



ANNUAL REPORT 2018



LEIBNIZ CENTRE FOR
AGRICULTURAL LANDSCAPE RESEARCH
(ZALF)



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An aerial photograph of a rural landscape, showing a complex mosaic of agricultural fields in various shades of green and brown, interspersed with dark, dense forest areas. The fields are irregular in shape, suggesting a long history of land use and division. The overall tone of the image is muted, with a greenish-grey overlay.

RESHAPING LANDSCAPES

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

An aerial photograph of a vast agricultural landscape, showing a complex mosaic of rectangular and irregular fields in various shades of green and brown. A winding river or stream cuts through the center of the landscape. The overall tone is muted, with a dark green overlay.

BY RETHINKING AGRICULTURE

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

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PREFACE

2018 was a special year for us in two respects: On the one hand, after a fundamental organizational restructuring, we began to work in a new research structure. With the newly created research areas and platforms, as well as the working groups below them, we can now better align our activities with the United Nations' sustainability goals and respond more flexibly to socially relevant issues. On the other hand, the close links between climate change, agriculture and society have become a particular focus of public attention. Extreme weather conditions with droughts and heat events have hit agriculture particularly hard in Germany and Northern Europe.



Prof. Frank A. Ewert, Scientific Director
of ZALF

In 2018, our research has addressed important topics of concern to agriculture and society. Extreme weather conditions with drought and heat events severely affected agriculture in Germany and Northern Europe this year. Diversification of arable and grassland production systems and landscapes may have beneficial effects on the efficient use of natural resources including water, which has been explicitly studied in the PETCHY (p. 24) Project. The mitigation of green house gas (GHG) emissions from agriculture to reduce its effect on climate change is subject to many studies. Of particular importance is the role of peatlands but effective management measures need to consider local environmental and socio-economic conditions, the main focus of PEATWISE (p. 29). Energy crops are another option to counteract GHG emissions from non-renewable fossil sources. Like other crops, they emit biogenic volatile organic compounds (VOC) which play an important role for communication among plants but also indirectly affect the climate. As little is known about factors and relationships determining the emission of VOCs we have addressed this topic in VOCE for selected energy crops (p. 25). Resource management of irrigated arid areas in central Asia requires new solutions that we try to develop within BIOWAT (p. 26). Another topic of increasing societal concern is biodiversity. In BIOMOVE we integrate biodiversity research with movement ecology in dynamic agricultural landscapes (p. 27). In CORRELATE soil erosion processes are studied trying to understand their effects on soil formation and functioning (p. 28).

We have been very successful in acquiring new projects within our research domain in 2018. Our work within the BonaRes Center (p. 16) has been evaluated positively ensuring a continuation of this successful large collaborative project for three more years. Another research area of increasing importance for us relates to the use of new and emerging technologies for arable and grassland management. An example of our increasing engagement in this topic is the SATTGRÜN-project, using latest modelling and sensing technologies (p. 17). The development of sustainable agricultural landscapes urgently requires management approaches to improve biodiversity and reduce the use of synthetic pesticides. Examples of two new projects in this field are MOPLASA (p. 18) and FINAL (p. 19). An essential characteristic of our research is the integration of ecological and socio-economic relationships. In two new projects, we integrate interests among areas along a rural to urban gradient (REGERECHT, p. 20) and develop sustainable nexus-strategies integrating the food, water and energy systems (SUNEX, p. 21).

If you are interested to learn more about these and other activities at ZALF, I invite you to take a closer look at our 2018 annual report.

PROF. FRANK A. EWERT
Scientific Director

THE MISSION OF ZALF IS TO DELIVER SOLUTIONS FOR AN ECOLOGICALLY, ECONOMICALLY 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 an integrated systems research: starting from processes in soils, plants and water to causal relationships on the field and landscape level as well as looking at global impacts and complex interactions between landscapes, society and economy.

Prof. Frank A. Ewert (Scientific Director)

Cornelia Rosenberg (Administrative Director)

RESEARCH STRUCTURE



LEIBNIZ CENTRE FOR AGRICULTURAL LANDSCAPE RESEARCH (ZALF)

PROF. FRANK EWERT (SCIENTIFIC DIRECTOR)

CORNELIA ROSENBERG (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 ecologically sustainable management strategies, but also societal demands on agricultural landscapes. Thus, solutions are generated that address the grand challenges facing society as a whole: climate change, sustainable land use, food security and the conservation of natural resources, biodiversity and ecosystem services.

Three Research Areas, two Research Platforms 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:

Dr. habil. 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. Klaus Müller



Research Area 3

»Landscape Research Synthesis«

What will the agricultural landscapes of the future look like?

Co-Heads:

Prof. Katharina Helming

Prof. Frank Ewert (acting)

RESEARCH PLATFORMS



Research Platform

»Data«

Co-Heads:

Prof. Gunnar Lischeid

Prof. Frank Ewert (acting)



Research Platform

»Models & Simulation«

Co-Heads:

Dr. Claas Nendel

Prof. Frank Ewert (acting)



Experimental Infrastructure Platform

Head:

Dr. Gernot Verch

ZALF RESEARCH AREAS AND RESEARCH PLATFORMS



Research Area 1 »Landscape Functioning«

Research activities in Research Area 1 »Landscape Functioning« focus on biophysical landscape processes in order to generate an integrated understanding of their importance and their interactions in the landscape context. Special emphasis is placed on carbon and nutrient cycling as well as crop plants in their role as biological drivers of these cycles.



Research Area 2 »Land Use and Governance«

Research Area 2 »Land Use and Governance« analyses the interactions between land use, ecosystems and ecosystem services. It is the aim to develop resource-efficient and site-specific production systems which account for the social and economic value of agricultural ecosystems for humans.



Research Area 3 »Landscape Research Synthesis«

In consideration of the spatial and system context, Research Area 3 »Landscape Research Synthesis« synthesises results from Research Areas 1 and 2 and external knowledge sources into specific knowledge required for decision making. This makes integrated assessments possible, e.g. of the effects of land use and climate change on food security and the provisioning of ecosystem services.



Research Platform »Data«

Agricultural landscape research requires and generates large sets of landscape data. The tasks of the Research Platform »Data« are thus the combination and provisioning of biophysical and socio-economic data at different structural, spatial and temporal scales as well as the continuous development of methods for analysing large and complex datasets.



Research Platform »Models & Simulation«

It is the central objective of the Research Platform »Models & Simulation« to develop a coherent concept for modelling complex agricultural landscapes, which integrates different disciplinary models and modelling methods. Models of non-linear and dynamic systems are investigated and improved with modern methods of system theory. In addition, modelling activities in other working groups are technically and conceptually supported.



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 the 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«

DR. HABIL. 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 cross-scale research questions, Research Area 1 works closely with the Research Platforms »Data« and »Models & Simulation« as well as Research Area 3 »Landscape Research Synthesis«. 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 both 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

Hydropedology

Contact: Dr. Horst Gerke | gerke@zalf.de

Silicon Biogeochemistry

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

Isotope Biogeochemistry & Gas Fluxes

Contact: Prof. Jürgen Augustin | jaug@zalf.de

Microbial Biogeochemistry

Contact: Dr. habil. Steffen Kolb | steffen.kolb@zalf.de

Fungal Interactions

Contact: Dr. Marina Müller | mmueller@zalf.de



RESEARCH AREA 2

»LAND USE AND GOVERNANCE«

PROF. SONOKO DOROTHEA BELLINGRATH-KIMURA

PROF. KLAUS MÜLLER

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 are additional topics of research in this Research Area.

CORE RESEARCH QUESTIONS:

- What are the effects of land use and individual management measures on the provisioning of ecosystem services and biodiversity and how can these services be improved?
- How can the provisioning, change and site-dependency of ecosystem services and biodiversity as well as the trade-offs between agricultural management measures and ecosystem services and biodiversity be modelled and valued?
- What are the demands and expectations of different stakeholders and stakeholder groups regarding the provisioning of ecosystem services and biodiversity? What are the resulting land use conflicts and locally adapted options and how are these spatially distributed?
- 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?

WORKING GROUPS

Resource-Efficient Cropping Systems

Contact: Dr. Johann Bachinger | jbachinger@zalf.de

Sustainable Grassland Systems

Contact: Dr. Jürgen Pickert | juergen.pickert@zalf.de

Provisioning of Ecosystem Services in Agricultural Systems

Contact: Prof. Bellingrath-Kimura | belks@zalf.de

Provisioning of Biodiversity in Agricultural Systems

Contact: Dr. Michael Glemnitz | mglemnitz@zalf.de

Farm Economics and Ecosystem Services

Contact: Dr. Peter Zander | peter.zander@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

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: Dr. Stefan Sieber | stefan.sieber@zalf.de

Co-Design of Change and Innovation

Contact: Prof. Thomas Weith | thomas.weith@zalf.de



RESEARCH AREA 3 »LANDSCAPE RESEARCH SYNTHESIS«

PROF. KATHARINA HELMING
PROF. FRANK EWERT (ACTING)

WHAT WILL THE AGRICULTURAL LANDSCAPES OF THE FUTURE LOOK LIKE?

Agricultural landscapes 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. 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 landscapes are therefore 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 »Landscape Research Synthesis« programme area is to integrate research results across disciplines and scales in order to develop robust assessment options for 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 can modelling approaches of cropping systems be combined to generate insights into yields, resource efficiency and environmental impacts across different spatio-temporal scales and to allow for the conceptual integration of cropping systems with systemic value chains for food production?
- How can future developments of cultivation systems (e.g. cultivation technology, autonomous machinery, modified crop rotations, agroforestry systems) be anticipated, integrated into future scenarios together with other drivers, and evaluated with respect to their impact on resource efficiency (water, land, energy, raw materials, cost) and ecosystem services under changing framework conditions (e.g. climate change, policy)? Which indicators are suitable when the analytical knowledge basis is scarce, and what are the effects of different system boundaries (field, farm, landscape, region or product) on the results?
- How do different spatio-temporal scales and system boundaries shape the determinants of land use changes? Which interactions exist between these determinants, and which patterns do they exhibit? How are preconditions and demands for land use services changing in the rural-urban continuum? What are their effects on the innovation potential of products and value chains?

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. Annette Pierr | apierr@zalf.de

Integrated Crop and Grassland Systems Analysis and Assessment

Contact: Dr. Heidi Webber | heidi.webber@zalf.de



RESEARCH PLATFORM »DATA«

PROF. GUNNAR LISCHIED
PROF. FRANK EWERT (ACTING)

CONTRIBUTION TO ZALF RESEARCH

A profound knowledge of the vast number of processes interacting in landscapes is a necessary but by no means sufficient prerequisite for both landscape research and the sustainable use of landscapes according to the UN Sustainable Development Goals. Due to common multi cause-multi effect relationships and the simultaneity of natural and anthropogenic processes, empirical approaches and methods are often fraught with high uncertainties. There is thus an urgent need for extensive and well-documented datasets as well as for sophisticated diagnostic tools as prerequisites for testing and refining our understanding of landscape functioning. The service groups within the Research Platform »Data« will ensure the comprehensive acquisition of meta-data, the long-term storage of well-documented data, and the provisioning of user-friendly interfaces for data access, search and retrieval.

In addition, powerful tools for the analysis of large and heterogeneous datasets must be applied and continuously enhanced. Modern landscape research requires methods that explicitly account for the challenges of high-dimensional, heterogeneous (i.e. nominal, ordinal, interval and ratio measurement scales) datasets with different temporal and spatial coverage and their typical characteristics (e.g. non-linearity, non-stationarity, spatial correlation, and memory effects).

The activities of the Research Platform »Data« build upon the data collected in Research Areas 1 and 2 and the associated thematic expertise. They are also closely linked to the data-based modelling activities in the Research Platform »Models & Simulation« as well as the interdisciplinary analyses and the development of a landscape theory in Research Area 3.

WORKING GROUPS

Dimensionality Assessment and Reduction

Contact: Prof. Gunnar Lischied | lischied@zalf.de

Small Water Bodies in Agricultural Landscapes

Contact: Prof. Gunnar Lischied | lischied@zalf.de

Geodata (Service)

Contact: Dr. Uwe Heinrich | uheinrich@zalf.de

Research Data (Service)

Contact: Adrian Krolczyk | adrian.krolczyk@zalf.de



RESEARCH PLATFORM »MODELS & SIMULATION«

DR. CLAAS NENDEL
PROF. FRANK EWERT (ACTING)

CONTRIBUTION TO ZALF RESEARCH

It is the central objective of the Research Platform »Models & Simulation« to develop a coherent concept for agricultural landscape modelling that integrates different disciplinary models and modelling methods. The required integration of data provisioning and modelling will be achieved through a close collaboration with the Research Platform »Data«. The interlinking with the thematic research in the Research Areas is meant to become a unique feature of agricultural landscape research at ZALF.

Today, model building is a well-established tool in many disciplines and the number and complexity of available models is steadily increasing. The complexity of landscape processes is one of the reasons for the multitude of modelling approaches that must be combined into newly developed modelling platforms to support integrated landscape research. Beyond model building, the use of models also results in new challenges that require scientific attention: methods of model calibration and validation, data assimilation techniques, data-driven modelling approaches and the behaviour of models and model ensembles at the boundaries of their application range are commonly not studied by researchers interested in landscapes. However, particularly models which operate at the landscape level and integrate processes of different entities to describe interactions at the interface of nature, economy and society are not yet fully

explored. Applied model solutions which represent agricultural landscapes as the arena of land use and governance decisions are also rare. The Research Platform »Models & Simulation« closes these gaps and provides a framework for the integration of different disciplines and modelling approaches aiming for an improved understanding of agricultural landscape functioning.

The Research Platform »Models & Simulation« will consist of working groups which conduct cutting-edge research on modelling and simulation methods. Depending on their focus they will work on

- the scale dependency of both model parameters and the availability of inputs,
- the limited prediction horizon of nonlinear systems, and
- the stochastics of system inputs.

