

ANNUAL REPORT 2016

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LEIBNIZ CENTRE FOR AGRICULTURAL LANDSCAPE RESEARCH (ZALF)



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PREFACE

The global challenges of the 21st century are of growing international concern and thus increasingly affect research programs and agendas. For example, in 2015 the United Nations (UN) agreed on the Sustainable Development Goals, which many countries started to implement as of 1st January 2016. Also, a new climate agreement was reached at the COP 21 Climate Conference in Paris in 2015, which has been signed by 175 countries until April 2016. Agriculture plays an increasing role in these agreements. This has considerable implications for agricultural research and particularly agricultural landscape research, which needs to address not only the range and detail of related problems but also their complexity.



Prof. Dr. Frank A. Ewert has been the Scientific Director of ZALF since 1st March 2016. At ZALF, we address many of these challenges in our research. Due to our interdisciplinary focus and our extensive and unique databases, we are able to investigate complex relationships at the landscape scale and thus contribute to the development of solutions to complex problems. Our particular strength resides in the combination of evidence-based research on landscape processes, land use systems and governance with methods on data analysis and mathematical modelling. The integration and synthesis of our results is thereby essential to support successfully decision- and policy-making across organisational levels including the transfer of our outcomes into science, politics and society. In several new research projects starting in 2016, we address problems related to climate mitigation, food security and sustainability of primary production and investigate the use of new technologies as for example related to the digitalization of agriculture.

Agricultural landscapes can be sink or source for greenhouse gases and other trace gases, which largely depends on agricultural management. The regulatory function of plant-microbiomes for the emission of biogenic volatile organic compounds in agricultural landscapes is subject to investigation in two new projects: Methanol-SINK und CHLOROFILTER (p. 12). Food security is still a problem in large parts of Africa. In a new study a comparative assessment of risk minimisation strategies for local agriculture is performed to reduce production risks for perl millet and increase productivity (p. 13). Several aspects of biodiversity as affected by human activities are investigated in different biological systems within the BIBS project (p. 14). A synthesis of results of this research will be made available to politics and public society. A close dialogue between researchers and farmers is the basis in the EU H2020 funded project Smart AKIS to identify pre-conditions for a broader use of Smart Farming Technologies (p. 15). Sustainability in agriculture is the particular subject of two other new projects. The VITAL project (p. 16) seeks for solutions to support the transfer of agriculture in Europe towards sustainable intensification. The PlanSmart project, (p. 17) focuses on the planning and governance of nature-based solutions for river landscapes. These new projects build on and continue the successful work of ongoing research. For example, in two ongoing projects, we have started to employ new technologies and approaches such as >Big Data< and drones to identify patterns in nature (p. 20) and landscapes (p. 22), respectively. Research in developing and transition countries in the context of the global challenges has been established at ZALF for some time. Among other projects, researchers at ZALF work together with colleagues from India to identify solutions for regions that are particularly prone to risk by climate change (p. 21) or with colleagues from different Universities in Brazil to develop sustainable land use strategies for South Amazonia within the CARBIOCIAL project (p. 23).

Climate mitigation is also a research topic in agricultural landscapes of regions close to the location of our institute. Of particular interest here is a better understanding of the carbon balance of kettle holes and ponds and their potential role as carbon sinks (p. 24). Research on sustainability at ZALF also addresses the sustainability

Our particular strength resides in

the combination of evidence-based

research on landscape processes,

land use systems and governance

with methods on data analysis and

mathematical modelling.

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of research itself as being studied in the *LeNa* project in which a framework for societal responsible research processes has been developed (p. 25).

Next to the many successful research activities, 2016 was also an important year for ZALF in other respects as summarised in a short review (p. 26–29). For example,

in March, ZALF hosted the international Crop Modelling Conference iCROPM-2016, which was jointly organised by the Institute of Crop Science and Resource Conservation at the University Bonn, ZALF, and several other international research organisations. The very successful conference was also my first international activity as the new Scientific Director of ZALF, following inauguration on 1st March 2016. ZALF has also been visibly active in the initiative for innovation in agriculture called *Landwirtschaft 4.0* and has improved its transfer activities, for example through the organisation of a podium discussion on legumes in Berlin for which three other Leibniz institutes and other partners could be engaged.

However, the biggest task in 2016 and the first challenge of the newly appointed executive board and the newly founded ZALF Board was the presentation of ZALF during the two-day evaluation visit of the evaluation board consisting of well-recognised

international scientists appointed by the Leibniz Association in June. We could show that since the last evaluation in 2013 ZALF had achieved considerable improvements in key evaluation criteria such as publications in peer-reviewed journals, an improved thematic focus, and a reorganisation of its administration. The new ZALF Executive Board successfully stressed our intention to intensify the initiated change process and convincingly communicated the vision for our future development. The Senate of the Leibniz Association clearly supported the change process to develop ZALF into an excellent and internationally recognised research institute and agreed to fund ZALF for the next seven years in March 2017.

Please be invited to read more details about our research and other activities in 2016 in this report.

Prof. Dr. Frank A. Ewert Scientific Director

CORE TOPICS

SOLUTIONS FOR THE SUSTAINABLE USE OF AGRICULTURAL LANDSCAPES—CORE TOPICS

ZALF FEATURES A UNIQUE COMBINATION OF EXPERTISE IN NATURAL, ENGINEERING, AND SOCIAL SCIENCES. FOCUSING ON THREE CORE TOPICS, RESEARCH QUESTIONS OF HIGH RELEVANCE TO SOCIETY CAN THUS BE STUDIED AT DIFFERENT SCALES.

Considering societal problems as a starting point for identifying research questions, ZALF derives its research topics mainly from the 2030 Agenda for Sustainable Development of the United Nations (UN) as well as the Grand Societal Challenges formulated by the Wissenschaftsrat (German Council of Science and Humanities), and in consideration of societal developments and relevant discussions in science policy.

Agricultural landscape research at ZALF focuses on the sustainable agricultural intensification as a contribution to food security and to the production of biomass for material and energetic use. Associated with these production-oriented aspects are research activities aiming for sustainable resource and water management, the improvement of ecosystem services as well as the maintenance and promotion of biodiversity in agriculturally used landscapes. The impacts of climate change on agricultural landscapes and the development of adequate adaption measures are our overarching research topics. The development of ecologically, economically, and socially sustainable land use concepts requires the consideration of the complex natural scientific mechanisms as well as relevant stakeholders and the socio-economic and institutional context.

ZALF's main task is therefore to combine natural, engineering, and social research in transdisciplinary approaches in order to develop solutions and recommendations for the sustainable use and development of agricultural landscapes. Research at ZALF is organised in three core topics, which focus on different characteristics and interdependencies of the overall system: natural sciences (Core Topic I), land use-related aspects (Core Topic II), and socio-economic research (Core Topic III).



CORE TOPIC I »LANDSCAPE FUNCTIONING«



CORE TOPIC II »LAND USE AND IMPACTS«



CORE TOPIC III »LAND USE CONFLICTS AND GOVERNANCE«

CORE TOPIC I »LANDSCAPE FUNCTIONING«



Core Topic I focusses on studying the natural science basis of the »functioning« of spatiotemporally differentiated landscape processes, aiming to improve the understanding of all relevant processes as well as their interdependencies and interactions within the landscape.

Core Topic I constantly derives new problem-oriented data and knowledge from basic research, which are then transferred to Core Topics II and III. This includes, for example, statements on the environmental impact of land use systems as well as recommendations regarding the optimisation of water and nutrient utilisation and the reduction of land use-related environmental impacts.

PROJECTS OF CORE TOPIC I (SELECTED)

- Agricultural landscapes influence the global atmospheric chemistry, DFG (p. 12)
- Building bridges in biodiversity research, BMBF (p. 14)
- The use of Big Data approaches to detect patterns in nature, Budget (p. 20)
- Drones decipher landscape patterns, ZALF, MWFK, BMEL (p. 22)
- Exploring the carbon dynamics of kettle holes, Leibniz Association (p. 24)
- Microbial consumption of methanol in a grassland, DFG
- Multiscale analysis of dust emissions from agricultural soils in La Pampa, Argentina, DFG

- Spatiotemporal dynamics of biogenic Si pools in initial soils and their relevance for desilication, DFG
- Landscape-scale biodiversity and the balancing of provisioning, regulating, and supporting ecosystem services, Sub-project Abiotic and biotic processes behind ecosystem services in European agricultural landscapes, EU/BMBF joint BiodivERsA/FACCE project
- Compilation of cross-compartment theories and models in terrestrial environmental sciences, DFG
- N stabilisation and N placement near roots as innovative technologies for optimising resource efficiency of urea fertilisation, BMEL

CORE TOPIC II »LAND USE AND IMPACTS«



Core Topic II deals with agricultural production in a landscape context, with explicit consideration and utilisation of the diverse feedback mechanisms operating on various spatial and temporal scales in agricultural landscapes.

Based on the natural science basis (Core Topic I), management measures and their role as controlling factors in the interaction of land use and ecosystems are the objects of investigation in Core Topic II. Climate change, trends in prices, changes in demand, and the governance of agricultural landscape use as well as technical developments and other socio-economic trends are considered as exogenous driving forces. Agricultural and forest land use is shaped by these drivers and at the same time interacts with ecosystems and the entire landscape. Indicator systems are developed for impact assessment and the evaluation of land use changes. These indicator systems aggregate individual analytical results into knowledge relevant for action and decision-making.

PROJECTS OF CORE TOPIC II (SELECTED)

- Unlocking the potential of crop upgrading strategies in Dodoma, Tanzania, BLE (p. 13)
- Smart farming technologies a must-have for 21st century farming? EU (p. 15)
- Novel and well-tried ways to a sustainable European agriculture, EU (p. 16)
- Sustainable land management strategies for southern Amazonia, BMBF (p. 23)
- Criteria for Socially Responsible Research processes, BMBF joint research project (p. 25)
- Development and comparison of optimised systems for the agricultural production of energy crops under different site conditions in Germany. Phase III, Sub-project 2: Ecological accompanying research, Part: Bioticy; Part: Abiotics, BMEL, FNR

- Agriculture for species diversity Development and implementation of a new nature conservation standard for organic farmers to increase species diversity at the farm level, WWF, Biopark
- Adaptation to climate change: Options for cropping and production systems in Europe, Work Package B: Economic assessment of climate change adaptation strategies; Work Package A: Co-design of climateadapted production systems, BMBF/ERA-NET
- Impacts of climate change on European agriculture and food securits — Risk assessment in cooperation with international projects, EU, FACCE JPI, ERA-NET

CORE TOPIC III »LAND USE CONFLICTS AND GOVERNANCE«



Core Topic III focuses on the preferences of various land users and stakeholders and the resulting land use conflicts at the landscape level.

Based on the analysis and evaluation of existing governance methods and instruments, scientists investigate the instruments and institutions required to achieve sustainable

land use and the stakeholders which are relevant for the development and implementation of institutional solutions. The inclusion of stakeholders that are relevant for agricultural landscape use as well as their interests and logic of action are prerequisites for adapting and newly developing governance approaches at regional, national, and international levels.

PROJECTS OF CORE TOPIC III (SELECTED)

- Novel and well-tried ways to a sustainable European agriculture, EU (p. 16)
- Planning and governing of nature-based solutions in river landscapes, BMBF junior research group (p. 17)
- Science as development aid: India undergoing (climate) change, DAAD (p. 21)
- Criteria for Socially Responsible Research processes, BMBF joint research project (p. 25)
- AgoraNatura—Developing an online marketplace for more nature, BMBF joint research project
- Scaling-up Nutrition: Implementing Potentials of nutrition-sensitive and diversified agriculture to increase food security, BMEL

- Innovation Group Ginkoo: Designing integrative innovation processes: New institutional and regional forms of coordination for sustainable land management, BMBF joint research group
- Providing smart delivery of public goods by EU agriculture and forestry, EU Horizon 2020
- Farm Level Indicators for New Topics in Policy Evaluation, EU-FP7
- Civil-Public-Private-Partnerships: Collaborative governance approaches for policy innovation to enhance biodiversity and ecosystem services delivery in agricultural landscapes. Sub-project: Production practices and ecosystem services + Sub-project: Coordination—production practices and governance recommendations, BMBF/ERA-NET



NEW PROJECTS

NEW PROJECTS

AGRICULTURAL LANDSCAPES INFLUENCE THE GLOBAL ATMOSPHERIC CHEMISTRY

STEFFEN KOLB



Agricultural landscapes are sinks and sources of greenhouse and other trace gases, whose emissions are substantially modulated by agricultural management. Organic trace gases formed by plant-driven processes, known as biogenic volatile organic compounds (bVOCs), can be degraded by microbiomes living in the soil as well as in or on above-ground plant parts. This regulatory function regarding bVOC emissions of agricultural landscapes is investigated at ZALF in two new projects: MethanolSINK and CHLOROFILTER.

