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ANNUAL REPORT 2022 & 2023

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LEIBNIZ CENTRE FOR AGRICULTURAL LANDSCAPE RESEARCH (ZALF)



ANNUAL REPORT 2022 & 2023

LEIBNIZ CENTRE FOR AGRICULTURAL LANDSCAPE RESEARCH (ZALF)

RESHAPING LANDSCAPES

WE LEAD THE WAY TOWARDS SUSTAINABLE LANDSCAPES OF THE FUTURE. TOGETHER WITH SOCIETY.

BY RETHINKING AGRICULTURE

WE DELIVER SOLUTIONS FOR AN ECONOMICALLY, ENVIRONMENTALLY AND SOCIALLY SUSTAINABLE AGRICULTURE.

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PREFACE

The years 2022 and 2023 were again characterized by far-reaching global and national developments that are having a strong impact on agricultural landscapes. The war in Ukraine and ongoing geopolitical tensions caused a further increase in energy and production costs along the entire agricultural value chain. At the same time, the challenges posed by climate change, the loss of biodiversity and ensuring food security for a growing world population continue to be pressing. Agriculture is called upon not only to become more productive, but also more sustainable as well as more resilient to climate change and crises. These developments require new solutions that demand both technological and social innovations and include a redesign of land use in general. We can only achieve a sustainable transformation by working together. That is why we want to conduct more research in the context of living labs, intensifying co-design processes with stakeholders from practice, politics and society.



Prof. Frank A. Ewert, Scientific Director of ZALF

ZALF's research projects are making a significant contribution to developing solutions to these challenges. They put a particular focus on strategies for adapting to climate change and reducing emissions in agriculture. The CarbonTillage project (p. 24), for example, shows how the use of a specially developed plough can promote carbon storage in the soil while improving soil structure. In Lusatia, a region severely affected by the coal mining phase-out and the consequences of climate change, the Land-Innovation-Lausitz project (p. 25) is developing innovative approaches for climate-adapted and sustainable land use systems as well as regional circular economies. The SpreeWasser:N project (p. 26) is researching adaptation strategies to the changing precipitation patterns in Brandenburg in order to optimize water storage and strengthen the resilience of agricultural systems. With similar goals in mind, the WetNetBB project (p. 16) is working on the rewetting of peatlands to improve carbon storage while preserving biodiversity. In an urban context, FoodSHIFT2030 (p. 27) is working to convert European food systems to be more low-carbon, circular and plant-based in order to contribute to the reduction of greenhouse gas emissions.

Technological innovations, the processing of complex data and the use of artificial intelligence (AI) are playing an increasingly important role in agriculture. The KIKompAg project (p. 28) combines AI, remote sensing and process-based models to deepen our understanding of agroecosystems at different scales. In FAIRagro an efficient research data management system is being developed, to avoid cost-intensive and redundant research and to ensure the quality of the results obtained (p. 20). The DFG Cluster of Excellence PhenoRob (p. 29) uses, among other things, new robotic technologies to investigate the optimal distribution of crops in small-scale agricultural systems such as the ZALF landscape laboratory patch-CROP. SoilRob (p. 17) is also concerned with new technology and digitalization. The BMBF-funded junior research group is investigating the use of autonomous field robots in spatially and temporally diversified cropping systems to improve soil health and resource efficiency. Our research shows that technological and social innovations, a combination of detailed knowledge and systems understanding, and targeted knowledge transfer are key to making agricultural systems sustainable, resilient and future-proof.

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Another research focus is on a deeper understanding of agro-ecological processes. The ISO-SCALE project (p. 18) is investigating how climate-induced environmental changes affect the distribution and storage of water in agricultural systems, while BENCHMARKS (p. 19) is developing reliable indicators for assessing soil health. This research is crucial to ensure ecosystem services in the long-term and guarantee agricultural productivity in times of climate change.

Finally, the ZALF initiative querFELDein (p. 21) makes an important contribution to science communication by making practice-relevant knowledge on sustainable land use, climate adaptation and environmental protection accessible to a wider audience. Knowledge exchange with society and the involvement of stakeholders from research, practice and politics are central elements of our research strategy.

I cordially invite you to learn more about our research on the following pages.

PROF. FRANK A. EWERT Scientific Director

THE MISSION OF ZALF IS TO DELIVER SOLUTIONS FOR AN ECONOMICALLY, ENVIRONMENTALLY AND SOCIALLY SUSTAINABLE AGRICULTURE – TOGETHER WITH SOCIETY

As a contribution to overcoming global challenges such as climate change, food security, biodiversity conservation and resource scarcity, we develop and design crop systems, integrated in their landscape contexts, that combine food security with sustainability. Therefore, we process complex landscape data with a unique set of experimental methods, new technologies and models as well as socio-economic approaches.

ZALF research is integrated systems research: starting from processes in soils and plants to causal relationships on the field and landscape level up to global impacts and complex interactions between landscapes, society and economy.



RESEARCH STRUCTURE

LEIBNIZ CENTRE FOR AGRICULTURAL LANDSCAPE RESEARCH (ZALF)

PROF. FRANK EWERT (SCIENTIFIC DIRECTOR) MARTIN JANK (ADMINISTRATIVE DIRECTOR)

AGRICULTURE OF THE FUTURE:

ENVIRONMENTALLY FRIENDLY. PRODUCTIVE. DIGITAL. KNOWLEDGE-BASED.

In contrast to natural landscapes, agricultural landscapes are characterized by both their use as well as their users. The interdisciplinary research at ZALF therefore covers not only economically and environmentally sustainable management strategies, but also societal demands on agricultural landscapes. Thus, solutions are generated that address grand challenges facing society as a whole: climate change, sustainable land use, food security and conservation of natural resources, biodiversity and ecosystem services.

Three Research Areas, one Research Platform and an Experimental Infrastructure Platform provide the necessary disciplinary excellence and technical infrastructure.

RESEARCH AREAS



Research Area 1 »Landscape Functioning« How do agricultural landscapes function? Co-Heads: Prof. Steffen Kolb Prof. Michael Sommer



Research Area 2 »Land Use and Governance« How can we sustainably develop and shape intensively used agricultural landscapes? Co-Heads: Prof. Sonoko Dorothea Bellingrath-Kimura Prof. Bettina Matzdorf



Research Area 3 »Agricultural Landscape Systems« What will the agricultural landscapes of the future look like? Co-Heads: Prof. Katharina Helming Prof. Heidi Webber

RESEARCH PLATFORMS



Research Platform »Data Analysis & Simulation« Co-Heads: Prof. Gunnar Lischeid Prof. Claas Nendel



Experimental Infrastructure Platform Head: Dr. Gernot Verch

ZALF RESEARCH AREAS AND RESEARCH PLATFORMS

AS OF NOV. 4TH, 2024



Research Area 1 »Landscape Functioning«

Research activities lead towards an integrated understanding of biogeochemical cycles in agricultural landscapes (C, N, Si) – including interactions between land and atmosphere (e.g. trace gas and dust fluxes) and their relevance for agricultural production. The focus is on interactions between crop plants, microorganisms and soils as well as lateral transport processes.



Research Area 2 »Land Use and Governance«

Research Area 2 »Land Use and Governance« analyzes the interactions between land use, ecosystems, their services to society, emerging conflicts and the governance of the overall system. It is the aim to develop resource-efficient, site-specific and conflict-minimizing production and governance systems which account for the social and economic value of agricultural ecosystems for humans.



Research Area 3 »Agricultural Landscape Systems«

Research Area 3 »Agricultural Landscape Systems« integrates methods from various disciplines in order to provide knowledge-based support for decisions on sustainable agricultural management. Future framework conditions and systemic changes in agricultural landscapes are anticipated, so that todays' decision making on agricultural landscape use can have a resilient, sustainable and beneficial effect in the future.



Research Platform »Data Analysis & Simulation«

At ZALF, the focus is on interactive and easy-to-use models and data analysis methods in landscape research. The research platform »Data Analysis and Simulation« develops a coherent concept for integration of data, models and simulation methods for landscape research, from technical solutions to a landscape theory.



Experimental Infrastructure Platform

The Experimental Infrastructure Platform integrates ZALF's numerous field- and landscape-scale research infrastructures such as the Experimental Stations, the Landscape Laboratory »AgroScapeLab Quillow« and landscape monitoring. In addition, the platform supports experimental research by, for example, operating and maintaining scientific instrumentation, conducting measurement campaigns and providing and managing experimental sites on grass- and croplands.



RESEARCH AREA 1 »LANDSCAPE FUNCTIONING«

PROF. STEFFEN KOLB PROF. MICHAEL SOMMER

HOW DO AGRICULTURAL LANDSCAPES FUNCTION?

Comprising of six working groups at present, Research Area 1 »Landscape Functioning« is performing knowledge-oriented research on deepening our understanding of processes, cause-and-effect relationships and causal chains as well as the interactions within and among the different landscape elements such as cropland, grassland, waterbodies and forests. In this context, memory effects must also be considered, i.e. mid- to long-term effects of previous actions or interventions in agricultural landscapes. Research activities in Research Area 1 include the detection and analysis of new phenomena, the continuous improvement and development of research methods as well as the analysis of process dynamics by coupling data with models.

The aim of our research is to improve the understanding of biogeochemical cycles (carbon, nitrogen, silicon) and their driving forces (soil, plants, microorganisms) in agricultural landscapes. This is where the research of our individual working groups is interlinked. The results are incorporated into the development of sustainable land management systems, as it is being done in Research Areas 2 and 3. For crossscale research questions, Research Area 1 works closely with the Research Platform »Data Analysis & Simulation« as well as Research Area 3 »Agricultural Landscape Systems«. The central platform for investigations and experiments on the field and landscape scale is the »AgroScapeLab Quillow« of the Experimental Infrastructure Platform.

CORE RESEARCH QUESTIONS:

- Which role do the long-term structures and processes of soil landscapes play in recent water and solute fluxes, biogeochemical cycles (C, N, Si), land-atmosphere interactions and agricultural productivity?
- How do positive and negative interactions between crop plants and their microbiome influence agricultural productivity, C and nutrient dynamics, and land-atmosphere interactions?
- How can stable isotopes and radionuclides be used to quantify and spatially characterize C and N metabolic processes in soils and land-atmosphere interactions?

WORKING GROUPS

Landscape Pedology Contact: Prof. Michael Sommer | sommer@zalf.de

Silicon Biogeochemistry Contact: Prof. Jörg Schaller | joerg.schaller@zalf.de

Isotope Biogeochemistry & Gas Fluxes Contact: Dr. Maren Dubbert | maren.dubbert@zalf.de Microbial Biogeochemistry Contact: Prof. Steffen Kolb | steffen.kolb@zalf.de

Soil Erosion & Feedbacks Contact: Prof. Michael Märker | michael.maerker@zalf.de

Fungal Interactions (until March 2024) Contact: Dr. Marina Müller | mmueller@zalf.de



RESEARCH AREA 2 »LAND USE AND GOVERNANCE«

PROF. SONOKO DOROTHEA BELLINGRATH-KIMURA PROF. BETTINA MATZDORF

HOW CAN WE SUSTAINABLY DEVELOP AND SHAPE INTENSIVELY USED AGRICULTURAL LANDSCAPES?

The focus of this Research Area lies on the investigation of land use practices and their interactions with associated ecosystem services and biodiversity. These interactions are not only studied for agriculturally managed crop- and grasslands, but also in the context of adjacent ecosystems such as forests and waterbodies. It is the aim to use research results to support the site-adapted management of agricultural landscapes under the impact of climate change and in different socio-economic and socio-cultural contexts. This adapted management must be supported by stakeholders and institutionally promoted. Research on the interactions, the development of suitable indicators for the valorization of the services provided by agricultural landscapes and embedded ecosystems, the development of suitable governance approaches as well as the dissemination of institutional, technological and management-related innovations as a prerequisite for a necessary transformation of agricultural systems are additional topics of research in this Research Area.

CORE RESEARCH QUESTIONS:

- What are the effects of individual management measures and land use and on the provisioning of ecosystem services and biodiversity in agricultural landscapes and how can these services be improved?
- How to address and value the provisioning, change and site-dependency of ecosystem services and biodiversity as well as the trade-offs between them and agricultural management measures?
- What are the expectations and preferences of different stakeholder groups regarding ecosystem services and biodiversity? What are the resulting locally adapted land use options in agricultural landscapes?
- What are suitable governance approaches for ensuring the societally desired provisioning of ecosystem services and biodiversity and for reducing land use-related conflicts? What is the role of research in the development and dissemination of such innovations and how can it support the necessary transformations?

WORKING GROUPS

Resource-Efficient Cropping Systems Contact: Dr. Moritz Reckling | moritz.reckling@zalf.de

Sustainable Grassland Systems

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Provisioning of Ecosystem Services in Agricultural Systems

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Provisioning of Biodiversity in Agricultural Systems Contact: Dr. Michael Glemnitz | mglemnitz@zalf.de

Biodiversity of Aquatic and Semiaquatic Landscape Features

Contact: Dr. Doreen Werner | doreen.werner@zalf.de

Lowland Hydrology and Water Management Contact: Prof. Christoph Merz | merz@zalf.de

Biotic Interactions between Forest and Agricultural Land (until Sept. 2024) Contact: Prof. Monika Wulf | mwulf@zalf.de

Governance of Ecosystem Services Contact: Prof. Bettina Matzdorf | matzdorf@zalf.de

Sustainable Land Use in Developing Countries Contact: Prof. Stefan Sieber | stefan.sieber@zalf.de

Co-Design of Change and Innovation Contact: Dr. Maria Busse | maria.busse@zalf.de Lead until Sept. 2024: Prof. Thomas Weith & Dr. Rosemarie Siebert

Environmental Justice in Agricultural Landscapes Contact: Dr. Lasse Loft | lasse.loft@zalf.de



RESEARCH AREA 3 »AGRICULTURAL LANDSCAPE SYSTEMS«

PROF. KATHARINA HELMING PROF. HEIDI WEBBER

WHAT WILL AGRICULTURAL LANDSCAPES OF THE FUTURE PROVIDE?

Agricultural landscape systems are subject to constant changes. The uses of the landscape interact with natural site conditions and are changed by external factors such as climate change and socio-economic dynamics. Our goal is to understand these complex changes with foresight and to design them in such a way that sustainable land use is possible. This means maintaining and improving agricultural productivity, biodiversity, ecosystem services and the attractiveness of landscapes as recreational areas.

The future developments of agricultural landscape systems are of utmost importance for the implementation of many sustainability goals. Agricultural landscapes are the object of research in numerous scientific disciplines, each with its own specific theories and methods. The task of the Research Area »Agricultural Landscape Systems« is to take a systemic approach across disciplines and scales in order to develop robust assessments of landscape use despite their complexity and to create a basis for action for farmers, political decision-makers and other users of agricultural landscapes.

