

ELLS Scientific Student Conference

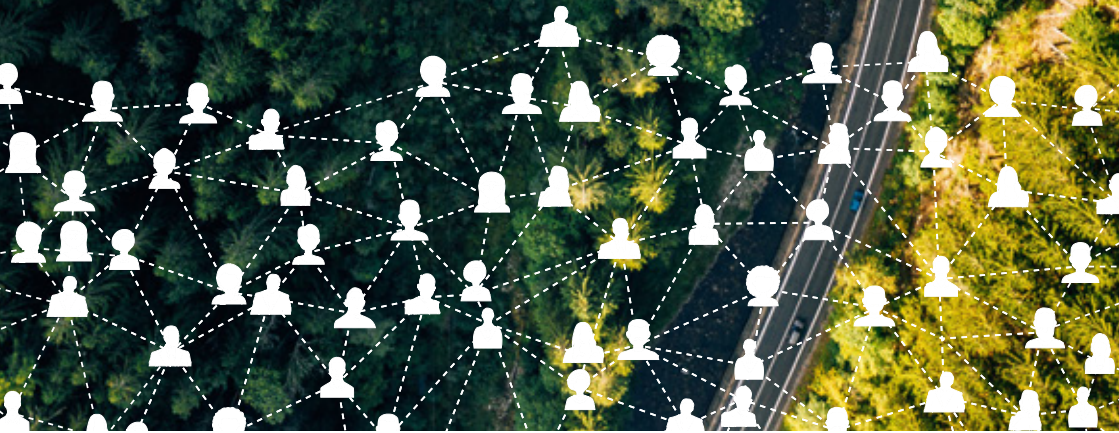


20th - 21st of November 2020

Hosted by: University of Natural Resources
and Life Sciences, Vienna

BOOK OF ABSTRACTS

THE WORLD OF TOMORROW -
A GREEN AND SUSTAINABLE SOCIETY



Euroleague
FOR LIFE SCIENCES



University of Natural Resources
and Life Sciences, Vienna

Impressum:

Scientific Student Conference 2020
Euroleague for Life Sciences
20 - 21 November 2020
University of Natural Resources and Life Sciences, Vienna
Austria
Editors: Ulrike Piringner, Kyrill Sattlberger, Helena Schuch
Layout: Idem
Cover: Tim Steiner

Euroleague

F O R L I F E S C I E N C E S

ELLS Member Universities

BOKU - University of Natural Resources and Life Sciences, Vienna

SCIENCE - University of Copenhagen, Faculty of Science

SLU - Swedish University of Agricultural Sciences

UHOH - University of Hohenheim

WUR - Wageningen University and Research Centre

CZU - Czech University of Life Sciences Prague

WULS-SGGW - Warsaw University of Life Sciences



UNIVERSITY OF
HOHENHEIM



WAGENINGEN UNIVERSITY
WAGENINGEN UR



ELLS Partner Universities

CAU - China Agricultural University, Beijing

HUJI - Hebrew University of Jerusalem, Robert H. Smith Faculty of Agriculture, Food and Environment

LU - Lincoln University, New Zealand



中國農業大學
China Agricultural University



האוניברסיטה העברית בירושלים
THE HEBREW UNIVERSITY OF JERUSALEM



LINCOLN
UNIVERSITY
TE WHARE WĀNAKA O AORAKI

Organization and Acknowledgements

The organizing committee gratefully acknowledges the support of the member universities and overseas partner universities in the network Euroleague for Life Sciences:

BOKU	University of Natural Resources and Life Sciences, Vienna, Austria
CZU	Czech University of Life Sciences, Prague, Czech Republic
SCIENCE	University of Copenhagen, Faculty of Science, Copenhagen, Denmark
SLU	Swedish University of Agricultural Sciences, Uppsala, Sweden
UHOH	University of Hohenheim, Stuttgart, Germany
WULS-SGGW	Warsaw University of Life Sciences, Warsaw, Poland
WUR	Wageningen University and Research, Wageningen, The Netherlands
CAU	China Agricultural University, Beijing, China
HUJI	Hebrew University Jerusalem, Jerusalem, Israel
LU	Lincoln University, Lincoln, New Zealand

Organizing Committee

Hubert Hasenauer, Rector (ELLS Board BOKU), Chair
Sabine Baumgartner, Vice-Rector (ELLS Board BOKU), Co-Chair
Walter Wenzel (ELLS Task Force BOKU), Co-Chair
Margarita Calderon-Peter
Nora Korp
Sarah Moser
Ulrike Piringer
Kyrill Sattlberger
Sarah Sperrer

