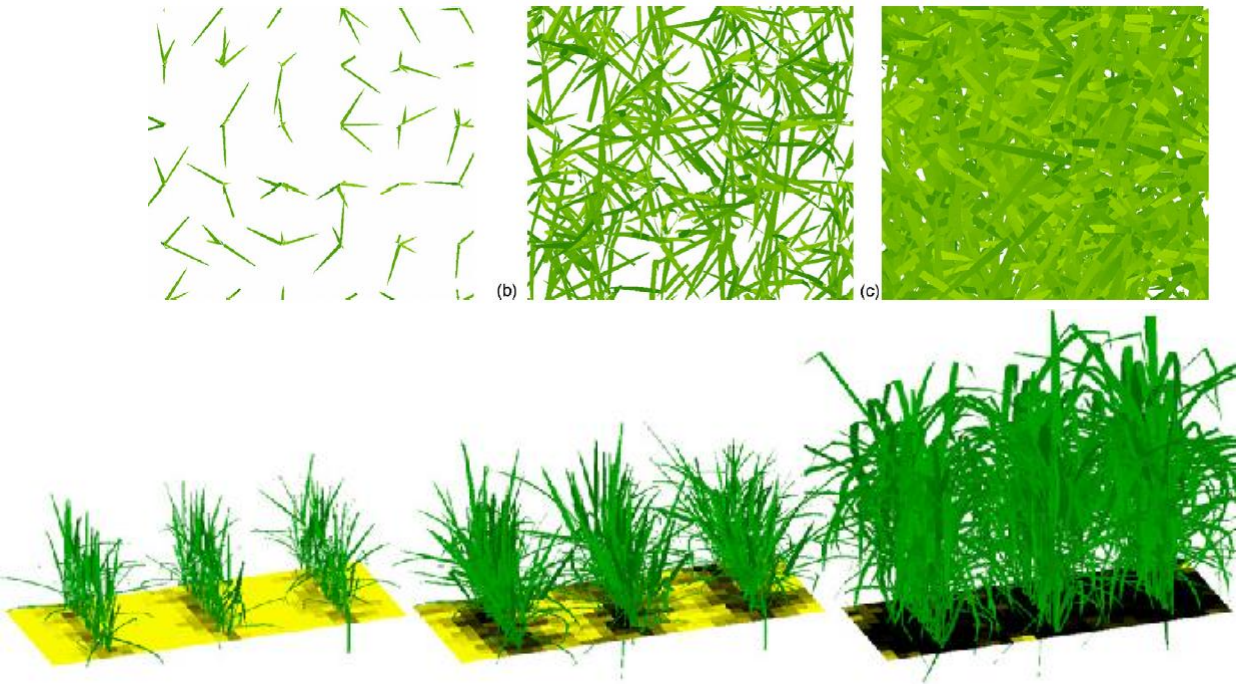


https://www.simplace.net/

FAIRagro – excisting models

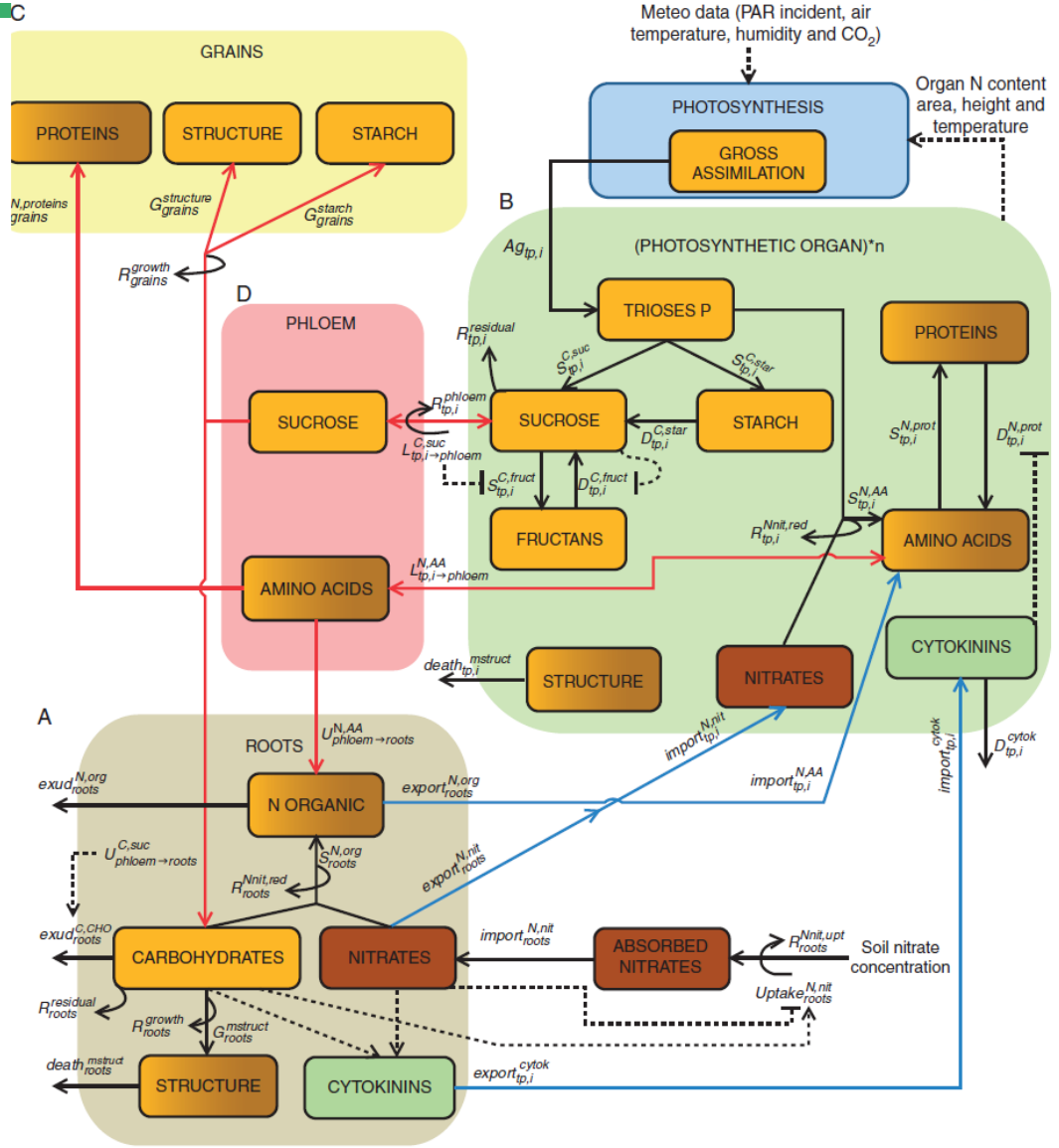
➔ Model aided breeding and management support

- Quantify environmental and management effects
- ➔ model linking
- ➔ functional structural plant modeling