CORE RESEARCH QUESTIONS:

- How do different systems and their interlinkage develop and what contribution can they make at landscape level to contribute to sustainable development? Which determinants and patterns do they follow? How can they be strengthened in urban-rural relationships? How do land use, the supply chain and food systems interact and how can they be coordinated so regional sustainable development is reinforced?
- How can modelling approaches of cropping systems be combined to generate insights to support improved incomes, build climate resilience, promote biodiversity and reduced environmental impacts across different spatio-temporal scales?
- Future agricultural landscapes are affected by framework conditions such as climate change, demand changes or policy regulations. But what specific role do these conditions play for agricultural management systems and value networks? What is the impact on ecosystem services of landscapes or on the resilience and resource efficiency of farms? What methods and metrics can be used to conduct such assessments, even if the empirical basis is not well consolidated?

WORKING GROUPS

Impact Assessment of Land Use Changes Contact: Prof. Katharina Helming | helming@zalf.de

Land Use Decisions in the Spatial and System Context Contact: Dr. Maria Kernecker | maria.kernecker@zalf.de Lead until July 2024: Dr. Annette Piorr Integrated Crop and Grassland Systems Analysis and Assessment Contact: Prof. Heidi Webber | heidi.webber@zalf.de

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RESEARCH PLATFORM »DATA ANALYSIS & SIMULATION«

PROF. GUNNAR LISCHEII PROF. CLAAS NENDEL

CONTRIBUTION TO ZALF RESEARCH

A sound knowledge of a variety of interacting processes is a necessary prerequisite for a sustainable use of landscapes. These processes are studied in numerous interconnected research projects, generating large sets of empirical data with various degrees of precision. These data need to be well documented and analyzed using powerful statistical methods. The Research Platform »Data Analysis and Simulation« ensures the compilation of meta-data, a long-term storage of well documented data and the development of user friendly interfaces for data research. In addition, powerful methods for the analysis of high-dimensional heterogeneous data sets with differing temporal and spatial coverage are further developed and applied, considering explicitly typical characteristics of these data sets like non-linearity, instationarity, spatial correlation and temporal memory.

Hypotheses derived from data analysis are tested using numerical models. Modelling is a well-established tool in many scientific disciplines with a steadily growing number and complexity of available models. Due to the complexity of landscape processes a variety of model approaches have been developed that need to be integrated in new model platforms to support integrated landscape research approaches. Beyond model development, additional challenges need to be addressed in landscape research: methods for model calibration and validation, data assimilation techniques, datadriven model approaches and model ensemble behaviour close to the limits of applicability. Especially models that integrate various processes at the landscape scale to describe interactions at the interface of nature, economy and society need more research. The research platform »Data Analysis and Simulation« closes that gap and provides a framework for the integration of various disciplines and modelling approaches for a better understanding of the functioning of agricultural landscapes.

WORKING GROUPS

Dimensionality Assessment and Reduction

Contact: Prof. Gunnar Lischeid | lischeid@zalf.de

Landscape Modelling Contact: Prof. Claas Nendel | claas.nendel@zalf.de

Ecosystem Modelling Contact: Dr. Ehsan Eyshi Rezaei | ehsaneyshi.rezaei@zalf.de Lead until Dec. 2024: Prof. Claas Nendel.

Multi-Scale Modelling Contact: Prof Frank Ewert | wiss.direktor@zalf.de Artificial Intelligence for Smart Agriculture Kontakt: Prof. Masahiro Ryo | masahiro.ryo@zalf.de

Data Infrastructures (Service) Contact: Dr. Xenia Specka | specka@zalf.de

Research Data Management (Service) Contact: Dr. Nikolai Svoboda | nikolai.svoboda@zalf.de

Model & Simulation Infrastructure (Service) Contact: Michael Berg-Mohnicke | michael.berg@zalf.de



EXPERIMENTAL INFRASTRUCTURE PLATFORM

OR. GERNOT VERCH

CONTRIBUTION TO ZALF RESEARCH

The Experimental Infrastructure Platform integrates ZALF's numerous field- and landscape-scale research infrastructures such as the Experimental Stations, the Landscape Laboratory »AgroScapeLab Quillow« and landscape monitoring into a single organisational unit headed by scientists with special technical expertise. The main task of the Experimental Infrastructure Platform is the implementation and support of institutionally and third-party funded research projects on behalf of ZALF working groups in the Research Areas and the Research Platform. The Experimental Infrastructure Platform is responsible for ensuring the stipulated quality and functionality of the technical scientific instrumentation (e.g. lysimeters, large automatic gas measurement chambers, irrigation system, mobile gantry crane with automated measuring technology for greenhouse gases) and the continuous development of the Experimental Infrastructure in accordance with the ZALF Research Strategy.

The three working groups of the Experimental Infrastructure Platform in Dedelow, Paulinenaue and Müncheberg support ZALF scientists both in the planning and the implementation phase of their projects, with a particular emphasis on the consideration of local aspects and the collaboration with local stakeholders. The services of the working groups include human resources and technical support, the planning, installation and management of field experiments on crop- and grassland, the maintenance and provisioning of field sites, measurement devices and instruments as well as the servicing and operation of technical facilities. On request, the service groups also conduct crop and landscape measurements as well as mapping and sampling campaigns and document the management of field sites. In addition, the service groups also support scientists from the Research Areas and Research Platform with respect to the organisation of information events for local stakeholders in the study region (e.g. farmers, authorities) and transfer activities such as field days, trials and presentations.



WORKING GROUPS

Experimental Station Dedelow (Service) Contact: Dr. Gernot Verch | verch@zalf.de

Experimental Station Paulinenaue (Service) Contact: Dr. Axel Behrendt | abehrendt@zalf.de Experimental Station Müncheberg (Service)

Contact: Dr. Katja Kramp | katja.kramp@zalf.de Lead until Sept. 2024: Dr. Dietmar Barkusky.



SELECTED NEW PROJECTS

LAND USE AND BIOMASS PRODUCTION ON WET PEATLANDS

MILOŠ BIELČIK, STEFFEN KOLB, JOANA BERGMANN



Peatlands have been widely drained for agriculture, creating fertile soils rich in organic matter. However, this also has unintended consequences: biodiversity, water retention capacity and soil fertility all decrease over time and the vast amount of carbon stored in these areas can now become a significant source of agricultural greenhouse gas emissions. Therefore, interest in rewetting peatlands as a natural climate protection measure is growing. While the basic principles of rewetting are simple, there are many challenges that require further scientific research, spanning from microbial ecology to economics. WETNETBB addresses these challenges with a transdisciplinary living lab approach.

While raising the groundwater level seems simple in principle, WETNETBB is looking for ways to continue agricultural use on the rewetted areas.



In WETNETBB, a diverse, transdisciplinary consortium was formed to address major societal issues surrounding rewetting of peatlands. A living lab approach is currently being established to foster collaboration between research and practice. This will

maximize the likelihood of widespread adoption of alternative agricultural practices on wet soils, known as paludiculture. The aim is to ensure continuous economic profitability for landowners, while partially restoring wetland ecosystems to halt biodiversity loss and stop the release of accumulated carbon in the form of greenhouse gases.

While the basic principles involve raising the water table to lower carbon dioxide emissions and create suitable conditions for alternative wetland crops, a deeper understanding and management of complex biological and socio-economic processes can greatly enhance the economic, ecological, and climatic benefits, as well as improve adoption of this alternative agricultural model.

Scientists at ZALF are conducting fine-scale field research at our intensive monitoring sites to better understand and predict the responses of plants and microbes to changes in the water table and temperatures, and the subsequent impact these may have on greenhouse gas fluxes, including carbon dioxide, nitrous oxide, and methane.

At the same time, social and economic scientists at ZALF are generating necessary supportive framework conditions for

rewetting and the establishment of paludicultures, including the development of new value chains. These two research areas are exciting and have scientific value in their own. However, what makes WETNETBB truly unique is the living lab approach, in which the project implements concrete rewetting measures under real-world conditions with practitioners, who are supported in developing, testing and evaluating the paludiculture practices using scientific models and social science research. In addition, synergies between various ecosystem services will be promoted, such as paludiculture production, greenhouse gas emission reduction and biodiversity enhancement.

 Project: Management and biomass utilisation of wet fens: Network of model and demonstration projects in peatland regions of Brandenburg (WETNETBB) Term: 2023–2033
 Funding agency: FNR Lead at ZALF: S. Kolb (steffen. kolb@zalf.de) Partner: ZALF, ATB, GFZ, HNEE, LfU

IMPROVED SOIL HEALTH WITH AUTONOMOUS ROBOTS IN DIVERSIFIED CROPPING SYSTEMS

KATHRIN GRAHMANN, LUKAS THIELEMANN, LINA ROHLMANN, BJÖRN G. WANG



Climate change and the growing demand for food and renewable raw materials are increasing the pressure to make agriculture both more efficient and sustainable. Spatially and temporally diversified cropping systems can contribute to solve those trade-offs. The SOILROB junior research group is investigating how the use of autonomous field robots in diversified cropping systems can support improving soil health and thus achieving various sustainability goals. SOILROB further aims to improve the understanding of soil health complexity in those systems and to define requirements for field robot-supported cropping systems and resulting land use conflicts.

The autonomous Naio Oz robot uses its harrow and hoeing units to mechanically control weeds in and between the rows of grain maize in patchCROP.



Simplification of agricultural landscapes through specialization in a small number of crop species, short crop rotations and the enlargement of fields poses a significant threat to the provision of critical ecosystem services (ESS) on a global scale. Diverse

cropping systems integrated within small-scale, demand-oriented agricultural landscapes could preserve soil functions while maintaining agricultural productivity. An important factor for this is soil health, a multifaceted concept that can be evaluated through various measurable indicators, enabling a direct comparison between diversified and conventional farming systems and providing insight into their respective impacts on ecosystem services and soil functions.

Diversification of agricultural landscapes through complex cropping systems requires more frequent, small-scale management operations, leading to increased demands in both planning and execution. Field robots offer a promising solution by enabling integrated management of smaller, diversified field structures. For example, they can reduce herbicide use in weed control through precision techniques like spot spraying or eliminate the need for chemicals entirely with mechanical control such as hoeing. Additionally, robots have the potential to enhance biodiversity by employing weed control strategies based on individual plant characteristics or specific thresholds, while also minimizing soil compaction due to their lower weight.

SOILROB investigates the potential of field robots as a solution for diversified cropping systems and their impact on improving soil health. The majority of field research will be carried out in the patchCROP landscape experiment. During the initial project years, measurements and sampling will be carried out to quantify physical, chemical and biological indicators with regard to soil-based ESS: biomass production and food security, filter function and water storage, carbon storage and biodiversity and habitat quality. A sensitivity analysis will identify one to three key indicators for each soil-based ESS, which will then be examined in satellite trials across various locations in Germany where autonomous robots are in place. SOILROB thus encompasses a range of soil types, crops, and robotic systems, generating broadly applicable insights into the benefits of field robotics for soil health. In addition, SOILROB is developing simulations of selected visualizable soil properties, such as water infiltration and compaction, within the digital twin digi.farming.lab, which was created in the virtual environment of the popular computer game Farming Simulator.

Project: Increasing soil health through the use of autonomous field robots in diversified agricultural landscapes (SOILROB) Term: 2023–2028 Funding agency: BMBF Lead at ZALF: K. Grahmann (kathrin.grahmann@zalf.de) Partners: TU Dresden, IfZ, LfL, ATB, HAIP, Kronos https://www.soilrob.de

INNOVATIVE MODELS FOR HIGH FREQUENCY, CROSS SCALE WATER PARTITIONING

MAREN DUBBERT, GÖKBEN DEMIR



Climate change is increasing the frequency and severity of environmental disturbances, such as drought, heavy rain and heat waves, threatening ecosystem services and food security. Understanding and managing these impacts is critical to maintaining agricultural productivity and ensuring water resource availability for various stakeholders. Thus, fully understanding the complex interactions and feedback processes that govern water and carbon cycles is paramount. By investigating these processes, the ISO-SCALE project aims to develop new tools for high-resolution, cross-scale analyses that can provide deeper insights into the dynamics of water partitioning and storage in cropping systems.

Field monitoring setup includes an eddy covariance tower at the ISO-SCALE field site.



In the Leibniz Excellence-funded project ISO-SCALE, we explore soil-plant-atmosphere continuum (SPAC) processes to assess the ecohydrological responses of plants and plant-soil systems to climate change-induced environmental perturbations. We investigate

spatio-temporal variations of evapotranspiration (ET, which includes soil evaporation and plant transpiration) and soil water partitioning in cropland systems.

The project is driven by the urgent need to manage the impact of climate change on water resources and croplands. Understanding the dynamics of SPAC processes is crucial for predicting and mitigating the effects of climate change on agriculture. We hypothesize that spatio-temporal variability in ET partitioning is influenced by plant phenology, management practices, and soil water status at the seasonal scale, while atmospheric drivers dominate at the diurnal scale. Short-term extreme events leave a long-term legacy on plant behaviour and soil moisture variation, making rapid plant availability and root plasticity critical for resilience and yield performance.

The complex feedback processes within SPAC are critical for both water and carbon cycling, affecting plant growth, groundwater recharge, and agricultural yields. However, traditional approaches are limited in providing a holistic understanding of these interconnected processes. Thus, ISO-SCALE addresses several key challenges, such as capturing dynamic SPAC interactions across scales using high-frequency, cross-scale, dense field measurements. We take advantage of recent advances in stable water isotope monitoring at a research site located at

the Reinshof Experimental Farm (Göttingen, Germany). The field monitoring setup includes an eddy covariance tower that provides high temporal resolution measurements of the isotopic composition of ET. In October 2023, the setup was completed with continuous monitoring of soil water isotopes, soil water content, and soil temperature within the tower footprint. Weekly samples are collected to track the stable water isotope signature in all eco-hydrological units. The eddy covariance based data can be combined with soil and plant isotope signatures to separate ET into its component fluxes, i. e. transpiration and evaporation. Our setup also allows us to quantify the isotopic signatures, and sources of ET, groundwater, stream and drainage water. The integration of cross-scale processes with high-frequency stable water isotope data into a multiscale model will improve the understanding of processes that are not directly observable, such as water partitioning and storage dynamics in crop systems. Ultimately, we aim to improve agricultural management practices and resilience to climate change.

Project: Stable Isotope and AI supported model development for high frequency, cross scale water partitioning (ISO-SCALE) **Term:** 2023–2026 **Funding agency:** Leibniz Collaborative Excellence Fund **Lead at ZALF:** M. Dubbert (maren.dubbert@zalf.de) **Partners:** University of Göttingen, IGB Berlin

A HOLISTIC ANALYSIS OF SOIL HEALTH

CARSTEN PAUL, CAMILLE IMBERT



The concept of soil health goes beyond the analysis of individual chemical, physical or biological parameters. We must understand soils as significant living systems that support the productivity and health of plants and animals, maintain or even improve water and air quality, and continue to provide ecosystem services over the longer term. To take effective action to improve soil health, reliable indicators are needed to assess soil health across different land uses and spatial scales. This is the focus of the BENCHMARKS project.

The ZALF-led patchCROP experiment in Germany is one of 27 international case study sites in the BENCHMARKS projects.



