

PhD-Days at ATB Potsdam, 26./27. May 2021, Online

Agenda

Wednesday, 26 May

Time	Topic	Speaker	Supervisor ATB	Supervisor University
13:00	Welcome	Prof. Barbara Sturm Dr. Ulrike Praeger		
13:10	<u>Phages in biogas plants</u>	Katharina Willenbücher	Dr. Thomas Hoffmann	Prof. Ulrich Szewzyk, TU Berlin
13:35	<u>Fermentation strategies for the lactic acid production from lignocellulosic raw & residue materials</u>	Linda Schroedter	Dr. Joachim Venus	
14:00	<u>Extrusion of different plants into fibre for peat replacement in growing media: adjustment of parameters to achieve satisfactory fibre-characteristics</u>	Christian Dittrich	Dr. Ralf Pecenka	Prof. Harald Kruggel-Emden, TU Berlin
14:25	Break			
14:45	<u>Quantification of nutrients in liquid organic fertilizers with diffuse reflectance spectroscopy</u>	Michael Horf	Dr. Sebastian Vogel	Prof. Cornelia Weltzien, TU-Berlin
15:10	<u>Deriving orchard maps for unmanned ground vehicles from UAV surveillance flight data</u>	Tjark Schütte	Prof. Cornelia Weltzien	Prof. Cornelia Weltzien, TU Berlin
15:35	<u>A multiphysics digital vegetable twin accounting for raw product variabilities in drying applications</u>	Jörg Schemminger		Prof. Barbara Sturm, HU Berlin Prof. Thijs Defraeye, Empa St. Gallen
16:00	Break			
16:15	Alumni report on their career after doctorate at ATB	Dr. Susanne Demba, Melk-FEE GmbH, Falkensee Dr. Helena Ponstein, Consultant in agriculture		
17:00 - 17:50	Online Live Tour Museum Barberini, Potsdam			

Thursday, 27 May

9:00	<u>Modelling potentials, impacts and limitations of residual biomass use for biogas production</u>	Andres Vargas Soplin	Dr. Ulrich Kreidenweis	Prof. Annette Prochnow, HU Berlin
9:25	<u>The EU's 'inclusive bioeconomy' discourse: the role of peripheral actors</u>	Hyunjin Park	PD Dr. Philipp Grundmann	PD Dr. Philipp Grundmann, HU Berlin
9:50	<u>Institutional drivers for bioeconomy development: a fuzzy-set qualitative comparative analysis between European countries</u>	Zhengqiu Ding	PD Dr. Philipp Grundmann	PD Dr. Philipp Grundmann, HU Berlin
10:10	Break			
10:30	<u>Valorization of by-products from wet coffee processing: waste to carbon-rich material using hydrothermal carbonization to improve the sustainability of the coffee value chain in Vietnam</u>	Huyen Chau Dang	Dr. habil. Judy Libra	Prof. Christina Dornack, TU Dresden
10:55	<u>Utilization of house crickets (<i>Acheta Domesticus</i>) in the food sector: Innovative and sustainable production</u>	Marios Psarianos	Dr. habil. Oliver Schlüter	
11:20	<u>Development of a parametric model for the air exchange rate of natural ventilated barn based on numerical simulation results</u>	El Hadj Moustapha Doumbia	Dr. Sabrina Hempel	Prof. Martin Kriegel, TU Berlin
11:45	Closing remarks			
12:00	End			

Short Abstracts

Phages in biogas plants

Katharina Willenbücher

Phages are viruses that infect bacteria and archaea. They influence the diversity of microbial communities in all habitats. Since the occurrence of phages in biogas plants has been little studied, a basic understanding of phage occurrence in these reactors must first be obtained. I aim to achieve a first approach to this with my work.



Fermentation strategies for the lactic acid production from lignocellulosic raw & residue materials

Linda Schroedter

To date, feedstocks for the production of the versatile compound lactic acid are mainly sugars from corn, sugarcane or cassava. Since these are costly and in competition with the provision of food and feed, the focus of lactic acid research shifts to alternative sugar sources. Lignocellulose is one of these promising feedstocks. For breaking its resistant structure, various pretreatment strategies exist, leading to lignocellulosic substrates that differ in form and composition. Consequently, this affects the applicability of fermentation processes. Detecting a microorganism that accepts such diversity of substrate, is a vital step towards a robust lignocellulose-based lactic acid production.



Extrusion of different plants into fibre for peat replacement in growing media: adjustment of parameters to achieve satisfactory fibre-characteristics

Christian Dittrich

Worldwide 40 million m³ peat is used for horticultural growing each year. The required peat is mined which has negative environmental impacts including habitat degradation and the release of sequestered CO₂. Replacing or reducing peat by substitution with lignocellulosic biomass processed into fibre by twin-screw-extrusion could contribute to more sustainable agriculture with regard to horticultural production. Therefore, plant wastes including pruning from *Olea europaea* L. and *Vitis* spp L., residues from perennial herbs like *Salvia* spp L., *Populus* spp L. and forest biomass were processed to fibre for peat replacement with a biomass extruder. Physical fibre characteristics were determined and compared to peat. All investigated materials are suitable to replace peat in growing media regarding their physical properties. However, chemical characteristics and effects of microbiological processes, such as decomposition, require further investigation.