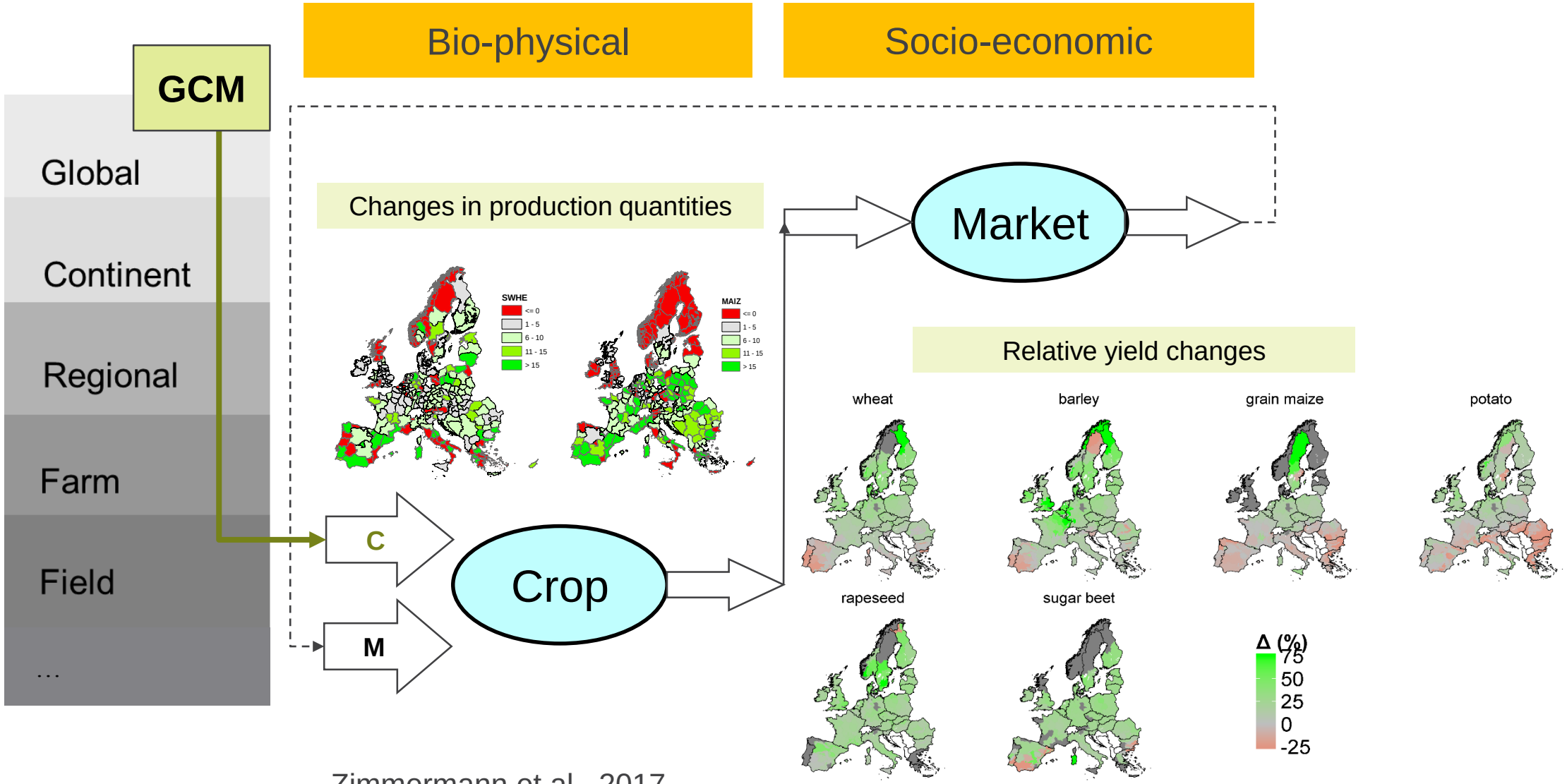
Evers et al., 2010

The CN wheat functional-structural plant model



Barillot et al., 2016

FAIRagro – excisting expertise in model-model and model-data fusion



Zimmermann et al., 2017