BENCHMARKS aims to validate and further develop indicators for monitoring soil health across Europe in the context of agricultural, forestry and urban soils. In doing so, BENCHMARKS will address local, regional, national and international scales. A Soil

Health Indicator Framework (SHIF) will be jointly developed and tested, using data from 27 case study sites across Europe. This data will also allow BENCHMARKS to define benchmark values and critical thresholds for respective indicator values. ZALF contributes to this effort by providing two case study sites: the patchCROP experiment in Tempelberg and a long-term field experiment on the effects of a no-tilling system in Lietzen.

Through extensive stakeholder dialogue, BENCHMARKS will facilitate the use of the SHIF in transparent, harmonized and cost-effective multi-scale and multi-user monitoring frameworks. The BENCHMARKS approach allows for tailored solutions that take into account biogeophysical heterogeneities between locations and land uses, different soil health objectives of stakeholder groups as well as options and limitations associated with different spatial scales. It also takes into account the capacities and limitations of those responsible for monitoring, reporting and verification (MRV). At the same time, BENCHMARKS will ensure that the resulting monitoring schemes are scientifically sound and address soil health as a whole, rather than selected elements such as soil fertility or carbon storage. Within BENCHMARKS, ZALF leads the work package responsible for dialogue with MRV users, to facilitate the implementation of the SHIF developed by BENCHMARKS at local, national and international scales.

At a European level, BENCHMARKS will co-develop a Soil Health Dashboard together with the European Joint Research Council. In addition, the results generated by BENCHMARKS will be highly relevant to the planned revision of the European Soil Monitoring Law.

Project: Building a European Network for the Characterisation and Harmonisation of Monitoring Approaches for Research and Knowledge on Soils (BENCHMARKS) **Term:** 2023–2027 **Funding agency:** EU **Lead at ZALF:** C. Paul (carsten.paul@zalf.de) **Partners:** Wageningen U+R, AGES, CRISP, INRAE and 25 more partners https://soilhealthbenchmarks.eu

A FAIR DATA INFRASTRUCTURE FOR AGROSYSTEMS RESEARCH

XENIA SPECKA, CARSTEN HOFFMANN, FRANK EWERT



FAIRagro is building a FAIR research data management for the agrosystems research community, creating the basis for sustainable crop production – now and in the future.

Efficient research data management (RDM) significantly supports research projects, avoids cost-intensive and redundant research and ensures the quality of the obtained results. FAIRagro is a consortium within the National Research Data Infrastructure (NFDI) association, in which around 30 agricultural research institutions across Germany work together. The aim is to provide researchers with a FAIR and quality-assured RDM system for the generation, publication and access to research data. FAIRagro intends to provide innovative and user-friendly data services as well as modern data science methods for the further development of agrosystems research.



Agriculture is facing growing challenges: increasing food demand with stagnating productivity, climate change, loss of biodiversity and degradation of natural resources. Improved availability and reuse of agricultural research data offers the potential to

help overcome these challenges.

FAIRagro is a joint initiative of the NFDI association to improve the usability and accessibility of research data in agricultural systems research. So far, around 30 universities, governmental institutions, research institutions and societies are involved in FAIRagro. The project is coordinated by ZALF.

The aim of FAIRagro is to provide researchers with a modern, fair and quality-assured RDM system for the generation, publication and access to research data as well as innovative and user-friendly RDM services. Using specific examples from agrosystems research (Use Cases), FAIRagro specifically addresses the needs of different disciplines, such as plant phenotyping, nutrient management and digital agriculture.

FAIRagro's Data Steward Service Center is a network of data stewards who are available to answer questions about RDM. They can be contacted via a helpdesk and provide information on the publication or reuse of data, for example. FAIRagro will significantly facilitate access to RDM by providing guidelines, training and information services as well as opportunities for personal consultation. In addition, there are various research data infrastructures (RDI), such as the BonaRes Repository at ZALF, in which researchers in agricultural science can publish their research data and thus share their findings with the community. However, the existing agricultural Use Cases RDIs in Germany are not yet connected with each other and there is a lack of uniform standards for an overarching RDM with central access points. Nevertheless, this is an important prerequisite for open, integrated and interdisciplinary research. Therefore, the FAIRagro Portal will establish such a central access point to the various RDM services in agricultural systems research, making research data more visible, easier to find and reuse in the future.

Project: FAIR Data Infrastructure for Agrosystems (FAIRagro) **Term:** 2023–2028 **Funding agency:** DFG **Lead at ZALF:** F. Ewert (wiss.direktor@zalf.de) **Partners:** JKI, ZB MED, Uni Bonn, IPK, FIZ Karlsruhe, Senckenberg, KTBL, FZJ, TUM, Thünen Institut, ATB et al. https://www.fairagro.net

ONLINE BLOG ON SUSTAINABLE LAND USE & CO.

HENDRIK SCHNEIDER, TOM BAUMEISTER, TANJA KOLLERSBERGER



In 2019, ZALF created the QUERFELDEIN-Blog, an innovative web platform that makes the latest scientific knowledge on sustainable land use, climate, environment and nutrition accessible to the wider public. Originally financed by third-party funding, it was successfully converted to a member-financed model in 2022. Currently, 20 scientific institutions contribute to QUERFELDEIN with their research findings.

Blog and podcast—the two main channels of the QUERFELDEIN network.



The online knowledge platform QUER-FELDEIN, is a central hub for communicating research findings on the topics of agriculture, the environment, climate and nutrition. Initially launched in 2019 as an alliance of research institutions in Brandenburg, the platform now pools research results

from more than 20 partners across Germany and Switzerland. QUERFELDEIN offers both practice-oriented solutions for farmers and in-depth analyses on a wide range of topics that are equally relevant for practitioners, researchers and interested members of the public.

A central aim of QUERFELDEIN is to translate scientific findings into a generally understandable language. In addition to a focus on blog posts, the platform also offers a wide range of media such as guidelines, policy papers and video tutorials on topics such as soil fertility, plant protection, water management and biodiversity.

From 2019 to 2021, QUERFELDEIN was funded by the MWFK Brandenburg. The switch to a member-financed payment model in 2022 was a decisive moment. The changeover made it possible to further increase the quality and diversity of content and to put the project on a sustainable financial footing. Members benefit from the services of the coordination office at ZALF and the support of their own press work.

As an important addition to the QUERFELDEIN brand, a new podcast was added in 2022 on all popular podcast channels. On Spotify, the QUERFELDEIN podcast has ranked first among science podcasts on the topic of agriculture. In addition to the full episodes, which are between 45 and 75 minutes long, there is always a short summary of around 10 minutes available to listen to. The podcast has been listened to by over 15,000 people to date.

A professional presence on Instagram, X and LinkedIn successively increases the reach of the entire QUERFELDEIN network. In 2022 the network was awarded the German Prize for Online Communication in the »Energy and Environment« category. The success of the project is reflected not only in the steadily growing number of members, but also in the positive response from science, politics, practitioners and the media.

Projekt: Online-Wissensthek querFELDein (QUERFELDEIN) Laufzeit: 2019 – laufend Förderer: MWFK Brandenburg, querFELDein-Partner Leitung (ZALF): T. Baumeister (tom. baumeister@zalf.de) Partner: PIK, IGB, DIFE, ATB, HNEE, BTU, INP, IRS, IGZ, FBN, IPK, LSB, IPB, Saxony5, FiBL, IAMO, Fraunhofer ISE, JLU, LFE https://www.quer-feld-ein.blog



SELECTED CURRENT PROJECTS

MORE CLIMATE PROTECTION, SOIL FERTILITY & YIELD WITH THE CARBON FARMING PLOW

MARISA R. GERRIETS, ANDREAS BAUR, MICHAEL SOMMER



Carbon farming plow in use during a site-specific field test in the Müncheberg area, Brandenburg.

Strengthening climate protection and increasing soil fertility and yields – all at the same time? The carbon farming plow that ZALF is developing together with LEMKEN in the CARBON TILL-AGE project is making this possible. The basic idea is simple: carbon-rich topsoil is transported to a depth of 55 cm in shafts, while at the same time, low-carbon subsoil is brought to the soil surface. This not only promotes carbon sequestration in the soil, but also breaks up soil compaction in the long term. Thus, crops have more root space and better access to water and nutrients in the subsoil.

The aim of »carbon farming« is to sustainably increase the humus stocks of agricultural soils and thereby achieve a CO₂-sequestration effect. A variety of plant cultivation measures are suitable for this purpose. The measure of their effectiveness is the perma-

nence of the increased humus stock.

Ameliorative fractional deep tillage (aFDT) with the Carbon Farming Plow from LEMKEN offers an innovative solution. With its plough bodies up to 55 cm deep shafts are dug into the subsoil at 75 cm intervals. Thereby, the carbon-rich topsoil is diluted with approx. 25 % low-carbon subsoil material. This creates a carbon deficit and the topsoil will bind new carbon. It takes around 10 years for the balance to be restored: plant and microbial carbon is stabilized by clay minerals, iron oxides or calcium ions. At the same time, the shafts are filled with carbon-rich topsoil material at depth. Microbial decomposition of soil organic matter is reduced due to the less favorable conditions. Overall, the humus stock of a soil increases (C sequestration), hence the ameliorated soils act as CO_2 sinks.

Studies from field trials dating back around 40 years show how much carbon is permanently stored by aFDT. This is possible because the principle of aFDT was already developed and tested in the GDR since the late 1950s, with the aim of increasing yield and yield security at that time. While 10 t CO₂eq per ha are sequestered in sandy soils until an equilibrium is reached after 10-15 years, it reaches 30 t CO₂eq per ha in loamy soils.

After 40 years, at least 50 % of the original carbon level was retained in the shafts, proving the sustainability of aFDT.

The results have also confirmed that the plow is working for the purpose for which it was originally intended: the long plow bodies sustainably break up widespread soil compaction in subsoils. This increases the rooting space and improves access to the resources in the subsoil, especially water. In historical field trials between 1961 and 1987, additional yields of 6 % were achieved for cereals. Results from a current pilot trial in the Uckermark region show yield effects of a comparable magnitude.

In the CARBON TILLAGE project, the Carbon Farming Plow is now being developed in cooperation with LEMKEN up to series production. This will require further extensive site-specific field trials. The effects of a aFDT on yields, earthworm populations and climate protection will also be quantified in strip trials.

Project: CARBON TILLAGE Term: 2022–2025 Funding agency: BMEL-BLE »Deutsche Innovationspartnerschaft (DIP) Agrar« Lead at ZALF: M. Sommer (sommer@zalf.de) Partners: LEMKEN, agrathaer, TIRRECConsult, Dr. O. Ehrmann https://t1p.de/Imlfe

SUSTAINABLE LAND USE AND BIOECONOMY IN LUSATIA

LUISE PORST, THOMAS MAURER



Structural change has been a key issue in Lusatia for decades and will remain crucial in view of the coal phase-out by 2038. At the same time, Lusatia is comparatively strongly affected by climate change: lower precipitation in the growing season, more frequent high temperature periods and higher evaporation rates are making conditions more difficult for agriculture. The »Land-Innovation-Lausitz« research alliance is developing innovative approaches for climate-resilient and sustainable land use systems in the region. The network also aims to establish regional value creation based on renewable natural resources and closed cycles of materials (circular bioeconomy).

Research and development to make Lusatia an examplary region for climate-resilient land use and sustainable bioeconomy.



In Lusatia, the consequences of climate change will have a major impact on agriculture in its current form. The main precipitation shifts to the winter months, increased dry spells in springtime can affect the growth phase of the plants and periods of heat

increase the evaporation rates during the vegetation period. The predominantly sandy soils in the region are becoming even more at risk of drying out, due to their low water holding capacity. At the same time, agricultural land is also becoming more susceptible to wind erosion, particularly in the conventional cultivation systems used and on comparatively large fields. Furthermore, loss of biodiversity on conventionally farmed land is also significant.

With the foreseeable end of coal mining, Lusatia is once again undergoing structural change. Around 8,000 high-quality industrial jobs in the region will have to be replaced. In view of the experiences of the post-reunification period in the 1990s, which were characterized by loss and a lack of prospects among other things, this represents a particularly poignant social challenge. However, at the same time, the phase-out of coal offers the opportunity to provide important impulses for future-oriented land use in terms of science and technology, the regional economy, and social innovation.

Against this backdrop, the »Land-Innovation-Lausitz« research alliance seeks to develop Lusatia into a model region for adapting land use to climate change. This is to be achieved through innovative agricultural methods and technologies, resource-efficient cultivation systems and the multifunctional use of agricultural land as the basis for a sustainable bioeconomy and the establishment of new regional value chains. To this end, around 60 partner institutions from science, business, agriculture, politics and public administration are working together on innovative solutions that will be relevant far beyond the region.

Teams from science and practice are exploring topics such as climate-resilient cultivation systems, regionally adapted soil additives, high-value ingredients of regional wild plants, sensor-based early detection of plant diseases, plant-based fibers and materials, the use of artificial intelligence in agriculture and the valorization of post-mining and cultural landscapes.

Project: Zentrales Innovations-Management für Land-Innovation-Lausitz (LIL-INNOVATION) Term: 2022–2024 Funding agency: BMBF Lead at ZALF: F. Ewert (wiss.direktor@zalf.de) Partners: BTU Cottbus https://land-innovation-lausitz.de/

DROUGHT MANAGEMENT AND IMPROVED GROUNDWATER RETENTION

JAN STAUTZEBACH, JÖRG STEIDL, COLJA KRUGMANN, ROLAND BAATZ, CLAAS NENDEL, CHRISTOPH MERZ



Climate projections for the Brandenburg region indicate a shift in precipitation from summer to winter. In contrast, seasonal water demand in the region will reach its maximum in summer. Extreme weather events such as droughts or heavy rainfall are also expected to increase. Accordingly, adaptation options for effective water retention during heavy rainfall events and surpluses in the winter months are required to stabilize the landscape water regime. Together with adapted management strategies and an early warning system for droughts aimed at agriculture and authorities, resilience to climatic changes can be strengthened.

Water is a very scarce resource in Brandenburg. Proposed solutions range from an early warning system for droughts to measures to hold back water in the landscape for longer.



also transferable to climatic and hydrological extremes elsewhere. ZALF project partners are forecasting more frequent extreme meteorological situations and mapping future water supply using the SWIM hydrological model. The results are then correlated with future water demand as well as measures to reduce demand (e.g. water storage). The expected ecological status of water ecosystems is investigated in addition.

ZALF is working on the development and optimization of innovative, long-term underground water storage options, targeted irrigation measures in agriculture and future planning of agricultural crops that are better adapted to dry periods. In order to store water from heavy precipitation and winter surpluses for the more demanding summer months, researchers are analyzing the potential of both above-ground and underground water reservoirs. Criteria-based site analyses are being carried out together with partners. This includes water storage in deep and near-surface aquifers, control of drainage systems and water retention in surface waters. These analyses are validated for typical regional locations using the MODFLOW, HydroGeoSphere and STORM models. Based on interactive maps, the information obtained will be bundled in a web-based retention toolbox, which will be used for digital pre-planning of retention measures by authorities, water suppliers, planning offices and interested citizens.

An early warning system designed by ZALF is enabling stakeholders to better adapt to drought events. The system is able to access current data from the German Weather Service in order to carry out real-time calculations of plant growth, soil moisture and other agronomic parameters using the MON-ICA model. Crop-specific irrigation recommendations and regional projections of water availability for arable crops are also made available to farms via a web interface.

