

Program

- 9:00 Welcome, organizational aspects** (Lecture hall 17, Liesel-Beckmann-Str. 1, Ground floor)
Prof. Kögel-Knabner, Dean TUM School of Life Sciences; Claudia Luksch, HEF
- 9:15 T1: Franziska Steiner** [TUM, Soil Science]
Drought response of soil aggregation and soil organic carbon dynamics in the rhizosphere of different maize cultivars
- 9:30 T2: Laura Argens** [TUM, Terrestrial Ecology Research Group]
Diversity increases multifunctionality in intensively managed grassland leys
- 9:45 “Elevator pitches”** -> poster introductions (2 min each), P1 – P8 => 16 min net
- 10:05 Coffee Break** (HEF-Foyer, Liesel-Beckmann-Str. 2, 25 min)
- 10:30 T3: Verena Styrynik** [Hochschule Weihenstephan-Triesdorf, Institut für Ökologie und Landschaft]
Alpine farming under climate change – How time of turnout affects productivity and plant and insect communities in the Bavarian Alps
- 10:45 T4: Kirk Bright Enu** [TUM, Strategic Landscape Planning and Management]
Wetlands degradation & nature-based solutions for climatic extremes mitigation in Ghana
- 11:00 T5: Marko Popovic** [TUM, Biothermodynamics]
Standard thermodynamic properties, biosynthesis rates, and the driving force of growth of five agricultural plants
- 11:15 “Elevator pitches”** -> poster introductions (2 min each), P10 – P15 => 12 min net
- 11:30 Poster Sessions A and B** (HEF-Foyer, Liesel-Beckmann-Str. 2, each session 20 min)
- 12:10 Lunch** (HEF, Liesel-Beckmann-Str. 2, Room 83/84, 50 min)
- 13:00 T6: Nikita Genze** [TUM Campus Straubing for Biotechnology and Sustainability, Bioinformatics]
Deep Learning-based Early Weed Segmentation using UAV Images of Sorghum Fields
- 13:15 T7: Carolin Brune** [TUM, Phytopathology]
In vivo and in vitro application of Trichoderma culture filtrates as biological control agent against Alternaria solani in potatoes (Early Blight)
- 13:30 T8: Tobias Lanzl** [TUM, Plant Breeding]
Linkage disequilibrium component of the genetic variance in plant breeding populations
- 13:45 T9: Theresa von Heyl** [TUM, Biotechnology of Reproduction]
The role of T cells in the protection against epithelial infections in chicken
- 14:00 Coffee break** (HEF-Foyer, Liesel-Beckmann-Str. 2, 30 min)
- 14:15 Voting for best talk, best elevator pitch, best poster**
(Lecture hall 17, Liesel-Beckmann-Str. 1, Ground floor)
- 14:30 Dr. Olga Malets & Dörte Dannemann** [TUM ForTe]
Research funding support for national and international funding opportunities
- 16:00 Awards for best talk, best Pitch, best poster – with “Beer & Pretzels”**

“Thanks you”s & “Good Bye”s

Topics & Abstracts

Talks

T1: Franziska Steiner

[TUM, Soil Science, Prof. Kögel-Knabner]

Drought response of soil aggregation and soil organic carbon dynamics in the rhizosphere of different maize cultivars

We investigated which functional rhizosphere traits determine soil aggregation and soil organic carbon (SOC) distribution in the rhizosphere of maize and whether maize cultivars differ in their potential to mitigate the effect of drought on both processes. Therefore, we measured morphological root parameters, soil aggregation, SOC distribution, natural ¹³C abundance and microbial enzyme activities in the rhizosphere of 38 maize genotypes under well-watered and drought-stressed conditions.

T2: Laura Argens

[TUM, Terrestrial Ecology, Prof. Weisser]

Diversity increases multifunctionality in intensively managed grassland leys

Experiments in extensive grasslands documented benefits of plant species richness on ecosystem functions. However, it remains to be determined whether such diversity effects are applicable in intensively managed grassland leys and contribute to agricultural sustainability. We showed that multifunctionality was increased by species richness, including production and predation, insect and mammal activity. This implies that the use of multispecies mixtures holds advantages for agricultural production and for sustainability in grassland leys.

T3: Verena Styrnik

[HSWT, Institut für Ökologie und Landschaft, Prof. Ewald]

Alpine farming under climate change – How time of turnout affects productivity and plant and insect communities in the Bavarian Alps

Ongoing climate change leads to an extended growing season with higher productivity of alpine pastures. To prevent shrub encroachment or abandonment, grazing management has to be adapted. Our project surveys effects of management on agronomical efficiency, plant and insect communities by examining two different turnout points on alpine pastures.