Scientists of the Terrestrial Microbiology working group in front of a phytotron with grassland plants (left to right: E. Kröber (CHLORO-FILTER), D. Bachmann (CHLOROFILTER), S. Kanukollu (MethanolSINK))



In the project MethanolSINK, S. Kanukollu is working on methanol conversion processes in managed grasslands at the ZALF research station in Paulinenaue. She analyses the microbiome composition of representative plant species and identifies methanol-

degrading microbes on various plant organs. In 2018, a field experiment will be conducted to study the activity of the aforementioned microbes in the rhizosphere and phyllosphere and methanol fluxes over space and time in collaboration with the atmospheric chemist A. Held of the University of Bayreuth. The ultimate project aim is to predict the quantitative dynamics of methanol fluxes based on measured data and further abiotic parameters. These results will be used to improve the modelling of methanol fluxes of managed grasslands.

The project CHLOROFILTER brings together German and French scientists to work on a systematic understanding of the global sink for chloromethane, a gaseous compound involved in the destruction of the ozone layer. The actual global budget of this chlorinated hydrocarbon is particularly uncertain regarding the sink terms. The consortium is following the hypothesis that the activity of microbiomes in the atmosphere and on the Earth's surface may be responsible for a major sink, which has been ignored so far. Project partners of the University of Heidelberg, of CNRS, the University of Strasbourg, and the University of Blaise-Pascal jointly work with E. Kröber and S. Kolb of the Terrestrial Microbiology working group of ZALF. In cooperation with the working group of F. Keppler (Heidelberg), for example, isotope signatures of chloromethane will be correlated with the sink type and strength. To date, it remains unclear to what degree the crop-microbiome system (also called crop holobiont) emits chloromethane, and how its emission rates vary in response to salt and temperature stress. The doctoral student D. Bachmann will address this important question.

Projects: Microbial Methanol Sink of a Grassland/The Impact of Microorganisms as a Sink of Atmospheric Chloromethane, **Terms:** 2016–2018/19 **Funding:** DFG/GRF, L'Agence national de la recherche **Lead:** S. Kolb (skolb@ zalf.de) **Partners:** MethanolSINK: A. Held (Atmospheric Chemistry, BayCEER, Univ. of Bayreuth)/CHLOROFILTER: F. Keppler (Dept. Biogeochemistry, Univ. of Heidelberg), S. Vuillieumier (Univ. of Strasbourg, CNRS), F. Bringel (CNRS Strasbourg), P. Amato, A. Délort (Univ. of Blaise-Pascal, Clermont Ferrand) **ZALF contribution:** LBG MethanolSINK: http://gepris.dfg.de/gepris/projekt/255179679 CHLOROFILTER: http://gepris.dfg.de/gepris/projekt/258712308

UNLOCKING THE POTENTIAL OF CROP UP-GRADING STRATEGIES IN DODOMA, TANZANIA

FRIEDER GRAEF, SONOKO DOROTHEA BELLINGRATH-KIMURA, MARCOS LANA



Poverty and hunger continue to be prevalent features of rural semi-arid Tanzania. This study aims to reduce production risks and improve pearl millet productivity by evaluating tied ridges and microfertilization as upgrading strategies (UPS) in the local farmers' context. Pearl millet cultivation is simulated based on spatial and temporal rainfall variability quantified using 60–70 rain gauges using the crop models DSSAT and APEX, comparing UPS and local crop management activities.

Tied ridges with pearl millet and peanut intercropping



Despite continuous efforts to reduce the number of people suffering from hunger since 1990, only a mere 5% reduction has been achieved in Sub-Saharan Africa. Land degradation, depletion of soil fertility, water stress, and high fertilizer costs contribute to

low crop yields, particularly for pearl millet, which is a main staple food crop in semi-arid regions of Tanzania. The onset, ending, and duration of the rainy season and growing period has become increasingly erratic, resulting in higher risk of crop failure, and consequently poverty and hunger.

This research project will test, compare, and combine upgrading strategies (UPS) of scientists and farmers to reduce the production risks of pearl millet. Over two rainy seasons, it will investigate tied ridges and microfertilization as scientifically proven in comparison with the management strategies of local farmers in the Tanzanian Dodoma region. The risk minimising strategies of the local farmers include e.g. (a) timedependent measures such as dry seeding, resowing and the use of differently maturing crop varieties, (b) coping with spatial rainfall variability through the cultivation of large and widely dispersed fields, and (c) measures for maintaining soil fertility.

This study will evaluate the spatial (survey level up to a few kilometers) and temporal (annual, monthly, daily, hourly) rainfall variability and its effects on the UPS of up to 15 different farmers. Rainfall data is collected from 60–70 rain gauges. The crop models DSSAT and APEX will be used to simulate pearl millet cultivation in order to understand the interlinkages between crop management along UPS, and the socio-economic and biophysical environment.



Spatial rainfall variability in a semi-arid environment in two different years (Graef and Haigis 2001)

Project: Unlocking the potential in assessing cropping upgrading strategies for food security in Dodoma, Tanzania (FS-Do) **Term:** 2016–2019 **Funding:** BMEL **Lead:** F. Graef (graef@zalf.de) **Partners:** Sokoine Univ. of Agriculture, Tanzania, S. Tumbo, F. Kahimba **ZALF contribution:** LSE

http://project2.zalf.de/trans-sec/public/factsheet

BUILDING BRIDGES IN BIODIVERSITY RESEARCH

GUNNAR LISCHEID



Various aspects of biodiversity and mutual interferences with human activities are studied in diverse biological systems, at different spatial scales, and by different disciplines. The BIBS project aims at bridging these different aspects. The compiled results will be made available to decision-makers and the general public. Special attention is paid to rapid man-made transitions of ecological systems.

Aerial view of one of the studied kettle holes in the AgroScapeLab Quillow. Picture taken by an unmanned aerial vehicle (UAV).



Various working packages focus on linkages between aquatic and terrestrial systems, urban and rural systems, above- and belowground systems, as well as near-natural and novel ecosystems. ZALF contributes to three work packages of BIBS. In the first work

package, ZALF has established and begun operating a sensor network in the AgroScapeLab Quillow in the Uckermark region, for which ZALF provides additional infrastructure, monitoring data, and basic information.

The second work package focuses on interactions between land use, biodiversity, and the ecosystem properties of kettle holes in a region of intense agricultural use. The effects of the surrounding terrestrial system on kettle holes are studied along a gradient of land use intensity. A mathematical model of biogeochemical processes in kettle holes will be applied and refined. In addition, machine learning approaches will be used to describe the interactions between external triggers and the biological and biogeochemical processes within kettle holes. The analysis will draw on existing data of the comprehensive landscape and kettle hole monitoring program of ZALF. Initial results indicate that biological, biogeochemical, and hydrological processes in kettle holes feature complex interactions. The input of nutrients, contaminants, and organic matter from adjacent arable fields into kettle holes can therefore yield diverse reactions, depending on the respective local conditions.

In work package 5, ZALF will contribute to an analysis of the costs and ecosystem services in a massively anthropogenically influenced environment. Here, especially in urban environments, new ecosystems develop continuously with novel biological communities of species that did not previously share a common development. These novel ecosystems are subject to new stress factors. This work package aims at a better understanding of the processes that result in rapid transitions from natural to novel communities and ecosystems. To that end, existing novel grassland ecosystems in an urban setting are monitored and supplemented by additional experiments. Biodiversity effects of native and invasive species on ecosystem services like control of the microclimate, carbon sequestration, and soil fertility can thus be assessed.

Project: Bridging in Biodiversity Science (BIBS) Term: 2016–2019 Funding: BMBF Lead at ZALF: G. Lischeid (lischeid@zalf.de) Partners: FU Berlin, Univ. Potsdam, TU Berlin, IGB, IZW, Museum f. Naturkunde Berlin, PIK ZALF contribution: LWH, LBG http://www.bbib.org/bibs-projekt.html

SMART FARMING TECHNOLOGIES — A MUST-HAVE FOR 21st CENTURY FARMING?

ANDREA KNIERIM, ANGELIKA WURBS



European agricultural, rural regions face many economic, social, and environmental challenges. Smart farming technologies (SFT) such as information management systems, precision agriculture, or automation and robotics may help to overcome some of them. The EU Horizon 2020 Project Smart AKIS investigates conditions and requirements for the wider acceptance of SFT, specifically aiming to close the gap between theory and practice. ZALF scientists analysed the needs, interests, and innovative ideas of farmers regarding SFT.

Drone technology provides real-time data of field conditions.



Project partners in 7 European countries (France, Germany, Greece, Serbia, Spain, the Netherlands, and the UK) are cooperating to contribute to more sustainability and competitiveness in the agricultural sector through SFT.

To investigate the needs, interests, and innovative ideas of farmers, a survey with a total of 271 participants of the countries involved was conducted. Up-front, all partners were equipped with a common framework, standards on innovation processes, and a common methodological approach. Furthermore, all the interviewers attended a joint training session led by the ZALF project team to ensure comparable interview conditions. The survey data unveiled valuable insights into farmers' perceptions of current challenges and the potential of SFT to overcome them.

Across Europe, the most important challenges for farmers were the reduction of crop diseases and soil conservation. Reducing harvest losses and water use were the challenges perceived as most, respectively highly important in Greece and Serbia, but surprisingly perceived as less important in Spain. Farm size seemed to influence these ratings; for example, a reduced water use was considered more important on small farms (< 2 ha) than on larger farms (> 100 ha). It was also observed that farmers prioritized SFT according to their cropping systems. GPS and similar devices (e.g. auto-steering) as well as drones, mapping, and aerial imagery are considered useful mainly for arable crops, whereas agricultural apps, weather stations, and soil moisture sensors with automatic data upload were preferred by vineyard and orchard farmers. However, results indicate that there are still serious doubts about the ability of SFT to help farmers overcome their challenges. Nevertheless, the interviewees seem to keep track of technological developments, as almost 70% of them recently sought out information specific to SFT. Still, the questions of whether or not SFT are a »must-have for 21st century farming« cannot yet be answered. Coming up, the ZALF project team will cooperate with the German partner DLG to conduct three regional workshops. Also, the data basis will be enlarged by additional expert interviews, and an ex-post study of promising cases of innovation processes will be conducted.

Project: Smart AKIS — European Agricultural Knowledge and Innovation Systems (AKIS) towards innovation-driven research in Smart Farming Technology **Term:** 2016–2018 **Funding:** EU Horizon 2020 **Lead at ZALF:** A. Knierim (aknierim@zalf.de), A. Wurbs (awurbs@zalf.de) **Partners:** DLG, ACTA, FRCuma Ouest, DLO, Delphy, D. Tinker and Ass. Ltd., Agric. Univ. of Athens, Biosense Inst. Serbia, INTIA, INI, CEMA **ZALF contribution:** SO, LSE http://cordis.europa.eu/project/rcn/200562_de.html http://www.smart-akis.com

NOVEL AND WELL-TRIED WAYS TO A SUSTAINABLE EUROPEAN AGRICULTURE

INGO ZASADA, MEIKE WELTIN



Sustainable intensification requires rethinking of farmers, regional decision-makers and the European agricultural policy. Novel technologies, well-tried agricultural practice, resource-efficient management, and regional cooperation are key elements for an integrated strategy. The project VITAL studies transformation processes of European agricultural systems towards a sustainably intensified production, and collaborates with farmers and stakeholders to identify innovative measures and new cooperation models to inform targeted policy design.