Scientific Committee

Walter Wenzel (ELLS Task Force BOKU), Co-Chair
Hermann Bürstmayr
Bernhard Freyer
Franz Grossauer
Hans-Peter Kaul
Markus Puschenreiter
Matthias Schreiner
Siegfried Steinkellner

TABLE OF CONTENTS

Welcome to the ELLS Scientific Student Conference	1
Welcome to BOKU!.....	2
ORAL PRESENTATIONS	3
O1.1 Green innovation and circular economy: Green Plants	3
O1.2 Rural and urban development for thriving communities: Shaping tomorrows rural and urban world... 4	4
O1.3 Food and health for the next generation: Food safety and health.....	6
O1.4 Innovations in Life Sciences: Green Technologies	8
O2.1 Green innovation and circular economy: Green Products.....	9
O2.2 Rural and urban development for thriving communities: Climate adaptation strategies in regional development	11
O2.3 Food and health for the next generation: Plant production for healthy food	13
O2.4 Innovations in Life Sciences: Innovative approaches in food production.....	14
O3.1 Green innovation and circular economy: Green Resources.....	16
O3.2 Rural and urban development for thriving communities: Monitoring the rural and urban development	18
O3.3 Food and health for the next generation: Environmental impacts of food production.....	19
O3.4 Innovations in Life Sciences: Socio-economic innovations in urban and rural areas.....	21
POSTER PRESENTATIONS	23
P1.1 Green innovation and circular economy: Green Plants	23
P1.2 Rural and urban development for thriving communities: Specific aspects of rural and urban development	25
P1.3 Food and health for the next generation: Impacting soils & crop management	29
P2.1 Green innovation and circular economy: Green Innovations.....	32
P2.2 Rural and urban development for thriving communities: Bio-science studies in rural and urban environment.....	35
P2.3 Food and health for the next generation: Food Systems for the Future	37
P3.1 Food and health for the next generation: Food Technology	39
P3.2 Rural and urban development for thriving communities: Specific aspects of sustainable development (Backup Oral).....	42
P3.3 Food and health for the next generation: Gardening System for the Future	45
AUTHOR INDEX.....	48
KEYWORD INDEX	50

Welcome to the ELLS Scientific Student Conference



Petr Sklenička (Rector CZU Prague)



Michal Lošťák (Vice-rector CZU Prague)

Dear participants of ELLS Scientific Student Conference, dear pioneers,

The way how you are addressed in this text might seem to be unusual, however still keeping usual patterns. This year conference, which is organized by Euroleague for Life Sciences (ELLS) for the students of its universities, is unusually usual or usually unusual. The outbreak of COVID-19 pandemic blocked usual format of the students' conference which has been held since 2009. However, within ELLS we believe the conference is one of tangible outcome of our cooperation. It enables to develop the nature of university education: to bring the students together to discuss the achievements of their work with their peers and teachers. Value added is the students get the first contact with the international scientific conference. The ELLS students' conference serves as an international benchmark indicating the trends within life sciences universities as for the students' work.

This is the reason why, despite the impact of COVID-19 pandemic on higher education, ELLS together with its students organization ELSA decided to continue with the conference, however in the new format which will reflect contemporary conditions. We changed the format but we continue with the content. That is why for the first time the conference is organized in a new on-line format. That is why we are the pioneers participating in such format of the conference because it is for the first time. Many international conferences or congresses postponed the date of their events. ELLS decided not to change the date but to change the format and to continue with well established content. That is why we are the participants as our predecessors have been being for already 12 years.

Thanks to BOKU Vienna we organized on-line platform which enables us to hold the conference as much as similar to usual one. At the same time we know the conference will be different. We will not have the possibility for face-to-face meetings and discussions over the presented topics. We will not have real circumstances for informal face-to face talks. ELLS organizes such event in on-line for the first time. It means we do not have any experience with the new format. Because of that we all might face problems or unexpected situations. On the other hand, we have great experience with previous conferences. It is something what keeps us to be optimistic to demonstrate that life-science universities, their staff and the students are frontrunners as for the reactions to the pandemics. The lessons we will learn during this usually unusual conference will be beneficial for us both personally (each of us will learn some kind novelty in term of conferences and communication with others) and collectively (ELLS and its universities will learn how resilient are we when facing extreme disruptions of our activities). That is why unusually usual ELLS students scientific conference is the challenge during pandemic time. This conference is one of the elements in the mosaic indicating how to overcome the pandemic in academic activities.