Project: Adaption to Water-related Extreme Climate Events: Drought Management, Integrated Water Resources Management and Advanced Water Storage Management in Berlin-Brandenburg, Germany (SPREEWASSER:N) **Term:** 2022–2025 **Funding agency:** BMBF **Lead at ZALF:** C. Merz (merz@zalf.de) **Partners:** TU Berlin, FU Berlin, PIK, Uni Trier, BfG, Adelphi, BWB, Sieker mbH, Truebner GmbH https://www.spreewasser-n.de/

SIGNIFICANT STEPS TOWARDS MORE SUSTAINABLE FOODSCAPES IN EUROPE

BEATRICE WALTHALL, JOSÉ LUIS VICENTE VICENTE, ANNETTE PIORR



Participants of the Berlin Living Lab experimenting with the foodshed model to translate dietary visions into spatially explicit contexts.

Cities across Europe are actively transforming their food systems towards circular, low-carbon, and plant-based futures to address challenges surrounding food security, global environmental change, and urbanization. These efforts aim to contribute to the EU's commitment to reducing greenhouse gas emissions by at least 40 % by 2030 and to revitalize urban-rural linkages, thereby achieving UN Sustainable Development Goals. However, these ambitions bring new governance challenges and require coordinated efforts to organize people and their food systems effectively. The FOODSHIFT2030 project aims to co-create, combine and multiply needed innovative food system solutions across Europe.



In 2023, the EU Horizon project FOOD-SHIFT2030, marked a significant milestone in the quest for sustainable food systems across nine European city regions. Through a concerted effort, FOODSHIFT2030 propelled a transformation of food systems

towards low-carbon, plant-based, and circular food futures, achieving its ambitious objectives. The project's impact extended far beyond mere accomplishment, as it fostered a collaborative environment where diverse stakeholders, including more than 90 food innovators, eight SMEs, eight NGOs, seven local governments, seven research institutes and numerous citizens, actively participated in shaping the future of food.

Powered by a bottom-up Living Lab approach, FOOD-SHIFT 2030 contributed to the co-creation of sustainable and innovative food system solutions, as diverse stakeholders pooled their expertise to drive change. Their endeavours ranged from reducing food waste and minimising plastic use in public catering to pioneering food hub prototypes and envisioning agricultural parks, which reflects a holistic commitment to transforming local food systems.

A central outcome of this transformative journey was the FOODSHIFT2030 Governance Lighthouses, led by ZALF. Acknowledged by the European Commission for their essential role, these lighthouses emerged as sources of inspiration, consolidating invaluable experiences and best practices into guiding principles for governing food system transformation. These principles, rooted in citizen-driven, systemic, cross-sectoral, place-based, multi-level and multi-stakeholder approaches, not only influenced policy making but also laid a robust foundation for future governance frameworks.

Furthermore, ZALF's application of the foodshed model added another dimension to the project's impact. By bridging agricultural planning and research, this model facilitated the promotion of sustainable food production systems and resilient agricultural practices across various city regions. For example, in the Berlin-Brandenburg region, this model was implemented through a participatory process and translated dietary visions into spatially explicit contexts, thus informing policy making in a more effective manner.

Overall, the results of the FOODSHIFT2030 project have yielded a wealth of knowledge, experience, and policy recommendations. These insights have been carefully synthesized into the FOODSHIFT2030 transition toolkit, which will serve as a valuable resource for stakeholders seeking to foster sustainable and resilient food systems in the future.

Project: Food System Hubs Innovating towards Fast Transition by 2030 (FOODSHIFT2030) **Term:** 2020–2023 **Funding agency:** EU Horizon **Lead at ZALF:** B. Walthall (beatrice. walthall@zalf.de) **Partners:** UCPH, CFH, Lejre, CFT, Ostend, ILVO, Avignon, INRA, BFPC, AGRA, EA, EAT, Pallini, DRAXIS, Bari, UMIL, CIHEAM Bari, FER, Wroclaw, WUELS, HCC, Brasov, ICEBERG, IAAC, Nfood, SUSMET, RESOLIS, IFOAM, SUSTAIN,

https://foodshift2030.eu/

IMPROVED DATA COMPETENCE IN RESEARCH WITH AI AND MULTI-MODAL INTEGRATION

CLAAS NENDEL, MASAHIRO RYO, GOHAR GHAZARYAN, AHSAN RAZA, ANASTASIIA SAFONOVA, LEONARDO INFORSATO, MAGDALENA MAIN-KNORN



KIKOMPAG – Bridging the gap between agricultural knowledge and data science.

Biosphere reserves (BR) are regions in which the sustainable development of landscapes in ecological, economic and social terms is to be implemented in an exemplary manner. BROMMI investigates how the special framework conditions of BRs can be used to permanently and extensively implement insect conservation in agricultural landscapes together with farmers and local authorities. In the project, ZALF is responsible for the agro-ecological and economic evaluation and further development of insect-promoting measures. This will be realised in close cooperation with five BRs throughout Germany, WWF Germany and the umbrella organisation of large protected areas »National Natural Landscapes«.



The use of AI and remote sensing in agriculture has attracted a lot of attention recently, yet its application remains limited. Many data-driven agricultural studies have been conducted by data scientists with limited agricultural knowledge, while agronomists

have had few opportunities to learn data-driven approaches. This mismatch highlights a critical gap that hinders the synergy between expert agricultural knowledge and data science. To address this, we will develop a coherent concept for monitoring and predicting agroecosystem behavior across multiple gradients and scales.

The BMBF-funded KIKOMPAG project has two main objectives. First, we are developing an integrated approach for crossscale monitoring of agricultural systems by combining remote sensing products with deep learning, mechanistic models and diverse reference datasets for arable land and grasslands. Secondly, we are creating a curriculum based on case studies covering different aspects of agroecosystem analysis using different data sources and modeling approaches. This curriculum will be freely available, allowing anyone to learn data-driven analysis techniques in a comprehensive way.

Over the past year, challenges posed by small data problems in remote sensing and the potential use of deep learning have been identified. In close cooperation with different stakeholders and considering the goals of the project, we tested various machine learning approaches based on cases for developing coherent frameworks at various scales. One case involved predicting subsurface soil properties with well-established mechanistic models using inverse modeling. By observing plant growth patterns above ground, we could predict subsurface soil properties and assist in calibrating machine learning models. Another case provided improved methods for remote sensing multiscale data fusion and insights into crop phenology at a field level for the analyzed crops. Lastly, we generated the model architecture for the tree-based ensemble learning method »Random Forest« for spatial prediction that can be applied to estimate monthly groundwater levels on a regional level. Further cases on large scales are currently being developed.

Alongside active research, the KIKOMPAG project includes workshops to train stakeholders on the newly developed frameworks. These workshops are designed to ensure that participants gain practical knowledge and skills in utilizing the innovative approaches created by the project, fostering a deeper understanding and more effective application of datadriven techniques in agricultural research and practice.

Project: Multi-modal data integration, domain-specific methods and AI to strengthen data competence in agricultural research (KIKOMPAG) **Term:** 2022–2025 **Funding agency:** BMBF **Lead at ZALF:** C. Nendel (claas.nendel@zalf.de) https://t1p.de/7gi9o

NEW TECHNOLOGY & FIELD ARRANGEMENTS

FRANK EWERT, IXCHEL HERNANDEZ-OCHOA



PHENOROB promotes technology-driven approaches to sustainable crop production, combining research from several core projects with an interdisciplinary approach. One core experiment, in strong cooperation with ZALF, focusses on large scale arrangements and is based at ZALF's own landscape laboratory PATCHCROP, which tests spatio-temporal crop diversification with small field sizes (patches) that offer multiple advantages over monocultures. New digital technologies allow for optimal crop allocation and site specific management, resulting in ideal field sizes and geometries that improve ecosystem service delivery, resource use efficiency and biodiversity.

Significantly reduced field sizes and redesigned field geometries are possible with lightweight field robots.



The overarching research question addressed with patchCROP in the PHENOROB Cluster of Excellence is to understand how crop diversification, implemented at different temporal and spatial scales, affects the multifunctional response of agroecosystems in

terms of crop growth, yield, input reduction, natural resource use and use efficiency, and biodiversity. The opportunities and impacts of new technologies such as sensing and robotics will be assessed from three perspectives: crop physiology, ecology and technology.

New lightweight robotic field technology offers the possibility of significantly reducing field sizes and redesigning field geometries, as it does not require large rectangular fields. Crop management can therefore be adapted to exploit the spatial heterogeneity of soils and other growing conditions, thereby improving resource use efficiency and increasing spatial and temporal crop diversity in the field. Spatially and temporally adapted management will focus on the choice of crop species, their spatial distribution and crop rotations as a function of soil heterogeneity, which also implies spatially heterogeneous crop management including tillage, sowing, fertilization, weed and pest management. However, it is currently unknown how these changes will affect agroecosystem performance in terms of competition, adaptation, resource conservation, resource use efficiency and biotic interactions such as plant disease epidemiology or biodiversity effects.

In the continuation of ZALF's close cooperation with PHE-NOROB at PATCHCROP, agro-ecosystem models will be an important tool to explore these dynamics, as they provide the flexibility to simulate complex system responses across a range of environments and management practices. These models will therefore complement the field experiments.

The specific objectives for the PHENOROB core project at ZALF are I) to develop and apply agro-ecosystem modelling tools to investigate the impacts of diversified cropping systems on ecosystem services and resource use efficiency, II) to gain mechanistic insights into the scale-dependent effects of crop diversification on agro-ecosystem performance, and III) to demonstrate and evaluate the potential of new digital technologies combined with crop modelling, remote sensing and machine learning to implement and manage sustainable new site-adapted field arrangements.

Project: Core Project 5: New Field Arrangement (PHENOROB) Term: 2019–2025 Funding agency: DFG Lead at ZALF: F. Ewert (wiss.direktor@zalf.de) Partners: Uni Bonn, Komturei Lietzen https://www.phenorob.de

THE YEAR 2022



1. APPOINTMENT Prof. Heidi Webber, Co-Head of Program Area 3, starts her professorship for »Integrated Crop Systems and Modeling« at BTU Cottbus.

https://t1p.de/npdhk

2. CARBON FARMING Prof. Claas Nendel and Dr. Carsten Paul are discussing options for carbon farming in agriculture in a workshop at the German Agricultural Research Alliance (DAFA).

https://t1p.de/fi29u





1. APPOINTMENT Prof. Jana Zscheischler takes up the junior professorship »Sustainability-Oriented Production Economics« in the Department of Geography at the University of Vechta. During her time at ZALF, she conducted research on the design of sustainable transformation processes in rural areas and agricultural landscapes.

JANUARY

FEBRUARY

MARCH

https://t1p.de/cc9pr

16. AWARD Prof. Sonoko Bellingrath-Kimura is awarded the Prize of the Foundation for the Promotion of Japanese-German Scientific and Cultural Relations (JaDe Foundation) at the Japanese Cultural Institute in Cologne.

https://t1p.de/uwfxa

16. BIODIVERSITY Forests, Covid, food and species extinction: the Leibniz Research Network on Biodiversity publishes »10 Must Knows« on biodiversity. In the run-up to the World Summit on Biodiversity, 45 scientists present facts about biodiversity in a well-founded and easily understandable way. Prof. Dr. Bettina Matzdorf and Dr. Lasse Loft from ZALF were involved.

https://t1p.de/mzy5d





7. RECHERCHE PRO-PLANT-EUR'S & TREES Two projects are conducting accompanying research in Africa: In Côte d'Ivoire, the aim is to improve the living and working conditions of smallholder cocoa farmers. In Togo, Ethiopia and Madagascar, GIZ's global Forests4Future project is investigating how to restore forest landscapes and achieve good governance in the forest sector.

https://t1p.de/b0vbv
https://t1p.de/syl8f

BONARES

3. HEALTHY SOIL The BMBF funding initiative »Soil as a sustainable resource for the bio-economy« (BonaRes) is entering its third funding phase. In this final project phase, the established infrastructure will be consolidated and the methods developed will be transferred to long-term use for sustainable soil management. ZALF operates the BonaRes repository for soil and agricultural research data and coordinates the BonaRes Center.

https://t1p.de/jxkzw


IN RETROSPECT

4. LEIBNIZ DEBATES What does sustainable agriculture look like in the face of climate change, biodiversity loss and a growing world population? Prof. Barbara Sturm (ATB), Manuela Rottmann (former Parliamentary State Secretary at BMEL) and Prof. Frank Ewert from ZALF discuss this question.

https://t1p.de/u6rv0





6. FIELD ROBOTICS The patch-CROP field robotics workshop brings together technology manufacturers and scientific institutions to showcase digital tools and robotics technology for agriculture.

https://t1p.de/0t9lu



1. HANNOVER MESSE Projects from the »Agricultural Systems of the Future« funding line will be showcasing their approaches to tomorrow's agriculture at the international trade fair.

https://t1p.de/xcn07

https://t1p.de/3mi7h

8. PODCAST Silvia Bender, State Secretary of the BMEL, and Prof. Dr. Frank Ewert discuss the topic of the Future Commission for Agriculture in the querFELDein podcast.

APRIL

5. LUSATIA The WIR! alliance »Land-Innovation-Lausitz« will receive six million euros for the second funding phase. Since 2019, BTU Cottbus and ZALF have been researching strategies to strengthen Lusatia, which is particularly affected by structural and climate change, through sustainable agriculture.

https://t1p.de/bng9o

28. MOSQUITO ATLAS The Citizen Science Project is part of the traveling exhibition MS Wissenschaft. The barge travels through Germany for several months a year, presenting changing exhibitions that promote an understanding of science and research. In 2022, the focus was on questions from citizens.

https://t1p.de/kb1c2



ΜΑΥ



12. OPINION PAPER Carbon farming is an approach to increasing the humus content of soils. Dr. Carsten Paul provides insights into how carbon farming works in practice and the implications for agriculture and ecosystems.

https://t1p.de/4lg4r

25. FELD MAGAZINE The ZALF research-magazine is published with the cover story »Chessboard in the Field«.

https://t1p.de/qc7bf

JUNE

27. AWARD The network quer-FELDein, founded and coordinated by ZALF, has been awarded the German Prize for Online Communication for its online blog and podcast in the category Energy and Environment. The science communication initiative regularly publishes research news from more than 20 scientific institutions in a form accessible to the general public.

https://t1p.de/oymkd



THE YEAR 2022



4. CLIMATE SECURITY In the context of the development of the National Security Strategy of the German Federal Government, Dr. Katharina Löhr participated as a panelist in the consultation workshop »Climate and Security in the National Security Strategy« at the Federal Foreign Office.

https://t1p.de/qdqj4

20. BLUE.GREEN.WILD

»Berlin, discover your nature: blue. green. wild.« is the motto of the environmental festival in the Spreepark. Visitors of all ages can experience the importance of urban nature for humans and animals in the form of water, green spaces and darkness. The festival is organized by a large network of partners, including ZALF.

https://t1p.de/0sety



1. ENERGY SAVING In view of the upcoming heating season and the conflict in Ukraine, a comprehensive package of energy-saving measures is being prepared and implemented. These include lowering office temperatures and preparing to switch from natural gas to renewable wood chips as the primary heating source. To ensure that no one freezes, ZALF blankets are being distributed.

