# 7th HEFagrar PhD Symposium
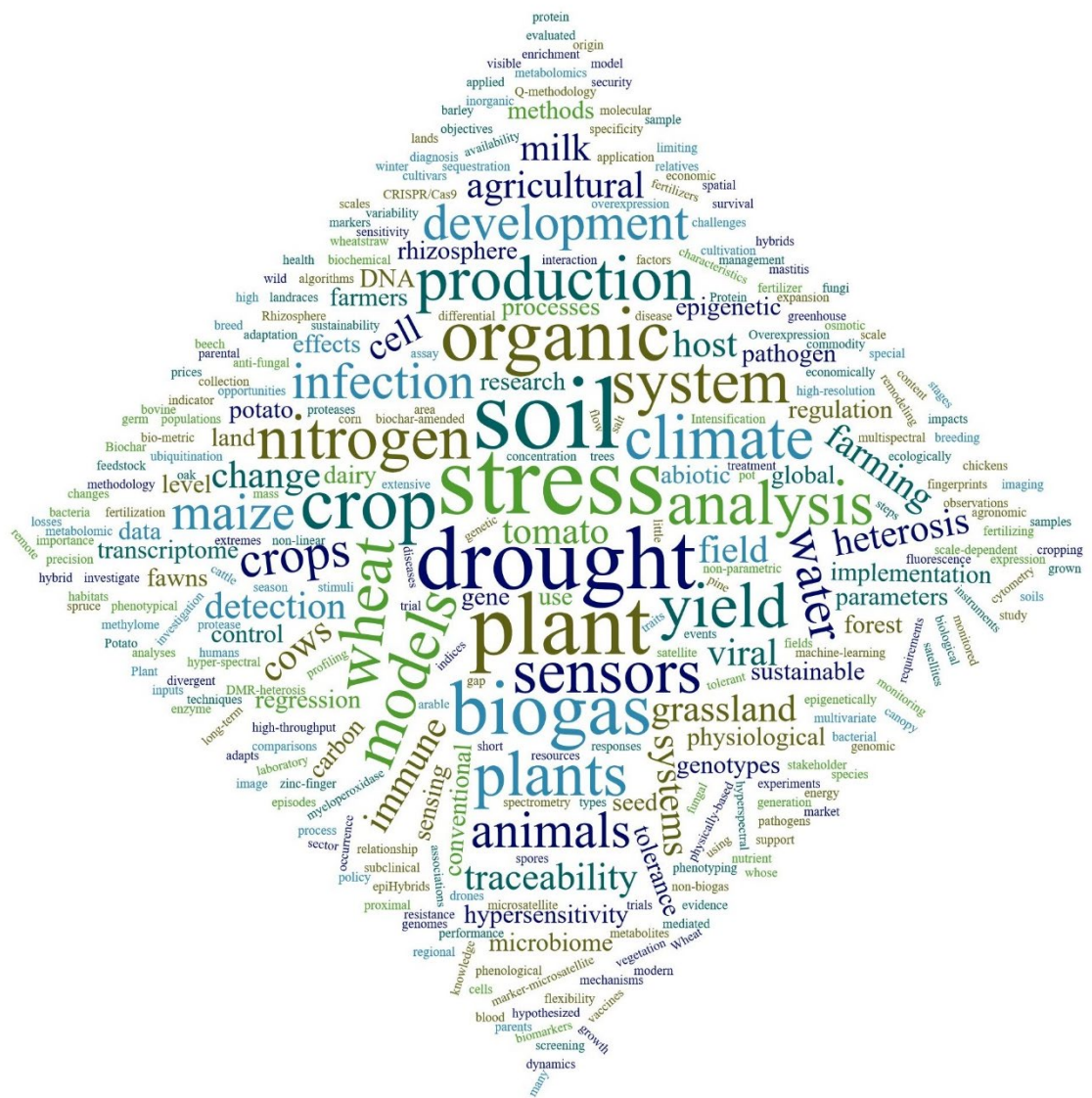# April 27, 2021

# Program

## Plenary Session  I

**08:30**   **Welcome, organizational aspects/recommendations of conduct**

**08:50**   **T1:**     **Benoit Martins**  [HelmholtzZentrum München, Comparative Microbiome Unit]
*The role of soil microbiome in the response of two potato cultivars to drought stress*

**09:10**   **T2:**     **Shu-Yin Tung** [TUM, Soil Science & LfL]
*Rhizosphere traits enhancing agronomic resilience of maize to drought stress*
*in controlled environment*

**09:30**   **T3:**     **Thomas Mösl** [TUM, Organic Agriculture and Agronomy]
*Comparing yield gaps of different organic and conventional farming systems at crop*
*and crop rotation level*