Chair of ELLS

**Petr Sklenička (Rector of the Czech University of Life Sciences Prague)
and Michal Lošťák (Vice-rector of the Czech University of Life Sciences Prague)**

Welcome to BOKU!



Hubert Hasenauer (Rector BOKU Vienna)

As Rector of the University of Natural Resources and Life Sciences, Vienna, I am pleased to welcome you to our university – virtually, to the first online edition of the ELLS Scientific Student Conference organized by BOKU!

The focus of our university is on sustainable development and brings together scientific, technical and socio-economic topics. At BOKU science and students exchange ideas with actors from economics and politics on the sustainable development of our society. This vision complements perfectly with the ideas of the Euroleague for Life Sciences. In 2001 BOKU co-founded this network that focuses on joint teaching and learning, student and staff mobility as well as quality assurance. The annual Scientific Student is one of its key activities and aims to encourage you as a student within the field of Life Sciences to engage internationally, discuss your own research and build your international career network.

The theme of this year's conference is "The World of Tomorrow – A Green and Sustainable Society". To build a resilient and liveable future, green innovations and a bio-based economy are important pillars. As climate change pressure grows sustainable solutions for the rural and urban development are urgently needed. A major concern in modern society are food security and safety, which became especially clear during the outbreak of Covid-19. These topics will be discussed on this 12th ELLS Scientific Student Conference and I am looking forward to it!

Building a sustainable future has always been the major aim of the University of Natural Resources and Life Sciences, Vienna (BOKU). BOKU's strategy for sustainability addresses research, university teaching and is put into practice at our university as institution, e.g. by a sustainability strategy, a carbon offsetting application and various climate protection projects. We as universities bear responsibilities to force sustainable development in society, therefore I am delighted that the ELLS Conference 2020 is putting this objective into practice with its first online edition. Conferences have an enormous environmental impact, as they demand often long-distance travelling. But not solely environmental impacts are concerning: barriers, such as founding difficulties, family-commitments or disabilities make it difficult for certain people to access. A virtual conference can be an incredibly impactful tool to reduce our carbon footprint and enhance social participation. Thus, let's all embrace this format as a pioneer of sustainability and as a chance to explore innovative ways of research communication and networking!

During the conference you will listen to many interesting research results of your colleague's scientific work and maybe even give a presentation yourself. I especially recommend to use the time between the presentations: join the different networking activities prepared by the ELLS Student Association ELSA, like the ELLS Café, the SSCavenger hunt or the Pub Quiz. Improve your own skills by attending an online training. Last but not least, meet graduates who made their dream come true by founding a start-up. In other words: get inspired at this first online ELLS Conference at BOKU!

Hubert Hasenauer,

Rector of the University of Natural Resources and Life Sciences, Vienna

ORAL PRESENTATIONS

O1.1 Green innovation and circular economy: Green Plants

O1.1.a

Nickel phytomining efficiency of different hyperaccumulator species

Monika Laux, University of Natural Resources and Life Sciences, Vienna (BOKU), Vienna, Austria

StudyProgrammeLevel: Master

Nickel phytomining is a technology for extracting this metal from Ni-rich serpentine soils. It is based on the cropping of Ni hyperaccumulating plants and the recovery of the metal from these crops. The factors determining the efficiency of this agronomic method are shoot nickel concentration and harvestable biomass. LIFE-Agromine is an EU funded project to demonstrate the phytomining efficiency in four different locations across Europe and to investigate associated ecosystem services and carry out a full life-cycle assessment of cropping hyperaccumulators for nickel recovery. The Austrian part of the project focuses at a field experiment on a serpentine site near Bernstein, Burgenland. In 2019 the phytomining efficiency of four hyperaccumulator species, *Odontarrhena chalcidica* (OC) (syn. *Alyssum murale*), *Bornmuellera tymphae* (BORN), *Leptoplax emarginata* (LEPT) and *Berkheya coddii* (BERK), was evaluated in four replicates on 10 m² plots established in spring 2019. The experimental plots were fertilized with pig manure and planted at a density of 4 plants per m². After harvesting the plants were dried and the shoot biomass was determined. Representative samples were digested and the Ni shoot concentrations determined via ICP-OES. Composite top soil (0-20cm) samples of 12 individual spots were taken from each plot. Before analyses the samples were air dried and 2 mm-sieved. pH, soil moisture and extractable Phosphorous and exchangeable cations were determined. Extracts with DTPA and Sr(NO₃)₂ were accomplished to assess labile Ni fractions. Ni concentrations in plant shoots were highest in LEPT and BORN (17.5 and 17.1 mg kg⁻¹ respectively), but those species produced not even half the amount of biomass per hectare compared to OC (5.9 t ha⁻¹). Thus the highest Ni yield was achieved with *O. chalcidica*, reaching 94 kg Ni ha⁻¹. Our results therefore show that *O. chalcidica* is the best-performing Nickel phytomining plant species on the Austrian site Bernstein.