WORKING GROUPS

Ecosystem Modelling

Contact: Dr. Claas Nendel | nendel@zalf.de

Integrated Landscape Modelling

Contact: Dr. Claas Nendel | nendel@zalf.de

Simulation Methods and Data-driven Models

Contact: Dr. Ralf Wieland | rwieland@zalf.de

Model & Simulation Infrastructure (Service)

Contact: Michael Berg-Mohnicke | michael.berg@zalf.de



EXPERIMENTAL INFRASTRUCTURE PLATFORM

DR. 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 the 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 Research Platforms. 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. Dietmar Barkusky | dbarkusky@zalf.de

SELECTED NEW PROJECTS

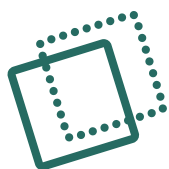


SATELLITE-BASED INFORMATION FOR GRASSLAND MANAGEMENT

BAHAREH KAMALI, CLAAS NENDEL



In January, the project partners met for a kick-off event at ZALF.



Agricultural grasslands not only provide ruminant feed for meat and milk production, but also store large amounts of carbon in the soil. In recent years, however, a decrease in productivity, changes in soil organic matter and a loss of biodiversity have

been observed at grassland sites. The protection of grassland ecosystems against these threats must be ensured by continuous, site-adapted and sustainable management regimes. The SATTGRÜN project, funded by BMEL, aims to develop innovative web-based products combining satellite data and simulation models. These products provide up-to-date information to identify necessary ecosystem management measures, to optimise mowing schedules, to maximise productivity, and to further improve feed quality.

Together with scientists from Humboldt-Universität zu Berlin, the Julius Kühn-Institute, the Helmholtz-Centre for Environmental Research UFZ, the German Weather Service and two private companies, ZALF applies various process-based models to simulate biotic and abiotic processes of grassland growth and to study the impacts of the natural and anthropogenic changes on grassland ecosystems. The agro-ecosystem model MONICA, developed at ZALF and adopted for perennial crops, will be applied across Germany. The complex interactions between the vegetation, the water cycle, and soil processes in the MONICA model increase model dimensionality and thereby necessitate the calibration of a large number of parameters and variables. The model is therefore coupled with an uncertainty-based calibration procedure and its performance is evaluated using experimental field data collected from different sites.

Permanent grassland accounts for approximately 28% of Germany's agricultural area and contributes substantially to sustainable food production and environmental benefits. The SATTGRÜN project uses agroecosystem models, enhanced with real-time satellite data, to provide deeper insights into the complex processes in grassland systems. The main project objectives are the development of innovative decision-making products for improving the economic performance of grassland farming, for increasing the resilience of grasslands under climate change conditions, and for protecting soils and groundwater.

In the next step, the calibrated model will benefit from the integration of high-resolution remote sensing data by implementing assimilation techniques such as particle filtering. The rapid development of remote sensing technology offers the potential for reliably estimating the properties of grasslands at large scales. The project integrates optical (Sentinel-2 and Landsat-8) and radar (Sentinel-1) data in order to systematically derive information on grassland properties with high spatial and temporal resolution (e.g. the phenological development of grassland vegetation). On this basis, canopy and vegetation parameters such as the leaf area index can be derived and assimilated into the MONICA model.

Project: Satellite-based Information for Grassland Management (SATTGRÜN) **Term:** 2017–2021 **Sponsor:** BMEL **Lead at ZALF:** C. Nendel (nendel@zalf.de) **Partners:** HU Berlin, JKI, DWD, UFZ, FarmFacts, Vista <http://www.satt-gruen-projekt.de>

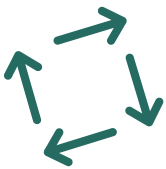
NON-CHEMICAL CONTROL OF THE SEA BUCKTHORN FLY

SANDRA LERCHE



Sea buckthorn fly

In the Federal State of Brandenburg, sea buckthorn is currently cultivated on approximately 370 ha, thus being the third most important fruit crop following apple and sweet cherry. 90 % of the sea buckthorn crops are cultivated according to the principles of organic farming. These areas are severely threatened by the massive occurrence of the sea buckthorn fruit fly *Ragoletis batava*. Both for ecological and integrated sea buckthorn cultivation, there is a lack of adequate strategies to reliably control the sea buckthorn fruit fly. Without a practice-oriented and timely pest control strategy, the future of sea buckthorn cultivation in north-eastern Germany is at great risk.



It is the aim of the ELER-funded EIP-agri project MOPLASA to develop a modular plant protection strategy for controlling the sea buckthorn fly. For this purpose, various non-chemical individual measures (modules) are combined to form a coherent modular strategy.

This principle enables sea buckthorn growers to apply a farm-specific combination of control measures against the fly.

Different modules like traps (different types and lures), mechanical soil cultivation, barriers, macro- and microorganisms like insect-pathogenic fungi, bacteria and nematodes, choice of sea buckthorn varieties, and mobile poultry farming will be tested and assessed both separately and in effective combinations. Biological parameters of the fruit fly will be determined, too. Thus, additional data will be provided which are important for the development of the control strategy.

Together with the four sea buckthorn growers, all individual modules are going to be tested comprehensively in laboratory, plot and field trials and integrated into a modular plant protection strategy. The promising modules are then examined for their compatibility and effectiveness. Parameters for the selection of suitable module combinations are the infestation pressure, the cultivation method, the range of varieties, and the required soil as well as climatic and weather conditions.

Apart from ZALF, the project group includes the four farms Gut Schmerwitz, Biohof Glindow, Havelfrucht and Forst Schneebecke as well as agrathaer GmbH, the Humboldt-Universität zu Berlin, the Pflanzenschutzdienst Brandenburg, the

Landesforschungsanstalt Mecklenburg-Vorpommern, the e-nema GmbH, the IGG GmbH, the Sanddornverein and the Julius Kühn-Institute, Institute for Biological Control. So, the pending tasks will be addressed collectively and with the required expertise.

Project results will be made available to all sea buckthorn growers as recommendations for action in a practical handbook and in short videos.

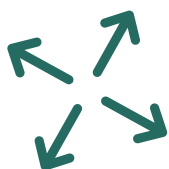
Project: Development of a Modular Plant Protection Strategy Based on Different Sustainable, Non-chemical Methods to Control the Sea Buckthorn Fly (MOPLASA) **Term:** 2018–2022 **Sponsor:** EIP-agri Brandenburg, ELER **Lead at ZALF:** S. Lerche (sandra.lerche@zalf.de) **Partner:** HU Berlin, agrathaer GmbH, LFA Mecklenburg-Vorpommern, LELF Brandenburg, Werderfrucht GmbH, Biohof Glindow GbR, Gut Schmerwitz GmbH & Co. KG, Forst Schneebecke, Internationale Geotextil GmbH, e-nema GmbH, Gesellschaft zur Förderung von Sanddorn und Wildobst e. V. <https://bit.ly/2UXM4Y9>

PROMOTION OF INSECTS IN AGRICULTURAL LANDSCAPES

ULRICH STACHOW, MARIA BUSSE, THOMAS KAISER



Agricultural landscape in the »Havelland Luch«



Since 1st October 2018, the Federal Department of Agriculture has been funding a research project on insect-friendly production systems, in which ZALF is playing a major role. The project centers on the establishment of three »landscape laboratories«

representing typical agricultural landscapes in Germany. The research approach encompasses various comprehensive steps:

- 1) We adopt a landscape perspective, thus looking at larger areas comprising of several km² (»landscape labs«), with all habitats regardless whether they are used for agriculture or not.
- 2) We develop regionally specific guiding principles that define and bring together the different aims of insect promotion (e.g. nature conservation, integrated pest management, etc).
- 3) We conduct plot-scale experiments outside the landscape laboratories to test individual measures of insect promotion.
- 4) We cooperate with all farmers operating within the landscape laboratories as well as with other relevant stakeholders to jointly develop productive measures which can be integrated into the farming systems.
- 5) We develop protocols for monitoring the effects of the measures, including comparison with reference landscapes in proximity to the landscape laboratories.
- 6) We develop the basis for agri-environmental schemes, e.g. for promoting insect-friendly grassland systems.

Insects are the most diverse group of animals and essential for the functioning of agricultural systems and landscapes. However, significant changes within agricultural landscapes have led to drastic declines of insect species numbers and abundances. How can this trend be stopped? This question is tackled by a joint research project, striving to develop and test insect-friendly agricultural production systems in various landscapes using an interdisciplinary approach that includes close cooperation between researchers and farmers. The focus will be on increasing the diversity of crops and land uses, for example by introducing energy crops.

7) The research project is designed as a long-term experiment of approx. 12 years, and aims for results that can be transferred to other agricultural landscapes.

Within this inter- and transdisciplinary project, ZALF cooperates with departments of the Thünen Institute, the Julius Kühn Institute and the Chamber of Agriculture of Lower Saxony. Among other tasks, ZALF is responsible for managing the landscape laboratory located northwest of Berlin in the »Havelland Luch«, a grassland-dominated agricultural landscape which is exemplary for the heterogeneous agricultural practice in northern European lowlands. In this laboratory, we investigate how species- and flower-rich grassland vegetation can be established and which agronomic measures can increase insect diversity. ZALF tasks also include the cooperation with all relevant stakeholders, in particular with farmers. This so-called »co-design process« will be conceived and implemented by ZALF in all planned landscape laboratories. Further overarching project activities of ZALF include the development of guiding principles for insect promotion, studies on the acceptance of the proposed measures by farmers as well as the synthesis of methods and results in order to assess the potential for transferability and generalization.

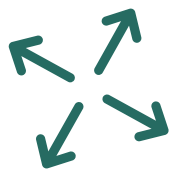
Project: Promotion of Insects in Agricultural Landscapes through Integrated Production Systems with Renewable Resources — a Science Assisted Model and Demonstration Project in Landscape Laboratories (FINAL) **Term:** 2018–2021 **Sponsor:** BMEL **Lead at ZALF:** U. Stachow (stachow@zalf.de) **Partners:** JKI, TI, Chamber of Agriculture of Lower Saxony

INTEGRATED DEVELOPMENT OF URBAN AND RURAL REGIONS

THOMAS WEITH



Settlement area? Open Space? Agriculture?



In the REGERECHT project, partners from science and practice will work together over the next five years to develop solutions for reducing the conflicts between the city, urban areas and rural regions and to establish new ways to balance differing interests. The focus is on the various land use demands and the associated resources and infrastructures. For example, the controversial development of settlements and the protection of agricultural land and forests.

The project uses an approach that combines science and practice right from the start. Through transdisciplinary cooperation, the various actors and their perspectives are involved as early as possible in the development and testing of solutions for land use conflicts.

These will be initially developed in a regional context in the vicinity of Schwerin, and subsequently transferred to other regions in Germany featuring cities of the same size and similar challenges.

At the beginning, various forms of urban-rural exchange and regional cooperation will be analyzed. This will be followed by a regional dialogue on land-use related urban-rural interdependencies. As a result, new forms of land governance are created that can also be used in other regions. They take into account regional interdependence models and concepts of justice.

The project explicitly targets local and regional governance, state and federal policy makers, companies, and non-governmental organizations.

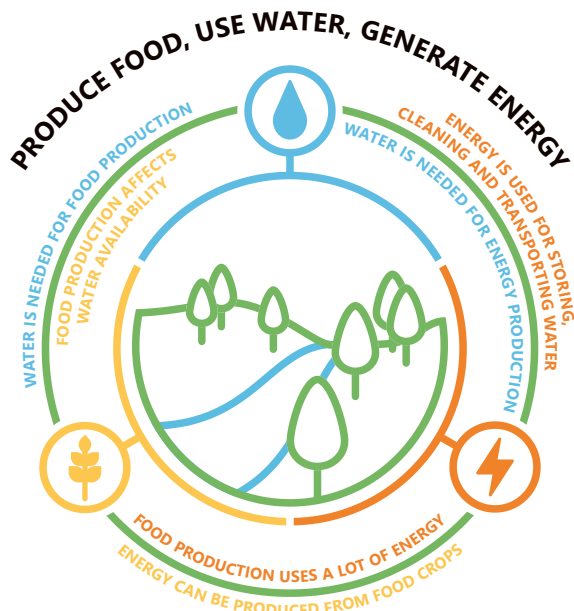
Rural and urban regions are often seen as opposites. However, a sustainable land use planning or the development of transport infrastructures and educational opportunities depend on cooperation. In September 2018, the project »REGERECHT — Integrative development of a fair balance of interests between the city, suburban area and rural region« funded by the Federal Ministry of Education and Research was launched.

The five-year project REGERECHT is supported by the Federal Ministry of Education and Research under the funding scheme »Stadt-Land-Plus« as part of the flagship initiative Zukunftsstadt. The »Stadt-Land-Plus« funding scheme aims to achieve an integrated sustainable development of regions by strengthening the urban-rural interrelations.

Project: REGERECHT — Integrative development of a fair balance of interests between the city, suburban area and rural region **Term:** 2018–2023 **Sponsor:** BMBF **Lead at ZALF:** T. Weith (thomas.weith@zalf.de) **Partner:** IRS, UFZ, TU Dresden, City of Schwerin, Amt für Raumordnung und Landesplanung Westmecklenburg, Landgesellschaft Mecklenburg-Vorpommern mbH, Bundesverband der gemeinnützigen Landgesellschaften (BLG), T-Systems Multimedia Solutions GmbH
<https://regerecht.de/>

URBAN SUSTAINABILITY STRATEGIES IN THE NEXUS OF FOOD, WATER AND ENERGY

INGO ZASADA, ALEXANDRA DOERNBERG, ANNETTE PIORR, FEE NANETT TRAU



Schematic representation of the Food-Water-Energy-Nexus



Cities and urban regions in Europe and worldwide are increasingly facing the challenges of urbanization, the growing concentration of the population and of economic activities as well as climate change adaptation. This implies an increasing consumption

of food, water and energy resources, thus leading to shortages and scarcity of these resources and jeopardising a sustainable and climate-friendly urban regional development. In the recent past, the so-called Food-Water-Energy (FWE)-Nexus representing the interactions between these systems has created attention in science, policy and society as an opportunity for potential efficiency gains and synergy effects. In the past, very different technical solutions and innovations have been advanced in the FWE-Nexus.