FAIRagro – excisting expertise in model-model and model-data fusion

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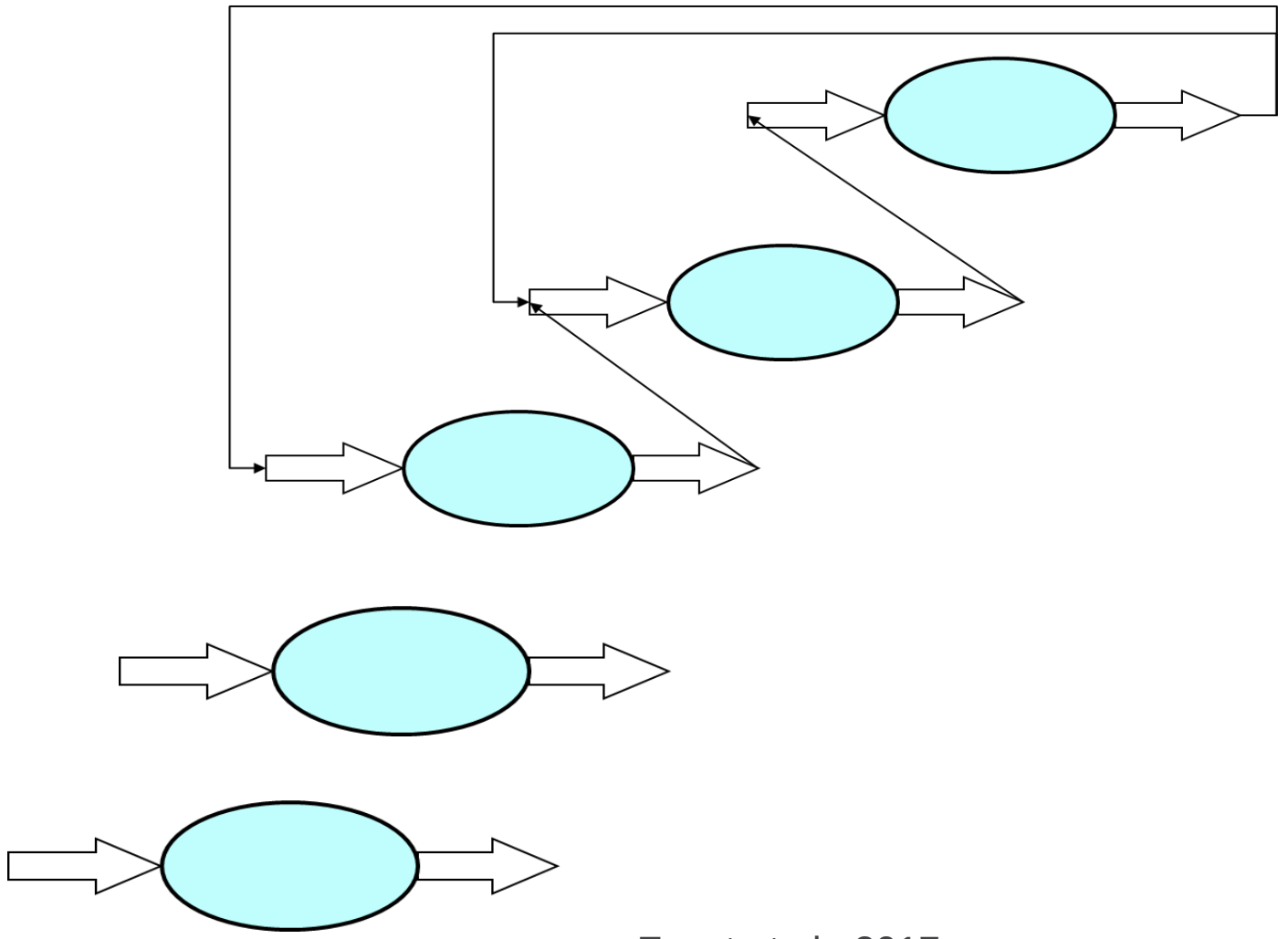
Genetics | Crop physiology | Farming system | Market