Agricultural use of the »Upper Rhinluch« peatland area in Brandenburg



Against the background of an increasing global demand for food and raw materials as well as a loss of biodiversity, climate change adaptation, and limited natural resources, there is a growing need for efficient resource use.

The European research project VITAL investigates transformation processes of agricultural systems towards a sustainably intensified production, simultaneously optimizing the agricultural production while reducing negative impacts on environment and society. Sustainable intensification approaches range from new technologies, such as precision farming or IT farm management solutions, to well-tried practices such as crop rotations, use of adapted varieties and residues of production. The system's resilience can thus be improved and the application of fertilizers and pesticides reduced.

Cooperation between farms plays a pivotal role for sustainable intensification, for example via coordinated landscape planning or interregional exchange of knowledge and resources. This is supported by the first project results from the German case study region, the »Upper Rhinluch« in Brandenburg. The area is a drained peatland, which is partly extensively, partly intensively used, and widely known as a crane resting area. Through personal interviews and a regional discussion workshop, lacking cooperation and coordination in land and water management as well as in the realisation of tourism potentials were pointed out as obstacles. However, manifold potentials for the use and expansion of sustainable new cultivation practices were also identified. In a next step, approaches for solutions and future scenarios will be developed in close cooperation between local stakeholders and scientists.

A joint large-scale survey with the EU project PROVIDE in Northern Germany will empirically investigate farmers' decision making regarding cultivation and management practices inbetween the two poles of food production and provision of environmental goods. The feasibility of different development paths will then be up-scaled to the European level.

Project: Viable InTensification of Agricultural production through sustainable Landscape transition (VITAL) **Term:** 2016–2019 **Funding:** EU Horizon 2020 (FACCE-JPI) **Lead at ZALF:** I. Zasada (ingo.zasada@zalf.de) **Partners:** VU Univ. Amsterdam, INRA Avignon, Polytechnic Univ. Valencia, agrathaer **ZALF contribution:** SO http://vital.environmentalgeography.nl

PLANNING AND GOVERNING OF NATURE-BASED SOLUTIONS IN RIVER LANDSCAPES

BARBARA SCHRÖTER, BETTINA MATZDORF



Nature-based solutions (NbS) are inspired by natural characteristics and processes and can contribute to increased sustainability and resilience of social-ecological systems. The concept is new to science and has to prove its value compared to established concepts like green or blue infrastructure, ecological engineering, or ecosystem-based approaches. In the context of social-ecological research, the junior research group PlanSmart therefore analyses aspects of planning and governing NbS in river landscapes using a transdisciplinary research approach.

Junior Research Group PlanSmart



Nature-based solutions, understood as actions which are inspired by nature, can help societies to address ecological, social, and economic challenges while at the same time supporting sustainability. They use natural characteristics and processes to make

social-ecological systems more resilient against risks, e.g. by securing biodiversity and wildlife habitats, improving water quality, retaining nutrients and greenhouse gases, and increasing human health and well-being. Examples for NbS are, amongst others, the restoration of floodplains and wetlands, the creation of marginal strips, the construction of wooden structures, and the transformation of arable land into grassland or forest. NbS can in part replace grey infrastructure, while often delivering a broad spectrum of ecosystem services and being more cost-effective than technical alternatives.

The concept of nature-based solutions has been developed by the International Union for Conservation of Nature (IUCN) some years ago and was recently adopted and further developed by the European Commission. It is a very new concept in science, which has to be tested for its additional value against established concepts like green / blue infrastructure, ecological engineering, ecosystem-based approaches, ecosystem services, or natural capital.

In April 2016, the PlanSmart research group got started to explore NbS for water-borne challenges such as securing water quality and provision, wastewater management and protecting river basins against flooding. The junior scientists study options for applying transdisciplinary planning methodologies and technologies, assessing ecological, social, and economic effects of NbS, developing innovative governance approaches, and analysing the process of knowledge co-generation.

The social-ecological junior research group is a cooperative project between the Institute of Environmental Planning at the Leibniz Universität Hannover and ZALF.

Project: PlanSmart—Planung und Governance naturbasierter Lösungen für wasserbasierte Herausforderungen in Flusslandschaften **Term:** 2016–2021 **Funding:** BMBF (FONA) **Lead at ZALF:** B. Schröter (barbara.schroeter@ zalf.de) **Partners:** C. Albert, Leibniz Univ. Hannover **ZALF contribution:** SO http://www.plansmart.info **CURRENT PROJECTS**







THE USE OF BIG DATA APPROACHES TO DETECT PATTERNS IN NATURE

GUNNAR LISCHEID



Measurement values of 12 solutes from more than 2000 water samples can be combined in a single figure using the SOM-SM method. Different colours indicate, for example, the level of contamination.

Data from the ZALF study region, which is located 90 km north of Berlin in the catchment area of the River Quillow in the Uckermark, has been collected since the early 1990s. In order to detect unknown correlations and interactions in nature, extremely

large quantities of data have to be merged in order to derive new and reliable information. What had been lacking to date was a way to identify certain recurring patterns in large quantities of data which may represent formerly unknown relations or relationships for which the evidence had been missing so far. In this context, the SOM-SM-method, which originates from >Big Data< analysis in theoretical physics, was applied by ZALF scientists. This method combines the processing power of a computer with the human capacity to recognize patterns. In a first analysis, 2449 water samples from streams, small natural ponds, so-called kettle holes, and the groundwater focused on finding explanations for the changing water quality in the Uckermark. The measured parameters included the pH value, electrical conductivity, as well as sulphate, nitrogen, chloride, phosphate, sodium, potassium, magnesium, calcium, ammonia, and organic carbon concentration. This data seemed to illustrate an improvement of groundwater quality, presumably due to decreasing fertilizer application.

The analysis, however, showed a gradual change in stream water quality, but not in the groundwater. Additional data helped to find a plausible explanation: groundwater levels had been dropping over several years. The reason for the improved water quality was thus not a reduction of fertilizer use, but the For 20 years, ZALF researchers have collected large amounts of data on soil, groundwater, and air, observed animals and analysed plants in a 160 km² study area. The data is supposed to help improve our understanding of environmental interactions. Previously, data merging and interpretation proved extremely difficult due to the enormous complexity and quantity of data—hence, derived statements on natural correlations were vague. An adaptation from theoretical physics first led to a new method and then to the discovery of patterns in the sea of data.

weather, because very little heavily contaminated water from the arable land had found its way into the streams during the recent warm and dry years.



Interactions between different measurement variables are visible as patterns in water samples.

By means of >Big Data< approaches, the effects of interventions in the environment, e.g. through nature conservation measures, and the causes of changes can be explored and identified in a much more differentiated way compared to traditional methods of data analysis.

Project: Big Data Approaches to detect Patterns in Nature **Term:** 2014–2018 **Funding:** Budget **Lead:** G. Lischeid (lischeid@zalf.de) **ZALF contribution:** LWH

SCIENCE AS DEVELOPMENT AID: INDIA UNDERGOING (CLIMATE) CHANGE

HARALD KÄCHELE



Extreme droughts have always threatened the lives of small farmers in the state of Odisha in India. In recent years, however, the number of natural disasters has increased. As part of a research group at ZALF, the Indian doctoral student Anu Susan Sam is looking to develop solutions for one of the most affected regions in India.

Hunger, disease, and water shortages resulting from periods of drought threaten the lives of the people in Odisha, India.



According to the Centre for Research on the Epidemiology of Disasters (CRED), approximately 4.25 million people have died between 1900 and 2015 as a consequence of extreme droughts. During this period, the Indian state of Odisha experienced 49

floods, 30 droughts, and 11 hurricanes. The progress of climate change has further exacerbated this trend in recent years. Within a doctorate project at the Institute of Socio-Economics supported by the German Academic Exchange Service (DAAD), Anu S. Sam, a native Indian, is now investigating one of the most affected regions of India with respect to local conditions and specific risk factors.

From 157 households in four different communities, data was collected on population structure, livelihood, health, social networks, physical, financial, and natural resources, as well as on the effects of natural disasters on the families. The bitter results were: More than 95% of the households had neither access to clean water nor toilets. Diarrhoeal diseases, allergies, skin diseases, and respiratory diseases are widespread. Most of the villagers are illiterate.

Nevertheless, tiny, but highly effective differences between the villages became obvious: households which, in addition to cultivating fields, also keep cows, buffaloes, goats, and chicken are less vulnerable. Families who can send their sons to building sites, factories, and restaurants outside the village have a reliable income. A minimum level of health care as well adequate water supply strengthens them for critical periods. But the most important thing appears to be the literacy of the people, especially for women and girls, who often bear the responsibility for feeding the entire family. With new knowledge, e.g. on how to adapt the cultivation of their fields to climate change, they can break new ground and take control of their destiny.

In a next step, the project intends to penetrate even deeper into society, with plans including studies on the role of women and the issue of labor migration.

Project: Sustainable Rural Development in India **Term:** 2014–2017 **Funding:** DAAD, Fiat Panis **Lead:** H. Kächele (kaechele@zalf.de) **Partners:** R. Kumar, ICRISAT **ZALF contribution:** SO

DRONES DECIPHER LANDSCAPE PATTERNS

MICHAEL SOMMER, MARC WEHRHAN



Spatial pattern of carbon export from the CarboZALF experimental field (Uckermark)

In the public p intended for r ered a threat t equipped with environmental »LIAS« (Linna)

In the public perception, a drone is either intended for military purposes or considered a threat to privacy, e.g. due to »toys« equipped with cameras. In agricultural and environmental research, drones — so-called »UAS« (Unmanned Aerial Systems) — have

become an indispensable technology for data acquisition, as they are flexible to use and easy to handle. On-board multispectral and thermal sensors or laser systems allow for the landscape-scale determination of important land surface properties with a very high spatial resolution and at any time. Thus, structures controlling landscape processes can be deciphered as well as their temporal changes during a vegetation period or over several years.

In the context of ZALF research on the interactions between land use and climate change, an interdisciplinary group of scientists studies the influence of soil erosion on CO₂ sources and sinks in agricultural landscapes (CarboZALF project). For this purpose, precise information on site-specific primary production and related carbon exports are required. In a recent ZALF case study, high-resolution data on carbon exports were acquired using drone-based multispectral imagery. At the CarboZALF experimental field, carbon exports of lucerne varied from 50 to 250 g C/m^2 , a magnitude which is highly relevant for net CO₂ fluxes. Furthermore, the export pattern was explained by the soils' erosional status: the lowest exports were found on extremely eroded soils (Calcaric Regosols); the highest exports on nutrient-rich, groundwater influenced soils (Endogleyic Colluvic Regosols) in depressions. The existence of small-scale variability within each soil zone demonstrates the potential of UAS-based remote sensing to support process research and uncertainty assessment at the landscape scale.

Drones are of increasing importance for agricultural and environmental research. ZALF applies drones to characterise vegetation patterns, plant biomass, and soil surfaces in agricultural landscapes. With the drone-based, spatially explicit analysis of carbon exports via crop harvest in relation to erosion-induced soil patterns, the interdisciplinary project CarboZALF recently achieved a breakthrough in quantifying one of the most sensitive parts of carbon balances — a precondition for the detection of CO₂ sources and sinks in agricultural landscapes.

Future drone-based research at ZALF will be extended towards landscape-scale patterns and dynamics of important state variables and processes, such as soil organic carbon, plant primary production, plant stress indication, dust transport, and transpiration of crop canopies.