T4: Kirk Bright Enu

[TUM, Strategic Landscape Planning and Management, Prof. Pauleit]

Wetlands degradation & nature-based solutions for climatic extremes mitigation in Ghana

Sub-Saharan Africa (SSA) is among the regions most vulnerable to climate change and related hydro-meteorological risks. While nature-based solutions are becoming popular for mitigating natural hazards, rapid urbanization is rather expediting environmental degradation in SSA. This PhD research aims to study the effectiveness of wetland conservation and restoration as a multifunctional NBS for mitigating floods in Kumasi, Ghana, and simultaneously increase quality of life in the city.

T5: Marko Popovic

[TUM, Biothermodynamics, Prof. Minceva]

Standard thermodynamic properties, biosynthesis rates, and the driving force of growth of five agricultural plants

Elemental composition of 5 agricultural plants was used to calculate their empirical formulas and growth stoichiometry. These were used to find standard thermodynamic properties of live matter and biosynthesis. Moreover, RUE was converted into energy obtained by plants through photosynthesis, which was used to calculate the driving force of plant growth. The relationship between the driving force and growth rates was analyzed, through phenomenological equations.

T6: Nikita Genze

[TUM Campus Straubing for Biotechnology and Sustainability, Bioinformatics, Prof. Grimm]

Deep Learning-based early weed segmentation using UAV images of sorghum fields

Weeds are undesired plants in agricultural fields that affect crop yield and quality. The use of herbicide is still the most common control strategy to remove weeds. To reduce the amount of herbicides and impact caused by uniform spraying, SSWM (site-specific weed management) and mechanical weed control have long been recommended. To implement such precise strategies, accurate detection and classification of weeds in crop fields are crucial first steps. Due to the phenotypic similarity between some weeds and crops as well as changing weather conditions, it is challenging to design an automated system for general weed detection especially in UAV (Unmanned Aerial Vehicle) imagery. In this work, we developed and evaluated state-of-the-art segmentation-based Deep Learning methods for early weed detection in sorghum fields under such challenging capturing conditions. Our model achieved an F1-score of over 86 % on a hold-out test-set on a per-pixel basis.

T7 Carolin Brune

[TUM, Phytopathology, Prof. Hückelhoven]

In vivo and in vitro application of Trichoderma culture filtrates as biological control agent against Alternaria solani in potatoes (Early Blight)

The ongoing discussion about chemical disease control, as well as the growing number of resistances toward active ingredients makes an alternative approach necessary. A promising alternative is the use of biological control agents. One of them being the soil-borne fungus *Trichoderma* spp. Most former studies focus on the effect of the living organism in order to control different pathogens. In this project we are focusing on the effect a mixture of secondary metabolites in culture filtrates can have on potato plants and the pathogen *Alternaria solani*. This approach excludes the living organism which could make it less dependent on environmental conditions and could lead to a more steady efficacy of the disease control.

T8: Tobias Lanzl

[TUM, Plant Breeding, Prof. Schön]

Linkage disequilibrium component of the genetic variance in plant breeding populations

The selection gain in plant breeding is determined by the genetic variance. Assuming no dominance and epistasis, the genetic variance can be decomposed into parts attributed to the individual loci and to linkage disequilibrium (LD) between all loci. We use simulations to show the influence of different factors on the LD component in plant breeding populations.

T9: Theresa von Heyl

[TUM, Biotechnology of Reproduction, Prof. Schusser]

The role of T cells in the protection against epithelial infections in chicken

Genetic modification of the chicken genome is an easy way to study the role of a specific immune cell population. By depletion of the constant region of the T cell receptor b chain we generated chickens lacking ab T cells. Ongoing studies are aiming to characterize the phenotype of ab T cell knockout chickens.

Poster Session A

P 1 A Martin Strenner

[TUM, Organic farming and Agronomy, Prof. Hülsbergen]

Reflectance Measurements - Effects of compost fertilization on organically grown corn plants

With regard on climate change and due to the availability of nutrients such as nitrogen and phosphorus, a recycling of nutrients is becoming more and more important. One way to recycle these nutrients is the use of compost. In this situation, plant sensors can help farmers identify possible effects on the plants as well as on the soil more quickly. Furthermore, it offers the farmer a fast and non-destructive decision support about what kind of compost and how much of it is necessary on the specific field to suit the needs of the plants within his crop rotation. In 2020 and in 2021 to detect the influence of fertilization on corn plants (zea mays), at six different stages of plant development reflection measurements were taken. Detecting the development of small corn plants is not very accurate, because of a strong influence of the visible soil. However, even at very early stages of the plant development (V4, BBCH 14) the vegetation indices NDVI, REIP and SR (780/740) show the differences between the different composts with relatively low values that indicates lower biomass production. During the further growing season, conversion processes within the soil became also visible.