Global
Continent
Regional
Farm
Field

Tissue
Cell
Gene
…



Ewert et al., 2017

FAIRagro – excisting expertise in model-model and model-data fusion

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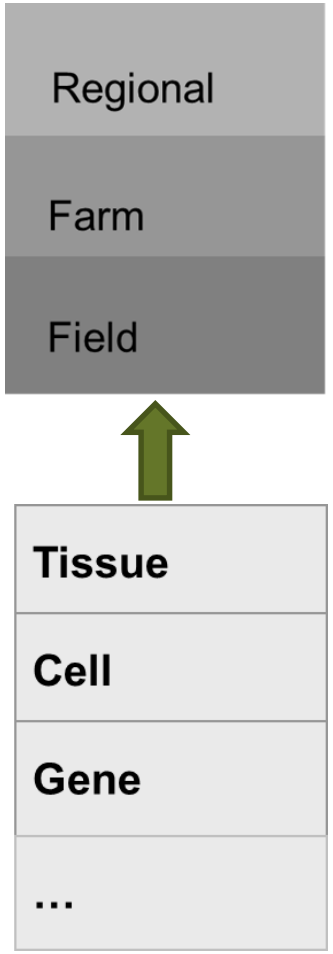
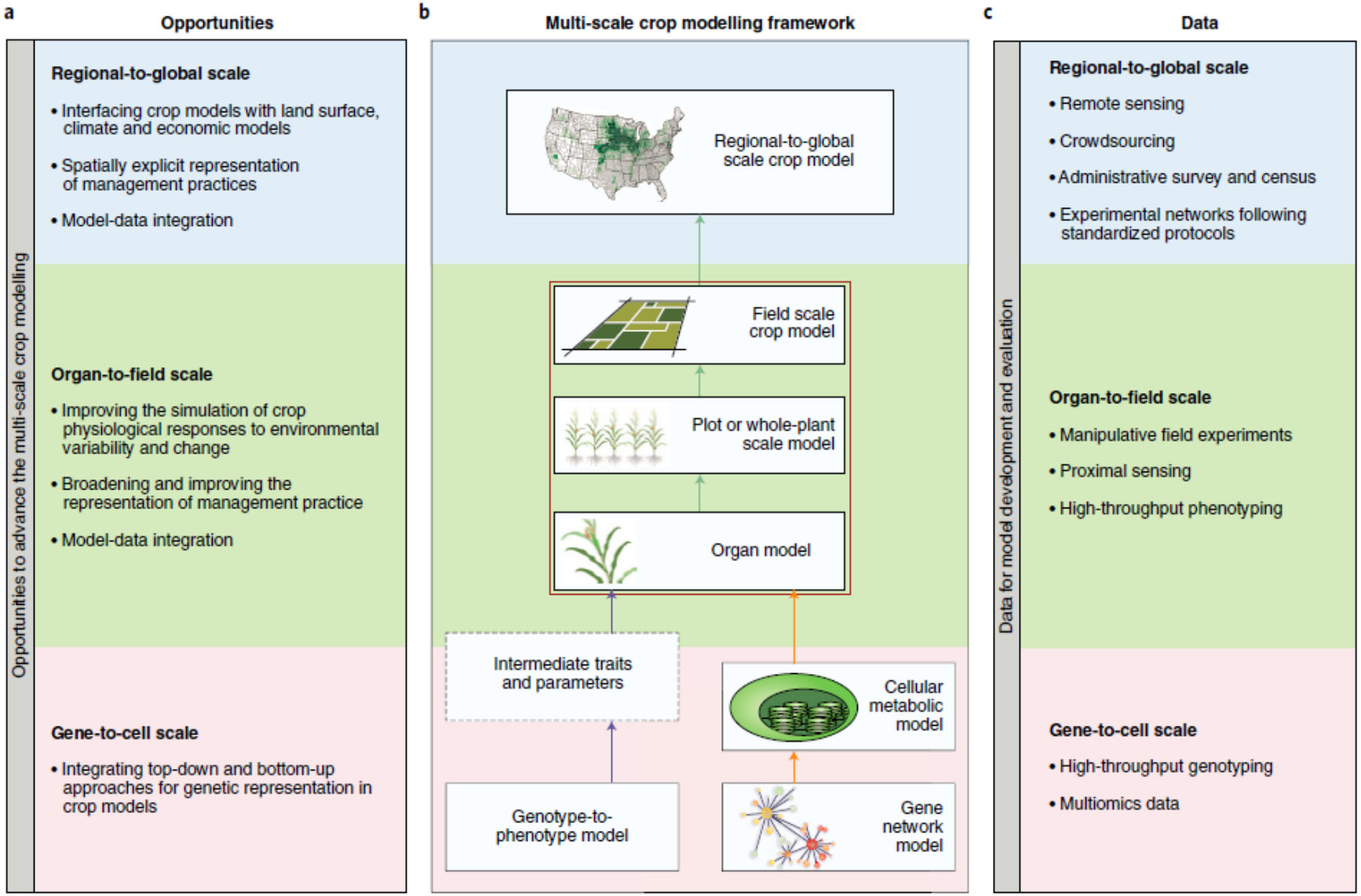
➔ Multi-scale crop modelling framework