ZALF drone

Project: Carbon Dynamics of Agricultural Landscapes in Global Change **Term:** 2009–2024 **Funding:** MWFK Brandenburg, BMEL **Lead:** J. Augustin (jaug@zalf.de), M. Sommer (sommer@zalf.de) **ZALF contribution:** BLF, LBG, LSA

SUSTAINABLE LAND MANAGEMENT STRATEGIES FOR SOUTHERN AMAZONIA

CLAAS NENDEL, ANNA HAMPF



With respect to climate protection and biodiversity, the Amazon rainforest is one of the most important ecosystems worldwide. For decades, however, the forest area has been shrinking and has given way to pastures and soybean fields, particularly in Mato Grosso and Pará. Within the the research project CARBIOCIAL, scientists of 10 German and several Brazilian universities, UFZ, and ZALF have therefore analysed the development of land use under different socio-economic scenarios, and developed sustainable land management strategies for Southern Amazonia.

Soybean fields are replacing tropical rainforest in the Southern Amazon, Brazil.



In particular, the project partners investigated how more carbon can be stored in soils, how climate change will affect agricultural yields, and how different socioeconomic scenarios may influence land use. With their simulation of agricultural yields,

ZALF scientists have made an important contribution to the CARBIOCIAL project, serving as a link between climate and land use simulations. Applying their Model for Nitrogen and Carbon in Agro-ecosystems (MONICA), they produced high-resolution yield maps for soybeans, maize, and cotton. These maps show the consequences of climate change by the year 2040: strongly decreasing rainfall in the entire research region and declining yields, especially in the northern part of the Pará state. The results of the yield simulations served as input for the agent-based farm economy model MPMAS and for the LandSHIFT land use model, which was used to estimate land use changes for various socio-economic scenarios (trend continuation, legal and illegal intensification, and sustainable development). In cooperation with the University of Kiel, the ZALF scientists also discovered that the application of easily accessible organic materials such as eucalyptus leaves, sawdust, sugar cane filter cake, or passion fruit residues can increase organic carbon contents in the upper 30 cm of the soil by about 5 tons per hectare per year. Another highlight of the CARBIOCIAL project was the exploration of carbon being stored in deep soil layers. For this purpose, soil scientists excavated a 10-meter-deep hole in the pristine rainforest inhabited by the indigenous Kajapó people. The local population is involved in the international CO₂ trade under the REDD (Reducing Emissions from Deforestation and Forest

Degradation) program and can thus benefit from the results of the soil survey: about 50% of the carbon stock is stored more than one meter below soil surface; this means REDD does not account for this data.

Although not all of the initial objectives of the CARBIOCIAL project have been achieved, it is nevertheless a successful example of interdisciplinary and transdisciplinary research, combining integrated modeling approaches and socio-economic aspects to contribute to a better understanding of human-environmental interactions in the Amazon and to the development of sustainable land management strategies.

Project: Kohlenstoff-Sequestrierung, Biodiversität und soziale Strukturen in Süd-Amazonien: Modelle und Implementierung von Kohlenstoff-optimierten Landnutzungsstrategien (CARBIOCIAL) **Term:** 2011–2016 **Funding:** BMBF **Lead at ZALF:** C. Nendel (nendel@zalf.de) **Partners:** Georg August Univ. Göttingen, HU Berlin, Hohenheim Univ., FU Berlin, Innsbruck Univ., Federal Univ. of Mato Grosso, EMBRAPA Rice & Beans and more **ZALF contribution:** LSA http://www.carbiocial.de

EXPLORING THE CARBON DYNAMICS OF KETTLE HOLES

GUNNAR LISCHEID



The kettle holes of Northeast Germany, i.e. small lakes in depressions, can be long-term sinks of organic carbon: organic remains are hardly decomposed in the oxygen-poor sediment. However, a small proportion may be emitted as climatic relevant methane. In addition, some carbon is released when kettle holes dry out. In their joint project, scientists of ZALF and IGB took a closer at these processes.

One of the studied kettle holes in the Uckermark region

The project focussed on intense studies of two kettle holes in the Uckermark region, supplemented by laboratory experiments and a variety of water, plant, and soil samples analysed for various elements and isotopes. The primary objective was to quantify the

input of organic carbon via soil erosion, photosynthesis in the kettle holes, and via groundwater influx as well as the carbon output via decomposition, methane emissions or groundwater efflux. In addition, the drivers of carbon turnover in the kettle holes were to be determined in order to assess the future development assuming different scenarios.

To that end, the project studied the transfer of soil material in the vicinity of the kettle holes, quantified the input via sediment probes and sampling of suspended matter, and measured organic carbon built up by plants and algae. The source of organic matter in water and soil was determined using carbon and nitrogen isotopes. Gaseous carbon release from the kettle holes and their surroundings was quantified by means of gas exchange measurements. Additional periodic sampling of another 60 kettle holes in the region allowed assessing the representativity of the results. Field studies and lab experiments showed that carbon and nutrient turnover in the kettle holes highly depended on the length of preceding desiccation phases. Based on the measured data, a biogeochemical model to simulate these turnover processes was set up and calibrated.

In general, the kettle holes exhibited an enormous spatial and temporal variability. Even adjacent kettle holes can differ substantially. Moreover, kettle holes are closely linked to their surroundings, which are often intensively agriculturally used. Despite the high variability and complexity, the LandScales project developed initial approaches to transfer findings from a few kettle holes to larger regions.



Kettle holes are hotspots of biodiversity and of biogeochemical processes in agricultural landscapes.

Project: Connecting processes and structures driving the landscape carbon dynamics over scales (LandScales)
Term: 2012–2016 Funding: Leibniz Association Lead:
G. Lischeid (lischeid@zalf.de) Partners: IGB ZALF contribution: LWH, LBG, BLF

CRITERIA FOR SOCIALLY RESPONSIBLE RESEARCH PROCESSES

KATHARINA HELMING, KATRIN DAEDLOW



The societal responsibility of research in shaping sustainable development is not only tied to the research topic, but also to the way it is conducted. In the LeNa project, a framework for reflection for »Socially Responsible Research« processes was developed, which systemises the »HOW« and requires a discussion of conflicts of interests and goals. It addresses requirements of societal responsibility for all research areas and disciplines, and complements thematic research contributing to solutions for societal challenges.

The 17 Sustainable Development Goals of the United Nations Agenda 2030: »Socially Responsible Research« develops the evidence base to achieve these targets.

> Today, sustainable development is a widely accepted societal principle. As a driving force for development, research bears its share of the responsibility for implementation — as much as politics, economy or civil society. This

poses challenges on research content and the modus of research, i.e. the research process itself. »Socially Responsible Research« describes a research process that contributes to sustainable development based on a critical and systematic reflection on research questions, theoretical assumptions, methods, results, as well as their communication and impacts. The three research organisations Leibniz Association, Fraunhofer-Gesellschaft, and Helmholtz Association developed a Framework for Reflection on »Socially Responsible Research«, which is built upon the rules of good scientific practice and supports researchers in considering societal responsibility during the entire research process. It contains eight reflection criteria applicable to all research disciplines and considers the questions of how, with whom, and for whom research is carried out.

Eig	ht cri	teria	for	»Social	ly i	Res	ponsi	bl	e R	esea	rcł	۱«
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Ethics	Dealing with societal values
Integrative approach	Incorporation of relevant aspects and inter- actions at spatial, temporal, analytical and methodological level
Interdisciplinarity	Combination of approaches and methods of different disciplines
User orientation	Involvement of potential users (e.g. politicians, businesses, civil society)

Reflection of impacts	Ex-ante and ex-post assessment of direct and indirect, intended and non-intended impacts
Transdisciplinarity	Integration of practice-oriented knowledge of non-scientific stakeholders
Transparency	Disclosing the research process, e.g. explica- tion of the normative foundation, impacts or the funding
Dealing with comple- xity and uncertainty	Explication of risks and of knowledge uncer- tainties about complex systems

The implementation of the Framework for Reflection in daily research routines requires a discussion of conflicts of interests and goals, and needs efforts on individual, organisational, and institutional levels.

Project: Sustainability Management in Non-University Research Organisations (LeNa), Sub-project 1: Socially Responsible Research **Term:** 2013–2016 **Funding:** BMBF **Lead at ZALF:** K. Helming [TP 1] (khelming@zalf. de)/Coordination C. Reimoser, FHG **Partners:** ISI, UMSI-CHT, LIT-ITAS, FZ Jülich **ZALF contribution:** LSE, DIR http://www.lena-projekt.de

THE YEAR



13TH KITCHEN GARDENS AGAINST MALNUTRITON

ZALF coordinates the BMEL-financed project »Scaling-up Nutrition: potential applications of nutrition-sensitive and diversified agriculture for improved food security« (Scale-N).

5TH SCIENCE MANGEMENT

The Center for Science and Research Management (ZWM) welcomed ZALF as a new member. ZWM supports the development of the entire science system through the conceptualization and implementation of training seminars and workshops, moderation and advice, and support for human resources and strategy development, as well as supervision of evaluation and change processes.



1ST CHANGING LEADERSHIP

ZALF's new Scientific Director Prof. Dr. Frank Ewert assumed his new role. Prof. Ewert has many years of national and international research experience regarding the development of sustainable cultivation and land use systems. As head of the interdisciplinary Working Group Crop Production at the University of Bonn, he led an international team.

JANUARY



20TH DISTINGUISHED AGRI-CULTURE FOR BIODIVERSITY

A jury of experts recognised ZALF's »Agriculture for Biodiversity« project as the most pioneering project of the UN Decade on Biological Diversity. ZALF scientists had developed an evaluation system for environmental protection services provided by organic agriculture at the operational level.

FEBRUARY

MARCH

25TH ONLINE MARKETPLACE FOR ECOSYSTEM SERVICES

The »AgoraNatura« project kicked off: In the future, it will be possible to trade the services people use that nature provides via an online marketplace. The goal is to create a platform that generates additional funds for ecosystem conservation. The nature market should be officially online by 2018.



15^{тн}-17^{тн} іскорм2016

In March, more than 300 agricultural scientists specialized in the application of computer models participated in the iCROPM Symposium in Berlin.



The three-day event was jointly organized and implemented by ZALF and the research networks MACSUR and AgMIP. The 85 lectures and 130 posters informed participants from all corners of the world about current trends and research questions.

IN RETROSPECT



4TH UNIQUE SOIL EXPERIMENT In April, leading international erosion researchers met for a globally unique field experiment at the ZALF Research Station. **18TH INNOVATION INITIATIVE AGRICULTURE 4.0** The Leibniz Research Alliance »Food and Nutrition« published a new position paper on the digitalization of agriculture. ZALF, along with ATB and IHP, was one of the initiators and played a key role in drafting the strategy paper. »Precision Agriculture« and »Smart



11TH LONG NIGHT OF THE SCIENCES At the ZALF booth located in the headquarters of the Leibniz Association in Berlin, visitors conducted interactive experiments to discover why soybeans and lupines are considered natural fertilizer factories.

APRIL

ΜΑΥ

JUNE

In only four days, long-term erosion effects due to soil cultivation were simulated on a 50-meter-long slope. With the help of installed sensors as well as highly accurate surface surveying and drone-based aerial imaging techniques, the scientists were able to experimentally determine the rates of soil transfer and generate new understandings of processes. Farming« are already part of everyday agricultural practices. In light of this, the scientists involved in the initiative call on this advanced digitalization to



not only follow an economic rationale, but also to allow for societal participation regarding questions of sustainability as well as environmental, animal, and consumer protection.



23RD OPEN SCIENCE: PHD DAY AT ZALF Science Slam, Poster Competition, Elevator Pitches: the event featured modern forms of knowledge dissemination channels and provided a platform for scientific exchange and discourse. A particular highlight was the keynote speech by open science pioneer Jon Tennant.

THE YEAR





6TH DOUBLE AWARDS

The Albrecht-Daniel-Thaer Honorary Award was given to Meike Weltin and Dr. Jens Rommel from ZALF's Institute of Socio-Economics. Ms. Weltin received the award for the best Master's thesis, and Mr. Rommel for the best doctoral thesis.

26TH INTERNATIONAL

EXCHANGE For many years, there has been close collaboration between ZALF and the World Agroforestry Centre (ICRAF) in Kenya and Tanzania. The collaboration began in 2007 with multiple projects and continues to this day.