Keywords:

phytomining, hyperaccumulator plants, green technology

O1.1.b

Determination of optimal term of Polyversum application for supportment of yield and persistence of red clover

Ondřej Szabó, Czech University of Life Sciences Prague (CZU), Prague, Czech Republic

StudyProgrammeLevel: Master

Root and root necks diseases play a significant role in red clover forage production. Especially, they have important influence for persistence and yield. There are not used any synthetic fungicides because of low rentability and efectivity. These reasons are the beginning of performing of biological protection. One of this preparation, which is already registered in another crops, is Polyversum. Polyversum are oospores of *Pythium oligandrum* organism. The goal of this thesis was to discover influence of the preparation and also the optimal amount for using. Some indicators were found, especially yield, compressed sward height, indicators of root morphology and indicators of diseases damage. Two experiments have been completed at the breeding station in Větrov. The first experiment (Větrov 1) was set up in 2016. This experiment tested Polyversum in basic (treatment done in autumn) and in intensively treated variation (treatment done after each cut) in the contrast with untreated control of two varieties of red clover - Start and Callisto. It was discovered that the preparation had positive effect for root branching and for health conditions in the second year of cutting. Yield influence was statistically conclusive in the second year of cutting in advantage to intensively treated variant. The second experiment (Větrov 2) was set up in 2018. This experiment compared Polyversum in three intensities of treatments (spring and autumn treatment and treatment after each cut) with untreated control and with the variation treated by the fungicide (preparation Prosaro). It was proved that Prosaro had influence

on compressed sward height and on health conditions. Some of the parameters do not reach efficiency in comparison to autumn treatment variation. Polyversum treatment variation offers many advantages also during the dry years. These advantages probably relate not only to antifungal effect, but also to stimulation effect, which hasn't been completely discovered yet.

Keywords:

legumes, *Pythium oligandrum*, biological protection, red clover

O1.1.c

Promoting of genetic diversity as a key for resilient forest ecosystems

Radka Kelblerova, Czech University of Life Sciences Prague (CZU), Prague, Czech Republic

StudyProgrammeLevel: Master

In these days, accelerated climate change is an undeniable phenomenon. Despite the difficulty of long-term prediction trends, increased scientific attention to the molecular-biological basis associated with these factors is essential. Opposite to morphological characteristics, the genetic composition can be depicted only by molecular genetic tools. In the research connected to my master thesis, I carried out the analysis of autochthonous Norway spruce populations from Krkonose mountains (Giant Mountains, Czech Republic). The research aim was to select individuals for a new propagation population (seed orchard) in a way to maximize genetic diversity in the new generation of Norway spruce seedlings. In a difficult situation of unpredictable but irreversible changes in climatic conditions, this is the most secure way to maintain resilient and sustainable forest ecosystems. Microsatellite (SSR) markers were used to reveal the genetic profiles of almost 500 trees from the autochthonous population. Genetic diversity was described and evaluated using population-genetic software, e.g. GeneMarker to genotype and GenAlEx to obtain data about population statistics. The main part of the research was the construction of a dendrogram determining genetic distances between clones. Based on pairwise relationship coefficients, the most suitable individuals were selected into a new propagation population. I proposed several scenarios of optimal seed orchard design. The scenarios differ in the number of genotypes and their vegetative copies (ramets) used for the deployment as well as in the size of planting plots. The crucial parameters of deployment were minimization of inbreeding and maximization of panmixia. We did that using the algorithm ONA developed at our institution and used for deployment layouts worldwide. Any of the suggested seed orchard designs have the potential to produce a high proportion of genetically diverse and non-related seeds.