Peng et al., Nature Plants, 2020

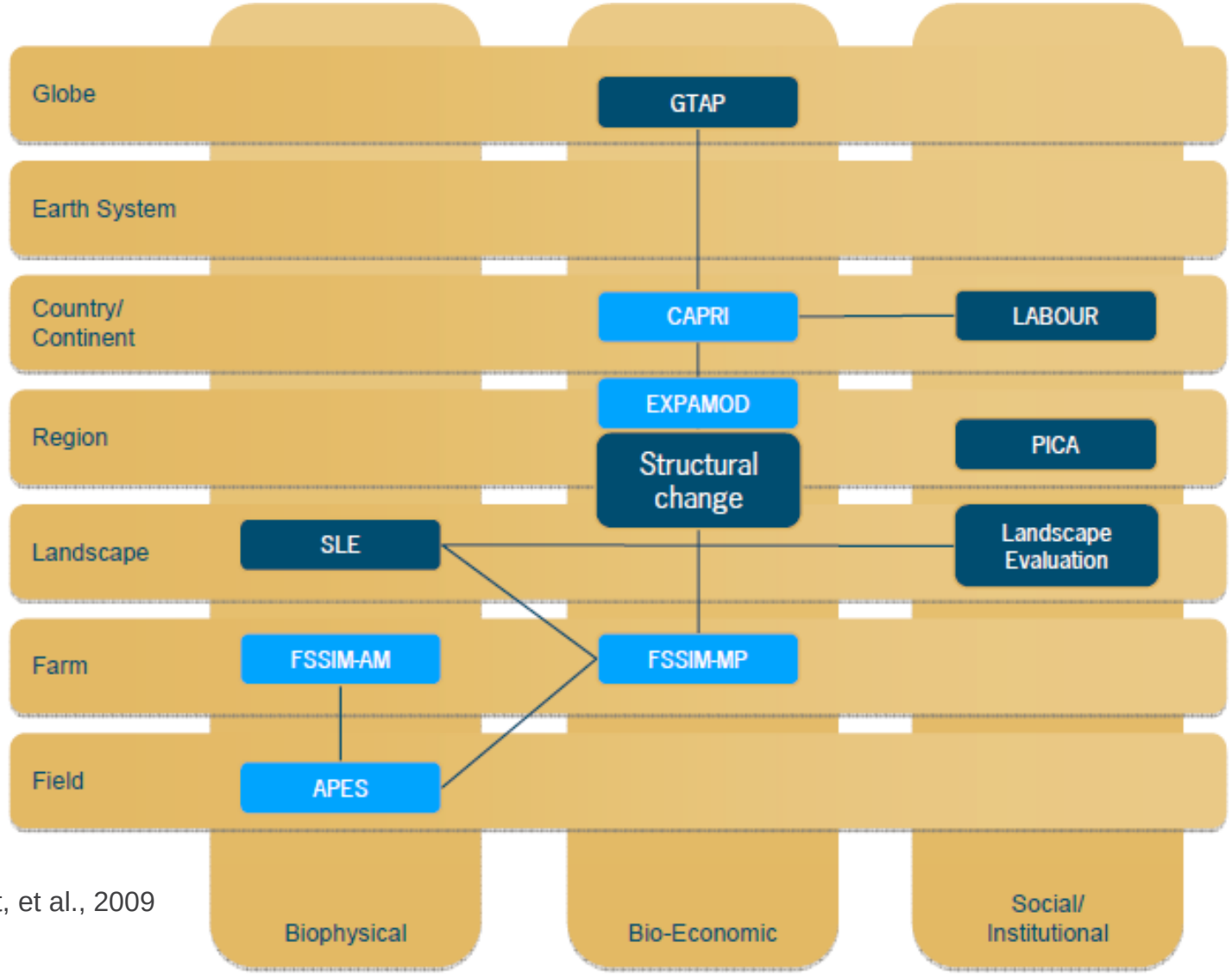
Data providers and users

FAIRagro

seamless

System for Environmental and Agricultural Modelling; Linking European Science and Society – EU FP6 Integrated Project

http://www.seamless-ip.org/
https://www.seamlessassociation.org/



Van Ittersum, et al., 2008; Ewert, et al., 2009

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Data providers and users

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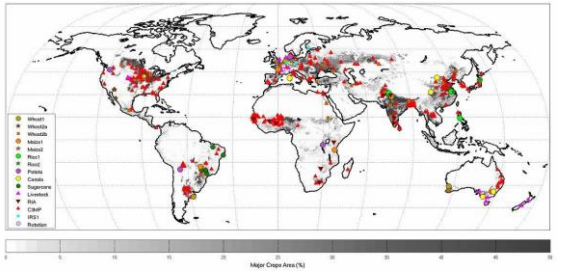
MACSUR a Knowledge Hub of FACCE-JPI

Joint Programming Initiative (JPI) on “Agriculture, Food Security and Climate Change”

https://macsur.eu/



AgMIP

Agricultural Model Intercomparison and Improvement Project

10+	30+	60+	200+	1000+
Years of research	Teams	Partners	Publications	Members

https://agmip.org/

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FAIRagro partners

FAIRagro

- Deutsche Zentralbibliothek für Medizin (ZB MED) Informationszentrum Lebenswissenschaften