P 2 A Shu-Yin Tung

[LfL , Institut für Agrarökologie und Biologischen Landbau, Dr. Freibauer]

Drought-affected agronomic performance of maize varieties and the link with rhizosphere traits

Drought is an increasing threat to crop production. Roots and rhizosphere are of especial interest in drought studies, since they play a key role in water acquisition of plants. We ran a high-throughput phenotyping experiment on 38 maize varieties to investigate the agronomic performance of plants under drought. The study aims to correlate the agronomic performance with belowground traits, in hope of uncovering traits that enhance agronomic resilience under drought stress.

P 3 A Christopher Tominello-Ramirez

[TUM, Phytopathology, Prof. Hückelhoven]

A customizable automated infection phenotyping platform for higher precision and throughput

Early blight is fungal pathogen of several Solanaceous crops caused by *Alternaria* spp. To screen for potential resistance traits in wild tomatoes, we are employing a low-footprint, low-cost, high-throughput, customizable, DIY automated phenotyping platform. With automated phenotyping, we are able to identify subtle quantitative resistance traits amongst a population of over 150 plants encompassing the entire species range of the wild tomato *Solanum chilense*. With precise and accurate infection phenotypes, we can utilize the high-quality data in downstream analyses.

P 4 A Tamara Schmey

[TUM, Phytopathology, Prof. Hückelhoven]

Diversity of the fungal pathogen *Alternaria* spp. on wild tomato plants

The wild relatives of modern tomato crops can still be found in South America. These plants occur in habitats as different as the Andes and the Atacama desert, but are all more or less susceptible to the fungal pathogen *Alternaria* spp. We collected and characterized these fungi. Interestingly, we found mainly small-spored *Alternaria* like *A. alternata*, which is gaining relevance for tomato crops. Further genomic analyses will increase our understanding of how this pathogen adapts to host and climate.

P 5 A Christine Anglhuber

[LfL, Institut für Tierzucht, Prof. Götz]

What are you made of? Genomic breed contributions in Fleckvieh and Brown Swiss cattle

Prediction of genomic breeding values within a breed usually assumes a certain homogeneity with respect to some fundamental genetic properties of the animals. For a breed having a long history of crossbreeding and admixture this assumption may be violated, possibly deteriorating genomic prediction quality. Inspection of pedigrees and especially of genomic data can be used to evaluate and

identify such situations. Genomic Breed Contribution (GBC) is a method to assign proportions of the genome of admixed animals to the contributing subpopulations or breeds. It might therefore provide relevant information for this purpose even in cases where pedigree records are incomplete or not reliable. Goals of this project are: to define relevant subpopulations contributing to both breeds, to estimate (base) allele frequencies within these subpopulations, to select informative markers and to calculate GBC for individual animals.

P 6 A Sabrina Schleibinger

[TUM, Reproductive Biotechnology, Prof. Schusser]

Targeting the chicken host protease via CRISPR/Cas9 system and its role during Influenza A Virus Infection

Influenza A viruses (IAVs) are leading zoonotic pathogens that may cause disease outbreaks in humans and animals. The host-virus interaction is highly determined by the ability of host proteases to cleave the viral hemagglutinin. The lack of knowledge about this topic in chickens led us to generate new tools that will facilitate the investigation of chicken host proteases mainly TMPRSS2. This includes the targeting of the chicken TMPRSS2 with CRISPR/Cas9 as well as the production of polyclonal antibody for the specific detection of TMPRSS2.

P 7 A Milena Brunner

[TUM, Reproductive Biotechnology, Prof. Schusser]

Analyzing the B cell receptor repertoire of chickens

Little is known about the humoral immune response and the generation of antibody diversity in chickens when compared to mammals. Therefore, I will establish a pipeline to analyze the B cell receptor (BCR) repertoire by Next-generation Sequencing (NGS). This method will then be used to study the antibody diversity and to analyze e.g. the effect of maternal antibodies or immunization on the chicken BCR repertoire.

P 8 A Hanna-Kaisa Vikkula

[TUM, Reproductive Biotechnology, Prof. Schusser]

Analysis of the interferon mediated immune response towards influenza A viruses by using genetically modified chicken models

Generation of genetically modified chickens is an ideal way to investigate the function of Mx proteins and potential influenza resistance in poultry. With use of knock-in and knock-out strategies, it is possible to access the differences between mammalian and chicken Mx proteins, which, in mammals are an important part of the innate immune response.

Poster Session B

P 9 B Moritz Camenzind

[TUM, Precision Agriculture, Prof. Yu]

Look on the bright side

Multispectral reflectance measurements of plant canopies in breeding trials are used to determine several different canopy traits such as leaf area and nitrogen content. Usually, these measurements are taken from a nadir angle which neglects the influence of the viewing geometry of the sensor to some extent. Therefore, we propose to measure canopy reflectance from different angles by adapting a workflow developed for RGB images. These perspectives might contribute to measuring canopy reflectance more accurately as well as to gaining new possibilities for high throughput field phenotyping.