Funded through the Sustainable Urbanisation Global Initiative (SUGI) / Food-Water-Energy Nexus, the joint research project SUNEX is striving to capture the systems' interdependencies through an integrated modelling framework and monitoring network. The approach will be applied to the four case study cities Berlin, Bristol, Doha and Vienna, featuring different socio-economic and climatic conditions, consumption patterns, and local and remote FWE resource shares. SUNEX aims to support the decision-making process by formulating sustainable urban FWE-Nexus strategies in consideration of the cities' different consumption patterns and limited resources. The FWE-Nexus concept will serve as central approach to ensure coherent solutions on sustainable use and management.

In the SUNEX project, ZALF is cooperating with research groups, companies and public bodies in Austria, the UK, Qatar

SUNEX aims to develop an integrated systems approach to support the local decision-making process in formulating inclusive urban Food Water Energy (FWE)-Nexus strategies. The applied Nexus-approach relies on empirical urban data, stakeholder dialogue and consistent development scenarios to address and understand the complex interlinkages between the three systems (agriculture / food production, water, energy) and to maximize their synergies. SUNEX offers a modelling framework aimed at managing limited urban resources in order to achieve sustainable urban transformation in social, economic and environmental aspects.

and the US. In the case study region Berlin-Brandenburg, we pursue an approach that takes the food system as a starting point and analyses potential efficiency gains and synergies at the interfaces to the water and energy system along the entire food chain (agricultural production, processing, distribution, consumption and disposal). The research project will be carried out in close consultation with practice partners and policy stakeholders to ensure a sufficient regional embedding and support for the decision-making processes.

Project: Formulating Sustainable Urban FWE Strategy by Optimizing the Synergies Between Food, Water and Energy Systems (SUNEX) **Term:** 2018–2021 **Sponsor:** BMBF **Lead at ZALF:** Anette Piorr (apiorr@zalf.de) **Partner:** AIT Austrian Institute of Technology, QEERI, UWE, ROC-Connect Inc., Ministry of Municipality and Environment Qatar, Bristol Water Ltd.
<http://sunex-project.eu/wp/>

SELECTED CURRENT PROJECTS



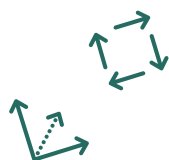
A VIEW FROM ABOVE: WATCHING BIODIVERSITY AT WORK

GUNNAR LISCHIED, PHILIPP RAUNEKER, MICHAEL SOMMER



Drone and PhD student at work

Numerous studies have investigated the effects of biodiversity, e.g., of vascular plants, on ecosystem functions. It has often been found that enhanced biodiversity increases the stability of ecosystems and increases the resource-use efficiency. It is commonly assumed that complementary use of niches plays a pivotal role: Species differ with respect to nutrient and water uptake mechanisms, rooting depth, or seasonal timing, thus enabling the sustained use of scarce resources that are not available for other species. The PETCHY project aims at testing this hypothesis with respect to plant water use.



The often observed beneficial effects of biodiversity on resource use efficiency and ecosystem stability have been ascribed to the fact that different species use different niches in time and space for water and nutrient uptake. It is therefore advisable to

confirm if higher biodiversity actually results in larger within-site spatial and temporal variability of functional patterns, such as plant water uptake. Here »temporal variability« refers to changes of spatial patterns of water uptake and evapotranspiration in time, depending on hydrological boundary conditions that favour or discriminate against single species or functional groups.

The PETCHY project aims at determining and comparing mean evapotranspiration of the experimental grassland plots of the Biodiversity Exploratories, the spatial patterns and spatial heterogeneity within the experimental plots, as well as the temporal stability of these patterns. To this end, two innovative techniques are combined. UAV-borne remote sensing using thermal and multispectral sensors allows determining the spatial patterns of the actual evapotranspiration at very high spatial resolution with low effort. Recently published approaches for analysing large sets of hydrological time series data have been very successful in disentangling the interplay of different effects on the observed dynamics. By merging these two approaches, the spatial and temporal aspects can be integrated in order to better understand the effect of biodiversity on plant water use.

The project approaches the topic from different angles:

- 1) The within-plot spatial heterogeneity of evapotranspiration is determined by means of high-resolution UAV-borne remote sensing. We expect that a higher spatial variability is associated with a higher resilience to drought stress.
- 2) The effects of plant species diversity on spatial patterns of evapotranspiration will be distinguished from the effects of small-scale soil heterogeneity with respect to nutrient availability, water holding capacity, and soil moisture. We expect mutual dependencies between plants and soil, but an additional effect of plant diversity on evapotranspiration in addition to the effects of soil.
- 3) Multi-temporal UAV surveys are used to check the observed spatial patterns of evapotranspiration for temporal stability. We expect that temporal (seasonal) stability of spatial patterns of evapotranspiration within single plots will decrease with increasing biodiversity.

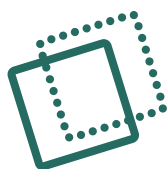
Project: Patterns of Evapotranspiration changing throughout the Year (PETCHY) **Term:** 2017–2020 **Sponsor:** DFG
Lead at ZALF: G. Lischied (lischied@zalf.de)
<https://bit.ly/2N8S65B>

EMISSIONS OF VOLATILE ORGANIC COMPOUNDS IN ENERGY CROPPING SYSTEMS

MICHAEL BERG-MOHNICKE, TOMMASO STELLA, CLAAS NENDEL



Gas flux chambers at the research station Dedelow



The emission dynamics of biogenic volatile organic carbon compounds (BVOCs) from crops are rarely studied, despite their key role in regulating ozone concentration, methane lifetime and the formation of secondary aerosols in the atmosphere. BVOC emissions are likely to change in the future, in association

with temperature, atmospheric CO₂ and land-use change. In order to assess the impact of bioenergy crops on air chemistry, the project VOCE measured the BVOC emissions of maize, winter rapeseed and ryegrass during the cropping seasons 2015, 2016 and 2017. This work was carried out by scientists of the KIT/IMK-IFU Garmisch-Partenkirchen and the Helmholtz Zentrum München at the ZALF Research Station in Dedelow, Brandenburg. For these measurements, special gas flux chambers (see picture) were used, which regularly and automatically recorded gas fluxes in a 10-minute time window covering an area of 1 m². Proton transfer reaction mass spectrometry (PTR-MS) was then used to identify and quantify the BVOCs emitted by the plants. These data were the primary source of information to calibrate and validate the BVOC emission modules, which were added to the agroecosystem model MONICA by ZALF scientists. Two distinct emission modules were tested, differing in structure and mechanisms. The simpler approach »Guenther« was able to reproduce the measured experimental data well, but unable to react to future changes of the atmospheric CO₂ concentration. This aspect is taken into account by the second integrated approach »JJV«, which requires further validation beyond the project lifetime.

With the model MONICA and the integrated modules developed during this project, ZALF makes available a generic

All plants emit signaling chemicals, called biogenic volatile organic compounds (BVOCs). These protect plants from stress and mediate communication within the ecosystem, attracting insects for pollination or sending warning signs to pests or neighboring plants. BVOCs also contribute to air chemistry and have a considerable indirect effect on the climate. The emissions from agriculture depend on the crop, environmental conditions, phenology, and field management. In order to quantify BVOC emissions for energy crops under current and future climatic conditions, the VOCE project measured BVOC fluxes from maize, rapeseed and ryegrass and extended available computer models to simulate these emissions in regional applications.

agroecosystem model which allows calculating the BVOC emissions of maize and winter rapeseed at the regional and national level. The open source nature of the project fosters the collaboration within the scientific community, which can benefit from the work carried out during the VOCE project and contribute to its extension. In this regard, ZALF encourages experimental work to study the BVOC emission patterns of other crops and hopes to bridge the gap between ecosystem and air chemistry models. Such integrated solutions help to disentangle some of the feedback mechanisms between crops and the atmosphere and could therefore become an essential tool for the design of climate-smart cropping systems.

Project: Emissions of Volatile Organic Compounds in Energy Cropping Systems (VOCE) **Term:** 2015–2018

Sponsor: BMEL **Lead at ZALF:** C. Nendel (nendel@zalf.de)

Partner: KIT/IMK-IFU, HMGU

RESOURCE MANAGEMENT IN ARID AND SEMI-ARID IRRIGATION REGIONS IN CENTRAL ASIA

DAGMAR BALLA, AHMAD HAMIDOV



In the large cotton plantations of Central Asia, water scarcity and soil salinity are central problems for agriculture and the environment. A large share of the irrigation water is subject to leaching, which leads to an increased groundwater level, the enrichment of salt within the plant root zone and, subsequently to physiological damages. Therefore, the groundwater level must be lowered by means of artificial drainage systems. About 60 % of the irrigation freshwater is thus returned to downstream surface waters as saline drainage water, which is not suitable for further agricultural usage. In light of both resource limitation and climate change, new innovative approaches for water re-use and recycling must therefore be developed.

Constructed wetlands in the study area with different macrophytes, in the foreground *Lemna minor*. The drainage canal is situated on the left-hand side, the irrigated fields on the right-hand side behind the earthen walls.



The joint project BLOWAT is aimed at the development of new sustainable and resource-efficient solutions for water, land, and energy management within rural areas in Central Asia. We investigate: a) whether phytoremediation using constructed wetlands

is an effective technology for lowering the salt content of the drainage water under the semi-arid conditions, b) whether the improved water quality can be used for irrigation, and c) which crops are suitable for these conditions. Furthermore, we test the use of the aquatic biomass for energy production purposes.

In the first work package, the Uzbek partner TIIAME constructed three retention ponds (approx. $6 \times 16 \text{ m}^2$) near Bukhara, Uzbekistan, through which drainage water (salt content $\sim 3 \text{ g/l}$) is slowly flowing. A part of the purified water was then transferred into the irrigation canal for irrigating adjacent cotton fields. In agreement with previous investigations, Lemnaceae showed the best results with respect to salt uptake. Furthermore, the in-situ experiments showed higher yields when cotton was irrigated with purified drainage water instead of non-reclaimed water. *Azolla* and *Lemna minor* featured the highest aquatic biomass growth per time and, hence, the largest raw material volume for bioenergy. The reproduction of *Lemna* seeds was verified for the extremely high and cold temperatures during the vegetation period and winter dormancy, respectively.

In the second work package, the Tajik partner IBPPG investigated alternative stress- and drought resistant crops like

spring wheat and beans in field experiments. To this end, seeds from the Russian Federal Research Centre for genetic plant resources in St. Petersburg and traditional cultivars from Tajikistan were used. The preliminary results indicate possible stress resistant varieties.

In the third work package, the Kazakh partner IHG identifies the volume of polluted drainage water using remote sensing. For this purpose, the Makhtalar irrigation region located within the Uzbek-Kazakh border zone is used as a reference area. Last but not least, in cooperation between ZALF and the project partners from the University of Kassel, aspects of environmental governance and the institutional preconditions of introducing this new technology in the conditions of Central Asia are analyzed. The results indicate a high civil societal, political and administrative acceptance of the introduction of these new technologies in practice. Supporting options, e.g. for biomass and water management, are currently under discussion, including the potential establishment of new value-chains with new entrepreneurial structures.

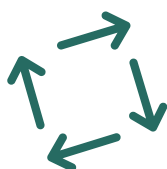
Project: Resource Management in the Salinized and Drought Stress-Endangered Irrigation Areas of Central Asia for Adapting to Climate Change (BLOWAT) **Term:** 2017–2019 **Sponsor:** BMBF **Lead at ZALF:** D. Balla (dballa@zalf.de) **Partner:** Univ. Kassel, TIIAME (Uzbekistan), IBPPG (Tajikistan), IHG (Almaty, Kazakhstan), IWMI (Tashkent, Uzbekistan)

MOVEMENT ECOLOGY MEETS BIODIVERSITY

MARINA MÜLLER, GABRIELE SCHIRO, MERLIN SCHÄFER, THOMAS MÜLLER



From the field to the microscope: studying the dispersal of phytopathogenic fungi



Active and passive movements of organisms have extensive consequences for the occurrence, development, composition and time dynamics of biological communities. The movement and dispersal abilities of different organisms do not only influence the respective populations, but also have direct and indirect effects on other organism groups (e.g. predator-prey interactions, disease dispersal). Nowadays, anthropogenic activities are changing these interactions. The degradation and fragmentation of habitats may directly lead to behavioral changes influencing organism development, limiting their movement or modifying their interactions with the environment, and thus strongly influence all tightly connected ecological communities of an ecosystem.

Some of the BIOMOVE projects study animals and their behaviour, such as the movement patterns of hares in landscapes of different complexity, changes in the movement of prey populations in relation to their predators and their risk behaviour (so called »landscape of fear«), or the influence of different individual behaviour of small rodents on their movement choices. Other projects study the metacommunities of water organisms living in small water ponds (kettle holes) or the passive dispersal of nectar yeasts through pollinators. Some of the projects develop and expand model-based analyses of movement and population data to simulate different drivers, e.g. related to the impact of resource availability on the movement paths of migratory birds.

In the BIOMOVE project conducted by ZALF, the passive dispersal of phytopathogenic fungi in wheat fields is investigated,

The DFG-funded research training group BIOMOVE links »biodiversity research« and »movement ecology«; two research areas which are mostly pursued separately from each other. A solid theoretical framework is required to understand how the movements of individuals influence the population and community dynamics of different organisms. The twelve projects of the first doctoral cohort investigate behavioral effects, diversity patterns and influencing factors in a dynamic agricultural landscape in the AgroScapeLab Quillow.

focusing on two fungal genera responsible for yield losses and critical for food security due to their ability to produce mycotoxins. The project aims to describe possible distribution patterns in the field and to identify the main driving factors. When comparing the two fungal genera, differences in their dispersal abilities (e.g. due to different spore shapes) and differences in the nutrient availability throughout the field seem to play a bigger role for a successful infection of the wheat ears than the spreading rate of the fungal spores. The influence of antagonistic bacteria on fungal growth and mycotoxin formation shown in laboratory experiments has not yet been demonstrated in the field.