**09:50**   **T4:**     **Lina Munos Hoyos** [TUM, Phytopathology]
*Comparative metabolomics profiling of Solanum lycopersicum to elucidate anti-fungul*
*defence mechanisms*

**10:10**   **"Elevator pitches"** -> poster introductions (2 min each), P2 – P8     => 14 min net

**10:30**   Coffee Break (20 min)

**10:50**   **T5:**     **Carolin Brune** [TUM, Phytopathology & LfL]
*Microbiological detection of Alternaria solani in soil samples and investigation of agricultural and*
*environmental factors and their influence on the persistence of the fungus in the soil*

**11:10**   **T6:**     **Olivia Spykmann**  [LfL, Digital Farming Group]
*Societal acceptance of autonomous cropping equipment- latent class analysis*
*of two choice experiments*

**11:30**   **T7:**     **Terese Venus**  [TUM, Agricultural Production and Ressource Economics]
*Understanding stakeholder preferences for future biogas development in Germany*

**11:50**   **"Elevator pitches"** -> poster introductions (2 min each), P1, P9 – P15     => 16 min net

**12:10**   lunch break  (90 min)

## Meeting in Plenum at 13:30

**13:30** **Organizational issues, explaining further proceeding**
**VOTING: Best Talk, Best Pitch**

## Non-Plenary Sessions starting 13:45

**Poster session A, B, C**

| **Poster session A** | *modelling, sensing, digitization approaches* |
|---|---|

**P 1** **Rogerio de Souza** [TUM, Digital Agriculture]
*Extreme lows of wheat production in Brazil*

**P 2** **Milica Colovic** [TUM, Precision Farming]
*Application of remote sensing methods for precision soil and crop management and efficient and sustainable use of water and energy resources*

**P 3** **Ali Mokhtari** [TUM, Precision Farming]
*Crop nitrogen spectral description based on physically-based model and machine learning algorithms: From field to regional scales*

**P 4** **Martin Strenner** [TUM, Organic Agriculture and Agronomy]
**The plant as an indicator – comparison of the impact on corn plants of different organic fertilizers in organic agriculture by using field spectroscopy.**

**P 5** **Tamara Wiesel** [TUM, Wildlife Biology/LfL, Landtechnik und Tierhaltung]
**Sightability model for fawn detection in grassland**

| **Poster session B** | *ecological and systems approaches in agriculture* |
|---|---|

**P 6** **Emanuel Jaufmann** [TUM, Organic Agriculture and Agronomy]
*Conception and scientific objective of two long-term field experiments with biochar-amended organic and inorganic fertilizers*

**P 7** **Catherine Kamau** [TUM, Soil Science/Helmholtz Zentrum]]
*The impact of high carbon amendments and pre-crops on rhizosphere communities in barley*

**P 8** **Maria A. Parreno** [TUM, Plant-Insect-Interactions]
*NutriB2: Nutrition as Critical Link between Biodiversity and Bee Health.*

**P 9** **Dr. Darius Kavaliauskas** [Vyautas Magnus University Agriculture Academy/ Bavarian Office for Forest Genetics]
*DNA marker-based forest reproductive material traceability system in Lithuania*

**P 10** **Tamara Schmey** [TUM, Phytophathology]
*Diversity of the fungal pathogen Alternaria spp. on wild tomato plants*   *(entfällt)*

**Postersession C**     *molecular approaches (in animal & plant sciences)*

**P 11**     **Sabine Farschtschi** [TUM, Animal Physiology and Immunology]
*Development of a high-resolution immunomonitoring method in bovine blood and milk*

**P 12**     **Dr. Mohanned Alhussien** [TUM, Reproductive Biotechnology]
*Sensitive and rapid lateral-flow assay for early detection of subclinical mammary infection in dairy cows*

**P 13**     **Sabrina Schleibinger** [TUM, Reproductive Biotechnology]
*Targeting the chicken host protease via CRISPR/Cas9 system and its role during Influenza A Virus Infection*

**P 14**     **Robert Piecyk** [TUM, Populationepigenetics and -epigenomics]
*Parental DNA methylation states predict patterns of methylome remodelling and phenotypic heterosis*

**P 15**     **Carlos Agius** [TUM, Plant Systems Biology]
*Abiotic stress regulation by XERICO E3 ligases*


# Plenary Session II

**15:00**   **Voting for best talk, best elevator pitch, best poster**

**15:15**        **Maximiliane von Zwehl, Dr. Chrysoula Dimaki** [GFVP]
*Introducing the Global Food Venture Programme*
        **Christoph Alessandri**
*Start-up Consulting at TUM*