JULY



AUGUST

29. ESA CONFERENCE The international congress of the European Society for Agronomy (ESA) will take place under the auspices of ZALF. Researchers discuss ways to achieve a climate-adapted, resource-conserving and digitized agriculture.

https://t1p.de/x76cj



SEPTEMBER

1. CO-WORKING ZALF opens another co-working space, where ZALF researchers can book flexible workspaces.



IN RETROSPECT

8.–9. CONFERENCE The diverse interactions between humans and the earth system are the focus of the conference »Integrated Earth System Research«, organized by the Leibniz Research Network of the same name with the participation of ZALF.

https://t1p.de/gsgdr

1. ORGANIZATIONAL MISSION STATEMENT Together with the company FELICICON, the employees developed basic values for cooperation at ZALF and summarized them in a

guideline. Employee workshops and a

https://t1p.de/l8gpx

survey were conducted at ZALF.



6. BIODIVERSITY In the run-up to the UN Climate Change Conference COP₁₅, the Leibniz Biodiversity Research Network, including ZALF, publishes the ten »must-do's« of biodiversity research. They build on their previous »10 must-knows« and provide recommendations for action to help conserve biodiversity.

https://t1p.de/km7st

OCTOBER



NOVEMBER

9. FAIRAGRO In order to facilitate access to agro-systems research data, FAIRagro will be included as a consortium in the National Research Data Infrastructure (NFDI) and funded for five years by the federal and state governments. FAIRagro is coordinated by ZALF and includes 29 partners.

https://t1p.de/tgvl8

15. AGRATHAER ZALF and agrathaer sign a strategic cooperation agreement. From January 2023, the former ZALF subsidiary will operate independently as an innovation service provider.

https://t1p.de/hlrly



DECEMBER



THE YEAR 2023



1. INDIGENOUS KNOWLEDGE

Dr. Katharina Löhr moderates the Expert Panel on Indigenous Knowledge Systems at the Global Forum on Food and Agriculture 2023.

https://t1p.de/s18o2





1. INTRANET After more than a year of development, the new intranet goes online with many improvements, especially in terms of usability and a new visual design.

22. LEGUNET The launch of the Legume Network promotes the cultivation, processing and use of legumes with regional partners throughout Germany. The project is funded by the BMEL's Protein Crop Strategy until 2025.

https://t1p.de/svtk2

JANUARY



1. SMART AGRICULTURE

Researchers from ZALF and the Institute for Ecological Economy Research (IÖW) were commissioned by the German Federal Agency for Nature Conservation (BfN) to develop recommendations for promoting the benefits of digital agricultural technology and minimizing its harmful effects on the environment.

https://t1p.de/td6xn

17. RESEARCH DATA ZALF

Research Data Management launches a new internal event format called Coffee Lectures. These provide researchers with regular input and the opportunity to clarify questions related to research data.

FEBRUARY

9. BUNDESTAG Prof. Dr. Sonoko Bellingrath-Kimura presents a jointly developed position paper of ZALF at a hearing of the German Bundestag on the use of pesticides in agriculture.

https://t1p.de/pfjnt



MARCH



IN RETROSPECT



6. NEW DFG RESEARCH GROUP

How can ecosystems be restored in rural regions of Africa? For this purpose, a new DFG research group will be established with the participation of ZALF, Leuphana University Lüneburg, HU Berlin and the University of Göttingen. A social-ecological systems approach will be applied.

all Leibniz institutions, ZALF is eval-

11. LEIBNIZ EVALUATION Like

uated every seven years. This includes an inspection by the Leibniz Senate and an independent assessment of how the institution has developed in terms of content and structure over the past few years and to what extent the plans for the future are convincing. **13. FIELD DAY** At the field day at the Dedelow Experimental Station, scientists and practitioners exchange views on topics such as partial tillage, crop protection and fertilization strategies for wheat and barley.

https://t1p.de/u69b2

15. DAFA WEBINAR Dr. Moritz Reckling and Prof. Dr. Claas Nendel discuss new arable crops and other adaptation options with Prof. Dr. Ralf Bloch from the HNE Eberswalde in the webinar of the »Agriculture in Climate Change« platform of the German Agricultural Research Alliance (DAFA).

https://t1p.de/yrxos

https://t1p.de/1kt8q

https://t1p.de/n89f9

APRIL

30. CONTRACTS 2.0 The Horizons 2020 project ends after four years. A handbook will be published with recommendations for decision-makers at EU, national and state level on how to design ecologically effective, economically viable and practicable agri-environmental programs.

https://t1p.de/0h60c





MAY

26. SOIL HEALTH ZALF organizes the workshop »Future of Soil Health in Brandenburg« for representatives from all levels of practice, administration and civil society in the framework of the EU project PREPSOIL.

https://t1p.de/9809t

29.–30. IAT INSPECTION The Leibniz Association is evaluating the application for the »Innovation Center for Agricultural System Transformation« (IAT) for the long-term strategic expansion of ZALF.

JUNE

https://t1p.de/weoye



THE YEAR 2023

1. DIGITIZATION The introduction of the digital Travel Expenses tool will further expand the digitization of the ZALF administration.

5. LEGUMES ZALF and Regionalwert AG are organizing a field day for farmers to discuss established and less common grain legumes in domestic production and practical issues related to legume cultivation.

https://t1p.de/rwt1c





15. VISIT Sahra Damus (Bündnis 90 Die Grünen), member of the state parliament and science spokesperson of the parliamentary group, visits ZALF.

1. RETIREMENT Prof. Dr. Klaus Müller retires. Prof. Dr. Katharina Helming becomes the new Deputy Scientific Director.



1. MÜNCHEBERG Müncheberg's merchants, restaurateurs, clubs and initiative groups have joined forces for the Short Night in order to promote the inner city and strengthen the local community. ZALF is present at the market place with a booth.

JULY

12.–13. PEATLANDS How do peatlands breathe after rewetting? The Thünen Institute for Forest Ecosystems is investigating this question together with ZALF and Sachsenforst in the Erzgebirge using the Eisenstraßen-moor as an example. Due to the difficult terrain, the necessary measuring towers are being erected with the help of a traditional workhorse.

https://t1p.de/hqed5



AUGUST



3. WETNETBB The project, in which ZALF is involved, has received funding from the German Minister of Agriculture, Cem Özdemir, for the transition to sustainable peatland use.

https://t1p.de/khblq

15. SOILROB Dr. Kathrin Grahmann's new BMBF junior research group investigates the positive effects of small, agile field robots on soil health and soil condition in different cropping systems.

https://t1p.de/7isnm

SEPTEMBER

8. VDL Representatives of the VDL visit the Paulinenaue research site and learn about fertilizer regulations, water balance, lysimeters and climate change.

https://t1p.de/ekn2m

21. APPOINTMENT Dr. Jörg Schaller is appointed adjunct professor at the University of Giessen.

https://t1p.de/hnmk6

25. FUTURE STRATEGY Prof. Dr. Frank Ewert is appointed to the German government's Advisory Council on the Future Strategy for Research and Innovation, where he is responsible for climate protection, adaptation, food security and the protection of biodiversity.

https://t1p.de/xfx7h

IN RETROSPECT

6. AGRI-PV The first national forum on agricultural photovoltaics, organized by ZALF, takes place and focuses on the question: »How does the market entry of agrivoltaics in Germany look like?«

https://t1p.de/jhcnx



1. AGRI-PV Under the leadership of ZALF, a position paper is being developed that identifies fields of action for a successful market ramp-up. The background to this is the many advantages and the still low uptake of Agri-PV.

https://t1p.de/4dqrt



8. APPOINTMENT The University of Cukurova has appointed the ZALF scientist Dr. Cenk Dönmez as professor at the Graduate School of Natural Sciences at the Chair of Landscape Planning, Department of Remote Sensing and GIS.

https://t1p.de/wwu8e



OCTOBER



10. PHD-DAY The annual PHD Day addresses the topics of motivation and the time after the PhD and is aimed at PhD students at ZALF and partnered institutions in the region.

https://t1p.de/sflnx

NOVEMBER

6. V140 On the 60th anniversary of the Müncheberg nutrient enrichment experiment, ZALF invites scientific partners as well as former and current employees to a field trip and scientific lectures.

https://t1p.de/hyc24

12.–18. AGRITECHNICA The CarbonTillage and DAKIS projects have a booth at Argitechnica, the world's leading agricultural technology exhibition.

https://t1p.de/igroy

https://t1p.de/s3lwt



DECEMBER



4.–5. BIOECONOMY FORUM In his keynote speech at the Bioeconomy Forum of the Bioeconomy Council, Prof. Dr. Frank Ewert identifies the conflicting goals and the levers for optimizing land use. According to Ewert, a whole portfolio of measures and techniques is needed to achieve success and circularity.

ANNEX

1..

FACTS & FIGURES 2022/2023

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2022 2023 **315** 278 Scientific journal articles (Peer-Reviewed)

> 163 | 133 out of which: First Authorship

221 214 out of which: Open-Access

30 16 Contributions to Edited Volumes



All publications at www.zalf.de





2022 2023

12.0 | 14.7 million € Total amount of third party funding

> 24.8 | 24.0 million € Basic funding

36.8 | 38.7 million € Total budget

32.7 % 38.0 %



494 Employees* (among them 232 scientists)

> 46 Employees involved in academic teaching

154 Tasks and offices in scientific boards and bodies

*as of October 21, 2024











66 New doctoral researchers at ZALF

26 Completed doctoral theses, thereof 19 by ZALF doctoral researchers

82 Master and bachelor theses



56 Newly started projects

410 Cooperating partners in 60 countries (approx.)

28 Scientific events

> **49** Colloquia

> > 150 Hectares of ZALF experimental sites

FINANCES 2022

TOTAL BUDGET (IN THOUSAND EURO, INCL. CASH ASSETS FROM THE PREVIOUS YEAR) 48,723

REVENUES FROM THIRD PARTY	DFG	1,299	EU	2,405
FUNDED PROJECT GRANTS IN	LEIBNIZ COMPETITION	652	FROM WHICH	
THE FINANCIAL YEAR 2022	FEDERAL MINISTRIES	6,404	HORIZON 2020	1,541
	STATE MINISTRIES		ELER	
	INDUSTRY		ERANET	419
	OTHER	973	INTERREG	47
			EIP	60
			EFRE (THIRD PARTY F	UNDED
			PROPORTION OF 80 %	5) 338
			IN THOU	SAND EURO

TOTAL THIRD PARTY FUNDS (IN THOUSAND EURO)

12,028

EXPENSES DURING BUDGET YEAR 2022



24.8 MILLION BASIC FUNDING THE BASIC FUNDING IS PROVIDED BY THE STATE OF BRANDENBURG Federal Ministry of Food TOGETHER WITH THE FEDERAL GOVERNMENT AND THE OTHER STATES. and Agriculture BRANDENBURG



FINANCES 2023

TOTAL BUDGET (IN THOUSAND EURO, INCL. CASH ASSETS FROM THE PREVIOUS YEAR) 51,857

REVENUES FROM THIRD PARTY	DFG	2,048	EU	2,607
FUNDED PROJECT GRANTS IN	LEIBNIZ COMPETITION	506	FROM WHICH	
THE FINANCIAL YEAR 2023	FEDERAL MINISTRIES	7,728	HORIZON 2020	1,943
	STATE MINISTRIES	817	ELER	344
	INDUSTRY	79	ERANET	
	OTHER	884	INTERREG	
			EIP	105
			EFRE (THIRD PARTY FL	JNDED
			PROPORTION OF 80 %)	
			IN THOUS	AND EURO

TOTAL THIRD PARTY FUNDS (IN THOUSAND EURO)

14,670

stry of Science, I

EXPENSES DURING BUDGET YEAR 2023



24,0 MILLION BASIC FUNDING 14,7 MILLION TP FUNDS THE BASIC FUNDING IS PROVIDED BY THE STATE OF BRANDENBURG Federal Ministry of Food and Agriculture TOGETHER WITH THE FEDERAL GOVERNMENT AND THE OTHER STATES. Federal Ministry of Food and Agriculture

MANAGEMENT, BOARDS & COMMITTEES



SCIENTIFIC ADVISORY BOARD OF ZALF

Prof. Dr. Nina Buchmann

ETH Zürich, Department of Environmental System Science (CH) Chair of the Scientific Advisory Board

Prof. Dr. Peter Gregory University of Reading (UK) Vice Chair of the Scientific Advisory Board

Prof. Dr. Christine Alewell University of Basel (CH) **Prof. Dr. Klaus Butterbach-Bahl** Karlsruhe Institute of Technology, IMK-IFU

Prof. Dr. Bridget Emmett UK Centre for Ecology and Hydrology (UK)

Prof. Dr. Claudia Bieling University of Hohenheim

Prof. Dr. Robert Finger ETH Zürich (CH) **Prof. Dr. Sara Hallin** Swedish University of Agricultural Sciences (SE)

Prof. Dr. Andrea Emilio Rizzoli University of Applied Sciences of Southern Switzerland, IDSIA (CH)

Prof. Dr. Christine Watson Scotland's Rural College (UK) | Swedish University of Agricultural Sciences (SE)

ASSEMBLY OF MEMBERS

Ministry of Science, Research and Culture, Brandenburg Dr. Nikola Sander Chair of the Assembly of Members*

Federal Ministry of Food and Agriculture Dr. Julian Braun Vice Chair of the Assembly of Members Federal Ministry of Education and Research Dr. Klaus-Peter Michel

Ministry of Rural Development, Environment and Agriculture, Brandenburg Peter Schubert

Humboldt-Universität zu Berlin Prof. Dr. Peter Feindt **University of Potsdam** Prof. Dr. Barbara Höhle

COOPERATIONS (SELECTED)

NATIONAL

UNIVERSITIES

- Brandenburg University of Technology Cottbus-Senftenberg
- Carl von Ossietzky University of Oldenburg
- Eberswalde University of Sustainable Development
- European University Viadrina
- Freie Universität Berlin
- Hochschule Geisenheim UniversityGeorg-August-Universität
- Göttingen
- Giessen University
- Humboldt-Universität zu Berlin
- Leibniz University Hannover
- Martin-Luther-Universität Halle-Wittenberg
- Technical University of Munich
- Technische Universität Berlin
 Technische Universität
- Technische Universität Braunschweig
- Universität Hamburg
- University of Applied Sciences
 Dresden
- University of Applied Sciences
 Osnabrück
- University of Bayreuth
- University of Bonn
- University of Freiburg
- University of Greifswald
- University of Hohenheim
- University of Kassel
- University of Potsdam
- University of Stuttgart

NON-UNIVERSITY RESEARCH

- Bernhard Nocht Institute for Tropical Medicine
- Deutsches BiomasseForschungszentrum
- Federal Research Institute for Animal Health, Friedrich-Loeffler-Institut
- Forschungszentrum Jülich
- Fraunhofer Institute for Systems and Innovation Research
- German Centre for Integrative
 Biodiversity Research
- Helmholtz-Centre for Environmental Research – UFZ
- Johann Heinrich von Thünen Institute
- Julius Kühn Institute
- Karlsruhe Institute of Technology