By linking movement and diversity patterns, all of the BIOMOVE projects contribute to a better understanding of the biotic interaction mechanisms of complex communities in agricultural landscapes and to the identification of key drivers.

Project: Integrating Biodiversity Research with Movement Ecology in Dynamic Agricultural Landscapes (BIOMOVE)

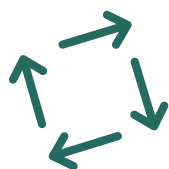
Term: 2015–2020 **Sponsor:** DFG **Lead at ZALF:** M. Müller (mmueller@zalf.de) **Partner:** Univ. Potsdam, FU Berlin, IZW <https://www.biomove.org>

HOW DO SOIL LANDSCAPES CHANGE OVER TIME?

MARIJN VAN DER MEIJ, MICHAEL SOMMER, ARNAUD TEMME, MARKUS EGLI

Intensive agriculture has severe impacts on natural soil patterns and related soil functions. Erosion relocates fertile soil material and changes hydrological pathways, nutrient leaching and soil fertility patterns in landscapes. The international project CORRELATE aims to quantify and differentiate the historical and modern rates of soil redistribution in agrarian landscapes and to determine how this redistribution affects natural processes forming soil profiles and controlling soil functions. If we understand the dynamic anthropogenic impact on agricultural soils and landscapes at different time scales, we can formulate effective management strategies for sustainable land use and for climate change mitigation.

Drone-based 3D image of the CarboZALF experimental site



The CORRELATE project is an international collaboration between modellers, isotope geochemists and pedologists from ZALF, Wageningen University, Kansas State University and the University of Zuerich. To separate long-term (millennial) from short-term (decadal) impacts on erosion

processes, we use different geochronological dating techniques to determine the age of different soil horizons. These ages can be used to determine when soil particles were eroded or deposited or at what rate new soil material is formed from the underlying substrate. The first dating results of horizons in colluvial soils using »Optical Stimulated Luminescence« (OSL) revealed that erosion processes in the hummocky ground moraines of north-eastern Germany have been proceeding since 3000 B.C., when the first humans inhabited the region. Due to agricultural intensification, the rates of soil redistribution have increased exponentially in recent times. These rates were determined by comparing the depth profiles of the cosmogenic nuclide ^{10}Be (long-term rates) and the fallout radionuclides $^{239+240}\text{Pu}$ (short-term rates) in the soils of the CarboZALF experimental site. Depending on the landscape position, the soil erosion rates averaged over millennia range between near 0 (plateau) and 2 tonnes per hectare and year (mid-slope). However, during the last few decades, mid-slope erosion rates increased to $25 \text{ t ha}^{-1} \text{ yr}^{-1}$ which considerably exceeds the natural soil formation rate.

In the next step, we will apply a numerical computer model (LORICA) to simulate how processes have changed soils and the landscape through time, ultimately creating the present-day soil patterns. Current computer models are poorly equipped to

simulate the complex fluxes of water and sediments that influence soil development in the north-eastern German lowlands. In our efforts to develop a model that successfully simulates these processes, we encountered numerous practical and methodological challenges for which we published first solutions.

The combination of geochronological techniques and numerical computer models provides the tools needed to reconstruct how erosion processes influenced soil and landscape functions over large time scales. A detailed understanding of soil and landscape evolution will be essential for coping with current changes in climate and food demand, both of which will put pressure on the already partly degraded landscapes in the near, but also in the distant future.

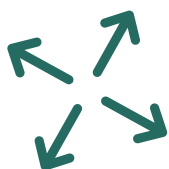
Project: Concurrent Evolution of Erosion Rates, Weathering and Profile Development of Agricultural Soils: a 4-D Approach (CORRELATE) **Term:** 2015–2020. **Sponsor:** BMEL, MWFK, Univ. of Zuerich **Lead at ZALF:** M. Sommer (sommer@zalf.de) **Partner:** Univ. of Zuerich, Kansas State Univ., Wageningen Univ.

PEATLAND MANAGEMENT PRACTICES TO REDUCE GREENHOUSE GAS EMISSIONS

TERESA KRAUS, NAHLEEN LEMKE, LASSE LOFT, BETTINA MATZDORF



Typical grassland use on a drained peatland



In the project PEATWISE, partners from Finland, Norway, Sweden, Denmark, the Netherlands, New Zealand, and Germany jointly aim to develop recommendations for sustainable management options for different types of drained peatlands. Measures to reduce GHG emissions commonly involve raising the groundwater table to a threshold level which, in most cases, has significant effects on the production conditions, compared to business as usual on drained peatlands. PEATWISE thus develops new site-specific management practices, supported by emission measurements conducted by other project partners.

At ZALF, Teresa Kraus investigates how the currently implemented policy instruments aiming at climate-friendly management practices are designed and institutionally embedded. In particular, she wants to better understand the interplay of governmental incentive-based policy instruments and incentive initiatives of the private sector, and how these could be coordinated in the future to facilitate favorable outcomes in their (sub-)national context.

Raising the water level is a measure that can support multiple ecosystem services at the same time and may affect multiple stakeholders on a landscape level. In this context, Nahleen Lemke will give special attention to collaborative approaches, i.e. the inclusion of different regional stakeholders into planning processes that can facilitate the cost-effective provisioning of multiple ecosystem services on peatlands.

As a starting point, we carried out a web-based survey in eight peatland-rich European countries (Finland, Sweden, Norway,

For centuries, peatlands, which naturally contain large amounts of organic matter, have been drained to extract peat and to use the fertile soil for agriculture and forestry. Today, however, we know that drained peatlands not only fulfil important production functions, but also release large amounts of greenhouse gases (GHG). Therefore, the restoration of their ecological functions to reach a notable reduction of GHG emissions must be carefully balanced with the local socio-economic realities. Against this background, the FACCE ERA-Gas project PEATWISE investigates how different options of water level regulation and management can contribute to reduced GHG emissions while maintaining production options.

Denmark, UK, the Netherlands, Germany and Poland). 60 experts, including researchers, stakeholders acting as multipliers for farmers (e.g. farmer's associations, NGOs) and government representatives, provided valuable insights on a regional and national level.

Building upon the results, we will conduct case study analyses in three PEATWISE partner countries. This will allow us to gain a deeper understanding of current needs and potential bottlenecks that must be taken into account when designing future incentives for peatland management practices with lower environmental impacts in Europe.

Project: Wise use of Drained Peatlands in a Bio-based Economy: Development of Improved Assessment Practices and Sustainable Techniques for Mitigation of Greenhouse Gases (PEATWISE) **Term:** 2017–2020 **Sponsor:** FACCE ERA-NET ERA-Gas **Lead at ZALF:** B. Matzdorf (matzdorf@zalf.de), L. Loft (lasse.loft@zalf.de) **Partners:** Swedish Univ. of Agricultural Sciences, Aarhus Univ., Radboud Univ. Nijmegen, Univ. of Eastern Finland, Univ. of Oulu, Univ. of Waikato

THE YEAR



BONARES

1ST CARBON-OPTIMISED LAND MANAGEMENT STRATEGIES FOR SOUTHERN AMAZONIA

German and Brazilian universities, the Helmholtz-Centre for Environmental Research (UFZ) and ZALF have, over a period of five years, developed sustainable land management strategies for the southern Amazon region as part of the »Carbiocial« research project. The results have now been published in a special issue of the trade journal »Regional Environmental Change« under the title »Carbon-optimised land management strategies for southern Amazonia«.

→ <https://bit.ly/2Si8feP>

5TH BONARES—VIRTUAL CENTRE FOR SOIL RESEARCH ON THE RIGHT TRACK

Following an interim evaluation, an international panel of experts recommended the continuation of the BonaRes Centre for Soil Research. They confirmed that the Centre has had a very successful start-up phase and that the partners involved have been successfully integrated into a virtual centre that is ideally equipped for the ambitious goal of providing scientific foundations for sustainable land use.

→ <https://bit.ly/2EirLQz>

1ST DFG PROJECT The significance of the element silicon (Si) is becoming increasingly important for research. There is increasing evidence in current studies that an improved supply of Si to crop plants leads to increased tolerance to stress factors such as drought. The DFG project »Biogenic Silicon in Agricultural Landscapes (BiSiAL)«, which was launched in March, is situated in this context. The focus is on the question of which Si pools in soils are relevant for the supply of plants and how these pools change over decades.

→ <https://bit.ly/2T7cZzs>

JANUARY

11TH SURVEY ON DIGITAL ASSISTANTS IN AGRICULTURE

Two thirds of those employed in agriculture already use digital farm management, mainly in the form of field maps and parallel driving systems, GIS surveying and GPS, fertilizer and/or PPP systems. This was the result of a ZALF survey.



FEBRUARY



26TH–28TH INTERNATIONAL SOIL CONFERENCE IN BERLIN

Fertile soils are the basis of life for humans, animals and plants. »Soil knowledge« and strategies for sustainable soil management are needed to conserve this important resource. The BonaRes Conference 2018 »Soil as a Sustainable Resource« brought 300 national and international soil researchers together in Berlin from 26th to 28th February.

→ <https://bit.ly/2C7QlXw>

MARCH

12TH–16TH SUCCESSFUL CONFERENCE PREMIERE

Around 250 participants from 25 countries met for the first »Landscape 2018« in Berlin. The conference, organized by ZALF in cooperation with international partners, focused on the central challenges of globalized agriculture: Climate Change, Food Security, Sustainability. More than 75 lectures, 70 posters, four thematic workshops and three field trips focused on the networking of diverse scientific disciplines and actors under the thematic umbrella of Agricultural Landscape Research.

→ <https://bit.ly/2JqCsob>



IN RETROSPECT



12TH–13TH COMMITTEES

At the meeting of the Scientific Advisory Board of the »European Joint Programming Initiative (JPI) – Agriculture, Food Security and Climate Change« in Berlin, Prof. Frank Ewert, Scientific Director of ZALF, was unanimously elected Chairman of the Advisory Board.

→ <https://bit.ly/2TL6Mha>

17TH GERMAN-AFRICAN DOCTORAL STUDENT MEETING

The Federal Office for Agriculture and Food (BLE) organized a conference in Berlin with the active support of ZALF in order to provide targeted support for young scientists. The aim was to



5TH LAYING OF THE FOUNDATION STONE

Starting in 2020, the »House of Cultural Biome Research« will conduct even more intensive research into the influence of micro-organisms on plant growth and climate change. The total ZALF investment amounts to 4.0 million euros, of which 80 percent are financed by the European Union (ERDF) and 20 percent by federal and state funds (Brandenburg).

→ <https://bit.ly/2u5OWaa>

APRIL

27TH AN ONLINE MARKET-PLACE FOR NATURE CONSERVATION

Shoes, travel, cars — there is now an online marketplace for almost everything. ZALF researchers want to transfer successful, internet-based business models to new territory: nature conservation. At the Hannover Fair, they presented their idea for an online marketplace with the »Agora-Natura« project, through which companies and private individuals can



invest in nature conservation projects whose benefits have been scientifically proven.

→ <https://bit.ly/1thoOXC>

MAY

promote the communication skills of the 25 doctoral students through a presentation course, to improve



their publication skills and to provide insights into the world of Open Data and Open Science.

→ <https://bit.ly/2XU7p77>

JUNE



9TH + 17TH ZALF GOES BERLIN

Just in time for the peak season for mosquitoes, ZALF answered the question of questions at the Long Night of Sciences: How will the summer of mosquitoes be in 2018? At the booth of the Citizen Science project »Mückenatlas« (Mosquito atlas), the guests learned interesting facts about the little »pests« — and were able to have their own specimens identified. One week later, the ZALF drone TRON lured interested visitors to Berlin's Princess Gardens as part of the Long Day of Urban Nature.

→ <https://bit.ly/2JaQplz>

THE YEAR



1ST HEAT AND DROUGHT PUT A STRAIN ON AGRICULTURE

It was one of the big issues this summer: the heatwave and its impact on German agriculture. Expected crop losses of up to 50 percent and demands on politicians for aid payments for affected farms led to a broad debate in the media and society. How can agriculture better adapt to climate change? ZALF took an active role in the discussion and was able to make a nationally visible contribution with appearances in more than 45 German TV, radio and print media.

→ <https://bit.ly/2FaR86H>

9TH UNITED FORCES FOR

INNOVATION The transformation from a research to an innovation project was successfully accomplished: Thanks to agrathaer's support in the application process, ZALF could successfully acquire the EIP project MoPlaSa, aiming at developing a module-based plan protection strategy to control the sea buckthorn fruit fly. The project joins farmers and industry.

→ <https://bit.ly/2JbHYuu>



14TH CONFERENCE ON SUSTAINABLE DEVELOPMENT

More than 220 participants from science, politics and society accepted the invitation of the Leibniz Association and took part in the conference on the United Nations Sustainable Development Goals in Berlin. ZALF was closely involved in the organization and implementation of the conference.

→ <https://bit.ly/2CowHkE>

JULY

AUGUST

SEPTEMBER



2ND IFSA SYMPOSIUM, CRETE

Under the motto »Identifying risks, improving opportunities«, international experts discussed the future implementation of sustainable agricultural systems. agrathaer GmbH, subsidiary of ZALF, moderated the session: »Farming system transitions to balance food production and sustainability: Perspectives from farm to landscape scale, actors and land use, drivers and constraints.«

→ <https://bit.ly/2TDLN0d>

25TH–26TH FEDERAL GOVERNMENT OPEN DAY

ZALF participated in the Open Day of the Federal Ministry for the Environment, Nature Conservation and Nuclear Safety (BMU) with the project »Living Agricultural Landscape – Farmers Shaping Diversity«. The aim of the project is to preserve and promote biodiversity in agricultural landscapes. It focuses on cooperation between science, nature conservation and actors from the agricultural sector. Federal Minister Svenja Schulze also came to the ZALF booth for a discussion.



