

PhD-Day at ATB Potsdam, Tuesday, 24 May 2022, Hybrid-Conference; Room Z003 and Zoom

Time	Topic	Speaker	Supervisor ATB	Supervisor University
8:45	Welcome	Prof. Barbara Sturm Dr. Ulrike Praeger		
9:00	Towards rural small-scale bioeconomy transition in Europe: A technological innovation systems analysis of grass-based biorefinery value chains	Zhengqiu Ding	PD Dr. Philipp Grundmann	PD Dr. Philipp Grundmann, HU Berlin
9:25	Institutional change in bioeconomy development in Germany: the role of power resources and discourse	Hyunjin Park	PD Dr. Philipp Grundmann	PD Dr. Philipp Grundmann, HU Berlin
9:50	On monitoring a bioeconomy transition and its impacts with relevant meso-level indicators	Wiebke Jander	PD Dr. Philipp Grundmann	PD Dr. Philipp Grundmann, Prof. Harald Grethe, HU Berlin
10:15	Break			
10:35	Investigating the physical, chemical and biological properties of stand-retted hemp straw and fibers towards the development of an alternative method for processing of hemp fibers	Morris Angulu	Dr. Hans-Jörg Gusovius	Prof. Martin Hofrichter, TU Dresden
11:00	Measurement of respiratory characteristics in cattle	Lena Dißmann	Dr. Gundula Hoffmann	Prof. Thomas Amon, FU Berlin
11:25	Green Talents Award Virtual Science Forum 2022	Dino Trescher (PR) Dr. Ulrike Praeger		
11:45	Group photo			
12:00	Lunch break			
13:00	Identification of Plant Indicator Species for High Biodiversity in Grassland Using Remote Sensing Imagery: A Multi-Label Image Classification Problem in Deeplearning	Deepak Hanike Basavegowda	Prof. Cornelia Weltzien	Prof. Cornelia Weltzien, TU Berlin
13:25	3D-point cloud analysis for precise structure change detection in trees	Marius Hobart	Dr. Michael Schirrmann	Prof. Cornelia Weltzien, TU Berlin
13:50	Modelling of ethylene and its removal in postharvest storage facilities of fresh horticultural produce	Akshay Sonawane	Dr. Pramod Mahajan	Prof. Cornelia Weltzien, TU Berlin
14:15	Break			

Time	Topic	Speaker	Supervisor ATB	Supervisor University
14:30	Agrotechnological, agroecological and regulatory aspects for the sustainable production of apples (<i>Malus domestica</i> Borkh.) in the Shida Kartli region of Georgia	Ekaterine Burkadze	Dr. habil. Manuela Zude Prof. Barbara Sturm	Prof. Zviad Bobokashvili Prof. Tamar Kvrivishvili Agricultural University of Georgia, Tbilisi, Georgia
14:55	Non-destructive kiwifruit flesh firmness measurement using a laser backscattering imaging system	Zhuo Yang	Dr. habil. Manuela Zude	Prof. Andrew East, Massey University, Palmerston North, New Zealand
15:20	Estimation of fruit chlorophyll content in postharvest condition analyzing intensity retrieved from reconstructed 3D LiDAR point cloud	Kowshik Kumar Saha	Dr. habil. Manuela Zude	Prof. Dr. Cornelia Weltzien
15:45	Break			
16:00	Mentoring for Postdocs at ATB	Prof. Dr. Christine Lang	MBCC Group - Consulting and Coaching in Microbiotics and Bioeconomy (Manager) Member of Scientific Advisory Board ATB	
16:30	Alumni report on their career after doctorate at ATB	Dr Makgafele Lucia Ntsoane, Postharvest Researcher, Company Infarm, Berlin		
17:00	Get together - Barbecue			

Short abstracts

Towards rural small-scale bioeconomy transition in Europe: A technological innovation systems analysis of grass-based biorefinery value chains

Zhengqiu Ding

To accelerate the transformation from a fossil-based to a bio-based economy highlights the importance of the expansion of current bio-based value chains along with the development of novel ones. Research and development activities increasingly need to address process integration along the value chain. However, there is a lack of sector-specific understanding of barriers and enablers. This paper addresses this gap, using an explorative case study approach. The challenges are hesitation of value chain actors in making new investments in terms of equipment and know-how, and missing complementary marketing competencies. However, technology optimization for integrating different production systems has been considered as an imminent opportunity.