- Forschungszentrum Jülich
- Johann Heinrich von Thünen-Institut, Bundesforschungsinstitut für Ländliche Räume, Wald und Fischerei
- Julius Kühn-Institut (JKI), Bundesforschungsinstitut für Kulturpflanzen
- Kuratorium für Technik und Bauwesen in der Landwirtschaft (KTBL)
- Leibniz-Institut für Agrartechnik und Bioökonomie (ATB)
- Leibniz-Institut für Informationsinfrastruktur (FIZ Karlsruhe)
- Leibniz-Institut für Pflanzengenetik und Kulturpflanzenforschung (IPK)
- Leibniz-Zentrum für Agrarlandschaftsforschung (ZALF)
- Rheinische Friedrich-Wilhelms-Universität Bonn Institut für Geodäsie und Geoinformation
- Senckenberg Gesellschaft für Naturforschung
- Technische Universität München, Hans Eisenmann-Forum, Lehrstuhl Digital Agriculture

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How can other partners participate in FAIRagro?

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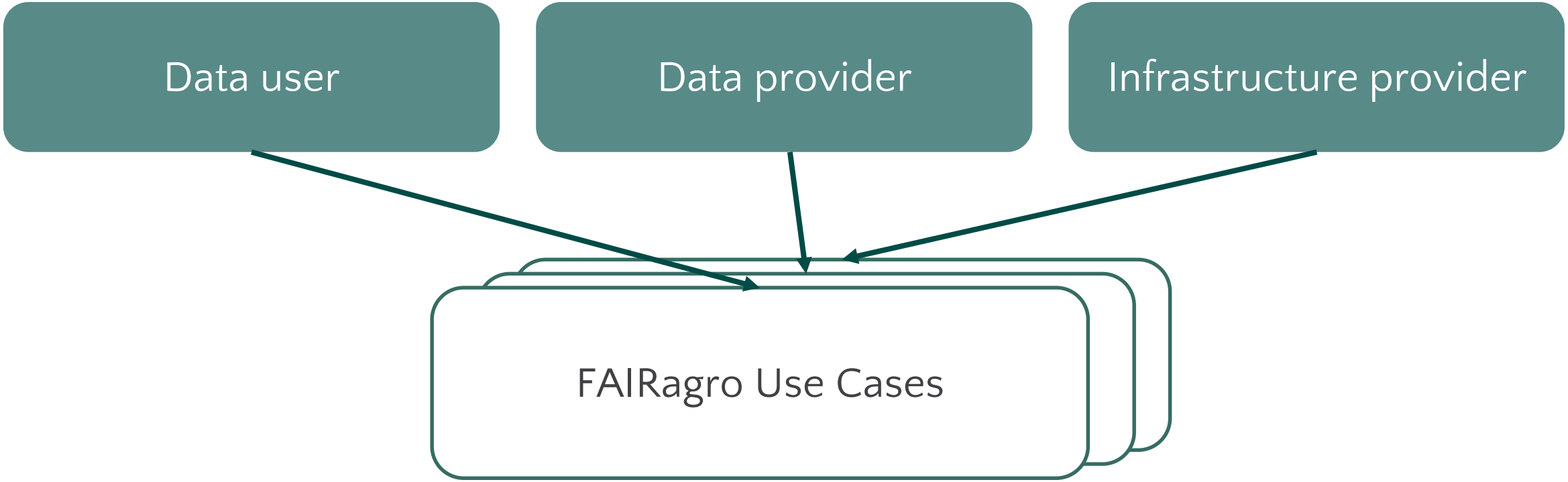
What contributions are possible?