29TH THE EXCELLENCE INITIATIVE

In the National Excellence Strategy, the decision on the future Clusters of Excellence was made at the end of September. The Excellence Commission in Bonn, composed of international experts and federal and state science ministers, selected 57 Clusters of Excellence from the 88 projects submitted. ZALF is an associated partner of the »PhenoRob« project run by the University of Bonn and Forschungszentrum Jülich.

→ <https://bit.ly/2Jd9isk>

IN RETROSPECT

18TH SCIENCE, POLITICS & PRACTICE AT ONE TABLE A panel discussion on »Agriculture and Climate Change« took place at ZALF in October. At the panel, science, practice and society discussed opportunities, risks and strategies for adapting to climate change with the audience. The conversation was broadcast on the radio and also extended to social media.



7TH DIGITAL DECISION AID IN GRASS SILAGE PRODUCTION agrathaers first EIP project »Q2GRAS«, entered the decisive transfer phase: the transformation of scientific data into a user-oriented practical tool has started. For this purpose, the requirements for the digital application were defined in a workshop with farmers, ZALF and associated partners.

3RD KNOWLEDGE TRANSFER INITIATIVE agrathaer initiated the first networking event for environmental- and geosciences with transfer agents from Leibniz and Helmholtz. The actors explored and discussed topics and challenges for knowledge transfer and worked on concrete solutions. The successful initiative will continue and other organizations, including the ZALF, joined the committee.

OCTOBER

28TH GERMAN PREMIERE FOR OPEN RESEARCH DATA In October, the BonaRes Data Center published the research data of the V140 long-term field trial for unrestricted re-use. Long-term field trials are essential research infrastructures for agricultural and soil sciences and essential for addressing current and future research questions. The Müncheberg »V140« long-term field trial was established in 1963 at the ZALF trial site, about 50 km east of Berlin in the district of Märkisch-Oderland. It is one of the few still active long-term field trials on sandy soil.

→ <https://bit.ly/2O6KZLF>



NOVEMBER



15TH ZALF WITH A NEW, OLD LOOK The external façades of the main buildings have been renovated in accordance with the regulations for historic monuments and are now gleaming again in their original colors. The three-part building complex was opened in 1928 and today houses, among other things, the Executive Board and the ZALF Library.

23RD AGRICULTURE 2050 How can we feed around 10 billion people in 2050? Vandana Shiva, Alternative Nobel Laureate, Norbert Lemken, Director for Agricultural Policy at Bayer Crop Science, and Prof. Sonoko Bellingrath-Kimura from ZALF discussed this issue at an event in Berlin.

DECEMBER

13TH MANAGEMENT GUIDELINES In December, ZALF successfully completed its development of management guidelines. As part of a participatory process, a common set of values for good management was developed and summarized in guidelines. Seminars and coaching sessions support managers in its implementation and further development.

31ST A SUCCESSFUL YEAR The number of peer-reviewed publications has continued to increase compared to the previous year, and third-party funding acquisition has tripled. ZALF also provides administrative support for this positive development, for example by continuously expanding its internal services in strategic science, funding and publication management.

ANNEX



FACTS & FIGURES



333

Employees
(among them 151 scientists)



5288

Newspaper articles



5.9 million €

Total amount of
third party money

600

Visitors

241

Peer-reviewed publications

22.2 million €

Basic funding

28

Employees doing
academic teaching



28.1 million €

Total budget

92

Tasks and offices in
scientific boards and bodies

16

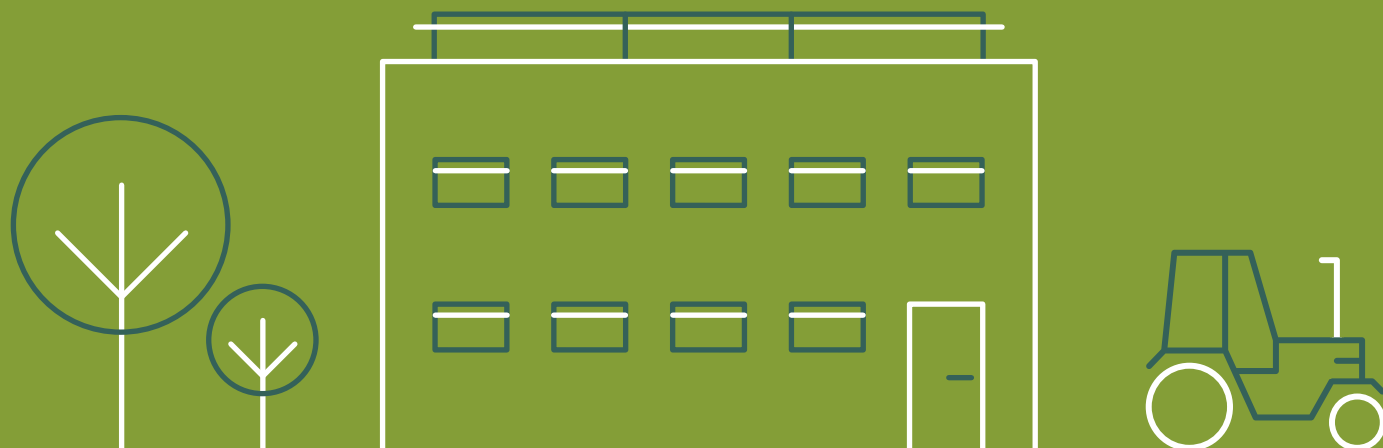
Scientific conferences
and workshops

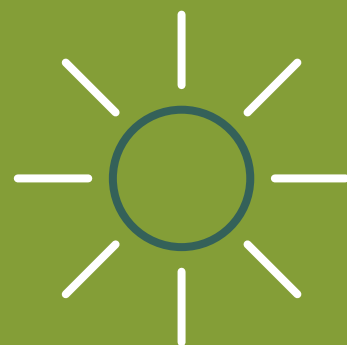
21%

Percentage of third party money

34

Colloquia



**11**

New doctoral researchers at ZALF

24

Newly started projects

13Completed doctoral theses,
thereof **10** by ZALF doctoral
researchers**250**Cooperating partners
in **24** countries (approx.)**21**Diplomas, master theses,
bachelor theses**150**Hectares of ZALF
experimental sites

FINANCES

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

37,306

REVENUES FROM THIRD PARTY
FUNDED PROJECT GRANTS IN
THE FINANCIAL YEAR 2018*

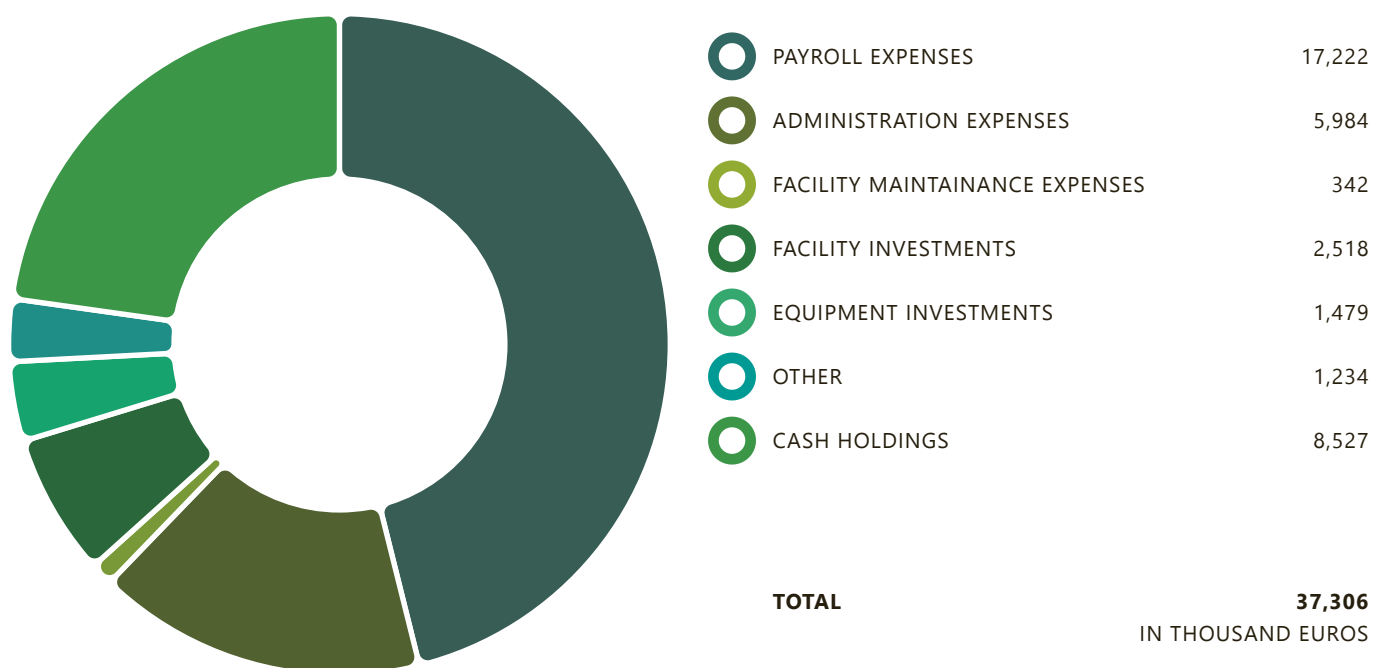
DFG	654
LEIBNIZ COMPETITION	132
FEDERAL MINISTRIES	3,871
STATE MINISTRIES	0
INDUSTRY	295
OTHER	109

EU	853
FROM WHICH	
HORIZON 2020	308
ERANET	144
EIP	68
EFRE (THIRD PARTY FUNDED PROPORTION OF 80–85 %)	333
IN THOUSAND EUROS	

TOTAL THIRD PARTY FUNDS (IN THOUSAND EUROS)

5,914

EXPENSES DURING BUDGET YEAR 2018**



22.2 MILLION BASIC FINANCE

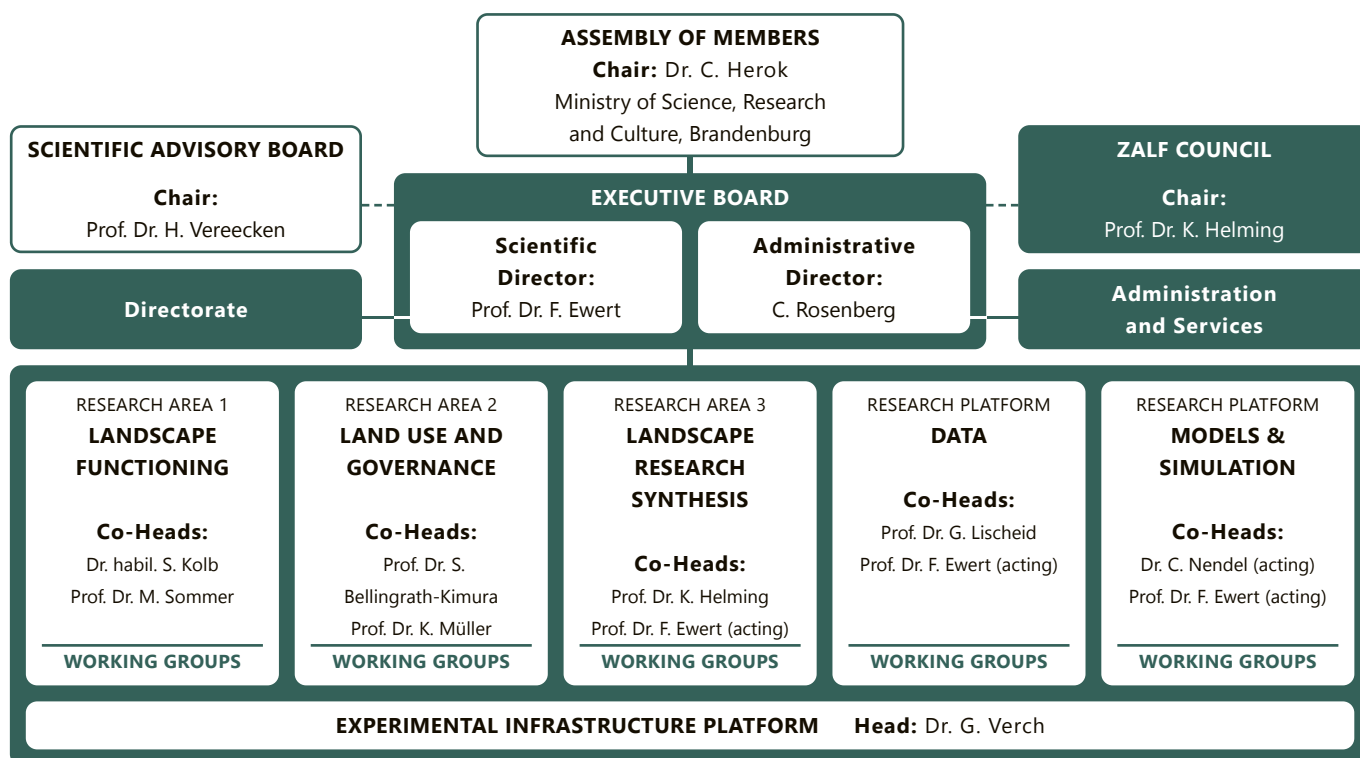
5.9 MILLION TP FUNDS

INSTITUTIONAL FUNDS OF THE FEDERAL MINISTRY OF FOOD AND AGRICULTURE (BMEL)
AND MINISTRY OF SCIENCE, RESEARCH AND CULTURE OF BRANDENBURG (MWFK)