**15:40**        **Roman Werner** [FACIT]
*Introducing PALTECH: Start-up Pitch*

**16:00**     **Awards for best talk, best Pitch, best poster**

        **"Thanks you"s & "Good Bye"s**

## Topics & Abstracts

### Talks

**T1** Benoit Martins
[HelmholtzZentrum   Comparative Microbiome Research Unit]
***The role of soil microbiome in the response of two potato cultivars to drought stress***.
My research work is focusing on how soil microbiome can be used to help potato plant to cope with drought stress, which is the main crop production limiting factors in the world. Due to importance of Potato production in the world (4th most food crop at the global scale) and the ongoing climate change, drought stress is expected to increase in agricultural lands. Use plant microbiome interaction data to breed tolerant potato genotypes would be an effective way to face and to counteract the detrimental effects of drought episodes accentuated by the global change.

**T2** Shu-Yin Tung
[TUM Soil Science & LfL Institut für Ökologischen Landbau, Bodenkultur und Ressourcenschutz]
***Rhizosphere traits enhancing agronomic resilience of maize to drought stress in controlled environment***
A number of 48 maize genotypes, including both old landraces and modern cultivars, were grown in a greenhouse facilitated with high-throughput phenotyping system. Two water treatments were imposed on the plants at shoot development stage: well-watered and water stress. The development of above- and below-ground parts of plants were monitored by continuous visible and fluorescence imaging. Rhizosphere traits influencing the agronomic performance of maize plants under drought stress will be investigated via image analysis

**T3** Thomas Mösl
[TUM   Organic Agriculture and Agronomy]
**Comparing yield gaps of different organic and conventional farming systems at crop and crop rotation level**
The yield gap between organic and conventional farming systems is a widely discussed topic and a key factor in discussions about sustainable Intensification. Previous work has mainly focused on the yield gap of single crops and failed to differ in between organic and conventional farming systems. The "Viehhausen System Trial" represents a new experimental approach that allows realistic system comparisons at field trial level. In this work we present the results from the first 11-years of this ongoing long term field experiment.

**T4** Lina  Munoz Hoyos
[TUM   Phytopathology]
***Comparative metabolomic profiling of Solanum lycopersicum to elucidate anti-fungal defence mechanisms***
We applied metabolomics based on UPLC-QTOF mass spectrometry in combination with multivariate data analysis to compare the metabolomic profiling in Solanum lycopersicum after treatments with Alternaria alternata, A. solani and Chitin (a general elicitor of anti-fungal plant defence responses) at two different time points to elucidate resistance related metabolites in early defense response.

**T5**    Carolin Brune
[TUM Phytopathology & LfL]
***Microbiological detection of Alternaria solani in soil samples and investigation of agricultural and environmental factors and their influences on the persistence of the fungus in the soil***
Plant pathogens like A. solani can lead to significant yield losses. The part of the disease cycle without a host plant is only investigated in little detail, although the soil-borne inoculum is known to be a source of the initial infection of host plants. This little knowledge about the occurrence and survival of spores in the soil lead to this study in which we aim for an investigation of factors influencing the survival rate of A. solani soil-borne inoculum. This study involves a wide range of screening processes, pot trials and a variety of sample analysis steps in the laboratory.

**T6**    Olivia Spykman
[LfL    Digital Farming Group]
***Societal acceptance of autonomous cropping equipment – a latent class analysis of two choice experiments***
Little information is available about the German society's opinion on robots in agriculture. Therefore, two experiments on weeding methods (n = 675) and autonomous tractors (n = 645) will be evaluated using latent class analysis to identify consumer segments. The results may be used to adress specific concerns and preempt societal rejection of these new agricultural technologies.

**T7**    Terese Venus
[TUM   Agricultultural Production and Resource Economics]
***Understanding stakeholder preferences for future biogas development in Germany***
As the German Renewable Energy Act (REA) strongly contributed to biogas expansion, the phase out of feed-in-tariffs poses serious challenges to the biogas sector and has implications for agricultural land use at the soil (e.g., digestate), field (e.g., crop variety) and sector level (e.g., land rental prices). Using the Q-methodology, we investigated stakeholder preferences for biogas development in Germany and identified four perspectives: (i) economic security and support, (ii) sustainability, (iii) opportunities for other farmers and (iv) alternative scale-dependent support. Although stakeholders recognized the importance of biogas for flexibility, there were diverging views on whether biogas should be economically independent in the long-run and how effects on the agricultural market should be handled. Provided that support compensates for specific aspects such as flexibility, special feedstock or heating, the policy changes will likely reduce tension between biogas and non-biogas farmers.