P 10 B Sarah Hertle

[LfL, Institute for Agricultural Engineering and Animal Husbandry, Dr. Haidn]

Automatic lameness detection on dairy farms - suitability of digital technologies for recording behaviour and performance data

Lameness is a major and common problem in dairy farms which is unfortunately still underestimated by most farmers. The objective of this study is to examine whether automatically recorded behaviour and performance data by animal-specific sensor systems are suitable to detect lameness on dairy farms. Data from various sensor systems of different manufacturers are collected on eight Bavarian dairy farms to refine and further develop created algorithms.

P 11 B Laura Carlson

[TUM, Economics of Horticulture and Landscaping, Prof. Bitsch]

Community Supported Agriculture (CSA, in Germany Solidarische Landwirtschaft – SoLaWi)

An exchange arrangement created in reaction to criticisms of conventional food systems, CSA takes various forms; depending on the economic, political and social environment in which CSA projects are embedded. The CSA movement in Germany – known as Solidarische Landwirtschaft (solidarity agriculture), or Solawi - is relatively young compared to other countries in the global north. A grounded theory approach is used to examine the development of CSA in Germany, the importance of and enactment of the concept of solidarity in individual Solawis as well as in the German Solawi network, and the potential of Solidarische Landwirtschaft to contribute to system-wide improvements in food system sustainability.

P 12 B Clara Wagner

[TUM, Economics of Horticulture and Landscaping, Prof. Bitsch]

MULTI-FAMILY CONSULTING - A new consulting concept for intrafamilial farm succession

In the course of intrafamilial farm succession, families and consultants involved face multiple challenges. Families need to integrate the needs and desires of several family members for a successful succession outcome; consultants need to technically and personally advise their clients during the process of farm succession. The innovative consulting concept of “multi-family consulting” for intrafamilial farm succession offers a holistic approach to overcome these challenges. During a period of one year, a group of five to six families works together through a number of workshops, in which technical and non-technical issues of farm succession are addressed. With the help of facilitators and experts, as well as the participants themselves, the families allocate the time and space, and receive the support needed to develop their own roadmap of the farm transfer.

P 13 B Pierre Damien Ntihinyurwa

[TUM, Land Management, Department of Aerospace and Geodesie, Prof. De Vries]

Towards Fit-for Rwanda sustainable farmland fragmentation management models

Both farmland fragmentation and farmland consolidation (defragmentation) are two sides of the same coin theoretically and paradoxically considered as tools of land management. Whereas farmland

fragmentation is generally considered negative for reducing farm efficiency, there may also be positive considerations and reasons why fragmentation persists (mainly related to climate change adaptation, crops diversification, production risks and land ownership and use related conflicts management) for land tenure security and food security purposes. Since both standpoints (positive and negative) are academically and scientifically accepted, this poses a major dilemmatic problem to farmland policy makers, whether they should devise policies in favour of defragmentation or fragmentation conservation in farmland. This research exactly intends to address this dilemma by deriving a meaningful and appropriate answer for the Rwandan context (characterised by fragmented subsistence farms, high population densities, farmland scarcity, diverse biophysical and ecological conditions, the ever increasing climate change vulnerability, and food insecurity patterns) by showing the conditions (where, when, how and why) under which one can opt for defragmentation/consolidation or fragmentation conservation, through the analysis of various farmland fragmentation scenarios (both beneficial and problematic) in the country, the performance and relevance of the existing strategies to control it, and the development of suitable local specific fragmentation management models to the existing scenarios for both food security and land tenure security purposes within the framework of the Sustainable Development Goals (SDGs 1, 2, 12, 13 and 15), following the Mixed Methods research approach. The findings will guide policy makers to devise and develop suitable socio-spatial farmland fragmentation management interventions tailored to the needs and concerns of local farmers and local conditions.

P 14 B Cora Huhn

[TUM, Economics of Horticulture and Landscaping, Prof. Bitsch]

Vocational education and training: Evidence from German landscapers' perspectives

The dual system for traditional vocational education and training (VET) in Germany enjoys worldwide recognition. The global trend seems to reach out to more modularized and unitized approaches in the design of apprenticeships. This research explores the development potential of the German landscaping VET from the perspective of different stakeholders.

P 15 B Jose Luis Antezana Huarcaya

[TUM, Governance in International Agribusiness, Prof. Menapace]

New personalized Menus platform for food restrictions.

An innovative interface web service for personalized Menus based on dietary restrictions for the global catering service markets. Our machine learning software will serve a new food option to those people suffering different kind of food reactions to find the correct menu by matching his/her food profile with the caterer available menus and change some dishes/ingredients creating a new personalized menu for them (according to their dietary restrictions) Thus each personalized Menu can be part in our web Multi-personalized platform to serve other users/caterers that may have similar requirements and may need those menus to be shared among them.