Keywords:

Norway spruce, SSR markers, seed orchard

O1.2 Rural and urban development for thriving communities: Shaping tomorrows rural and urban world

O1.2.a

Horse Riding Trails Design Guidelines in Chojnowski Regional Park

Paulina Olborska, Warsaw University of Life Sciences (WULS-SGGW), Warsaw, Poland

StudyProgrammeLevel: Master

Horse tourism is becoming an increasingly common form of spending free time. There is a need to travel outside the equestrian schools, mainly to the forest or other open space. In many countries, including Poland, there are no recommendations for the design of horse trails. The formulation of such rules is necessary for the safety of riders and horses, as well as other guests of the area. The purpose of my this work project is to present the arrangement of recreation area along horse trails in Chojnów Regional Park (ChRP) using develop key guidelines for shaping horse trails design. To achieve this goal, I collected the rules for designing horse trails and related recreational areas, taking into account technical as well as natural features. The

implementation of these principles is presented on the example of a rest area for riders and horses in the ChRP in Poland. Park is located very close to Warsaw. Due to its location the Park is popular among visitors: local communities and Warsaw residents. There are four riding routes in the ChRP, but there is not a single resting place for horses and riders, so I decided to design such a place along one of the most popular trails. I took into account various rules related to the distribution of objects, technical and natural aspects. The design part proposes four model solutions for resting places for riders and horses, taking into account local technical conditions - user safety, arrangement of equipment elements, style, choice of materials and natural conditions - selection of species, ground conditions. Each solution presents a division into functional zones: entry, leisure, economic, and a intended for horses. The proposed solutions ensure safety and comfort for riders, horses and other users of the Park and take into account its natural values.

Keywords:

horse riding trails, designing horse trails, outdoor recreation

O1.2.b

Fractal geometry visions in Landscape Architecture: Case study: „Gavril” Lake, Ocna Sugatag, Romania

Diana-Maria Mircea, University of Natural Resources and Life Sciences, Vienna (BOKU), Vienna, Austria

StudyProgrammeLevel: Master

The main idea of this scientific research highlights the fact that nature has always been a source of inspiration for designers in areas such as art, architecture and landscape architecture. Throughout history, the fractal concept is the support of many forms and patterns found in nature. Natural landscapes possess a lot of precision in patterns, sizes, shapes, connectivity and frequency, which is usually not noticed by a simple look. Landscape ecological studies that explore the fractal geometry of nature have found many examples of consistent variations in landscape pattern. Mandelbrot's fractal geometry is an innovation in topological space theory and provides the opportunity to describe landscapes by using mathematical calculations. The role of a landscape architect is to create a connection between the calculated fractal forms and those existing in nature, which are formed spontaneously. An automated design system allows fractals to be created interactively and instantly overlaid on existing images or maps. The connection between computerized fractal models and environmental simulation methods can enhance both ecological relevance and aesthetic value of the landscape. Starting from this scientific argumentation, this paper is intended to be a practical application of this concept, on the green space of Salt Lake "Gavril", Ocna Sugatag village, Maramures County, Romania.

Keywords:

Concept, Fractal geometry, Design, Environment, Landscape

O1.2.c

Sustainable place shaping in protected urban nature: a case study about a climate adaptation project in Denmark

Xiaowen Zhang, University of Copenhagen, Faculty of Science (SCIENCE), Copenhagen, Denmark

StudyProgrammeLevel: Master

Storkeengen is a protected nature area in Denmark characterized by a complex landscape type including river, wetland and urban ecosystems and it requires long-term adaptation to sea-level rise and storm water flooding. The physical shaping of Storkeengen is achieved by nature-based adaptation for climate change in terms of constructed wetlands to manage the water and recreational opportunities to secure improved health outcomes for local communities. However, converting a protected nature area into a climate adaptation project is controversial, and includes processes of contrasting place shaping that calls for analyses on how key stakeholders relate to the Storkeengen as a place in a social-ecological system perspective.

Place values and place meaning constitute the inner dimension of this place shaping process. They are highlighted in this study to understand how actors can better interpret place values in Storkeengen and make “sense” of this place to the local community. The study also presents an analysis of stakeholders’ interests, opinions and relationships in this climate adaptation project, and a further exploration on how actors can play a role in leading public participation and making sound decisions.