**Poster**

**P1**    Rogerio De Souza Noia Junior
[TUM   Digital Agriculture]
*Extreme lows of wheat production in Brazil*
1) Wheat production in Brazil is insufficient to meet domestic demand and falls drastically in response to adverse climate events.
2) Multiple regression models were used to estimate national production based on past climate, cropping area, yield, and commodity prices.
3) Projections with five CMIP6 climate change models suggest extremes of low wheat production historically occurring once every 20 years would become up to 90% frequent by the end of this century, depending on representative concentration pathway, magnified by wheat price.

**P2**    Milica Colovic
[TUM,  Precision Farming]
*Application of remote sensing methods for precision soil and crop management and efficient and sustainable use of water and energy resources*
In this project, the suitability of application of different remote sensing techniques (proximal, drones, satellites) for precision soil and crop management and sustainable use of water and energy resources was evaluated.  The research experiment was conducted on sweet maize grown under different water and nitrogen inputs and during two growing season many instruments and models were applied. Moreover, some of the the main objectives of the research are to characterize soil spatial variability by using proximal sensors and investigate relationship between hyper-spectral vegetation indices and both bio-metric and physiological crop parameters.

**P3**    Ali Mokhtari
[TUM   Precision Agriculture]
*Crop nitrogen spectral description based on physically-based model and machine learning algorithms: From field to regional scales*
Assessing the capability of hyperspectral and multispectral sensing for winter wheat nitrogen content monitoring from field to regional scales. We will test three different methods, namely, (1) non-linear non-parametric regression (machine learning algorithms), (2) physically-based models, and (3) hybrid models. We will then distinguish wheat fields over Germany and estimate crop nitrogen content during different phenological stages using satellite observations

**P4**    Martin Strenner
[TUM   Organic Agriculture and Agronomy]
*The plant as an indicator – comparison of the impact on corn plants of different organic fertilizers in organic agriculture by using field spectroscopy*
In conventional farming systems, crop sensors have already proved their ability to guide nitrogen fertilization by detecting the N-uptake of the canopy. In Germany, corn (zea mays) has after winter wheat the second largest share of arable land. The cultivation of corn is in many cases strongly connected to high doses of organic fertilizer whose nutrient availability is difficult to estimate. In this study, our goal is to verify the possibility to detect the impacts of organic fertilizing on the plants as well as on the soil by using the plants itself as an indicator.

**P5**      Tamara Wiesel

[TUM Wildlife Biology & LfL Landtechnik und Tierhaltung]

***Sightability model for fawn detection in grassland***

Many fawns get injured or killed by grassland mowers in May and June every year. Detection methods like thermal imaging or visual sensors can help to find fawns in grassland to rescue and secure them. Manifold factors can influence this detection process. Therefore, it is important to determine relevant factors in order to know which factors lead to certain success rates of each method.


**P6**      Emanuel Jaufmann

[TUM   Organic Agriculture and Agronomy]

**Conception and scientific objective of two long-term field experiments with biochar-amended organic and inorganic fertilizers**

Biochar can be an option to sequester carbon in soils for millenials and to improve soil characteristics. Two long-term field experiments were established to investigate short- and long-term effects of biochar-amended organic and inorganic fertilizers on plant growth, nitrogen dynamics, carbon sequestration and soil parameters.


**P7**      Catherine Wambui Kamau

[TUM Soil Science & Helmholtz Zentrum]

***The impact of high carbon amendments and pre-crops on rhizosphere communities in barley***

My project focuses on the impact of addition of organic amendments on bacterial communities in the rhizosphere of barley.I am also investigating the positive effects elicited by these amendments on the rhizosphere communities under drought stress. Our work so far has shown an enrichment of bacteria of the phylum Actinobacteria after addition of wheatstraw. We hypothesize that this effect may improve plant tolerance to drought and are currently carrying out an experiment to investigate this.


**P8**      Maria Alejandra Parreno

[TUM   Plant-Insect-Interactions]

***NutriB2: Nutrition as Critical Link between Biodiversity and Bee Health***

Food intake is a strong determinant of the health and fitness of animals and insects, in particular bees, are no exception. Bees obtain most nutrients from flowering plants through consuming pollen and nectar. Chronic intake of monotonous, low quality or toxic food, reduces the immune-competence, thus affecting bee health, in what is known as "nutritional stress". We study the relation between a biodiverse environments (aka, plant species diversity) to bee diversity and health in agricultural landscapes.