Quantification of nutrients in liquid organic fertilizers with diffuse reflectance spectroscopy

Michael Horf

The knowledge of precise nutrient concentrations of organic fertilizers is a prerequisite for their appropriate application to improve yield and to avoid environmental pollution by over-fertilization. Traditional standard chemical analysis is cost and time-intensive and thus it is unsuitable for a rapid analysis before manure application. Furthermore, empiric contents from recommendation sheets do not cover the fertilizer's real variety, due to a strongly heterogeneous composition depending on a wide variety of factors (e.g. animal species and age, feed compositions, storage managements, etc.). As a promising alternative, diffuse reflectance spectroscopy (in the visual and near-infrared region) was extensively examined to be a precise, fast, and low cost alternative for on-farm nutrient analysis of liquid organic fertilizers.



Deriving orchard maps for unmanned ground vehicles from UAV surveillance flight data

Tjark Schütte

In digitalised agriculture and specifically in precision agriculture, the goal is to improve the efficiency of food production by trying to achieve optimal growth conditions on – at best – single plant scale. As a result, the number of control operations is increasing, which can lead to an increased workload for farmers. These are some of the reasons, why increased automation can be critical to increasing the efficiency and resilience of sustainable agricultural food production processes. In the area of vehicle automation and field robotics, one of the main challenges is the task of environment mapping, which is often achieved through Simultaneous Localisation and Mapping (SLAM). This task may be supported by instead using high resolution aerial photographs collected by UAVs. A methodology as well as first models and maps based on UAV surveillance flight data are going to be presented.



A multiphysics digital vegetable twin accounting for raw product variabilities in drying applications

Jörg Schemminger

The need for sustainable, holistic, and safe agricultural value chains is generally acknowledged. Tackling these challenges, the understanding of interdependencies between unit operations – upstream and downstream – is essential. Prerequisites are models that describe physical and chemical effects on individual products' level, especially for process steps having a high impact on quality and energy consumption such as drying.

Product-focused and physics-based digital twins provide the needed non-invasive insights: the virtual replica of an agricultural product connects mechanistic multiphysics-modeling with continuously measured process, raw product, and environmental data and thus enables product-centered process control with best drying conditions for each individual piece of produce.



Modelling potentials, impacts and limitations of residual biomass use for biogas production

Andres Vargas Soplín

This research will address the topic of residual biomass use for biogas production at a local scale, and its potential benefits, impacts and limitations. In that sense, specific research will be conducted in: a) modelling the potential use of fallen tree leaves for biogas production and its environmental impacts, b) residual feedstock variability in biogas production and its repercussions, and c) linking ecosystem services, agricultural management and biogas production.



The EU's 'inclusive bioeconomy' discourse: the role of peripheral actors

Hyunjin Park

The paper aims to examine the change in inclusion discourses and interpretation of inclusion in the EU and German bioeconomy strategies between their initial and updated versions and b) the role of discourse coalitions of peripheral actors in this change. The paper reveals how inclusion discourse changed from the first bioeconomy strategies to their revised ones in terms of the priority given to and the degree of inclusion. Our scrutiny of discourse coalitions, their tactics, and the functioning of institutional practices points towards an accompanying social change flanked by power struggles of the peripheral actors in the bioeconomy transition.



Institutional drivers for bioeconomy development: a fuzzy-set qualitative comparative analysis between European countries

Zhengqiu Ding

This study explores the configurations of institutional factors that explains current bioeconomy development in 25 European countries. Using multiple sources of secondary data from national bioeconomy strategy documents and Knowledge Center for Bioeconomy, the study employs fuzzy-set qualitative comparative analysis (QCA) to illustrate how combinations of institutional conditions would cause the outcome of current heterogenous bioeconomy development cross 25 European countries. The study contributes to a comprehensive understanding of configurational conditions for bioeconomy development by cross-national comparison. The study results are useful and of relevance for policy makers as they indicate point towards supportive institutional configurations characterized by well aligned governance means. Countries adopted fragmented approaches should spare no effort to enhance policies to create a holistic bioeconomy strategy.



Valorization of by-products from wet coffee processing: waste to carbon-rich material using hydrothermal carbonization to improve the sustainability of the coffee value chain in Vietnam

Huyen Chau Dang

The project purpose is to develop new innovative solutions to valorize by-products in the coffee processing sector in Vietnam. The project will explore, first theoretically and then experimentally, the use of hydrothermal carbonization (HTC) process, to convert wet solid by-products to carbon-rich materials used as solid fuel. The research result will be evidence for the technical feasibility of integrating HTC in the wet-processing plant and its waste treatment facilities as well as develop and assess alternative designs for process combinations, evaluating their impact on resource use and environmental emissions in coffee processing.



Utilization of house crickets (*Acheta Domesticus*) in the food sector: Innovative and sustainable production

Marios Psarianos

The aim of the doctoral work aims to suggest innovative and sustainable alternatives in the production line of food products derived from house crickets. The production line is separated in two major parts; one before harvesting (rearing of the crickets) and one after harvesting (utilization of the insect compounds). Alternative feed substrates have been tested to replace the commercial feed, while a higher-scale rearing has been implemented to increase the amount of generated insect biomass. Additionally, a biological process has been implemented for chitosan generation, while non-thermal processing has been used to enhance the extraction of insect protein and fat.



Development of a parametric model for the air exchange rate of natural ventilated barn based on numerical simulation results

El Hadj Moustapha Doumbia

The air exchange rate (AER) and the direction of air movement are key parameters in this context to evaluate animal housing with regard to animal welfare and environmental compatibility. The objective is to obtain fundamental insights into the influence of the parameters on the formation of airflow patterns and therefore on the estimation of AER in naturally ventilated barns. A parametric model shall be derived that describes the influences of each parameter on the general and local AER in the form $AER=f(\text{velocity magnitude, velocity direction, temperature, length/width ratio, side window opening})$. The model shall be able to predict the AER for an arbitrary combination of the investigated parameters.