Institutional change in bioeconomy development in Germany: the role of power resources and discourse

Hyunjin Park

This paper traces institutional change around the use of biomass in the German bioeconomy with a focus on biogas production and cascade use and investigates drivers of the institutional change. By analyzing policy documents, legislation, position papers, and key stakeholder interviews with the help of the distributive theory of institutional change, the paper highlights the role of power resources and discourse in the change process. The paper aims to shed a light on the power dynamics of the policy actors and their influence on the trajectory of bioeconomy development in Germany.

On monitoring a bioeconomy transition and its impacts with relevant meso-level indicators

Wiebke Jander

Bioeconomy transitions can support achieving sustainable development goals but may also jeopardize some of them. Making trade-offs between different goals of the bioeconomy visible is a main objective of bioeconomy monitoring systems on the (supra)national level. This work contributes to the development of such a system by developing relevant indicators for the transition from a fossil-based to a bio-based economy and related economic and environmental impacts with an environmentally extended input-output model. Indicators have been applied to substitution in the German plastics sector for the year 2016.

Investigating the physical, chemical and biological properties of stand-retted hemp straw and fibers towards the development of an alternative method for processing of hemp fibers

Morris Angulu

The hemp fiber processing technology has lagged behind in comparison to processing technologies for major fibers like cotton and synthetic fibers. This is in spite of the high productivity of hemp in terms of the lignocellulosic fiber-mass produced per unit area. In order to develop the value chain of hemp fiber production, more economically competitive processing technologies have to be developed. This work investigates the physical, chemical and biological properties of stand-retted hemp straw and fiber and compares it those of its counterparts produced through the current standard practice of dew retting. The results do not only provide information on the suitability of stand retting as an alternative method of processing hemp fibers, but also help in identifying possible areas of applications for the resulting fibers.

Measurement of respiratory characteristics in cattle

Lena Dißmann

The respiration rate (RR) of dairy cows is a very sensitive parameter that can indicate a stress situation (e.g. heat stress, anxiety, pain) as well as pathological processes and the severity of the stress condition at an early stage. The common method for determining the RR of cattle is to visually count the flank movements. However, visual detection of RR is very time consuming and labour intensive, and potentially results in interference with the animals and their RR due to the need for a person to be present. However, previous sensor technologies for recording RR must be attached to the animal and often require WLAN or Internet connectivity in the barn. In the project, it will be possible for the first time to record the individual RR of dairy cows without contact under practical conditions. The novelty here is the use of imaging methods (infrared thermography and depth camera) and its processing via AI methods.

Identification of Plant Indicator Species for High Biodiversity in Grassland Using Remote Sensing Imagery: A Multi-Label Image Classification Problem in Deep Learning

Deepak Hanike Basavegowda

Extensively used grasslands (meadows and pastures) are ecologically valuable areas in the agricultural landscape and part of the multifunctional agriculture. In Germany, the quality of these grasslands is assessed based on the occurrence of certain plant species known as indicator or character species, with indicators being defined at regional level. Therefore, the recognition of these indicators on a spatial level is a prerequisite for monitoring grassland biodiversity. The identification of indicator species for the status quo of grassland using traditional methods was found to be challenging and tedious. Deep learning-algorithms applied to high-resolution UAV imagery could be the key solution, where UAV with remote sensors can map a large area of grassland in comparison to manual or ground mapping methods and deep learning-algorithms can automate the detection process.