* as of February 20, 2019

** as of February 11, 2019

MANAGEMENT, BOARDS & COMMITTEES



SCIENTIFIC ADVISORY BOARD OF ZALF

Prof. Harry Vereecken

Forschungszentrum Jülich, Institute of Bio- and Geosciences
Chair of the Scientific Advisory Board

Dr. Dr. habil. Stefan Mann

Federal Department of Economic Affairs, Education and Research, Agroscope (CH)
Vice Chair of the Scientific Advisory Board

Prof. Christine Alewell

University of Basel, Department of Environmental Sciences (CH)

Prof. Klaus Butterbach-Bahl

Karlsruhe Institute of Technology, IMK-IFU

Prof. Nina Buchmann

ETH Zürich, Department of Environmental System Science (CH)

Prof. em. Dr. Peter Gregory

University of Reading (UK)

Prof. Bernd Hansjürgens

Martin-Luther-Universität Halle-Wittenberg | UFZ

Dr. Laurent Philippot

INRA Dijon (FR)

Prof. Andrea Emilio Rizzoli

University of Applied Sciences of Southern Switzerland, IDSIA (CH)

Prof. Christine Watson

Scotland's Rural College (UK) | Swedish University of Agricultural Sciences (SE)

ASSEMBLY OF MEMBERS

Dr. Claudia Herok

Ministry of Science, Research and Culture (MWFK, Ref. 22), Brandenburg
Chair of the Assembly of Members

Dr. Jürgen Ohlhoff

Federal Ministry of Food and Agriculture
Vice Chair of the Assembly of Members

Dr. Klaus-Peter Michel

Federal Ministry of Education and Research

Peter Schubert

Ministry of Rural Development, Environment and Agriculture, Brandenburg

Prof. Wolfgang Bokelmann

Humboldt-Universität zu Berlin, Faculty of Life Sciences

Prof. Robert Seckler

University of Potsdam, Vice President for Research and Young Scientists

Udo Folgart

Agro-Glien GmbH

Prof. Klement Tockner

FWF Der Wissenschaftsfonds (AT)

DOCTORAL RESEARCHERS

NEW IN 2018

Eufemia, Luca

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

Heitmann, Nadja

Supervision at ZALF: Dr. Marina Müller
Brandenburg University of Technology
Cottbus-Senftenberg
Supervision: Prof. Klaus Birkhofer

Hoffmann, Annika

Supervision at ZALF: Dr. Marina Müller
Humboldt-Universität zu Berlin
Supervision: Prof. Carmen Büttner

Huang, Siyu

Supervision at ZALF: Dr. Tobias Naaf,
Dr. Stephanie Holzhauer
University of Potsdam
Supervision: Prof. Monika Wulf

Ibrahim, Esther Shupel

Supervision at ZALF: Dr. Claas Nendel
ZALF Mentor: Prof. Katharina Helming
Humboldt-Universität zu Berlin
Supervision: Prof. Patrick Hostert

Kraus, Teresa

Supervision at ZALF: Prof. Bettina Matzdorf,
Dr. Lasse Loft
Leibniz University Hannover
Supervision: Prof. Bettina Matzdorf

Lemke, Nahleen

Supervision at ZALF: Prof. Bettina Matzdorf
Leibniz University Hannover
Supervision: Prof. Bettina Matzdorf

Ott, Edward

Supervision at ZALF: Prof. Bettina Matzdorf,
Dr. Barbara Schröter
Leibniz University Hannover
Supervision: Prof. Bettina Matzdorf

Schulze, Christoph

Supervision at ZALF: Prof. Bettina Matzdorf,
Dr. Claas Meyer
Leibniz University Hannover
Supervision: Prof. Bettina Matzdorf

Timsy

Supervision at ZALF: Dr. habil. Steffen Kolb
Humboldt-Universität zu Berlin
Supervision: Dr. habil. Steffen Kolb

Will, Maria

Supervision at ZALF: Dr. Doreen Werner
University of Greifswald

SCHOLARSHIP HOLDERS

Name	Land	Förderung
Arshad, Muhammad	Germany	Fritz Thyssen Foundation
Batunacun	P.R. China	China Scholarship Council
Dam, Thi Huyen Trang	Vietnam	Vietnam International Education Development, Ministry of Education and Training
Eichhorn, Franziska	Germany	Zwillenberg-Tietz Foundation
Hafner, Johannes	Germany	Elsa-Neumann Stipendium, Humboldt Universität zu Berlin
Hampf, Anna Claudia	Germany	Heinrich-Böll-Foundation
Hemminger, Karoline	Germany	Marianne und Dr. Fritz Walter Fischer Foundation
Huynh, Thanh Hien	Vietnam	Vietnam International Education Development, Ministry of Education and Training
Ibrahim, Esther Shupel	Nigeria	National Centre for Remote Sensing (NCRS)
Jiang, Li	P.R. China	DAAD
Mahmood, Nasir	Pakistan	Punjab Higher Education Commission
Ostermann, Emu-Felicitas	Japan	Tokyo University of Agriculture and Technology
Reinke, Henrik	Germany	Marianne und Dr. Fritz Walter Fischer Foundation
Sam, Anu Susan	India	DAAD
Shurigin, Vyacheslav	Norway	DAAD
Sun, Chuanzhun	P.R. China	China Scholarship Council
Susman, Roni	Indonesia	Ministry of Finance, The Republic of Indonesia at Jarkata
Thai, Thi Huyen	Vietnam	Vietnam International Education Development, Ministry of Education and Training
Ullah, Ayat	Pakistan	Higher Education Commission Islamabad
Vasic, Filip	Serbia	DBU (MOE scholarship programme)
Vijayan, Dhanya	India	Alexander von Humboldt Foundation
Wambura, Frank Joseph	Tanzania	DAAD
Weißhuhn, Peter	Germany	DBU
Welidehanna, Fikadu Getachew	Ethiopia	Alexander von Humboldt Foundation
Wenz, Elena	Germany	Marianne und Dr. Fritz Walter Fischer Foundation

DOCTORAL THESES

COMPLETED 2018

Besendörfer, Christian

Innovation management in sustainable land management
Supervision at ZALF: apl. Prof. Thomas Weith
University of Potsdam
Supervisor: PD Dr.-Ing. Thomas Weith

Bonatti, Michelle

Development of analytical framework and educational response tools to improve food and nutritional security in Tanzania, Africa
Supervision at ZALF: PD Dr. Stefan Sieber
Humboldt Universität zu Berlin
Supervisor: Prof. Klaus Müller

Diehl, Katharina

Ex ante impact assessment of research uptake in land use
Supervision at ZALF: Prof. Hubert Wiggering
Humboldt Universität zu Berlin
Supervisor: Prof. Wolfgang Bokelmann

Herbrich, Marcus

Effects of erosion-affected soil evolution on water and dissolved carbon fluxes, soil hydraulic properties, and crop development — hydro-pedological analysis using high precision weighing lysimeters
Supervision at ZALF: PD Dr. Horst Gerke
University of Potsdam
Supervisor: Prof. Michael Sommer

Hoffmann, Mathias

Improving measurement and modelling approaches of the closed chamber method to better assess dynamics and drivers of carbon based greenhouse gas emissions
Supervision at ZALF: Prof. Jürgen Augustin
University of Potsdam
Supervisor: Prof. Michael Sommer

Löhr, Katharina

Conflict Prevention and Management (CPM) System in Transdisciplinary Research Collaborations: Potential and Constraints. The case of an international food security research project
Supervision at ZALF: PD Dr. Stefan Sieber
Humboldt Universität zu Berlin
Supervisor: Prof. Klaus Müller, Prof. Lars Kirchhoff

Reckling, Moritz

Design and assessment of legume-supported cropping systems
Supervision at ZALF: Dr. Johann Bachinger
Swedish University of Agriculture Sciences
Supervisorin: Prof. Christine Watson

Sam, Anu Susan

Climate change, labour migration and food security: an Indian perspective
Supervision at ZALF: Prof. Harald Kächele
Humboldt Universität zu Berlin
Supervisor: Prof. Klaus Müller

Schomers, Sarah

Governance structures within payments for ecosystem services implementation: Effectiveness, efficiency and equity implications from an institutional economic perspective
Supervision at ZALF: Prof. Klaus Müller
Leibniz University Hannover
Supervisorin: Prof. Bettina Matzdorf

Wallor, Evelyn

Adaptation and validation of the CANDY model regarding carbon release from agricultural used fen soils with respect to secondary soil development
Supervision at ZALF: Dr. Kurt-Christian Kersebaum
Humboldt Universität zu Berlin
Supervisorin: Prof. Jutta Zeitz

... and 3 external doctoral theses with supervision by ZALF researchers.

GUESTS & FELLOWS

GUESTS WITH RESEARCH STAYS AT ZALF

Battisti, Prof. Rafael

University of São Paulo, Agricultural College ESALQ, Brazil

Filipovic, Dr. Lana

University of Zagreb, Department of Soil Amelioration, Faculty of Agriculture, Croatia

Jiang, Li

China Agricultural University, P.R. China

Oguntunde, Philip Gbenro

Federal University of Technology, Department of Agricultural and Environmental Engineering, Nigeria

Ostermann, Emu-Felicitas

Tokyo University of Agriculture and Technology, Japan

Sanchez, Evangelina Pareja

University of Lleida, Spain

Schoving, Celine

INRA, Toulouse, France

Shurigin, Vyacheslav (PhD)

University of Bergen, Norway

Spanner, Tobias

Leibniz University Hannover, Germany

Sun, Dr. Chuanzhun

South China Agricultural University, P.R. China

Teixeira, Dr. Edmar

Plant & Food Research Institute, New Zealand

Ullah, Ayat

University of Agriculture, Peshawar, Pakistan

Vijayan, Dhanya

Kannur University, India

Welidehanna, Fikadu Getachew

Haramaya University, Ethiopia

Zelege, Dr. Ketema Tilahun

Charles Sturt University, Wagga, Australia

... and additional long-term stays of international doctoral researchers on scholarships

FELLOWS

Burkhard, PD Dr. habil. Benjamin

Leibniz University Hannover, Germany

Geßler, Prof. Arthur

Swiss Federal Institute for Forest, Snow and Landscape Research WSL, Switzerland

Kleber, Prof. Markus

Oregon State University, USA

Nautiyal, Prof. Nautiyal

Institute for Social and Economic Change, India

Oguntunde, Prof. Philip Gbenro

Federal University of Technology — Akure, Nigeria

Schönhart, Dr. Martin

University of Natural Resources and Life Sciences, Vienna, Austria

NEW* THIRD PARTY FUNDED PROJECTS

Duration	Title	Funding
January 2018 – June 2022	Biogenic silicon in agricultural landscapes (BiSiAL) — Quantification, qualitative characterization, and importance for Si balances of agricultural biogeosystems	German Research Foundation (DFG)
January 2018 – December 2019	Exemplary demonstration network for expanding and improving cultivation and utilization of lupines	Federal Ministry of Food and Agriculture (BMEL)
March 2018 – November 2018	Permanent soil observation in the federal state of Brandenburg — Data validation and updating for soil classification	Landesamt für Umwelt, Brandenburg (LfU)
April 2018 – November 2020	Biodiversity and ecosystem service assessment baseline study in agrarian landscapes of India and Tajikistan (GLZ-Biodiv)	Deutsche Gesellschaft für Internationale Zusammenarbeit (GIZ) GmbH
May 2018 – December 2019	Operational strategy recommendations for dealing with water scarcity in agriculture	Landwirtschaftliche Rentenbank
May 2018 – April 2021	Formulating sustainable urban FWE strategy by optimizing the synergies between food, water and energy systems (SUNEX)	EU ERA-NET
May 2018 – April 2021	Connectivity and synchronisation of lake ecosystems in space and time (CONNECT)	Leibniz Competition
June 2018 – May 2021	Biting midges as virus vectors in Germany with special emphasis on changing climatic conditions (CeratoVir)	Federal Ministry of Food and Agriculture (BMEL)
August 2018 – December 2021	Implementing innovative processing technologies for nutrient-dense plant foods (African indigenous vegetables and legumes) to safeguard perennial nutrition security — an East African and Southeast African country comparison (Vegi-Leg)	Federal Ministry of Food and Agriculture (BMEL)
August 2018 – December 2022	Development of a modular plant protection strategy based on different sustainable, non-chemical methods to control the sea buckthorn fly (MOPLASA)	European Innovation Partnership (EIP), State of Brandenburg
August 2018 – August 2021	Sustainable transition to entrepreneurial production in agriculture through upgrading (STEP-UP)	EU ERA-NET
August 2018 – October 2021	Optimizing agricultural cropping strategies and measures for climate adaptation — analysis and assessment at the landscape level with special regard to their interactions with plant protection, productivity, cropping structure and greenhouse gas emission (OptAKlim)	Federal Ministry of Food and Agriculture (BMEL)
September 2018 – August 2023	Integrative development of a fair balance of interests between the city, suburban area and rural region (REGERECHT)	Federal Ministry of Education and Research (BMBF)
September 2018 – August 2021	Center for Soil Research (BONARES, phase 2)	Federal Ministry of Education and Research (BMBF)
October 2018 – September 2021	BONARES — Sustainable Subsoil Management — Long-term effects of subsoiling on soil fertility and crop yields of the long-term field trial »V210« in Müncheberg (Soil3-II)	Federal Ministry of Food and Agriculture (BMEL)
October 2018 – September 2021	Changes in semi natural habitat inventory and land use between 1991–1995 and 2018–2021 within agricultural regions: Impacts on biodiversity (BioZeit)	Federal Ministry for the Environment, Nature Conservation and Nuclear Safety (BMU)