Contact us: fairagro@zalf.de

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How can other partners participate in FAIRagro ➔ NFDI4Agri?

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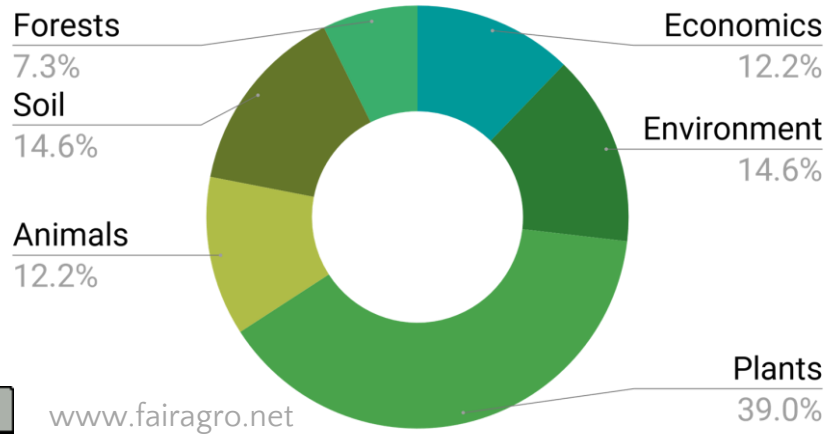
Proposal 2020 ➔ not successful

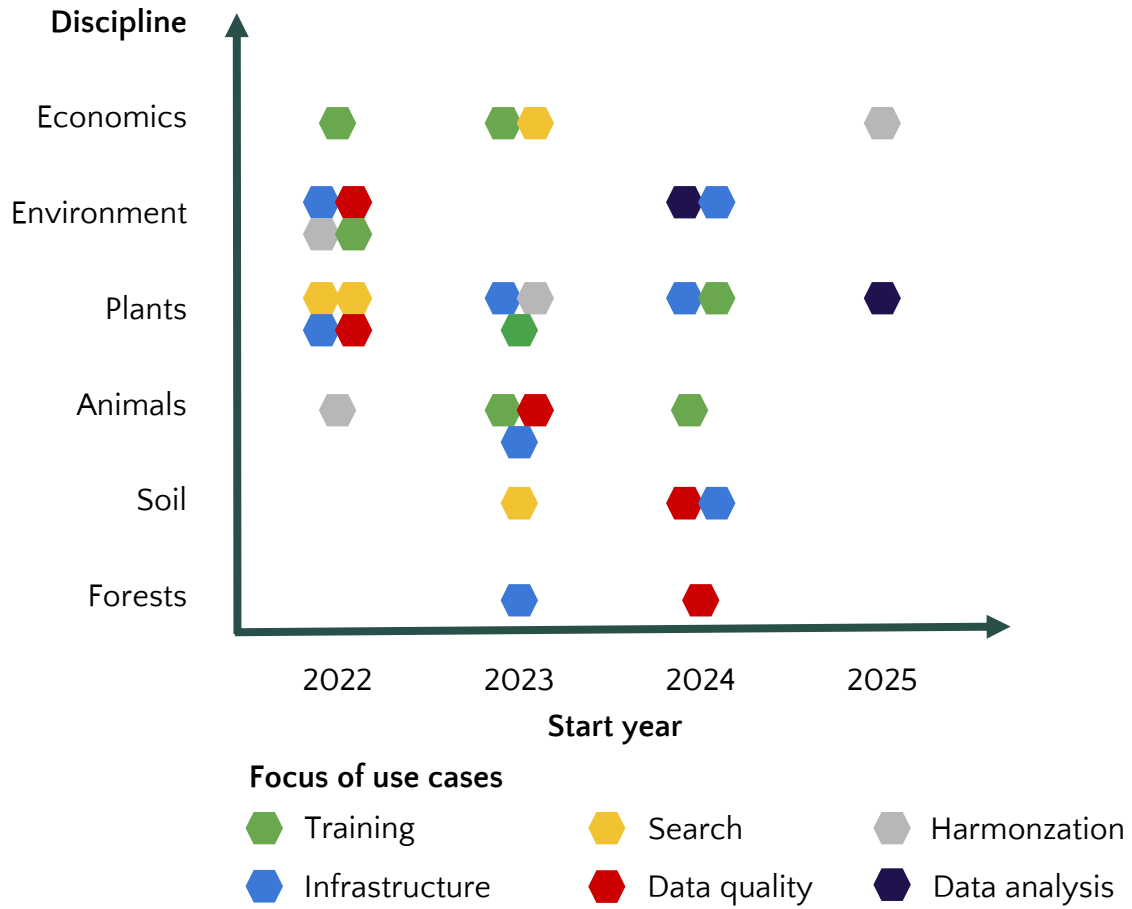
30 use cases from agricultural disciplines