15TH KNOWLEDGE TRANSFER

Bringing together practical experience and science: under this objective, ZALF's Institute of Land Use Systems organized an expert discussion and a field day on the topic of »Strategy Development for Soybean Cultivation and Sensitive Locations« particularly for employees engaged in agriculture.

SEPTEMBER

JULY

AUGUST



18TH LEIBNIZ PRESIDENT AS GUEST A diversified program was prepared for Prof. Dr. Eng. Matthias Kleiner: after an exchange with the Executive Board and the Heads of Institutes, a field visit was scheduled. Standing in the midst of drones used to investigate landscapes from the air and chambers for analysing soil gases, the focus laid especially on data — as the »raw material« of future agricultural landscape research. Anthony Kimaro, an employee at ICRAF headquarters in Nairobi and a ZALF fellow, visited ZALF to facilitate cooperation even further. Together, ZALF and ICRAF prepare project proposals and publication of the results from work in Tanzania.



19TH-21ST EXCURSION

In September, ZALF invited counterparts from the Soil Science Department of the Institute of Plant Nutrition and Soil Science from Christian Albrechts University in Kiel to discuss the topic of »Post-Glacial Soil Landscapes in Eastern Brandenburg«. The event program included visits to ongoing field experiments of the Institute of Soil Landscape Research including the CarboZALF experimental site and the erosion measurement site near Christianenhof.

IN RETROSPECT



18TH MÜNCHEBERGER RESEARCH AWARD ZALF scientist Dr. Ralf Bloch received the Honorary Award of the Research Town of Müncheberg. The jury notes the realworld relevance of his doctoral thesis on the influence of climate change on agriculture in Brandenburg.

1ST PROCEEDINGS – 20 YEARS ON-FARM EXPERIMENT LIETZEN

The proceedings cover the diverse topics of a field day in May organized by agrathaer GmbH. Contributions include the Challenges of Agriculture 4.0 and the importance of field trials, as well as developments in soil cultivation and technology, and address the history, progress, and research results of the On-Farm Experiment Lietzen over the past 20 years.



6TH GUESTS FROM BELARUS

Guests from the Federal Government of Belarus visited ZALF in the course of an informational tour on the subject of organic agriculture, which was commissioned by the German Foreign Office of the Goethe-Institute. Emphasis was placed on the development and modelling of cultivation methods in organic agriculture.

OCTOBER

NOVEMBER

DECEMBER

28TH SCIENCE IN DIALOGUE: SPOTLIGHT ON LEGUMES AND

PULSES In October, ZALF held an interactive panel discussion at the headquarters of the Leibniz Association in Berlin on the topic of »Legumes — An Old Crop with a Big Future«. As a special feature, scientists from four different Leibniz Institutions, and thus with different areas of expertise, all addressed the subject of legumes from different perspectives. In addition to questions of genetics, cultivation, and animal nutrition, discussions also focused on nutritional physiology. Over 75 attentive audience members followed the discussion and actively engaged in the debate through social media.



22ND SURVEY: MORE GREEN ON BERLIN ROOFTOPS?

ZALF scientists conducted a survey asking Berlin residents about their opinion on urban agriculture. First results from the study were released in November: rooftop gardens receive widespread approval as the preferred cultivation method, as unoccupied city spaces can thus be sensibly used for food production.



23RD FUTURE WORKSHOP

The »Future Food Commons« project investigates new forms of the interaction between consumption and production in the context of food provision. In the first »Future Workshop« in September, participants from different social groups discussed potential developments of food supply. The workshop was led by the Frauenhofer ISI. The discussions were based on results from interviews and literature analyses conducted by ZALF. ANNEX

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ANNUAL REPORT 2016

FACTS & FIGURES



320 Employees (among them 174 scientists)

2310

26 Employees doing academic teaching

139 Tasks and offices in scientific boards and bodies

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		_

2839 Newspaper articles

215 Peer-reviewed publications



36 Scientific conferences and workshops

> 16 Colloquia



8.4 million € Total amount of third party money

21.1 million € Basic funding

29.9 million € Total budget

28% Percentage of third party money





14 New doctoral researchers

9 Completed doctoral theses

42 Diplomas, master theses, bachelor theses



21 Newly started projects

241 Cooperating partners in 34 countries



FINANCES

EXPENSES DURING BUDGET YEAR 2016*

PAYROLL EXPENSES	17,275
O ADMINISTRATION EXPENSES	5,879
O FACILITY MAINTAINANCE EXPEN	SES 258
O FACILITY INVESTMENTS	776
O EQUIPMENT INVESTMENTS	884
GRF FEES	512
SAW FEES	676
CASH HOLDINGS	2,774
TOTAL	29,033

Contributions of third parties	GRF	415	PRIVATE COMPANIES	346
in budget year 2016**	FEDERAL FINANCED PROJECTS	6,258	SAW	370
	STATE FINANCED PROJECTS	231	OTHERS	172
	EU	227	FOUNDATIONS	139
	ERANET	202	IN THOURSAND	EUROS

21.1	MILLION	CORE	FINAN	ICING
		00.12		

8.4 MILLION TP FUNDING

CORE FINANCING BY THE BRANDENBURGIAN MINISTRY OF SCIENCE, RESEARCH AND CULTURE (MWFK) AND THE FEDERAL MINISTRY OF FOOD AND AGRICULTURE (BMEL)

* expenses at key date March 21, 2017

^{**} contributed third party money at key date February 28, 2017

MANAGEMENT, BOARDS & COMMITTEES



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Prof. Dr. Ernst Berg Universität Bonn Chairman

Prof. Dr. Nicola Fohrer Christian-Albrechts-Universität zu Kiel

Dr. Annette Freibauer Johann Heinrich von Thünen-Institut

Prof. Dr. Henning Kage Christian-Albrechts-Universität zu Kiel

Prof. Dr. Martin Kaupenjohann Technische Universität Berlin

Prof. Dr. Michael Kleyer Universität Oldenburg

Dr. Stefan Mann Eidgenössisches Departement für Wirtschaft, Bildung und Forschung WBF, Schweiz

Prof. Dr. Felix Müller Christian-Albrechts-Universität zu Kiel

Prof. Dr. Harry Vereecken Forschungszentrum Jülich

MEMBERS OF ZALF

Dr. Claudia Herok

Ministerium für Wissenschaft, Forschung und Kultur (MWFK, Ref. 22), Brandenburg Head of the Assembly of Members

Bernt Farcke Bundesministerium für Ernährung und Landwirtschaft

Peter Schubert Ministerium für Ländliche Entwicklung, Umwelt und Landwirtschaft, Brandenburg

Dr. Klaus-Peter Michel Bundesministerium für Bildung und Forschung

Prof. Dr. Wolfgang Bokelmann Humboldt-Universität zu Berlin, Lebenswissenschaftliche Fakultät

Udo Folgart Agro-Glien GmbH

Prof. Dr. Ulrich Schurr Forschungszentrum Jülich

Prof. Dr. Robert Seckler Universität Potsdam, Vizepräsident für Forschung und wiss. Nachwuchs

INSTITUTES OF ZALF



The Institute of Soil Landscape Research BLF (BLF) studies structures, processes and functions of soil landscapes, meaning long-standing soil associations within their current landscape ecological context. For a fundamental understanding of the development and functioning of soil landscapes, soil processes are analyzed in their dependency on spatio-temporally variable structures — all the way from the micrometer scale up to the landscape scale.

> Head of Institute: Prof. Dr. Michael Sommer

The Institute of Landscape Biogeochemis-LBG try (LBG) investigates principles of C and N cycles in agricultural landscapes and their influences on the responses of landscape processes to climate change and land use management. Drivers and regulators of landscape processes are microbiomes, plants, and plant-soil-biome interactions, which are studied at the laboratory, greenhouse and landscape level.

> Head of Institute: PD Dr. Steffen Kolb

LSA

The Institute of Landscape Systems

Analysis (LSA) explores ecosystem functions and services of agricultural landscapes. Methods and models for analysis and assessment purposes are developed to facilitate a better understanding and evaluation of relevant processes. These are the foundation for an integrated sustainability impact assessment of climate change, policy making and societal demands on agricultural landscapes. > Acting Head of Institute: Dr. Claas Nendel

The Institute of Land Use Systems (LSE) LSE develops sustainable land use systems and studies their contributions to the provision of ecosystem services in a landscape context. New assessment tools and indicators are created that can be used for simulation models as well as new governance approaches.

> Head of Institute: Prof. Dr. Sonoko D. Bellingrath-Kimura

The Institute of Landscape Hydrology LWH

(LWH) develops methods for sustainable water management that simultaneously ensure agricultural production, maintain ecosystem services and protect biodiversity. The institute's work is based on a sound understanding of the interplay between hydrological, biogeochemical and biological processes including their interactions under changing environmental conditions. > Head of Institute: Prof. Dr. Gunnar Lischeid

The Institute of Socio-Economics (SO)

SO investigates economic, social and political aspects of the sustainable use of agricultural landscapes. Research questions address actor behavior, governance approaches as well as innovation processes. Due to the complexity of the research questions, disciplinary investigations are complemented by inter- and transdisciplinary approaches. > Head of Institute: Prof. Dr. Klaus Müller

DOCTORAL RESEARCHERS & POSTDOCS

DOCTORAL RESEARCHERS, NEW IN 2016

Bachmann, Denise

Inst. of Landscape Biogeochemistry Supervisor at ZALF: Dr. Eileen Kröber, PD Dr. Steffen Kolb Humboldt-Universität zu Berlin Supervisor: Prof. Dr. Sonoko D. Bellingrath-Kimura

Cavael, Ulrike

Inst. of Socio-Economics Supervisor at ZALF: Katharina Diehl University not yet determined Supervisor not yet determined

Früh, Linus

Inst. of Land Use Systems Supervisor at ZALF: Dr. Doreen Walther Universität Greifswald Supervisor: PD Dr. Helge Kampen

Huynh, Thanh H.

Inst. of Land Use Systems Supervisor at ZALF: Dr. Angelika Wurbs Humboldt-Universität zu Berlin Supervisor: Prof. Dr. Klaus Müller

Kerkow, Antje

Inst. of Land Use Systems and Inst. of Landscape Systems Analysis Supervisor at ZALF: Dr. Doreen Walther, Dr. Ralf Wieland Freie Universität Berlin Supervisor: Dr. Franz Hoelker, Prof. Dr. Jonathan Jeschke

Krause, Marlen

Inst. of Socio-Economics Supervisor at ZALF: Prof. Dr. Bettina Matzdorf University not yet determined Supervisor: not yet determined

Mgeni, Charles

Inst. of Socio-Economics Supervisor at ZALF: Dr. Stefan Sieber Humboldt-Universität zu Berlin Supervisor: Prof. Dr. Klaus Müller

Naqvi, Syed Mohsin R.

Inst. of Socio-Economics Supervisor at ZALF: Prof. Dr. Harald Kächele Humboldt-Universität zu Berlin Supervisor: Prof. Dr. Klaus Müller

Silungwe, Festo R.

Inst. of Land Use Systems Supervisor at ZALF: Dr. Frieder Graef Humboldt-Universität zu Berlin Supervisor: Prof. Dr. Sonoko D. Bellingrath-Kimura

Susman, Roni

Inst. of Socio-Economics Supervisor at ZALF: Prof. Dr. Klaus Müller, apl. Prof. Dr. Thomas Weith University of Potsdam Supervisor: apl. Prof. Dr. Thomas Weith

Thai, Thi H.