...and 16 Leibniz institutes, in 1 Leibniz Research Alliance and 40 Leibniz institutes in 6 research networks

OTHER GOVERNMENTAL AND NON-GOVERNMENTAL INSTITUTIONS

- agrathaer GmbH
- Bavarian State Research Center for Agriculture
- Biosphere Reserves
- Bundesanstalt für Materialforschung und -prüfung
- Deutsche Umwelthilfe
- Deutscher Wetterdienst
- Ernährungsrat Berlin e. V.
- Federal Institute for Geosciences and Natural Resources
- Fruit Advisory Service of the Altes Land
- Landesamt f
 ür Umwelt Brandenburg
- Landwirtschaftskammer Niedersachsen
- proPlant Agrar- und Umweltinformatik GmbH
- Society for the promotion of mosquito control
- Stiftung Westfälische Kulturlandschaft
- The German Farmers' Association
- World Wildlife Fund (WWF)

INTERNATIONAL

UNIVERSITIES

- Aarhus University, Denmark
- Estonian University of Life Sciences Tartu, Estonia
- Kobenhavns Universitet, Denmark
- Sokoine University of Agriculture, Tanzania
- Swedish University of Agricultural Sciences, Sweden
- Tokyo University of Agriculture and Technology, Japan
- Autonomous University of Madrid, Spain
- University of Pisa, Italy
- University of Colorado Riverside, United States of America
- University of Helsinki, Finland
- University of Natural Resources and Life Sciences Vienna, Austria
- University of the Philippines Los

Baňos, Philippines

- Vrije Universiteit Amsterdam, Netherlands
- Wageningen University, Netherlands
- Wroclaw University of Environmental and Life Sciences, Poland
- Zurich University of Applied Sciences, Switzerland

NON-UNIVERSITY RESEARCH

- Agricultural Research Institute of Mozambique, Mozambique
- Agroscope, Switzerland
- French Agricultural Research Centre for International Development – C. I. R. A. D., France
- The French National Centre for Scientific Research – CNRS, France
- Chinese Academy of Environmental Planning, China
- CIAT Centro International de Agricultura Tropical, Colombia
- Forschungsinstitut für biologischen Landbau, Switzerland
- French National Research Institute for Agriculture, Food and Environment (INRAE), France
- International Institute for Applied Systems Analysis, Austria
- Japan International Research Center for Agricultural Sciences, Japan
- Norwegian Bioeconomy Research
 Institute, Norway

DOCTORAL RESEARCHERS

NEW IN 2022

Al Hamwi, Mhd Wael Supervision at ZALF: Dr. Maren Dubbert Mentor:Prof. Stefan Sieber Justus Liebig University Giessen Supervision: Prof. Jörg Schaller

Arndt, Marie Supervision at ZALF: Prof. Katharina Helming Mentor: Dr. Johannes Schuler Humboldt-Universität zu Berlin Supervision: Prof. Peter Feindt

Bayer, Christian Lukas Supervision at ZALF: Prof. Katharina Helming Mentor: Dr. Maria Lee Kernecker University of Bergen Supervision: Prof. Birgit Kopainsky

Buabeng, Kwabena Supervision at ZALF: Dr. Katharina Löhr Mentor: Dr. José Luis Vincente Vincente Humboldt-Universität zu Berlin Supervision: Prof. Stefan Sieber

Cooke, Diane Supervision at ZALF: Prof. Heidi Webber Mentor: Prof. Cenk Dönmez Free University Berlin Supervision: Prof. Britta Tietjen

Dahlmann, Adrian Supervision at ZALF: Dr. Maren Dubbert Mentor: Dr. Roland Baatz Potsdam University Supervision: Prof. Gunnar Lischeid

Eshetu, Shibire Bekele Supervision at ZALF: Prof. Stefan Sieber Mentor: Dr. Ariani C. Wartenberg Humboldt-Universität zu Berlin Supervision: Prof. Stefan Sieber

Gebremedhin, Asmelash Tesfaye Supervision at ZALF: Dr. Katharina Löhr Mentor: Dr. Claudia Sattler Hawassa University Supervision: Prof. Tsegaye Bekele

Harfouch, Mayssa Supervision at ZALF: Prof. Claas Nendel Mentor: Dr. Maria Lee Kernecker Potsdam University Supervision: Prof. Claas Nendel

Hoops, Lara

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Kampermann, Ivonne Jasmin Supervision at ZALF: Dr. Maire Holz Mentor: Dr. Joana Bergmann Humboldt-Universität zu Berlin Supervision: Prof. Timo Kautz

Kohler, Daniel Supervision at ZALF: Dr. Doreen Werner Mentor: Dr. Mathias Hoffman University of Greifswald Supervision: PD Dr. Helge Kampen

Kynast, Danica Supervision at ZALF: Prof. Steffen Kolb Mentor: Dr. Annette Piorr Humboldt-Universität zu Berlin Supervision: Prof. Steffen Kolb

Mengsuwan, Konlavach Supervision at ZALF: Prof. Masahiro Ryo Mentor: Dr. Carsten Paul Brandenburg University of Technology Supervision: Prof. Masahiro Ryo

Moluh Njoya, Hamza Supervision at ZALF: Dr. Katharina Löhr Mentor: NA Humboldt-Universität zu Berlin Supervision: Prof. Stefan Sieber **Momanyi, Denis** Supervision at ZALF: Prof. Stefan Sieber Mentor: Dr. Johannes Schuler Humboldt-Universität zu Berlin Supervision: Prof. Stefan Sieber

Moroder, Alma Maria Supervision at ZALF: Prof. Sonoko Dorothea Bellingrath-Kimura Mentor: Dr. Ariani C. Wartenberg Humboldt-Universität zu Berlin Supervision: Prof. Sonoko Dorothea Bellingrath-Kimura

Ollendorf, Franziska

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Pesch, Martin Supervision at ZALF: Dr. Axel Behrendt Mentor: Dr. Moritz Reckling Humboldt Universität zu Berlin Supervision: Prof. Steffen Kolb

Raharinaivo, Hamy Supervision at ZALF: Dr. Katharina Löhr Mentor: Dr. Barbara Schröter University of Antananarivo Supervision: PD Dr. Zo Hasina Rabemananjara

Reichenspurner, Margarethe Supervision at ZALF: Prof. Bettina Matzdorf Mentor: Prof. Heidi Webber Leibniz University Hannover Supervision: Prof. Bettina Matzdorf

Rivera Palacio, Juan Camilo Supervision at ZALF: Prof. Masahiro Ryo Mentor: Dr. Gohar Ghazaryan Free University Berlin Supervision: Prof. Masahiro Ryo

Rock, Katharina Supervision at ZALF: Prof. Jana Zscheischler Mentor: Dr. Constance Rybak University of Vechta Supervision: Prof. Jana Zscheischler

Sánchez Garciá, Paula Andrea

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Schiller, Josepha

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Strauss, Veronika

Supervision at ZALF: Dr. Carsten Paul Mentor: Dr. Maria Busse Leibniz University Hannover Supervision: Prof. Benjamin Burkhard

Thakur, Nishita

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Tokou, Bonna Antoinette

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Uhuegbue, Peter Onyisi

Supervision at ZALF: Prof. Jörg Schaller Mentor: Dr. Matthias Hoffman Technical University Dresden Supervision: Prof. Karsten Kalbitz

Voigt, Anja

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Weddige, Ulf

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...and 2 external PhDs

DOCTORAL RESEARCHERS

NEW IN 2023

Agu, Amarachi Jacinta Supervision at ZALF: Dr. Sandra Uthes Mentor: Dr. Götz Uckert Justus Liebig University Giessen Supervision: Prof. Joachim Aurbacher

Akaribo, Freeman Nsoh Supervision at ZALF: Prof. Heidi Webber Mentor: Dr. Cheng Chen Brandenburg University of Technology Supervision: Prof. Frank Wätzold

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Bhattarai, Nisha Supervision at ZALF: Dr. Ruth Ellerbrock Mentor: Dr. Tobias Naaf Technical University Berlin Supervision: Prof. Carsten Müller

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Kimaro, Prisca Elifuraha

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Kröcher, Jenny

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Krupp, Lena

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Lang, Ferdinand

Supervision at ZALF: Dr. Bettina Matzdorf Mentor: Dr. Ariani Wartenberg Leibniz University Hannover Supervision: Prof. Matzdorf, Bettina

Li, Hongjie

Supervision at ZALF: Prof. Claas Nendel Mentor: Dr. Shaswati Chowdhury Potsdam university Supervision: Prof. Claas Nendel

Liesche, Juliane

Supervision at ZALF: Dr. Doreen Werner Mentor: Dr. Maire Holz Greifswald University Supervision: PD Dr. Helge Kampen

Miriti, Philip Kiriinya

Supervision at ZALF: Dr. Fatima Lehnhardt Mentor: Dr. Gohar Ghazaryan The University of Göttingen Supervision: Prof. Xiaohua Yu

Nandke née Kunz, Stefanie

Supervision at ZALF: Prof. Frank Eulenstein Mentor: Dr. Rosemarie Siebert Potsdam University Supervision: Prof. Dr. Anja Linstädter

Nehls, Henrike

Supervision at ZALF: Dr. Doreen Werner Mentor: Dr. Maire Holz Greifswald University Supervision: PD Dr. Helge Kampen

Paeenroudposhti, Nahid Rasouli

Supervision at ZALF: Dr. Joana Bergmann Mentor: Dr. Gohar Ghazaryan University of Münster Supervision: Prof. Norbert Hölzel

Playfair, Stephan

Supervision at ZALF: Prof. Gunnar Lischeid Mentor: Dr. Ferreol Berendt Potsdam University Supervision: Prof. Gunnar Lischeid

Rohde, Clara

Supervision at ZALF: Dr. Maren Dubbert Mentor: Dr. Joana Bergmann Friedrich-Schiller University Jena Supervision: Prof. Anke Hildebrandt

Stautzebach, Jan

Supervision at ZALF: Prof. Christoph Merz Mentor: Dr. Johannes Schuler Free University Berlin Supervision: Prof. Christoph Merz

Volles, Nils

Supervision at ZALF: Prof. Steffen Kolb Mentor: Dr. Claudia Sattler Humboldt-Universität zu Berlin Supervision: Prof. Steffen Kolb

Wold, Olga

Supervision at ZALF: Prof. Claas Nendel Mentor: Dr. Katja Kramp Potsdam University Supervision: Prof. Claas Nendel

Yang, Xin

Supervision at ZALF: Dr. Ehsan Eyshi Rezaei Mentor: Dr. Fatima Lehnhardt Potsdam University Supervision: Prof. Claas Nendel

...and 2 external PhDs

DOCTORAL THESES

COMPLETED IN 2022

Cavael, Ulrike

Ecological interaction of plant and soil on apple replant sites

Supervision at ZALF: Dr. Marina Müller, Dr. Peter Lentzsch Universität Kassel

Supervision: Prof. Dr. Rainer Jörgensen

Grünfeld, Leonie*

Parallels between experimental and field arbuscular mycorrhizal fungal communities in response to habitat structure Supervision at ZALF: apl. Prof. Dr. Monika Wulf

Freie Universität Berlin Supervision: Prof. Dr. Matthias C. Rillig

Hafner, Johannes

Development of a component-based assessment framework to evaluate fuelwood energy systems: Modelling the cooking energy demand and on-farm fuelwood production potential of smallholder farmers in semi-arid regions in Tanzania

Supervision at ZALF: apl. Prof. Dr. Stefan Sieber Humboldt-Universität zu Berlin Supervision: Prof. Klaus Müller

Huynh, Thanh Hien

Spatiotemporal variability in maize biomass yield and soil characteristics under the impacts of land-use management Supervision at ZALF: Prof. Dr. Sonoko Dorothea Bellingrath-Kimura, Dr. Angelika Wurbs Humboldt-Universität zu Berlin Supervision: Prof. Dr. Andreas Gattinger

Konrad, Jessika

The influence of vegetation structure and the effects of short rotation on the diversity and the zoological structure of selected arthropod communities (Col.: Carabidae; Arach.: Araneae et Opiliones) in agricultural woodlands of Northern Hessen.

Supervision at ZALF: Dr. Michael Glemnitz, Dr. Ralph Platen Martin-Luther-Universität Halle (Saale) Supervision: Prof. Dr. Christa Volkmar

Mahrookashani, Amir Hossein*

Simulation and analysis of drought stress effect on wheat in interaction with high temperatures Supervision at ZALF: Prof. Dr. Frank Ewert Universität Bonn Supervision: Prof. Dr. Frank Ewert

Nguyen, Huu Thuy*

Towards improved process respresentation for modelling CO₂ and H₂O fluxes of crops Supervision at ZALF: Prof. Dr. Frank Ewert Institut für Nutzpflanzenwissenschaften und Ressourcenschutz (INRES), Universität Bonn Supervision: Prof. Dr. Frank Ewert

Siegmund, Nicole

Multiscale analysis of dust emissions from agricultural soils in La Pampa (Argentina) Supervision at ZALF: Prof. Dr. Michael Sommer, Dr. Roger Funk Universität Potsdam, Institut für Geoökologie Supervision: Prof. Dr. D. Buschiazzo

Täumer, Jana*

Landuse factors determining distribution and sesonal activities methane-consumption and -production in grasslands and forest soils Supervision at ZALF: Prof. Dr. Steffen Kolb Ernst-Moritz-Arndt-Universität. Institut für Mikrobiologie Supervision: Prof. Tim Urich

Thai, Thi Huyen

Cereal grain yield responses to fertilizer management in sandy soil in a long-term fertilizer experiment in Northeast Germany Supervision at ZALF: Prof. Dr. Sonoko Dorothea Bellingrath-Kimura, Dr. Dietmar Barkusky Humboldt-Universität zu Berlin Supervision: Prof. Dr. Sonoko Dorothea Bellingrath-Kimura

Theses by doctoral researchers with a supervision agreement at ZALF as well as by *external candidates with supervision by ZALF staff.