**P9**      Dr. Darius Kavaliauskas

[Vytautas Magnus University Agricultural Academy/Bavarian Office for Forest Genetics]

***DNA marker-based forest reproductive material traceability system in Lithuania***

Scots pine, Norway spruce, Pedunculate oak and European beech are among the economically and ecologically most important forest trees species in Europe and Lithuania. According to EU Council Directive (1999/105/EC) on forest reproductive material (FRM) the EU Member States are responsible for the regulation, requirements, and implementation of FRM quality control and origin traceability system. Therefore, we intend to create two level DNA marker-microsatellite based FRM traceability control system on (a) reference seed lot samples from each seed collection from seed stands and (b) DNA "fingerprints" of seed orchard clones. Thus, with this poster presentation I want to introduce you to the project and its implementation plan which aim is to perform a pilot FRM traceability study based

on microsatellite markers and to prepare a methodology for FRM traceability system implementation in Lithuania for four selected tree species. This work is supported by the Project. No. 09.3.3-LMT-K-712-19-0007.

**P10**    Tamara Schmey
[TUM, Phytopathology]
***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.

**P11**    Sabine Farschtschi
[TUM   Animal Physiology and Immunology]
***Development of a high-resolution immunomonitoring method in bovine blood and milk***
To find new biomarkers for the detection of bovine diseases, it is useful to take a closer look at the various immune cell populations present in blood and milk of dairy cows. For this purpose we established a high-resolution differential cell count (DCC) by means of flow cytometry. In a first feasibility study vaccines were used as immune stimuli to show their effects on the blood and milk DCC and search for interesting immune cell types.

**P12**    Dr. Mohanned Naif Alhussien
[TUM Reproductive Biotechnology & ICAR-National Dairy Research Institute (India)]
***Sensitive and rapid lateral-flow assay for early detection of subclinical mammary infection in dairy cows***
A semiquantitative lateral flow assay was developed for the detection of subclinical mastitis (SCM) in dairy cows targeting myeloperoxidase enzyme of milk neutrophils. The developed assay was verified with 75 cows, and displayed high sensitivity and specificity. This assay is highly accurate and allows the detection of SCM in dairy cattle without the need for expensive instruments which may help in early diagnosis and treatment of SCM.

**P13**    Sabrina Schleibinger
[TUM   Reproductive Biotechnology]
***Targeting the chicken host protease via CRISPR/Cas9 system and its role during Influenza A Virus Infection***
Influenza A viruses (IAVs) pose major health problems in humans and animals. The viral infection is facilitated by the cleavage of the viral hemagglutinin via host proteases. In this work, we plan to characterize the physiological role of the chicken protease TMPRSS2 as well as its effect on promoting the viral infection. Therefore, we established a CRISPR/Cas9 system that will allow a targeted knockout of this gene in primordial germ cells and subsequently the generation of TMPRSS KO chickens. The generated animals will be analysed for their susceptibility to IAVs.

**P14**   Robert Piecyk
[TUM   Populations-epigenetics and epigenomics]
***Parental DNA methylation states predict patterns of methylome remodelling and phenotypic heterosis***
Despite the importance and wide exploitation of heterosis in commercial crop breeding, the molecular mechanisms behind this phenomenon are not well understood. There is growing evidence that besides genetic also epigenetic factors contribute to heterosis. We previously used near-isogenic but epigenetically divergent parents to create so-called epigenetic F1 hybrids (epiHybrids) in Arabidopsis thaliana. Preliminary phenotypic analysis in our lab revealed that specific differentially methylated regions (DMRs) in parental genomes are associated with heterosis in the epiHybrids. We hypothesized that these DMR-heterosis associations are mediated by extensive methylome and transcriptome remodeling.

**P15**   Carlos Agius
[TUM   Plant Systems Biology]
***Abiotic stress regulation by XERICO E3 ligases***
Protein ubiquitination plays a major role in many plant biological processes and is involved in the adaptation of plants to abiotic stresses. XERICO being classified as RING (REALLY INTERESTING NEW GENE) zinc-finger protein is involved in abiotic stress regulation. Overexpression of XERICO in Arabidopsis incurs hypersensitivity to ABA and salt or osmotic stress. Similarly, in maize overexpression of ZmXerico1 and ZmXerico2 shows ABA hypersensitivity, improved drought tolerance and, under controlled drought conditions increased yield. XERICO is repressed in the Arabidopsis ga1 mutant after GA treatment, and is present in multiple GA-regulated gene expression studies. As such XERICO was classified as being a main GA-regulated gene. Little is known about XERICO' s function in the model plant tomato (Solanum lycopersicum), which possesses three putative XERICO orthologues (SlXER1, SlXER2, SlXER3). Using phenotypical, transcriptome and biochemical analysis, we aim to further unravel the role of XERICO in abiotic stress responses.