Inst. of Land Use Systems Supervisor at ZALF: Dr. Dietmar Barkusky, Dr. Monika Joschko Humboldt-Universität zu Berlin Supervisor: Prof. Dr. Sonoko D. Bellingrath-Kimura

Tsutskikh, Elena

Inst. of Landscape Systems Analysis Supervisor at ZALF: Dr. Claas Nendel Humboldt-Universität zu Berlin Supervisor: Prof. Dr. Jutta Zeitz

Weltin, Meike

Inst. of Socio-Economics Supervisor at ZALF: Dr. Ingo Zasada University of Rostock Supervisor: Prof. Dr. Silke Hüttel

Zulfiqar, Hasan

Inst. of Socio-Economics Supervisor at ZALF: Prof. Dr. Harald Kächele Humboldt-Universität zu Berlin Supervisor: Prof. Dr. Klaus Müller

POSTDOCS, NEW IN 2016

Bloch, Ralf Inst. of Land Use Systems

Buchen, Caroline Inst. of Landscape Biogeochemistry

Hamidov, Ahmad Inst. of Land Use Systems

Lerche, Sandra Inst. of Landscape Biogeochemistry

Pätzig, Marlene Inst. of Socio-Economics

Techen, Anja Inst. of Land Use Systems

SCHOLARSHIP HOLDERS

Name	Country	Institute	Sponsorship
Arodudu, Oludunsin T.	Nigeria	Land Use Systems	Marie Skłodowska-Curie Fellowship
Batunacun	P. R. China	Landscape Systems Analysis	Chinese Scholarship Council
Brunet Navarro, Pau	Spain	Landscape Systems Analysis	Marie Skłodowska-Curie Fellowship
Chen, Cheng	P. R. China	Socio-Economics	Chinese Scholarship Council
Dam, Thi H. T.	Vietnam	Land Use Systems	Vietnam International Education Development — Ministry Education and Training
Egamberdieva, Dr. Dilfuza	Usbekistan	Landscape Biogeochemistry	Alexander von Humboldt-Found- ation
Gao, Yongbo	P. R. China	Landscape Hydrology	Chinese Scholarship Council
Hampf, Anna C.	Germany	Landscape Systems Analysis	Heinrich-Böll-Stiftung
Huynh, Thanh H.	Vietnam	Land Use Systems	Vietnam International Education Development — Ministry Education and Training
lqbal, Muhammad A.	Pakistan	Landscape Systems Analysis	Alexander von Humboldt-Found- ation
Li, Qirui	P. R. China	Socio-Economics	Chinese Scholarship Council
Mahgoub, Prof. Dr. Emadeldin	Tansania	Socio-Economics	DAAD
Naqvi, Syed M. R.	Pakistan	Socio-Economics	50 Overseas Scholarships, University Agriculture, Faisalabad
Nongpat, Chaichana	Thailand	Land Use Systems	Tokyo University of Agriculture and Technology
Sam, Anu S.	India	Socio-Economics	DAAD
Selecky, Tomas	Germany	Land Use Systems	DBU
Sun, Jin	P. R. China	Socio-Economics	Chinese Scholarship Council
Susman, Roni	Indonesia	Socio-Economics	Indonesian Endowment Fund for Education
Thai, Thi H.	Vietnam	Land Use Systems	Vietnam International Education Development — Ministry of Education and Training
Wambura, Frank J.	Tansania	Landscape Hydrology	DAAD
Wang, Dr. Meng	P. R. China	Landscape Systems Analysis	Chinese Scholarship Council
Weißhuhn, Peter	Germany	Land Use Systems	DBU
Zulfiqar, Hasan	Pakistan	Socio-Economics	University of Agriculture, Faisalabad

DOCTORAL THESES

Abbas, Azhar

Inst. of Socio-Economics Socioeconomic impacts of climatic extremes and their management: a case study of floods in Pakistan with special reference to aspects of mitigation, coping strategies and adaptation of farming sector Supervisor at ZALF: Prof. Dr. Harald Kächele Humboldt-Universität zu Berlin Supervisor: Prof. Dr. Klaus Müller

Badorreck, Annika

Inst. of Soil Landscape Research Multidimensional visualization of preferential flow pathways using neutron and X-ray radiation Supervisor at ZALF: PD Dr. Horst Gerke Brandenburg University of Technology Cottbus-Senftenberg Supervisor: Prof. Dr. Dr. h. c. Reinhard F. Hüttl

Bloch, Ralf

Inst. of Land Use Systems The vulnerability of organic farming to climate change effects in the Federal State of Brandenburg, Germany Supervisor at ZALF: Dr. Johann Bachinger University of Kassel Supervisor: Prof. Dr. Jürgen Heß

Hommel, Robert

Inst. of Landscape Biogeochemistry The interrelation of carbon and water balance in beech-dominated forests — from leaf level water use efficiency to stand and area scale assessments Supervisor at ZALF: Dr. Zachary Kayler Humboldt-Universität zu Berlin Supervisor: Prof. Dr. Arthur Geßler

Krikser, Thomas

Inst. of Socio-Economics The contribution of foundations to ecofriendly and sustainable development Supervisor at ZALF: Prof. Dr. Bettina Matzdorf Leuphana University Lüneburg Supervisor: Prof. Dr. Gerd Michelsen

Kühdorf, Katja

Inst. of Landscape Biogeochemistry Diversity and identification of mycorrhizal fungi of Tropical Comarostaphylis arbutoides Supervisor at ZALF: Dr. Babette Münzenberger Brandenburg University of Technology Cottbus-Senftenberg Supervisor: Prof. Dr. Dr. h. c. Reinhard F. Hüttl

Oyeogbe, Anthony I.

Inst. of Landscape Systems Analysis Parameterising MONICA for cotton: calibration and validation for rainfed cotton in Nigeria Supervisor at ZALF: Dr. Claas Nendel Indian Agricultural Research Institute, New Delhi Supervisor: Prof. Dr. Patel Amarnath

Papendiek, Franka

Directorate

Fodder legumes for green biorefineries: a perspective for sustainable agricultural production systems Supervisor at ZALF: Dr. Hans-Peter Ende, Prof. Dr. Hubert Wiggering University of Potsdam Supervisor: Prof. Dr. Hubert Wiggering

Zielke, Dorothee

Inst. of Land Use Systems Population genetics and distribution of the invasive mosquito Aedes japonicus japonicus (Diptera: Culicidae) in Germany and Europe Supervisor at ZALF: Dr. Doreen Walther University of Bonn Supervisor: PD Dr. Helge Kampen

GUESTS & FELLOWS

GUESTS WITH RESEARCH STAYS AT ZALF

Abbas, Azhar

Inst. of Socio-Economics University of Agriculture, Faisalabad, Pakistan

Ajeel, Ali

Inst. of Soil Landscape Research Mediterranean Agronomic Institute of Bari, Italy

Ankit, Kumar

Inst. of Land Use Systems Indian Institute of Technology, Kanpur, India

Arshad, Muhammad

Inst. of Socio-Economics University of Agriculture, Faisalabad, Pakistan

Battisti, Rafael

Inst. of Landscape Systems Analysis University of São Paulo, Brazil

Bender, Fabiani D.

Inst. of Landscape Systems Analysis University of São Paulo, Brazil

Chaichana, Nongpat

Inst. of Land Use Systems University of Tokyo, Faculty of Agriculture and Technology, Japan

Chen, Cheng

Inst. of Socio-Economics China Scholarship Council, P. R. China

Dam, Thi H. T. Inst. of Socio-Economics Hue Agriculture and Forestry University, Vietnam

Gholami, Dr. Shaieste Inst. of Landscape Biogeochemistry University of Razi, Iran

Iturri, Dr. Antonela

Inst. of Soil Landscape Research National University of La Pampa, Santa Rosa, Argentina

Jurajev, Umid

Inst. of Landscape Hydrology Tashkent Inst. of Irrigation and Melioration, Uzbekistan

Kimaro, Dr. Anthony

Inst. of Socio-Economics World Agroforestry Centre, Tanzania

Li, Quirui

Inst. of Socio-Economics China Agricultural University, P. R. China

Mahgoub, Assoc. Prof. Dr. Emadeldin

Inst. of Socio-Economics Agricultural Research Corporation, Sudan

Mendizabal Cortes, Alejandra D.

Inst. of Landscape Systems Analysis University of São Paulo, Brazil

Omari, Richard A.

Inst. of Land Use Systems University of Tokyo, Faculty of Agriculture and Technology, Japan

Ramazonov, Umar

Inst. of Landscape Hydrology Tashkent Institute of Melioration and Irrigation, Uzbekistan

Sam, Anu S.

Inst. of Socio-Economics International Crops Research Inst. for the Semi-Arid Tropics, India

Seitz, Prof. Dr. William

Inst. of Landscape Systems Analysis Texas A&M University, USA

Turturro, Antonietta C.

Inst. of Soil Landscape Research University of Bari Aldo Moro and Mediterranean Agronomic Inst. of Bari, Italy

Wang, Meng

Inst. of Landscape Systems Analysis China Agricultural University Beijing, P. R. China

FELLOWS

Altieri, Prof. Dr. Miguel

Inst. of Land Use Systems University of California, Berkeley, USA

Burkhard, PD Dr. habil. Benjamin

Inst. of Land Use Systems Leibniz Universität Hannover, Germany

Geßler, Prof. Dr. Arthur

Inst. of Landscape Biogeochemistry Swiss Federal Institute for Forest, Snow and Landscape Research WSL, Birmensdorf, Switzerland

Kimaro, Dr. Anthony

Inst. of Socio-Economics World Agroforestry Centre (ICRAF), Tanzania

Kleber, Prof. Dr. Markus

Inst. of Soil Landscape Research Oregon State University, Corvallis, USA

Miller, Prof. Dr. Bradley A.

Inst. of Soil Landscape Research Iowa State University, Department of Agronomy, Ames, USA

Nautiyal, Prof. Dr. Sunil

Inst. of Socio-Economics Institute for Social and Economic Change, Bangalore, India

Oguntunde, Prof. Dr. Philip Gbenro

Inst. of Landscape Hydrology Federal University of Technology, Akure (FUTA), Nigeria

NEW THIRD PARTY FUNDED PROJECTS

Title	Duration	Funding	Institutes
Bridging in biodiversity science	March 2016– February 2019	BMBF	Landscape Biogeochemistry Landscape Hydrology
Concurrent evolution of erosion rates, weathering and profile development of agricultural soils: a 4-D Approach	February 2016– January 2018	University of Zurich— Cooperation	Soil Landscape Research
European Agricultural Know- ledge and Innovation Systems (AKIS) towards innovation-driven research in smart machines and systems	March 2016– August 2018	EU Horizon 2020	Land Use Systems Socio-Economics
Identification and mapping of mosquitoes in northern Norway	April 2016– April 2017	EU Horizon 2020	Land Use Systems
Inner-city development and climate adaptation: from urban land use conflicts to regional synergies	March 2016 – December 2016	Federal State of North Rhine West- phalia, LANUV	Socio-Economics
Innovative approaches to plan- ning and implementing nature- based solutions for resilient development of metropolitan regions	April 2016– March 2021	BMBF (SOEF-Junior Research Group)	Socio-Economics
Laboruntersuchungen mittels Heliuminkubationsmethode zur N ₂ O/N ₂ -Freisetzung aus der Denitrifikation nach einer N-Düngung	March 2016 – December 2016	Stickstoff Werke Priesteritz GmbH	Landscape Biogeochemistry
Modular treatment and monito- ring of wastewater for agricultu- ral water reuse	September 2016– August 2019	BMBF	Landscape Hydrology
Monitoring of the Asian Tiger Mosquito (Culicidae: Aedes albo- pictus) in Jena (Thuringia)	April 2016– January 2017	City of Jena	Land Use Systems
Nachhaltig intensivierte Anbau- und Verarbeitungsprozesse zur sicheren Produktion von Spree- wälder Gurken g. g. A. in höchs- ter Qualität	December 2016– February 2018	EU (European Inno- vation Partnership, EIP), Federal State of Brandenburg	Landscape Biogeochemistry
N-Stabilisierung und wurzel- nahe Platzierung als innovative Technologien zur Optimierung der Resourceneffizienz bei der Harnstoffdüngung	July 2016– July 2019	BMEL	Landscape Biogeochemistry
Productivity vs. sustainability: Towards better support of viable and sustainable EU farms	August 2016– March 2017	EU (European Parlia- ment, contract)	Land Use Systems Socio-Economics