COMPLETED IN 2023

Asante, Michael*

Impact of tillage and integrated soil fertility management on soil carbon balance in maize-based systems in Northern Ghana Supervision at ZALF: Dr. Mathias Hoffmann UAC – University of Abomey-Calavi, UCC – University of

Cape Coast Supervision: Prof. Kwame Agyei Frimpong

Calitri, Francesca

Concurrent evolution of erosion rates, weathering and profile development of agricultural soils: a 4-D Approach (CORRELATE)

Supervision at ZALF: Prof. Dr. Michael Sommer University of Zurich Supervision: Prof. Markus Egli

Ehrhardt, Annelie

Preferential flow induced saturation as a trigger for the onset for lateral water movements along material and horizon boundaries in agricultural erosion affected soil of a hummocky ground moraine Supervision at ZALF: Dr. Horst Gerke Martin-Luther-Universität Halle-Wittenberg Supervision: Prof. Dr. Hans-Jörg Vogel

Friedrich, Jonathan

Sustainability Transitions in German Livestock Farming: The Role of Innovation, Incumbents and Imagined Supervision at ZALF: Dr. Jana Zscheischler, Dr. Sandra Uthes

Georg-August-Universität Göttingen Supervision: Prof. Dr. Heiko Faust

Hoffmann, Annika

Trade-offs between dispersal ability and niche competition of co-occurring microorganisms in the phyllosphere of host plants Supervision at ZALF: Dr. Marina Müller Humboldt-Universität zu Berlin Supervision: Prof. Carmen Büttner

Klotz, Marius

The ecological role of silicon in tropical forests: effects on plant nutrient stoichiometry, drought resistance, and herbivory Supervision at ZALF: apl. Prof. Dr. Jörg Schaller Universität Bayreuth Supervision: Prof. Bettina Engelbrecht

Matavel, Custodio Efraim

Integrating more efficient renewable energy technologies into food systems in Central Mozambique Supervision at ZALF: apl. Prof. Dr. Stefan Sieber, Prof. Dr. Klaus Müller Humboldt-Universität zu Berlin Supervision: apl. Prof. Dr. Stefan Sieber

Ostermann-Miyashita, Emu-Felicitas

Citizen Science as a tool to Assess Human-Wildlife conflict and coexistence in human-dominated landscapes. Case study of three returning wildlife species in northeast Germany Supervision at ZALF: Dr. Hannes Jochen König Humboldt-Universität zu Berlin Supervision: Prof. Dr. Sonoko Dorothea Bellingrath-Kimura

Sossa, Leonce Geoffery*

Effects of different water management and N fertilizer levels on C emissions of rice production in Benin, West-Africa Supervision at ZALF: Dr. Mathias Hoffmann UAC – University of Abomey-Calavi Supervision: Prof. Dr. Ir. Luc O. Sintondji

Theses by doctoral researchers with a supervision agreement at ZALF as well as by *external candidates with supervision by ZALF staff.

SCHOLARSHIP HOLDERS

Name	Country	Funding
Adetoye, Ayoade Matthew	Nigeria	DFG
Adiku, Samuel	Ghana	Alexander von Humboldt Foundation
Amoussou, Abiolla Robertson Kévin	Benin	GIZ
Awoke, Mahlet Degefu	Ethiopia	ATSAF Academy Stuttgart
Ayar, Said Aqa	Afghanistan	Yousef Jameel Scholarship
Bai, Yunxiao	China	UCAS
Baldivieso Soruco, Carla Rene	Bolivia	ATSAF Academy e.V.
Buabeng, Kwabena	Ghana	Katholischer Akademischer Ausländer-Dienst (KAAD)
Chavez Miguel, Giovanna	Mexico	ATSAF Academy Stuttgart
Choudhary, Akshita	India	DAAD
Cristóbal Reyes, Sofía	Mexico	Stiftung der Deutschen Kakao- und Schokoladenwirtschaft
Darkhani, Faiza	Afghanistan	Alexander von Humboldt Foundation
Egamberdieva, Dilfuza	Uzbekistan	Alexander von Humboldt Foundation
Eichhorn-Lüneburg, Franziska	Germany	Zwillenberg-Tietz Foundation
Eshetu, Shibire Bekele	Ethiopia	Alexander von Humboldt Foundation
Faye, Awa	Senegal	Agropolis Foundation, France
Giwa, Eniololade George	Nigeria	Erasmus Mundus Joint Master Degree in Develop- ment Studies and Foresight - Global Development Policy (GLODEP)
Guerra, Aaron	United States of America	DAAD
Gütte, Annelie Maja	Germany	Heinrich Böll Foundation
Haddaway, Neal Robert	Sweden	Alexander von Humboldt Foundation
Hemminger, Karoline	Germany	
Heyer, Ines	Germany	University of Potsdam
Hoang, Trong Nghia	Vietnam	Department of Agroecosystems, Faculty of Ag- riculture, University of South Bohemia in Ceske Budejovice, Czech Republic
Kimbi, Thedy Gerald	United Republic of Tansania	DAAD
Kipkulei, Harison	Kenya	DAAD
Liu, Yuan	China	Chinese Academy of Science
Maomou, Madeleine	Guinea	GIZ
Moluh Njoya, Hamza	Cameroon	Alexander von Humboldt Foundation
Msangi, Haji	United Republic of Tansania	DAAD
Mugabe, Paschal Arsein	United Republic of Tansania	Alexander von Humboldt Foundation
N'Guessan, Ahou Anne Patricia	lvory Coast	GIZ
Oguntunde, Philip Gbenro		Alexander von Humboldt Foundation

Name	Country	Funding
Pandey, Divya	India	Alexander von Humboldt Foundation
Parker, Emma	United States of America	DAAD
Perkovic, Stanislava	Bosnia-Herzegovina	German Federal Environmental Foundation
Quattara, Djakaridja	lvory Coast	GIZ
Rakotosalama, Mickael Jeannot	Madagascar	GIZ
Rock, Katharina	Germany	Konrad-Adenauer-Stiftung
Sow, Ahmadou	Senegal	DAAD
Srivastava, Nimisha	India	DAAD
Thakur, Nishita	India	ZALF
Thomas, Chiara	Germany	GIZ
Tomova, Tsvetelina	Bulgaria	DBU
Tsutskikh, Elena	Russia	Humboldt-Universität zu Berlin
Turco, Fabio	Italy	Erasmus
Van Hee, Jens Peter R	Belgium	BMZ
Wei, Yuqi	China	China Scholarship Council (CSC)
Yang, Hui	China	China Scholarship Council (CSC)
Zeleke, Ketema Tilahun		Alexander von Humboldt Foundation

NEW THIRD PARTY FUNDED PROJECTS

2022

Duration	Title	Funding
January 2022 – December 2023	Small-scale processes, large effect: rhizosphere traits as key for P efficiency in upland rice	German Research Foundation (DFG)
January 2022 – December 2023	FAIR	European Commission
January 2022 – June 2026	Integrated cropping systems analysis: methods and models for climate risk and adaptation assessments	Leibniz Association (competitive procedure)
February 2022 – January 2025	Center for Soil Research (BonaRes)	Federal Ministry of Education and Research (BMBF)
March 2022 – September 2022	Safeguarding overlooked Ecosystems: Protect, Manage and Restore Grasslands and Savannahs in Argentina, Colombia and Paraguay through multisectoral engagement and knowl- edge-sharing (Grasland)	Federal Ministry for the Environ- ment, Nature Conservation and Nuclear Safety (BMU) & Federal Agency for Nature Conservation (BfN)
April 2022 – March 2023	Identification of small-scaled erosion hotspots at the landscape level based on modelled soil inputs from agricultural land into aquatic ecosystems (Erospot)	Bayerisches Staatsministerium für Ernährung, Landwirtschaft und Forsten
April 2022 – December 2024	High quality protein feeds from alfalfa – Effects of cultivation and conservation on alfalfa nutritional ingredients using an in- direct drying process and optimization of the carbon footprint (HEILU)	European Commission
April 2022 – July 2025	Fractional deep tillage – Technical and technological solutions for climate protection and yield security in agriculture (CarbonTillage)	Federal Ministry of Food and Ag- riculture (BMEL)
May 2022 – November 2022	Validating Agroecology and Polyculture Design Tools through Citizen Science (VAPOTO)	Leibniz Association (competitive procedure)
May 2022 – May 2025	Designed experiments for optimizing infrared spectroscop- ic characterizations and quantifications of soil organic mat- ter at scales of increasing complexity: importance of band shifts, spectral variable selection and subtraction approaches (IR_SOM_ions)	German Research Foundation (DFG)
July 2022 – June 2025	Synergetic integration of photovoltaics in agriculture as a contri- bution to a successful energy transition – networking and sup- port of the market ramp-up of agri-PV in Germany (SynAgri-PV)	Federal Ministry of Education and Research (BMBF)
July 2022 – June 2025	Biting midge (ceratopogonid) -borne viruses as important fac- tors influencing livestock farming in Germany – monitoring, bio- nomics, genetics and infection (CeratoVirPlus)	Federal Ministry of Food and Ag- riculture (BMEL)
July 2022 – June 2025	Preparing for the ,Soil Deal for Europe' Mission (Prepsoil)	European Commission
July 2022 – September 2025	Addressing the triple burden of malnutrition through behaviour- al change in food consumption and physical activity: A rural-ur- ban comparative study in Tanzania (FoCo-Active)	Federal Ministry of Food and Ag- riculture (BMEL)
August 2022 – July 2025	Adaptation to extreme water events: Drought management, in- tegrated water management concepts and improved water stor- age in the Berlin-Brandenburg region (SpreeWasserN)	Federal Ministry of Education and Research (BMBF)

Duration	Title	Funding
August 2022 – September 2022	XVII European Society for Agronomy Congress (ESA 2022)	German Research Foundation (DFG)
September 2022 – August 2026	Food Provision through Sustainable Farming Systems and Value Chains (VISIONARY)	European Commission
September 2022 – August 2026	new VALue landscapes for plant PROtein Pathways (VALPRO Path)	European Commission
September 2022 – August 2025	digitalisation for agroecology (D4AgEcol)	European Commission
September 2022 – August 2024	Sustainable water-saving irrigation technologies for achieving water, energy and food security in the context of climate change in Uzbekistan (SusWEF)	Federal Ministry of Education and Research (BMBF)
October 2022 – September 2024	WIR! – Wandel durch Innovation in der Region – Landschaft. Innovation. Lausitz – Zentrales Innovations-Management für Land-Innovation-Lausitz (LIL-Innovation)	Federal Ministry of Education and Research (BMBF)
October 2022 – September 2026	Co-developing innovations for sustainable land management in West African smallholder farming systems (COINS)	Federal Ministry of Education and Research (BMBF)
October 2022 – September 2025	Künstliche Intelligenz für Digitale Landwirtschaft (KIKompAg)	Federal Ministry of Education and Research (BMBF)
October 2022 – September 2025	Promotion of insects in agricultural landscapes through inte- grated cultivation systems with renewable raw materials – A sci- entifically supported model and demonstration project in land- scape laboratories, Sub-project 3: Co-Design, transferability and accompanying research (FInAL II)	Federal Ministry of Food and Ag- riculture (BMEL)
November 2022 – October 2025	Landscape innovations in the Lausitz region for a climate-adapt- ed bioeconomy and nature-based bioeconomy tourism (LIL-KliBioTo)	Federal Ministry of Education and Research (BMBF)
November 2022 – October 2025	Innovative business models for soil health (NOVASOIL)	European Commission
November 2022 – October 2025	Use of proximal and remote sensing data from various sensors to develop modeling approaches for assessing soil organic car- bon (SOC) stocks and its dynamics on agriculturally used grass- lands on peat soils (MoorgrünFE)	Federal Ministry for the Environ- ment, Nature Conservation and Nuclear Safety (BMU)
November 2022 – November 2024	EO AFRICA – NATIONAL INCUBATORS	European Commission
December 2022 – November 2025	Screening of genetic resources of chickpea (Cicer arietinum) and grass pea (Lathyrus sativus): Adaptation to climate change in Germany with alternative legumes for human consumption (CiLaKlima)	Federal Ministry of Food and Ag- riculture (BMEL)
December 2022 – November 2026	Fostering agroecology transition in North Africa through mul- ti-actor, evaluation, and networking (NATAE)	European Commission
December 2022 – November 2026	Raising the bio-based industrial feedstock capacity of Marginal Lands (MarginUp)	European Commission
December 2022 – November 2027	Soils for Europe (SOLO)	European Commission

NEW THIRD PARTY FUNDED PROJECTS

2023

Duration	Title	Funding
January 2023 – December 2025	Mosquitoes and mosquito-borne zoonoses in Germany (CuliFo3)	Federal Office for Agriculture and Food (BLE)
January 2023 – December 2023	Remote Sensing and modelling to assess crop-specific response to climate stressors (CropClim)	European Commission
January 2023 – December 2025	Demonstration network for expanding and improving the cultivation and utilisation of grain legumes in Germany (LeguNet)	Federal Ministry of Food and Ag- riculture (BMEL)
March 2023 – February 2025	Data Infrastructure for Agrosystem Sciences (FAIRagro)	German Research Foundation (DFG) & Federal Ministry of Edu- cation and Research (BMBF)
March 2023 – February 2026	Improving large-area mechanistic yield simulations through disentangling genotype × environment × management factors (YieldGEM)	German Research Foundation (DFG)
March 2023 – March 2026	Central European alliance for increasing climate change resil- ience to combined consequences of drought, heatwave, and fire weather through regionally-tuned forecasting (Clim4Cast)	European Commission
April 2023 – March 2025	Concept and technology development for swarm robotics for the expansion of organic sugar beet cultivation in the Ucker- mark (Germany), Sub-project (VAP4): Participatory development of cultivation methods (Uckerbots)	Federal Ministry of Education and Research (BMBF)
April 2023 – March 2026	»Just« conservation? Bridging values for equitable biodiversity governance (BridgingVALUES)	European Commission
April 2023 – March 2026	Grassland conservation across European landscapes protecting biodiversity and ecosystem services with ecological networks. (GreeNet)	Federal Ministry of Education and Research (BMBF)
May 2023 – April 2029	Potentials of agroforestry and agri-PV systems in combination with optimized combinations of measures for maximizing hu- mus build-up and carbon storage on agricultural land. (HUMAX)	Federal Ministry of Food and Ag- riculture (BMEL)
June 2023 – May 2029	Innovative farm strategies that integrate sustainable N ferti- lization, water management and pest control to reduce wa- ter and soil pollution and salinization in the Mediterranean (PRIMA – Safe-H ₂ O-Farm)	European Commission
June 2023 – July 2027	Contribution of orphan crops in building resilient food sys- tems in the era of climate change in Manyoni District – Tanzania (Or-Crop)	Federal Office for Agriculture and Food (BLE)
June 2023 – January 2026	ADAPTive Management of Forest Ressources for a sustainable timber industry in the Brandenburg – Berlin Region, subproject 5 (ADAPT-Wald-Holz)	Federal Ministry of Education and Research (BMBF)
July 2023 – December 2023	Upscaling Food and Nutrition Security through Solar Powered Irrigation integrated with Rainwater Harvesting for Small-scale Farmers in the Upper Ewaso Ng'iro Basin, Kenya (SPIS-4-FNS)	Federal Ministry of Food and Ag- riculture (BMEL)
September 2023 – August 2026	Regionale Bio-Wertschöpfungsketten in Brandenburg – Produk- tionssysteme und sozialer Zusammenhalt im Wandel (RegBio2B)	Federal Ministry of Education and Research (BMBF)
September 2023 – August 2024	Adoption of digital tools by African farmers for sustainable intensification of cropping systems: A case study of Nigeria (FADIT)	German Research Foundation (DFG)