3D-point cloud analysis for precise structure change detection in trees

Marius Hobart

Photogrammetry for structure delineation in tree crops is a common way to get spatial information about phenotypic characteristics. Unmanned aerial vehicle (UAV) based, this method combines advantages in a good resolution of large covered areas. However, photogrammetry can be challenging for grass covered orchards, if the tree wall is not opaque. My first findings show underestimated tree heights along the tree wall. This was dedicated to missed fine shoots, which were not resolved in the 3D point cloud.

Modelling and simulation of ethylene in post-harvest storage of fresh produce

Akshay Sonawane

Ethylene gas is referred to as a 'ripening hormone'. The movement of ethylene in the postharvest storage needs to model for effective removal. The study aims to develop integrative modelling for ethylene in packaging and storage environments for fruit and vegetables. The modelling will involve individual units such as ethylene production rate in fruits, ethylene transmission rate through packaging film, the kinetics of ethylene removal using a photolysis reactor, and KMnO_4 . The ultimate aim is to combine all models and perform simulations under realistic supply chain conditions that include time-temperature-humidity variation in the storage and transport of fruit and vegetables.

Agrotechnological, agroecological and regulatory aspects for the sustainable production of apples (*Malus domestica* Borkh.) in the Shida Kartli region of Georgia

Ekaterine Burkadze

Selection proper agrotechnological activities and increasing the shelf-life of the product, decreasing food waste is crucial for food security. The aim of my work was to study existing practices of agriculture in the region and identify if these activities are causing soil degradation or fruit contamination. Further, within the value chain effect of 1-MCP on fresh and processed apples (*Malus x domestica* Borkh.) was an area of research. We have studied soil at

cultivated and uncultivated areas, two cultivars Golden Delicious and Pinova from Shida Kartli region of Georgia. Apples were collected in pre-mature and matured stages and subjected to 1-methylcyclopropene (1-MCP) for 24 h before storage, while control fruit without treatment were directly stored at one-sided controlled atmosphere, for 2 and 4 months. As a result, no soil degradation, and no contamination of fruits with heavy metals (Cd, Cu, Pb, Zn) was detected. The study revealed that 1-MCP treatment does not add value to quality characteristics of dried apple chips, considering SSC, sugars, total phenols, unless it supports the firmness of matured fruits especially after long periods of storage.

Non-destructive kiwifruit flesh firmness measurement using a laser backscattering imaging system

Zhuo Yang

As a primary quality indicator, kiwifruit flesh firmness (FF) is important but difficult to analyse nondestructively. The commercially used spectral-optical data contain the sum signal of absorption and scattering of photons, which are related to kiwifruit's chemical and physical properties, respectively. As a dynamic process, FF change is correlated with many other post-harvest physiology activities, which is not consistent with the optical reading. In this study, a non-destructive approach based on laser backscattering image (LBI) technique with a time series model was tested to estimate 'SunGold™' and 'Hayward' kiwifruit FF changes during kiwifruit postharvest 15-day shelf-life ripening.

Estimation of fruit chlorophyll content in postharvest condition analyzing intensity retrieved from reconstructed 3D LiDAR point cloud

Kowshik Kumar Saha

Alternative to destructive chemical analysis, non-destructive technique such as spectroscopy in the visible wavelength range can detect the chlorophyll pigment content in the fruit's peel. However, spectroscopy involves high cost and skilled labour, not feasible for commercial application for the growers or traders. Therefore, non-contact and fast detection technique of fruit chlorophyll content has increasing demand in the postharvest handling sector. In this study, fruit intensity of laser returns at 660 nm wavelength were extracted from reconstructed 3D point cloud. After correction of intensity information, intensity histogram curves were produced. Finally, intensity histogram curves and corresponding reference chlorophyll contents were utilized for building calibration model using partial least squares analysis to predict the chlorophyll content.