Title	Duration	Funding	Institutes
Soil and water management: Novel methods for improving the water and nutrient use efficiency in agriculture	February 2016 – December 2016	Stiftung fiat panis	Land Use Systems Landscape Hydrology
The effect of food value chain upgrading strategies on agricul- tural productivity and incomes in Tanzania: Opportunities for optimized nutritional and food security for local food systems	May 2016– July 2019	BMEL	Socio-Economics
The vulnerability of ecosystems: how to assess the exposure and sensitivity to biotope changes and the adaptive capacity of biocoenosis	January 2016– June 2019	DBU	Land Use Systems
Transfer of the smartphone based nature protection app (NatApp) into the agricultural and nature conservation practice	April 2016– March 2017	DBU	Land Use Systems
Umsetzung des Nationalen Aktionsplans zur nachhaltigen Anwendung von Pestiziden – Kon- zeption eines repräsentativen Monitorings zur Belastung von Kleingewässern in der Agrarland- schaft	September 2016– November 2017	Bund Digitale Infra- struktur und Verkehr	Landscape Hydrology
Unlocking the potential in asses- sing cropping upgrading strate- gies for food security in Dodoma, Tanzania	May 2016– April 2019	BMEL	Land Use Systems
Update of the soil description of soil monitoring plots in the state of Brandenburg	May 2016– November 2016	LfU–Landesamt für Umwelt, Brandenburg	Soil Landscape Research
Viable intensification of agricul- tural production through sustai- nable landscape transition	May 2016– April 2019	EU Horizon 2020 ERA-NET Cofund	Socio-Economics
Zukunftsfähige Technologien und Dienstleistungen für das Wasser- und Ressourcenmanagement am oberen Yangtze, Sichuan	November 2016– July 2017	BMBF	Landscape Hydrology

COOPERATION (SELECTED)

NATIONAL UNIVERSITIES

- Christian-Albrechts-Universität Kiel
- Friedrich-Schiller-Universität JenaGeorg-August-Universität
- Göttingen
- Justus-Liebig-Universität Gießen
- Karlsruher Institut für Technologie
- Leibniz Universität Hannover
- Technische Universität Berlin
- Technische Universität Dresden
- Technische Universität München
- Universität Bayreuth
- Universität Bonn
- Universität Hohenheim
- Universität Kassel
- Universität Koblenz-Landau
- Universität Rostock

COOPERATION THROUGH JOINT APPOINTMENTS, INFRASTRUC-TURE USE AND SUPERVISION OF EARLY CAREER RESEARCHERS

- Brandenburgische Technische Universität Cottbus-Senftenberg
- Ernst-Moritz-Arndt-Universität Greifswald
- Fachhochschule Eberswalde
- Freie Universität Berlin
- Humboldt-Universität zu Berlin
- Martin-Luther-Universität Halle-Wittenberg
- Universität Potsdam

NON-UNIVERSITY RESEARCH INSTITUTIONS (SELECTED)

- Deutsches GeoForschungsZentrum
- Deutsches Institut für Wirtschaftsforschung
- Forschungszentrum Jülich
- Fraunhofer-Gesellschaft zur Förderung der Angewandten Forschung
- Friedrich-Loeffler-Institut
- Helmholtz-Zentrum für
 Umweltforschung
- Institut f
 ür Landes- und Stadtentwicklungsforschung
- Johann Heinrich von Thünen-Institut
- Julius-Kühn-Institut
- Senckenberg Gesellschaft für Naturforschung

• Umweltforschungszentrum Leipzig-Halle

and 32 Leibniz Institutes in 5 Leibniz Research Alliances

OTHER GOVERNMENTAL AND NON-GOVERNMENTAL INSTITU-TIONS (SELECTED)

- Bundesanstalt f
 ür Geowissenschaften und Rohstoffe
- Bundesanstalt für Gewässerkunde
- Bundesforschungsanstalt für Forstund Holzwirtschaft
- Deutscher Bauernverband
- Fachagentur Nachwachsende Rohstoffe
- Landesamt f
 ür Umwelt, Gesundheit und Verbraucherschutz Brandenburg
- Landesforschungsanstalt f
 ür Landwirtschaft und Fischerei Mecklenburg-Vorpommern
- Landwirtschaftskammer Niedersachsen
- Landwirtschaftskammer Nordrhein-Westfalen
- Marktgesellschaft mbH der Naturland Betriebe
- Ministerium für Landwirtschaft, Umwelt und Verbraucherschutz Mecklenburg-Vorpommern
- Öko-Dorf Brodowin e. V. Gisela und Werner Upmeier Stiftung
- Paulinenauer Arbeitskreis Grünland und Futterwirtschaft e. V.

INTERNATIONAL UNIVERSITIES

- Aarhus University, Denmark
- Catholic University Louvain, Belgium
- Eidgenössische Technische Hochschule Zürich, Switzerland
- Federal University of Goiás, Brazil
- Free University Amsterdam,
- Netherlands
- Ghent University, Belgium
 Sokoine University of Agricu
- Sokoine University of Agriculture, Tanzania
- Tokyo University of Agriculture and Technology, Japan
- National University of La Pampa at Santa Rosa, Argentina
- University of Florida, USA
- University of Natural Resources and Life Sciences Vienna, Austria
- University Vienna, Austria
- Universität Zürich, Switzerland
- Wageningen University, Netherlands
- Warsaw University of Life Sciences, Poland

NON-UNIVERSITY RESEARCH

- Academy of Sciences of the Czech Republic, Czech Republic
- Academy of Sciences of the Republic of Tajikistan
- Baraev Scientific Center for Cereal Production, Kazakhstan
- Brazilian Agricultural Research Corporation Brasilia, Brazil
- Brazilian Bioethanol Science and Technology Laboratory, Brazil
- Eidgenössische Forschungsanstalt für Wald, Schnee und Landschaft, Switzerland
- National Institute for Agricultural Research Paris, France
- Natural Resources Institute, Finland

TEACHING

BRANDENBURG UNIVERSITY OF TECHNOLOGY COTTBUS-SENFTENBERG

- Agrarökologie Vorlesung, SS 2016
- Nachhaltige Waldbewirtschaftung Vorlesung, SS 2016
- 10 Jahre Leipzig Charta: Wie integriert ist Stadtentwicklungsplanung heute?
 Vorlesung, WS 2016/2017

CHRISTIAN-ALBRECHTS-UNIVERSITÄT ZU KIEL

 Strategien zum nachhaltigen Boden- und Umweltmanagement Lecture, SS 2016

FREIE UNIVERSITÄT BERLIN

- Zur Quartär- und Hydrogeologie Brandenburgs und Westpolens Seminar, SS 2016
- Landschaftswasserhaushalt von Berlin und Brandenburg Lecture, WS 2016/2017
- International Master's Program "Environmental Earth Sciences« Seminar, WS 2016/2017

EBERSWALDE UNIVERSITY FOR SUSTAINABLE DEVELOPMENT

- Pflanzenernährung im ökologischen Landbau Lecture, WS 2016/2017
- Monitoring und Indikatoren Lecture, WS 2016/2017
- Allgemeine Bodenkunde–Grundlagen Lecture, WS 2016/2017
- Bodenlandschaft und Stoffhaushalt Seminar, SS 2016
- Umwelt, Gesellschaft, Nachhaltigkeit Lecture, WS 2016/2017
- Einführung in die Ökonomik, Kurs Umweltökonomie Lecture, WS 2016/2017
- Agrar- und Umweltpolitik Lecture, WS 2016/2017
- Politik und Organisation der ökologischen Agrar- und Ernährungswirtschaft Lecture, WS 2016/2017
- Regionales Stoffstrommanagement und Kreislaufwirtschaft Lecture, SS 2016

HUMBOLDT UNIVERSITÄT ZU BERLIN

- Modellierung pflanzlicher Systeme Lecture, WS 2016/2017
- Natural Ressources Management Lecture, WS 2016/2017
- Forschungsmethoden im Pflanzenbau Lecture, SS 2016
- Theory and models for an integrated analysis of ecosystem services Seminar, SS 2016

LEIBNIZ UNIVERSITÄT HANNOVER

 Naturschutz- und Umweltökonomie Lecture, SS 2016

TECHNISCHE UNIVERSITÄT BERLIN

 Bodenmesstechnik Lecture, SS 2016

UNIVERSITY OF POTSDAM

- Einführung in die Hydrochemie Lecture, SS 2016
- Bodenlandschaften Lecture, WS 2016/2017
- Landschaftspraktikum "Bodenlandschaftsanalyse in der Uckermark« Seminar, SS 2016
- Regionalentwicklung und Landschaftswandel in Europa II–Deutschland und Polen im Vergleich Seminar, SS 2016
- Regionalentwicklung und Landschaftswandel in Europa
 - Seminar, WS 2016/2017
- Angewandte Mathematik und Statistik f
 ür Ökologen Lecture, WS 2016/2017

UNIVERSITÄT ROSTOCK

• Umweltökonomie Lecture, SS 2016

OFFICES & TASKS (SELECTED)

Augustin, Jürgen

 Editorial board member at the Emission Factor Database der TFI (IPCC)

Bachinger, Johann

- Mitglied im wiss. Beirat des Biosphärenreservates Spreewald
- Mitglied der Expertenrunde für Forschung und Züchtung des Demeter e. V.
- Vertreter des ZALF in der AG Ökologischer Landbau (Senat der Bundesforschungseinrichtungen)

Berger, Gert

- Mitglied der AG Pflanzenschutz und Biodiversität
 (Bundesanstalt für Landwirtschaft und Ernährung)
- Mitglied im Fachbeirat Naturhaushalt und Nachhaltiger Pflanzenbau (BVL)

Dalchow, Claus

• Editorial advisory board member at Landscape Online

Eulenstein, Frank

- Sprecher der AGs Nachwachsende Rohstoffe und Nährstoff-Effizienz im Pflanzenbau (DWA)
- Beiratsmitglied der Gemeinnützigen Landbauforschungsgesellschaft Sottorf mbH

Ewert, Frank

- Jury-Mitglied im Expertenbeirat Agrarsysteme der Zukunft (BMBF)
- Expert for the working group Bio-basierte Wertschöpfungsketten (BMBF)
- Mitglied der Leitungsgruppe Forschung (BMEL)
- Scientific advisory board member of the Joint Programming Initiative on Agriculture, Food Security and Climate Change (FACCE-JPI, EU)
- Gutachter zur Forschungsförderung (BMBF), zum Förderprogramm des Leibniz-Wettbewerbs (SAW) und zum Themengebiet Umwelt (Stiftung Mercator Schweiz)
- Assessment panel member of the Biotechnology and Biological Sciences Research Council, UK
- Co-leader of the wheat modelling team Agricultural Model Intercomparison and Improvement Project (AgMIP)
- Co-chair of the expert working group on plant modelling (Wheat Initiative)
- Editorial board member at Agriculture, Ecosystems & Environment/Field Crops Research/Nature Scientific Reports/European Journal of Agronomy

Gaasch, Nadin

 Mitglied der Landesarbeitsgruppe Berlin/Brandenburg/ Mecklenburg-Vorpommern (ARL)

Gerke, Horst

- Vice-chair of the Soil Systems Science Division, Subdivision Soil Physics (EGU)
- Co-editor at Journal of Hydrology and Hydromechanics

Hagemann, Ulrike

- Stellv. Vorsitzende der AG Bodengase (DBG)
- Guest associate editor at Journal of Plant Nutrition and Soil Science

Heinrich, Uwe

- Vertreter des ZALF in der AG Geoinformation (BMEL)
- Vertreter des ZALF im Verband der Geoinformationswirtschaft Berlin/Brandenburg
- Vertreter des ZALF zum Klimanavigator des Climate Service Center (Helmholtz-Zentrum Geesthacht)

Helming, Katharina

- Expert for Horizon 2020 (EU)
- Editorial board member at Agronomy for Sustainable Development/Journal of Soil and Water Conservation/Land

Hierold, Wilfried

Mitglied im Naturschutzbeirat des Landkreises Barnim

Kächele, Harald

- Chairmanship at the Global Nature Fund
- Stellvertretender Vorsitzender im Naturschutzbeirat des Landes Brandenburg (MLUL Brandenburg)
- Vorsitzender der Deutschen Umwelthilfe e. V.
- Beiratsmitglied der Berliner Stadtreinigungsbetriebe
- Stiftungsratsmitglied der Stiftung Lebendige Stadt
- Stiftungsratsvorsitzender der Tropenwaldstiftung Oro Verde

Kaiser, David B.