- Cover the range of community needs
- Engage directly with users
- Align work program across use cases
- Demonstrator of services
- Cooperation with other NFDI consortia

Representation of use cases across disciplines



Planned start year of use cases for different disciplines



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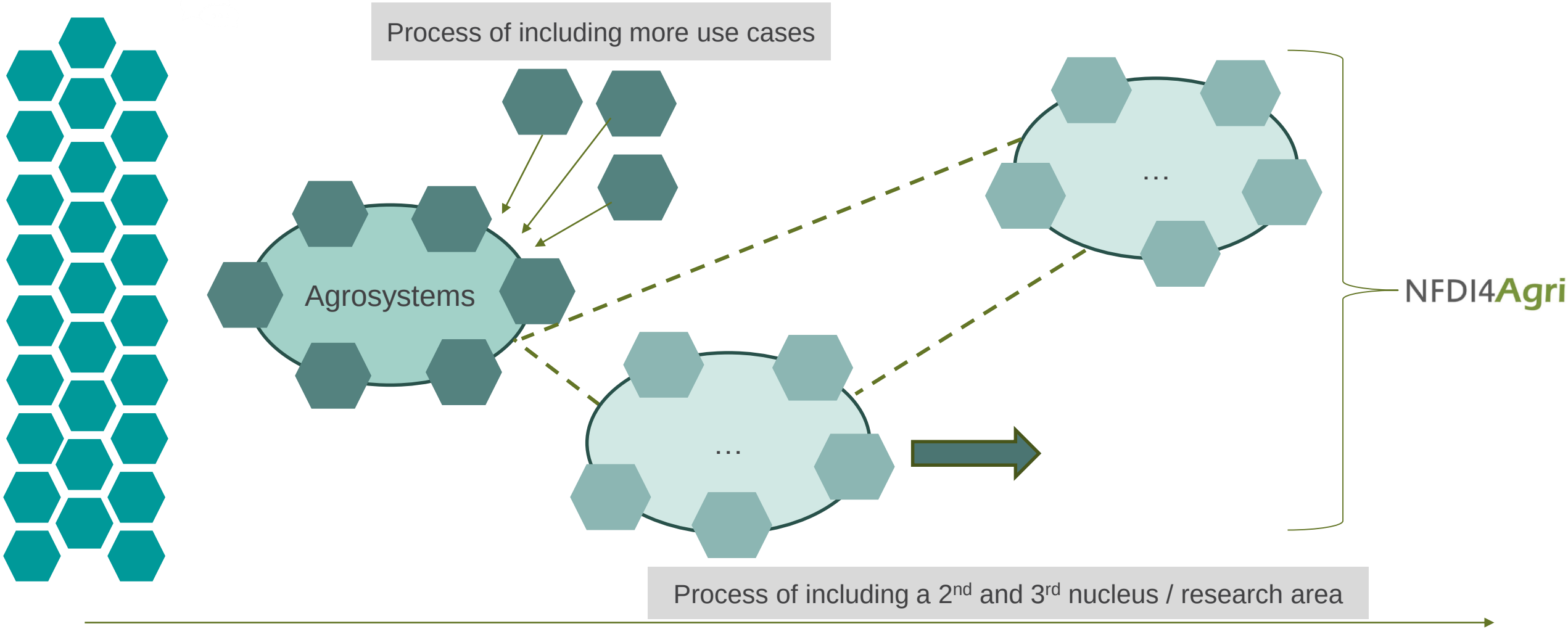

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Sprecher: Prof. Dr. Frank Ewert

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23. Juni 2021

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