Duration	Title	Funding
October 2018– March 2021	Effect of nitrification inhibitors on N ₂ O emissions after slurry application using online soil incubation	SKW Stickstoffwerke Piesteritz GmbH
October 2018– September 2021	Floristic diversity of manor parks in an intensively used agricultural landscape in Brandenburg (DivGut)	Zwillenberg-Tietz Foundation
October 2018– December 2018	Forest conservation and livelihood opportunities of indigenous people in tropical rainforest areas of India	Alexander von Humboldt Foundation
October 2018– September 2021	Integrated System for Site-Specific Soil Fertility Management (IAS, Phase 2)	Federal Ministry of Educa- tion and Research (BMBF)
October 2018– September 2021	Monitoring and modelling of non-equilibrium soil water dynamics and lateral subsurface flow in hillslope soils (VAMOS)	German Research Founda- tion (DFG)
October 2018– September 2021	Promotion of insects in agricultural landscapes through inte- grated farming systems with renewable raw materials (FInAL)	Federal Ministry of Food and Agriculture (BMEL)
November 2018– October 2021	Translating knowledge for legume-based farming for feed and food systems (Legumes Translated)	EU—Horizon 2020
December 2018– November 2021	Agroforestry in Southern Africa (ASAP): Estimation of the wind erosion susceptibility of agro-forestry-systems	Federal Ministry of Educa- tion and Research (BMBF)

COOPERATION (SELECTED)

NATIONAL

UNIVERSITIES

- Brandenburg University of Technology Cottbus-Senftenberg
- Carl von Ossietzky University of Oldenburg
- Christian-Albrechts-Universität Kiel
- European University Viadrina
- Eberswalde University of Sustainable Development
- Freie Universität Berlin
- Friedrich Schiller University Jena
- Georg-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 Dresden
- TU Dortmund University
- University of Bayreuth
- University of Bonn
- University of Duisburg-Essen
- University of Freiburg
- University of Hohenheim
- University of Kassel
- University of Potsdam
- University of Stuttgart
- University of Veterinary Medicine Hannover, Foundation

NON-UNIVERSITY RESEARCH INSTITUTIONS (SELECTED)

- Federal Research Institute for Animal Health, Friedrich-Loeffler-Institut
- Forschungszentrum Jülich
- Fraunhofer Institute for Systems and Innovation Research ISI
- German Centre for Integrative Biodiversity Research
- Helmholtz Centre Potsdam—GFZ German Research Centre for Geosciences
- Helmholtz-Centre for Environmental Research—UFZ
- Johann Heinrich von Thünen Institute
- Julius Kühn Institute
- Karlsruhe Institute of Technology

... and 47 Leibniz institutes,
in 4 Leibniz Research Alliances.

OTHER GOVERNMENTAL AND NON-GOVERNMENTAL INSTITUTIONS (SELECTED)

- Bundesanstalt für Materialforschung und -prüfung
- Deutsche Gesellschaft für Internationale Zusammenarbeit (GIZ) GmbH
- Deutsche Landwirtschafts-Gesellschaft e. V.
- Deutscher Verband für Landschaftspflege e. V.
- Deutscher Wetterdienst
- Federal Agency for Nature Conservation
- Federal Institute for Geosciences and Natural Resources
- German Federal Environmental Foundation
- Gesellschaft für Konservierende Bodenbearbeitung e. V.
- Landesamt für Ländliche Entwicklung, Landwirtschaft und Flurneuordnung Brandenburg
- Landesanstalt für Landwirtschaft und Gartenbau Sachsen-Anhalt
- Landwirtschaftskammer Niedersachsen
- Landwirtschaftskammer Nordrhein-Westfalen
- proPlant Agrar- und Umweltinformatik GmbH
- The German Farmers' Association

- University of Colorado Riverside, United States of America
- University of Córdoba, Spain
- University of Helsinki, Finland
- University of Lund, Sweden
- University of Pretoria, South Africa
- University of the Philippines Diliman, Philippines
- University of Novi Sad, Serbia
- Wageningen University, Netherlands
- Warsaw University of Life Sciences, Poland

NON-UNIVERSITY RESEARCH INSTITUTIONS

- Academy of Sciences of the Czech Republic, Czech Republic
- Agricultural Research Institute of Mozambique, Mozambique
- AgroBioInstitute, Bulgaria
- Agroscope, Switzerland
- Centre for Research and Technology—Hellas, Greece
- CNRS—Laboratoire des Interactions Plantes-Microorganismes, France
- Consejo Superior de Investigaciones Científicas, Spain
- Finnish Environment Institute, Finland
- Forschungsinstitut für biologischen Landbau, Switzerland
- Institut national de la recherche agronomique (INRA), France
- Institute of Botany, Plant physiology and Genetics, Tajikistan
- International Food Policy Research Institute (IFPRI), USA
- Natural Resources Institute Finland, Finland
- Norwegian Bioeconomy Research Institute, Norway
- Qatar Environment and Energy Research Institute, Qatar
- Teagasc—the Agriculture and Food Development Authority, Ireland
- The James Hutton Institute, United Kingdom
- U. M. Institute of Hydrogeology and Geoecology, Kazakhstan

INTERNATIONAL

UNIVERSITIES

- Aarhus University, Denmark
- Free University Amsterdam, Netherlands
- Scotland's Rural College, United Kingdom
- Sokoine University of Agriculture, Tanzania
- Swedish University of Agricultural Sciences, Sweden
- Tashkent Institute of Irrigation and Melioration, Uzbekistan
- Tokyo University of Agriculture and Technology, Japan
- University of Natural Resources and Life Sciences, Vienna, Austria
- National University of La Pampa, Argentina
- ETH Zurich, Switzerland
- University of Bologna, Italy

TEACHING

BRANDENBURG UNIVERSITY OF TECHNOLOGY COTTBUS—SENFTEMBERG

- Nachhaltige Waldbewirtschaftung
Lecture, SS 2018

CHRISTIAN-ALBRECHTS-UNIVERSITÄT ZU KIEL

- Bodenphysik – Transportprozesse
Lecture, SS 2018
- Bodenrekultivierung
Lecture, WS 2018/2019

FREE UNIVERSITY OF BERLIN

- Landschaftswasserhaushalt von Berlin und Brandenburg
Lecture, WS 2018/2019
- Zur Quartär- und Hydrogeologie Brandenburgs und Westpolens
Seminar, SS 2018

EBERSWALDE UNIVERSITY FOR SUSTAINABLE DEVELOPMENT

- Regionales Stoffstrommanagement und Kreislaufwirtschaft
Lecture, SS 2018
- Grundlagen und Instrumente der Regionalentwicklung
Lecture, WS 2018/2019
- Monitoring und Indikatoren
Lecture, WS 2018/2019
- Standortlehre
Lecture, WS 2018/2019
- Umwelt, Gesellschaft, Nachhaltigkeit
Lecture, WS 2018/2019
- Volkswirtschaftslehre, (Course B.Sc. Landschaftsnutzung und Naturschutz)
Lecture, WS 2018/2019
- Volkswirtschaftslehre, (Course B.Sc. Ökolandbau und Vermarktung)
Lecture, WS 2018/2019
- Bodenlandschaft und Stoffhaushalt
Seminar, SS 2018
- Bodenkunde – Geländeübung
Seminar, WS 2018/2019

HUMBOLDT UNIVERSITÄT ZU BERLIN

- Integrated Natural Resource Management
Lecture, SS 2018
- Process and Quality Management in Agriculture and Horticulture
Lecture, SS 2018
- Where is farming heading? Evaluation of sustainable intensification innovations in the context of regional future scenarios
Lecture, SS 2018
- Environmental Sociology and Environmental policy
Lecture, WS 2018/2019
- Multifunctional agricultural landscape use
Lecture, WS 2018/2019

LEIBNIZ UNIVERSITY HANNOVER

- Naturschutz- und Umweltökonomie
Lecture and Seminar, WS 2018/2019

MARTIN-LUTHER-UNIVERSITÄT HALLE-WITTENBERG

- Ressourcenmanagement und Ressourcenschutz
Lecture, SS 2018

TECHNISCHE UNIVERSITÄT BERLIN

- Bodenmesstechnik
Lecture, SS 2018
- Bodenchemisches Praktikum
Seminar, SS 2018

UNIVERSITY OF POTSDAM

- Biogeochemie
Lecture, SS 2018
- Einführung in die Hydrochemie
Lecture, WS 2018/2019
- Bodenlandschaften
Lecture, WS 2018/2019
- Zeitreihenanalyse und Spektralanalyse
Lecture, WS 2018/2019
- Untersuchungsplanung und Datenauswertung
Lecture, WS 2018/2019
- Botanische Geländeübungen
Seminar, SS 2018
- Humangeographisches und fachdidaktisches Doktorandenseminar
Seminar, SS 2018
- Landschaftspraktikum Bodenlandschaftsanalyse in der Uckermark
Seminar, SS 2018
- Stadt-Land-Verflechtungen: Zwischen alten Konflikten und neuen Möglichkeiten
Seminar, WS 2018/2019

... and 10 additional individual lectures by ZALF scientists.

OFFICES & TASKS (SELECTED)

Augustin, Jürgen

- Board member at the Emission Factor Database der TFI (IPCC)

Bachinger, Johann

- Editorial Board member at [Organic Farming](#)
- Member of the scientific advisory board of the Biosphärenreservat Spreewald
- Member of the expert group »Research and Breeding« of Demeter e. V.
- Representative of ZALF at the working group »Ökologischer Landbau«, Senat der Bundesforschungseinrichtungen

Bellingrath-Kimura, Sonoko D.

- Vice Chair of Commission 4.3—Soil and land use change, International Union of Soil Science
- Chair of research area Sustainable Agriculture at the Leibniz Research Alliance »Sustainable Food Production and Healthy Nutrition«
- Board Member of the German Society of Agronomy (GPW)

Berger, Gert

- Member of the working group »Pflanzenschutz und Biodiversität«, Federal Office for Agriculture and Food (BLE)
- Member of the »Fachbeirat Naturhaushalt und Nachhaltiger Pflanzenbau« Federal Office of Consumer Protection and Food Safety (BVL)

Dalchow, Claus

- Editorial advisory board member at [Landscape Online](#)

Dietrich, Ottfried

- Member of the working group 3.4 »Wetlands«, Deutsche Vereinigung für Wasserwirtschaft (DWA)
- Member of the expert group »Water (+Energy and Climate)«, round table »Internationalisierung von Bildung, Wissenschaft und Forschung: Perspektiven schaffen in Afrika« of the Federal Government

Ellerbrock, Ruth

- Editorial board member at [Geoderma](#)

Eulenstein, Frank

- Speaker of the working groups »Renewable raw material« and »Nutrition efficiency in plant production« (DWA)

Ewert, Frank

- Jury member of the expert group of Agrarsysteme der Zukunft (BMBF)
- Expert within the working group »Bio-based value chains« (BMBF)
- Member of the Steering Group Research (BMEL)
- Chair of the scientific advisory board within the Joint

Programming Initiative on Agriculture, Food Security and Climate Change (FACCE, EU)

- Editorial board member at [Agriculture, Ecosystems & Environment/Field Crops Research/Scientific Reports \(SpringerNature\)/Socio-Environmental Systems Modeling \(SESMO\)](#)

Gerke, Horst

- Co-editor at [Journal of Hydrology and Hydromechanics](#)
- Associate editor at [Journal of Plant Nutrition and Soil Science](#)
- Guest editor at [Vadose Zone Journal](#)

Hagemann, Ulrike

- Guest associate editor at [Journal of Plant Nutrition and Soil Science](#)

Heinrich, Uwe

- Representative of ZALF at the working group Geoinformation (BMEL)
- Representative of ZALF at the Verband der Geoinformationswirtschaft Berlin / Brandenburg
- Representative of ZALF at the climate navigator of the Climate Service Center, Helmholtz-Zentrum Geesthacht

Helming, Katharina

- Scientific advisory board member at the H2020 Research project SUREFARM
- Reviewer at Horizon 2020 (EU)
- Editorial board member at [Agronomy for Sustainable Development/Land](#)
- Reviewer at the research funding programme FONA
- Lead author from the author panel (UNEP) for the Land Policy Chapter of the Global Environment Outlook (GEO6)

Hierold, Wilfried

- Member of the Naturschutzbeirat Landkreis Barnim

Kächele, Harald

- Member of the Naturschutzbeirat of the Ministry of Rural Development, Environment and Agriculture (MLUL) of the state of Brandenburg
- Member of the expert group for »Naturschutz und Landschaftspflege« of the Senatsverwaltung für Umwelt, Verkehr und Klimaschutz des Landes Berlin
- Head of the Deutsche Umwelthilfe e. V. (DUH)
- Head of the Gesellschafterversammlung der DUH Umweltschutz-Service GmbH
- Chairman of the foundation council of the Tropenwaldstiftung Oro Verde
- Member of the scientific advisory board of the Barnim Panorama Wandlitz

Kersebaum, Kurt-Christian

- Associate editor at [Field Crops Research](#)

Lischeid, Gunnar

- Spokesman of the expert group Umwelt-System-Theorien of the Alliance working group »Infrastructures in Terrestrial Research« (DFG and other)
- Editorial board member at [Frontiers in Water: Water and Hydrocomplexity](#)

Matzdorf, Bettina

- Advisory board member of the innovation group Ginkoo

Mirschel, Wilfried

- Editorial board member at [European Agrophysical Journal](#)

Müller, Klaus

- Referee for [Land Use Policy/Ecological Indicators/GAIA/Ecology and Society/Konjunkturpolitik/Jahrbuch für Regionalwissenschaften](#)
- National advisory board member at [Landscape Online](#)
- Chairman of the review-panel for BMBF-Calls
- Consultant for the Schweizerischer Nationalfonds
- Consultant for the Österreichische Nationalbank
- Expert at the enquete commission 6/1 »Zukunft der ländlichen Regionen vor dem Hintergrund des demografischen Wandels«, Landtag Brandenburg
- Member of the Ausschuss Siedlungsstruktur/Natur und Umwelt, Planungsgemeinschaft Oderland-Spree

Nendel, Claas

- Member of the steering committee C-MIP
- Member of the executive board und designated president of the European Society of Agronomy (ESA)
- Editorial board member at [European Journal of Agronomy](#)
- Vice chair of Commission IV of the German Soil Science Society

Pätzig, Marlene

- Treasurer and member of the steering committee of the European Pond Conservation Network (EPCN)

Pickert, Jürgen

- Member of the working group »Grasland definition and classification«, European Grassland Federation
- Member of the steering committee for Grasland of the German Agricultural Research Alliance (DAfA)
- Member of the committee »Grünland und Futterbau«, Deutsche Landwirtschaftsgesellschaft (DLG)
- Member of the managing board of Deutsches Maiskomitee and editorial staff at [Mais](#)
- Member of the managing board of the Paulinenauer AK Grünland und Futterwirtschaft e. V.