 Mitglied im Normenausschuss Wasserwesen 119, AK Bioverfügbarkeit (DIN)

Kalettka, Thomas

- Chairmanship at the European Pond Conservation Network
- Mitglied der AG Gewässerschutz und Pflanzenschutz (Forum zum Nationalen Aktionsplan Pflanzenschutz)
- Beiratsmitglied im F+E-Vorhaben Umsetzung des Nationalen Aktionsplans zu nachhaltigen Anwendung von Pestiziden, AG Gewässerschutz und Pflanzenschutz (UBA)

Kersebaum, Kurt-Christian

- Delegate for the management committee und working group head bei COST ES1106, Assessment of European Agriculture Water Use and Trade under Climate Change (EU / ESF / COST)
- Associate editor at International Journal of Biometeorology/Field Crops Research

Lana, Marcos

- Founding member of Agroecology Europe
- Member and representative of Germany at Latin-American and Caribbean Scientific Society of Agroecology

Lischeid, Gunnar

• Sprecher der Expertengruppe Umwelt-System-Theorien der Allianz-AG Infrastrukturen in der terrestrischen Forschung (DFG u. a.)

Matzdorf, Bettina

- Gutachterin beim Wissenschaftsrat, AG zur Evaluierung des Inst. für Sozial-ökologische Forschung
- Beiratsmitglied der Innovationsgruppe Ginkoo

Mirschel, Wilfried

• Editorial board member at European Agrophysical Journal

Müller, Klaus

- Referee for GAIA/Ecology and Society/Konjunkturpolitik/ Jahrbuch für Regionalwissenschaften
- Gutachter beim Schweizerischer Nationalfonds
- Sachverständiger in der Enquetekommission 6/1 Zukunft der ländlichen Regionen vor dem Hintergrund des demografischen Wandels (SPD-Landtagsfraktion Brandenburg)
- Mitglied im Ausschuss Siedlungsstruktur/Natur und Umwelt der Planungsgemeinschaft Oderland-Spree
- Vorsitzender des Naturpark-Kuratoriums Märkische Schweiz

Nendel, Claas

- Guest editor at Regional Environmental Change/ Agricultural Systems
- Editorial board member at European Journal of Agronomy

Pickert, Jürgen

- Mitglied der AG Grünland Definition und Klassifizierung (European Grassland Federation)
- Mitglied der Steuerungsgruppe Grünland der Deutschen Agrarforschungs Allianz
- Mitglied des Ausschusses für Grünland und Futterbau (DLG)
- Vorstandsmitglied des Deutschen Maiskomitees
- Redaktionsbeirat bei Mais (Deutsches Maiskomitee)
- Vorstandsmitglied des Paulinenauer AK Grünland und Futterwirtschaft e. V.

Piorr, Annette

- Expert at the Swedish research program FORMAS, Panel Use of Natural Resources (Swedish National Research Council)
- Expert for the EU

Sieber, Stefan

• Editorial board member at Food Security

Siebert, Rosemarie

- Gutachterin für das BMBF
- Mitglied der ARL
- Referee for Sociologia Ruralis / Land Use Policy
- Gutachterin bei der Wissenschaftlichen Kommission Niedersachsen

Strauß, Christian

- Expert for BMBF, EU, COST
- Geschäftsführer der Landesarbeitsgemeinschaft Berlin / Brandenburg / Mecklenburg-Vorpommern der ARL
- Sprecher der Regionalgruppe Berlin-Brandenburg der Vereinigung f
 ür Stadt-, Regional- und Landesplanung
- Mitglied der AG Wasser bewegt Berlin (Stiftung Zukunft Berlin)
- Referee for Environment, Development and Sustainability

Ulrich, Andreas

- Editorial board member at European Journal of Soil Biology
- Beauftragter für biologische Sicherheit im Länderinstitut für Bienenkunde, Hohen Neuendorf

Walther, Doreen

- Mitglied im Bundesfachausschuss des Naturschutzbunds Deutschland
- Stellv. Leiterin des AK Deutscher Dipterologen
- Vorstandsmitglied der Deutschen Gesellschaft für Medizinische Entomologie und Acarologie
- Editorial board member at Studia dipterologica
- Koordinatorin für Europa im Forschungsnetzwerk Simuliidae

Weith, Thomas

- Sprecher der ARL-Landesarbeitsgemeinschaft Berlin / Brandenburg / Mecklenburg-Vorpommern
- Member of the international expert group Habitat III (International Society for City and Regional Planners)
- Editorial board member at Zeitschrift für Evaluation

Wieland, Ralf

 Beiratsmitglied der FG Simulation in Umwelt und Geowissenschaften, Medizin und Biologie der AG Simulation (Gesellschaft für Informatik)

Willms, Matthias

• Referee for Journal of Plant Nutrition and Soil Science

Wulf, Monika

- Associate editor at Applied Vegetation Science/Journal of Vegetation Science
- Mitglied im Fachkollegium Ökologie der Agrarlandschaften (DFG)

Wurbs, Angelika

• 2. Sprecherin des AK Europa (Leibniz Association)

Zander, Peter

Editorial boardmember at Agricultural Systems

Zasada, Ingo

Editorial board member at Land Use Policy

PEER-REVIEWED JOURNAL ARTICLES

Abbas, A., Amjath Babu, T. S., Kächele, H., Usman, M., Müller, K. (2016) An overview of flood mitigation strategy and research support in South Asia: implications for sustainable flood risk management. International Journal of Sustainable Development & World Ecology 23, 1, 98–111.

Abeer, H., Abd-Allah, E. F., Alqarawi, A. A., Al Huqail, A. A., **Egamberdieva, D., Wirth, S.** (2016) Alleviation of cadmium stress in Solanum lycopersicum L.by arbuscular mycorrhizal fungi via induction of acquired systemic tolerance. Saudi Journal of Biological Sciences 23, 2, 272–281.

Adelle, C., Weiland, S., Dick, J., González Olivo, D., Marquardt, J., Rots, G., Wübbeke, J., **Zasada, I.** (2016) Regulatory impact assessment: a survey of selected developing and emerging economies. Public Money & Management 36, 2, 89–96.

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IMPRINT

ABBREVIATIONS

ΑСΤΑ	Association de Coordination
	Technique Agricole
AgMIP	Agricultural Model Intercompari-
	son and Improvement Project
ARL	Akademie für Raumforschung
	und Landesplanung
АТВ	Leibniz-Inst. für Agrartechnik
	und Bioökonomie/Leibniz Inst.
	for Agricultural Engineering and
	Bioeconomy
BLF	Inst. für Bodenlandschaftsfor-
	schung/Inst. of Soil Landscape
	Research
BMBF	Bundesministerium für Bildung
	und Forschung / Federal Ministry
	of Education and Research
BMEL	Bundesministerium für Ernährung
	und Landwirtschaft / Federal Mi-
	nistry of Food and Agriculture
BVI	Bundesamt für Verbraucher-
	schutz und Lebensmittelsicher-
	heit / Federal Office of Consumer
	Protection and Food Safety
CEMA	
CLINA	pomonte de constructoure du
	Machinismo Agricolo
	in Science and Technology
Dolphy	Delphy Wageningen Nieder
Delbliv	
2 0.10.13	Jando
DEC	lande
DFG	lande Deutsche Forschungsgemein-
DFG	lande Deutsche Forschungsgemein- schaft
DFG DIN	lande Deutsche Forschungsgemein- schaft Deutsches Inst. für Normung/
DFG DIN	lande Deutsche Forschungsgemein- schaft Deutsches Inst. für Normung/ German Inst. for Standardization
DFG DIN DIR	lande Deutsche Forschungsgemein- schaft Deutsches Inst. für Normung/ German Inst. for Standardization Direktorat / Directorate
DFG DIN DIR DLG	lande Deutsche Forschungsgemein- schaft Deutsches Inst. für Normung/ German Inst. for Standardization Direktorat/Directorate Deutsche Landwirtschaftsge-
DFG DIN DIR DLG	lande Deutsche Forschungsgemein- schaft Deutsches Inst. für Normung/ German Inst. for Standardization Direktorat/Directorate Deutsche Landwirtschaftsge- sellschaft/German Agricultural
DFG DIN DIR DLG	lande Deutsche Forschungsgemein- schaft Deutsches Inst. für Normung/ German Inst. for Standardization Direktorat/Directorate Deutsche Landwirtschaftsge- sellschaft/German Agricultural Society
DFG DIN DIR DLG DLO	lande Deutsche Forschungsgemein- schaft Deutsches Inst. für Normung/ German Inst. for Standardization Direktorat/Directorate Deutsche Landwirtschaftsge- sellschaft/German Agricultural Society Stichting Dienst Landbouwkundig
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HU Berlin	Humboldt Universität zu Berlin
ICRAF	The International Council for
	Research in Agroforestry/World
ICRISAT	Agroiorestry Centre
ICRISAI	Semi-Arid Tropics Patancheru
	India
iCROPM	International Crop Modelling
	Symposium
IGB	Leibniz-Inst. für Gewässerökolo-
	gie und Binnenfischerei/Leibniz-
	Inst. of Freshwater Ecology and
	Inland Fisheries
IHP	Leibniz-Inst. für innovative Mikro-
	elektronik/Innovations for High
	Performance Microelectronics
	Iniciativas Innovadoras SAL
INTIA	Inst.o Navarro de Techologias e
ICI	Fraunhofer Inst. für System und
131	Innovationsforschung / Fraunho-
	fer Inst. for Systems and Innovati-
	on Research
IZW	Leibniz-Inst. für Zoo- und Wild-
	tierforschung/Leibniz Inst. for
	Zoo and Wildlife Research
JPI	Joint Programming Initiative
KIT-ITAS	Inst. für Technikfolgenabschät-
	zung und Systemanalyse/Inst.
	for Technology Assessment and
	Systems Analysis
LBG	Inst. fur Landschaftsbiogeoche-
	chomistry
ISA	Inst für Landschaftssystemana-
2074	lyse / Inst. of Landscape Systems
	Analysis
LSE	Inst. für Landnutzungssyste-
	me/Inst. of Land Use Systems
LWH	Inst. für Landschaftswasserhaus-
	halt/Inst. of Landscape Hydro-
	logy
MACSUR	Modeling European Agriculture
	with Climate Change for Food
	Security
MLUL Brondon	Ministerium für Umwelt, Gesund-
Branden-	helt und verbraucherschutz des
burg	Rural Development Environment
	and Agriculture of the Federal
	State of Brandenburg
MWFK	Ministerium für Wissenschaft.
Branden-	Forschung und Kultur des Landes
burg	Brandenburg

РІК	Potsdam-Inst. für Klimafolgen-		
	forschung/Potsdam Inst. for		
	Climate Impact Research		
SAW	Senatsausschuss Wettbewerb der		
	Wissenschaftsgemeinschaft G. W.		
	Leibniz/The Senate Competition		
	Committee		
so	Inst. für Sozioökonomie/Inst. of		
	Socio-Economics		
ТР	Teilprojekt		
TU Berlin	Technische Universität Berlin		
UMSICHT	Fraunhofer-Institut für Umwelt-,		
	Sicherheits-, und Energietech-		
	nik/Fraunhofer Inst. for Envi-		
	ronmental, Safety, and Energy		
	Technology		
UN	Vereinte Nationen/United		
	Nations		
UVP-Ge-	Gesellschaft für die Prüfung der		
sellschaft	Umweltverträglichkeit		
ZWM	Zentrum für Wissenschaftsma-		
	nagement/Center for Science		
	and Research Management		

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