Title	Funding
Management and biomass utilisation of wet fens: Network of model and demonstration projects in peatland regions of Brandenburg, Sub-project 4: Hydrology, derivation of bio-indi- cators and socio-economy (WetNetBB)	Federal Ministry of Food and Ag- riculture (BMEL)
An open access knowledge and data repository to safeguard soils (SOILWise)	European Commission
The adaptive potential of wheat phenology to climate change (Pheno-Plasticity)	German Research Foundation (DFG)
Towards healthy soils by using autonomous field robots in di- versified agricultural landscapes (SoilRob)	Federal Ministry of Education and Research (BMBF)
Management and marketing of a truffle plantation in Nieder- lausitz (Brandenburg)(Trüffelplantage 2.0)	Federal Ministry of Education and Research (BMBF)
Fair institutions for sustainable agricultural landscapes: An em- pirical investigation of procedural equity in incentive-based pol- icy instruments for the provision of ecosystem services (FairPES)	German Research Foundation (DFG)
Model-based scenario analysis to optimise crop production for climate protection (Mod0Klim)	Federal Ministry of Food and Ag- riculture (BMEL)
Al- and citizen science-supported monitoring of certified biodi- versity projects (KICS-Zert)	Federal Ministry of Education and Research (BMBF)
	TitleManagement and biomass utilisation of wet fens: Network of model and demonstration projects in peatland regions of Brandenburg, Sub-project 4: Hydrology, derivation of bio-indi- cators and socio-economy (WetNetBB)An open access knowledge and data repository to safeguard soils (SOILWise)The adaptive potential of wheat phenology to climate change (Pheno-Plasticity)Towards healthy soils by using autonomous field robots in di- versified agricultural landscapes (SoilRob)Management and marketing of a truffle plantation in Nieder- lausitz (Brandenburg)(Trüffelplantage 2.0)Fair institutions for sustainable agricultural landscapes: An em- pirical investigation of procedural equity in incentive-based pol- icy instruments for the provision of ecosystem services (FairPES)Model-based scenario analysis to optimise crop production for climate protection (Mod0Klim)Al- and citizen science-supported monitoring of certified biodi- versity projects (KICS-Zert)

TEACHING

UNIVERSITY OF FREIBURG

- Angewandte Klimafolgenforschung | Lecture, SS 2023
- Ecohydrology | Lecture, WS 2023/2024

BRANDENBURG UNIVERSITY OF TECHNOLOGY

- COTTBUS SENFTENBERG
- Nachhaltige Waldbewirtschaftung | Lecture, SS 2022
- Environmental Data Science | Lecture, WS 2022/2023 & WS 2023 & 2024
- Agro-ecosystems analysis and modelling | Lecture, WS 2022/2023

FREE UNIVERSITY OF BERLIN

- Landschaftswasserhaushalt von Berlin und Brandenburg | Lecture, WS 2022/2023
- Quartär- und Hydrogeologie | Lecture, SS 2023

EBERSWALDE UNIVERSITY FOR SUSTAINABLE DEVELOPMENT

- Großes Exkursionspraktikum Thüringen | Seminar, SS 2022
- Großes Exkursionspraktikum Rügen | Seminar, SS 2023
- Landschaftökologischer Beleg | Seminar, SS 2023
- StaVeg Teil Boden | Lecture, WS 2022/2023
- StaVeg | Seminar, SS 2023
- Grundlagen und Instrumente der Regionalentwicklung | Lecture, WS 2022/2023
- Monitoring und Indikatoren | Lecture, WS 2022/2023 & WS 2023/2024
- Nachhaltigkeitsbewertung und Oekobilanzen | Lecture, WS 2022/2023
- Ökobilanzen und Klimaschutzmaßnahmen | SS 2023
- Szenarien zukünftiger Agrar- und Ernährungssysteme | Vorlesung, WS 2022/2023
- Standortlehre | Lecture, WS 2022/2023 & WS 2023/2024
- Bodenkunde | Lecture, WS 2022/2023
- Volkswirtschaftslehre | Lecture, WS 2022/2023
- Landnutzungs- und Agrargeschichte | Lecture, SS 2023
- Einführung in die Ökonomik der agrarischen Landnutzung | Lecture, WS 2023/2024

HUMBOLDT-UNIVERSITÄT ZU BERLIN

- Agroecosystems, Environment and Sustainable Natural Resource Use | Lecture, WS 2022/2023 & WS 2023/2024
- Environmental Sociology and Environmental Policy | Lecture, WS 2022/2023
- Advanced Empirical Methodology for Socio-Ecological Systems Analysis | Lecture, SS 2022 & SS 2023
- Multifunctional agricultural landscape use | Lecture, WS 2022/2023
- Agrarökologie | Lecture & Seminar, WS 2022/2023
- Laborkurs Phytomedizin Plant microbiota | Seminar, SS 2022 & WS 2022/2023
- Environmental Sociology and Policy | Lecture, WS 2023/2024

- Topics in Agricultural and Food Policy: Environmental Justice | Lecture, WS 2023/2024
- Remote sensing for Agriculture and Food Security | Lecture, WS 2023/2024

MARTIN-LUTHER UNIVERSITY HALLE-WITTENBERG

Ressourcenmanagement und Ressourcenschutz | Lecture, SS 2022

LEIBNIZ UNIVERSITY HANNOVER

- Conservation Economy | Lecture, WS 2022/2023
- Nature Conservation and Environmental Economy | Seminar, WS 2023 / 2024

TECHNISCHE UNIVERSITÄT BERLIN

 Bodenchemisches Laborpraktikum f
ür Fortgeschrittene | Seminar, WS 2022/2023 & WS 2023/2024

TOKYO UNIVERSITY OF AGRICULTURE AND TECHNOLOGY

Transformation of Agriculture | Seminar, WS 2023/2024

UNIVERSITY OF BAYREUTH

• Rhizospere Biogeochemistry | Lecture, WS 2023/2024

UNIVERSITY OF GÖTTINGEN

 Model approaches and applications in agro-ecosystems | Lecture, WS 2022/2023 & WS 2023/2024

UNIVERSITY OF POTSDAM

- Agriculture and Nature Conservation: Conflicts and Synergies | Seminar, SS 2022 & SS 2023
- Agroecology | Lecture, SS 2022 & SS 2023
- Biogeochemie | Lecture, SS 2022 & SS 2023
- Zeitreihenanalyse und Spektralanalyse | Lecture, WS 2022/2023
- Experimental Design and Data Analysis | Lecture, WS 2022/2023 & WS 2023/2024
- Hydrogeologie (Subsurface Hydrology) | Lecture, WS 2023 / 2024
- Einführung in die Hydrochemie | Lecture, WS 2022/2023
- Humangeographisches und fachdidaktisches Doktorandenseminar | Seminar, SS 2022 & WS 2022/2023 & SS 2023
- Stadt Land Zukünfte? | Seminar, WS 2022/2023
- Landgrabbing ein Thema auch in Deutschland? | Seminar, SS 2022
- Bodenlandschaften | Lecture, WS 2022/2023
- Landschaftspraktikum Bodenlandschaftsanalyse in der Uckermark | Seminar, SS 2022 & SS 2023
- Botanische Geländeübungen | Seminar, SS 2022 & SS 2023
- Einführung in die Umweltplanung | Lecture, SS 2022

...and 21 additional individual lectures by ZALF scientists

GUESTS & FELLOWS 2022/2023

GUESTS WITH RESEARCH STAYS AT ZALF

Adiku, Dr. Samuel University of Ghana, Ghana

Akum, Robert Ayueboning The Federal University of Technology Akure, Ondo State, Nigeria

Haddaway, Dr. Neal Stockholm Environment Institute, Sweden

Hernandez Ochoa, Dr. Ixchel Manuela University of Bonn, Germany

Kah, Matty University of Abomey Calavi, Benin Republic

Msangi, Haji Sokoine University of Agriculture, Tansania

Murugan, Rajasekaran University of Natural Resources and Applied Life Sciences (BOKU), Austria

Oguntunde, Philip Gbenro The Federal University of Technology Akure, Ondo State, Nigeria

Oita, Azusa National Agriculture and Food Research Organization (NARO), Japan

Raggas, Amina Ecole national supérieur agronomique, Algeria

Sanz Sanz, Dr. Maria-Esther Institut national de la recherche agronomique (INRA), France

Sheet, Reem

The Mediterranean Agronomic Institute of Montpellier (IAMM) of the International Centre for Advanced Mediterranean Agronomic Studies (CIHEAM), France

Tega, Yasmina Institut de l'Environnement et de Recherches Agricoles du Burkina Faso (INERA), Burkina Faso

Wei, Yuqi China Agricultural University, China

... as well as other long-term stays of international doctoral students as scholarship holders

FELLOWS

Burkhard, Prof. Benjamin Leibniz University Hannover, Germany

Filipovic, Prof. Vilim University of Zagreb, Slowenia

Fischer, Prof. Jörn Leuphana University of Lüneburg, Germany

Hayashi, Prof. Masaki University of Calgary, Canada

Kirkegaard, Prof. John Allen Commonwealth Scientific and Industrial Research Organisation (CSIRO), Australia

Kleber, Prof. Markus Oregon State University, USA

Obersteiner, Prof. Michael Environmental Change Institut Oxford, United Kingdom

Pannell, Prof. David J. University of Western Australia, Australia

Six, Prof. Johan ETH Zurich, Switzerland

Wang, Prof. Enli Commonwealth Scientific and Industrial Research Organisation (CSIRO), Australia

Wendong, Zhang Cornell University, Dyson School of Applied Economics and Management, NY, USA

MANDATES & RESPONSIBILITIES (SELECTED)

Augustin, Jürgen

• Associate editor at Journal of Plant Nutrition and Soil Science

Bachinger, Johann

• Member of the Research Steering Group for the Organic Food and Farming Industry, Federal Ministry of Food and Agriculture

Bellingrath-Kimura, Sonoko D.

• Member of the Commission for Soil Protection, Federal Environment Agency

Dubbert, Maren

- Editorial board member at Hydrological Processes
- 2nd Chairwoman of Working Group on Stable Isotopes

Egamberdieva, Dilfuza

• Co-Editor at Frontiers in Microbiology/Frontiers in Political Science/Microorganisms

Ewert, Frank

- Speaker of the NFDI consortium »FAIRagro«
- Member of the International Advisory Board of the Soil Mission Support (SMS)
- Editorial board member at European Journal of Agronomy/Field Crops Research/Scientific Reports (Springer Nature)/Socio-Environmental Systems Modeling (SESMO)
- Member of the »Forum #Zukunftsstrategie« (BMBF)
- Member of the International Advisory Board of the PE&RC Graduate School for Production Ecology & Resource Conservation, University Wageningen
- Member of the Steering Group DFG Exellenz Cluster PhenoRob
- President of the Scientific Evaluation Board of the French National Research Agency (ANR)
- Co-Leader of Wheat Modelling Team on Agricultural Model Intercomparison and Improvement Project (AgMIP)
- Co-speaker of »WIR Land Innovation Lausitz«(BMBF)
- Appointed member of the Cultural Landscape Advisory Council of the State of Brandenburg by the Ministry of Agriculture, Environment and Climate Protection of the State of Brandenburg
- Spokesperson of Leibniz Section E »Environmental Sciences«, Leibniz Association
- Appointed member of the Leibniz Senate Committee on Strategic Extensions, the Senate Committee on Competition and the Executive Committee of the Leibniz Association, Leibniz Association
- Member of the steering group of the European research alliance »Towards a pesticide-free agriculture«

Eyshi Rezaei, Ehsan

• Associate Editor at Field Crops Research

Fienitz, Meike

• Appointed member of the Ethics Committee of the Thaer Institute Humboldt-Universität zu Berlin

Funk, Roger

• Associate Editor at Aeolian Research

Gerke, Horst

Associate editor at Journal of Plant Nutrition and Soil Science

Helming, Katharina

- Scientific Advisory Board member at the Horizon Europe project MRV4SOC
- Chair of the Scientific Advisory Board of the European Joint Program Soil
- Editorial board member at Agronomy for Sustainable Development/Land

Hierold, Wilfried

 Member in »Naturschutzbeirat des Landkreises Barnim«, Untere Naturschutzbehörde

Hoffmann, Carsten

- Member of the AGROVOC Editorial Community of the FAO
- German Delegate of the Horizon Europe Partnership »Agriculture of Data«, European Commission

Joschko, Monika

 Member of the Scientific Advisory Board of the »Förderverbands Humus«

Kersebaum, Kurt-Christian

- Associate editor at Field Crops Research
- Member of the ASA Fellow Committee of the American Society of Agronomy

Kolb, Steffen

- Editorial board member at Applied and Environmental Microbiology / American Society of Microbiology
- Associate editor at Frontiers in Microbiology

Kramp, Katja

• Treasurer of the Board Deutsche Gesellschaft für allgemeine und angewandte Entomologie (DGaaE) e. V.

Lischeid, Gunnar

- Speaker of the Scientific Council of the pearls Foundation (Potsdam Research Network)
- Editorial board member at Frontiers in Water: Water and Complexity
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ABBREVIATIONS

AI	Artificial intelligence	INIA	National Institute for Agricultural and Food Research
АТВ	Leibniz Institute for Agricultural Engineering and Bioeconomy	INRAE	Institut national de recherche pour l'agriculture, l'alimentation et l'environnement
BfG	Federal Institute of Hydrology	IRS	Leibniz Institute for Research on Society and Space
BfN	Federal Agency for Nature Conservation	ЈКІ	Julius Kühn-Institut
BLE	Federal Office for Agriculture and Food	LSB	Leibniz Institute for Food Systems Biology
BMBF	Federal Ministry of Education and Research	MLUK	Ministry of Agriculture, Environment and Climate
BMEL	Federal Ministry of Food and Agriculture		Protection of the State of Brandenburg
СІММҮТ	International Maize and Wheat Improvement Center	MWFK	Brandenburger Ministerium für Wissenschaft, Forschung und Kultur
DAAD	German Academic Exchange Service	NEDI	National Research Data Infrastructure
DBU	German Federal Environmental Foundation	NGO	Non-governmental organization
DFG	German Research Foundation	РІК	Potsdam Institute for Climate Impact Research
EFRE	European Regional Development Fund	PV	Photovoltaic
EIP	European Innovation Partnerships	SME	Small and medium-sized enterprises
ELER	European Agricultural Fund for Rural Development	TI	
EMAS	Eco-Management and Audit Scheme	UF7	Helmholtz Centre for Environmental Research
ESS	Ecosystem services	UN	
EUV	European University Viadrina	VDI	Berufsverband (Agrar Ernährung Umwelt)
FAO	Food and Agriculture Organization	VOC	volatile organic compounds
FH ISI	Fraunhofer Institute for Systems and Innovation Research	WUR	Wageningen University
FIBL	Research Institute of Organic Agriculture		
FZJ	Forschungszentrum Jülich		
GDR	German Democratic Republic		
GIZ	Deutsche Gesellschaft für Internationale Zusammenarbeit		
HEL	University of Helsinki		
HNEE	Eberswalde University for Sustainable Development		
ΙΑΡ	Fraunhofer-Institut für Angewandte Polymerforschung		
iDiv	Deutsches Zentrum für integrative Biodiversitätsforschung		
IDSIA	Istituto Dalle Molle di Studi sull'Intelligenza Artificiale		
IFVC	Institute of Field and Vegetable Crops, Serbien		
IGB	Leibniz-Institute of Freshwater Ecology and Inland Fisheries		
ІНР	Leibniz-Institut für innovative Mikroelektronik		
IIAT	International Institute of Tropical Agriculture, Kenia		
IMK-IFU	Karlsruher Institut für Technologie		

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