Piorr, Annette

- Chair of the review panel on food production at FORMAS, Swedish National Research Council

- Appointed member of the expert committee for Naturschutz und Landschaftspflege, Senatsverwaltung für Umwelt, Verkehr und Klimaschutz Berlin

Sieber, Stefan

- Editorial board member at [Food Security](#)

Siebert, Rosemarie

- Appointed member of the Landesarbeitsgemeinschaft Berlin/Brandenburg/Mecklenburg-Vorpommern (ARL)
- Referee for [Sociologia Ruralis/Land Use Policy](#)

Ulrich, Andreas

- Editorial board member at [European Journal of Soil Biology](#)
- Topic editor and guest associate editor at [Frontiers in Microbiology](#)
- Delegate for biological safety at the Länderinstitut für Bienenkunde, hohen Neuendorf
-

Weith, Thomas

- Appointed member of the Akademie für Raumforschung und Landesplanung
- Editorial board member at [Central European Review of Economics and Management](#)

Weltin, Meike

- Spokeswoman of the doctorates of Section E—Environmental Sciences of the Leibniz Association, Leibniz PhD Network Steering Group

Werner, Doreen

- Member of the Bundesfachausschuss des Nature And Biodiversity Conservation Union (NABU)
- Acting head of the AK Deutscher Dipterologen
- Head of the managing board of the Deutsche Gesellschaft für Medizinische Entomologie und Acarologie
- Editorial board member at [Studia dipterologica](#)
- Coordinator for Europe at the research network Simuliidae

Wulf, Monika

- Editorial board member at [Applied Vegetation Science/Journal of Vegetation Science](#)
- Member of the review board Ecology of Agricultural Landscapes (DFG)

Zander, Peter

- Editorial board member at [Agricultural Systems](#)

Zasada, Ingo

- Editorial board member at [Land Use Policy](#)
- Spokesman of the Leibniz Postdoc Network of section E of the Leibniz Association

PEER-REVIEWED JOURNAL ARTICLES

Abbas, A., Amjath-Babu, T. S., **Kächele, H.**, Usman, M., Iqbal, M. A., **Arshad, M.**, Shahid, M. A., **Müller, K.** (2018) Sustainable survival under climatic extremes: linking flood risk mitigation and coping with flood damages in rural Pakistan. *Environmental Science and Pollution Research* 25, 32, 32491–32505.

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Abd_Allah, E. F., Alqarawi, A. A., Hashem, A., **Wirth, S.**, **Egamberdieva, D.** (2018) Regulatory roles of 24-epibrassinolide in tolerance of *Acacia gerrardii* Benth to salt stress. *Bioengineered* 9, 1, 61–71.

Ahmad, P., Ahanger, M. A., **Egamberdieva, D.**, Alam, P., Alyemeni, M. N., Ashraf, M. (2018) Modification of osmolytes and antioxidant enzymes by 24-epibrassinolide in chickpea seedlings under mercury (Hg) toxicity. *Journal of Plant Growth Regulation* 37, 1, 309–322.

Ahmad, P., Alyemeni, M. N., Ahanger, M. A., **Egamberdieva, D.**, Wijaya, L., Alam, P. (2018) Salicylic acid (SA) induced alterations in growth, biochemical attributes and antioxidant enzyme activity in faba bean (*Vicia faba* L.) seedlings under NaCl toxicity. *Russian Journal of Plant Physiology* 65, 1, 104–114.

Ahrends, H. E., Eugster, W., Gaiser, T., Rueda-Ayala, V., Hüging, H., **Ewert, F.**, Siebert, S. (2018) Genetic yield gains of winter wheat in Germany over more than 100 years (1895–2007) under contrasting fertilizer applications. *Environmental Research Letters* 13, 10, Article 104003.

Alqarawi, A. A., Hashem, A., Kumar, A., Al-Arjani, A.-B. F., Abd_Allah, E. F., Dar, B. A., **Wirth, S.**, Davranov, K., **Egamberdieva, D.** (2018) Allelopathic effects of the aqueous extract of *Rhazya stricta* on growth and metabolism of *Salsola villosa*. *Plant Biosystems* 152, 6, 1263–1273.

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Basso, B., Dumont, B., Maestrini, B., Shcherbak, I., Robertson, G. P., Porter, J. R., Smith, P., Paustian, K., Grace, P. R., Asseng, S., Bassu, S., Biernath, C., Boote, K. J., Cammarano, D., De Sanctis, G., Durand, J.-L., **Ewert, F.**, Gayler, S., Hyndman, D. W., Kent, J., Martre, P., **Nendel, C.**, Priesack, E., Ripoche, D., Ruane, A. C., Sharp, J., Thorburn, P. J., Hatfield, J. L., Jones, J. W., Rosenzweig, C. (2018) Soil organic carbon and nitrogen feedbacks on crop yields under climate change. *Agricultural & Environmental Letters* 3, 1, Article 180026.

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Becker, R., **Ulrich, A.** (2018) Improved detection and quantification of cauliflower mosaic virus in food crops: assessing false positives in GMO screening based on the 35S promoter. *European Food Research and Technology* 244, 10, 1861–1871.

Berger, G., **Graef, F.**, Pallut, B., Hoffmann, J., Brühl, C. A., Wagner, N. (2018) How does changing pesticide usage over time affect migrating amphibians: a case study on the use of glyphosate-based herbicides in German agriculture over 20 years.

Frontiers in Environmental Science 6, Article 6.

Bogena, H. R., Montzka, C., Huisman, J. A., Graf, A., Schmidt, M., Stockinger, M., von Hebel, C., Hendricks-Franssen, H. J., van der Kruk, J., Tappe, W., Lücke, A., Baatz, R., Bol, R., **Groh, J.**, Pütz, T., Jakobi, J., Kunkel, R., Sorg, J., Vereecken, H. (2018) The TERENO-Rur hydrological observatory: a multiscale multi-compartment research platform for the advancement of hydrological science. *Vadose Zone Journal* 17, 1, Article Number: 180055.

Bonatti, M., **Schlindwein, I. L.**, **Lana, M.**, Bundala, N., **Sieber, S.**, **Rybak, C.** (2018) Innovative educational tools development for food security: engaging community voices in Tanzania. *Futures* 96, 79–89.

Borba, J., **Bonatti, M.**, **Sieber, S.**, **Müller, K.** (2018) Theatre methods for food security and sovereignty: a Brazilian scenario. *Journal of Rural Studies* 62, 29–39.

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Chaignaud, P., Morawe, M., Besaury, L., **Kröber, E.**, Vuilleumier, S., Bringel, F., **Kolb, S.** (2018) Methanol consumption drives

the bacterial chloromethane sink in a forest soil. *The ISME Journal* 12, 11, 2681–2693. 

Chen, L., Li, J., **Zander, P.** (2018) Can political connections maintain the sustainability of R&D investment in China? There is no such thing as a free lunch. *Sustainability* 10, 11, Article 4238. 

Coucheney, E., Eckersten, H., Hoffmann, H., Jansson, P.-E., Gaiser, T., **Ewert, F.**, Lewan, E. (2018) Key functional soil types explain data aggregation effects on simulated yield, soil carbon, drainage and nitrogen leaching at a regional scale. *Geoderma* 318, 167–181. 

da Rosa Couto, R., Comin, J. J., Souza, M., Ricachenevsky, F. K., **Lana, M.**, Gatiboni, L. C., Ceretta, C. A., Brunetto, G. (2018) Should heavy metals be monitored in foods derived from soils fertilized with animal waste? *Frontiers in Plant Science* 9, Article 732. 

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Dalla Marta, A., Eitzinger, J., **Kersebaum, K.-C.**, Todorovic, M., Altobelli, F. (2018) Assessment and monitoring of crop water use and productivity in response to climate change. *The Journal of Agricultural Science* 156, 5, 575–576. 


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De Lombaerde, E., Verheyen, K., Perring, M. P., Bernhardt-Römermann, M., Van Calster, H., Brunet, J., Chudomelová, M., Decocq, G., Diekmann, M., Durak, T., Hédli, R., Heinken, T., Hommel, M., Jaroszewicz, B., Kopecký, M., Lenoir, J., Macek, M., Máliš, F., Mitchell, F. J. G., **Naaf, T.**, Newman, M., Petřík, P., Reczyńska, K., Schmidt, W., Świerkosz, K., Vild, O., **Wulf, M.**, Baeten, L. (2018) Responses of competitive understory species to spatial environmental gradients inaccurately explain temporal changes. *Basic and Applied Ecology* 30, 52–64.


De Smedt, P., Baeten, L., Proesmans, W., Berg, M. P., Brunet, J., Cousins, S. A. O., Decocq, G., Deconchat, M., Diekmann, M., Gallet-Moron, E., Giffard, B., Liira, J., Martin, L., Ooms, A., Valdés, A., **Wulf, M.**, Hermy, M., Bonte, D., Verheyen, K. (2018) Linking macrodetritivore distribution to desiccation resistance in small forest fragments embedded in agricultural landscapes in Europe. *Landscape Ecology* 33, 3, 407–421.

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Egamberdieva, D., **Jabborova, D.**, **Wirth, S.**, Alam, P., Alyemeni, M. N., Ahmad, P. (2018) Interactive effects of nutrients and Bradyrhizobium japonicum on the growth and root architecture of soybean (*Glycine max* L.). *Frontiers in Microbiology* 9, Article 1000. 

Egamberdieva, D., **Ma, H.**, **Reckling, M.**, **Wirth, S.**, **Bellingrath-Kimura, S. D.** (2018) Potential effects of biochar-based microbial inoculants in agriculture. *Environmental Sustainability* 1, 1, 19–24.


Ehrmann, S., Ruyts, S. C., Scherer-Lorenzen, M., Bauhus, J., Brunet, J., Cousins, S. A. O., Deconchat, M., Decocq, G., De Frenne, P., De Smedt, P., Diekmann, M., Gallet-Moron, E., Gärtner, S., Hansen, K., Kolb, A., Lenoir, J., Lindgren, J., **Naaf, T.**, Paal, T., Panning, M., Prinz, M., Valdés, A., Verheyen, K., **Wulf, M.**, Liira, J. (2018) Habitat properties are key drivers of *Borrelia burgdorferi* (s.l.) prevalence in *Ixodes ricinus* populations of deciduous forest fragments. *Parasites & Vectors* 11, Article: 23. 

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Emberson, L. D., Pleijel, H., Ainsworth, E. A., van den Berg, M., Ren, W., Osborne, S., Mills, G., Pandey, D., Dentener, F., Büker, P., **Ewert, F.**, Koebler, R., Van Dingenen, R. (2018) Ozone effects on crops and consideration in crop models. *European Journal of Agronomy* 100, 19–34. 

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Fabian, J., Zlatanovic, S., Mutz, M., Grossart, H.-P., van Geldern, R., **Ulrich, A.**, Gleixner, G., Premke, K. (2018) Environmental control on microbial turnover of leaf carbon in streams—ecological function of phototrophic-heterotrophic interactions. *Frontiers in Microbiology* 9, Article 1044. 


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
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
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ABBREVIATIONS

AIT	Austrian Institute of Technology
BGR	Bundesanstalt für Geowissenschaften und Rohstoffe/ Federal Institute for Geosciences and Natural Resources
DAAD	Deutscher Akademischer Austauschdienst/ German Academic Exchange Service
DBU	Deutsche Bundesstiftung Umwelt/ German Federal Environmental Foundatio
DWD	Deutscher Wetterdienst
HMGU	Das Helmholtz Zentrum München – Deutsches Forschungszentrum für Gesundheit und Umwelt/German Research Center for Environmental Health
IBPPG	Institute of Botany, Plant Physiology and Genetics, Academy of Science Republic of Tajikistan
IHG	U.M. Ahmetsafin Institute of Hydrogeology and Geoecology (Kazakhstan)
IRS	Leibniz-Institut für Raumbezogene Sozialforschung (IRS)/ Leibniz Institute for Research on Society and Space
IWMI	International Water Management Institute (Uzbekistan)
JKI	Julius Kühn-Institut – Bundesforschungsinstitut für Kulturpflanzen/ Federal Research Centre for Cultivated Plants
KIT/IMK-IFU	Institute of Meteorology and Climate Research, Atmospheric Environmental Research, Karlsruhe Institute of Technology
LELF	Landesamt für Ländliche Entwicklung, Landwirtschaft und Flurneuordnung Brandenburg/ State Office for Rural Development, Agriculture and Land Consolidation Brandenburg
LFA	Landesforschungsanstalt Mecklenburg-Vorpommern/ State Research Center of Mecklenburg-Vorpommern
QEERI	Qatar Environment & Energy Research Institute
TI	Johann Heinrich von Thünen-Institut/ Federal Research Institute for Rural Areas, Forestry and Fisheries
TIAME	Tashkent Institute of Irrigation and Agricultural Mechanization Engineers
TUM	Technische Universität München/ Technical University of Munich
UFZ	Helmholtz-Zentrum für Umweltforschung – UFZ/ Helmholtz Centre for Environmental Research – UFZ
UWE	University of the West of England
VISTA	Vista-Geowissenschaftliche Fernerkundung GmbH/ Vista GmbH – Remote Sensing in Geosciences

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