This case study reveals that how actors frame this project as a place influence public idea about Storkeengen as a place. It also suggests that a place should be framed in a more symbolic, socio-cultural and identity-expressive way to target different governmental needs of e.g. resolving conflicts and achieving a broader social acceptance. Eventually, the findings lead to a deeper understanding of how to increase social and ecological resilience when a place-based trajectory in urban environment is designated in responding to global agendas such as climate adaptation, biodiversity improvement, and sustainable development.

Keywords:

Nature-based solutions, Place-based approach, Climate adaptation, Stakeholder involvement, Urban development

O1.3 Food and health for the next generation: Food safety and health

O1.3.a

False identification of *Macrocooccus caseolyticus* as *Staphylococcus aureus*

Weronika E. Górecka, Warsaw University of Life Sciences (WULS-SGGW), Warsaw, Poland; **Joanna Pławińska-Czarnak**, Warsaw University of Life Sciences (WULS-SGGW), Warsaw, Poland; **Magdalena Rzewuska**, Warsaw University of Life Sciences (WULS-SGGW), Warsaw, Poland; **Magdalena Kizerwetter-Świda**, Warsaw University of Life Sciences (WULS-SGGW), Warsaw, Poland

StudyProgrammeLevel: Master

Staphylococcus aureus may be the causative agent of many cases of infections and severe food poisoning; therefore, its presence in foods is of major concern. Accurate and quick identification of *S. aureus* in diagnostic laboratories is extremely important due to the reliability of the results obtained and the selection of appropriate guidelines for determining the antimicrobial resistance of the isolated strain. In general, the recognition of this species in bacteriological laboratories is based on colony and cell morphology, catalase, and coagulase production, and if used, on the results of commercial latex tests for the identification of *S. aureus*. Accurate identification of atypical strains requires the use of molecular biology methods, which is impossible to apply routinely in diagnostic laboratories. In this study, we compared efficacy of routine phenotypic identification methods with the results of 16S rRNA gene sequencing for the identification of *S. aureus*. **Materials and Methods:** A total number of 31 staphylococcal isolates were obtained from the raw meat samples (beef, pork, and chicken meat). Staphylococci were evaluated using cell and colony morphology, catalase, and oxidase activity, and tested with the agglutination SlidexStaph test (BioMérieux). All isolates recognized in agglutination test as *S. aureus*, but oxidase-negative, were subjected to identification using 16S rRNA gene sequencing. **Results:** All 31 isolates showed cell and colony morphology as well as catalase activity typical for staphylococci. All of them were recognized as *S. aureus* using the SlidexStaph test. Seven (22,6%) isolates were oxidase-positive and identified as *Macrocooccus caseolyticus* using 16S rRNA gene sequencing. **Conclusion:** Rapid diagnostic agglutination tests used for the identification of *S. aureus* may give false-positive results, therefore the results of such tests should be interpreted carefully and confirmed by performing other tests, such as oxidase production.

Keywords:

Staphylococcus aureus, identification, Macrocooccus

O1.3.b**Plant-based diet and depressive symptoms in a selected group of women***Katarzyna Łożyńska, Warsaw University of Life Sciences (WULS-SGGW), Warsaw, Poland***StudyProgrammeLevel:** Bachelor

Data was collected between November 2019 and January 2020 via the Computer-Assisted Web Interview method in a group of 416 people. From them 342 participants who met inclusion criteria (female, age 18-50 years old and being on a vegetarian or vegan diet) were included in the study. Food intake was assessed by a food frequency questionnaire. The validated Five Well-Being Index (WHO-5) and Patient Health Questionnaire (PHQ-9) were used to assess well-being. The WHO-5 test ranges 0-25 and the score <13 points means poor well-being; the PHQ-9 test ranges 0-27 and the score <5 indicates the lack of depression symptoms. The most of women included in the study were on vegetarian diet (63.5%). Based on the WHO-5 test, 56.8% of women on vegan diet and 45.6% of those on vegetarian diet were classified to well-being group, based on the PHQ-9 test the lack of depression symptoms were observed in 48.0% of vegan and 31.3% of vegetarian women. Vegetarian women with good versus poor well-being (WHO-5 test: ≥ 13 versus < 13 points) more frequently consumed vegetables (2.43 ± 1.08 vs 2.14 ± 1.05 times/day), whole grains (1.81 ± 1.01 vs 1.30 ± 0.94 times/day), legumes (0.91 ± 0.84 vs 0.58 ± 0.60 times/day) and meat substitutes (0.30 ± 0.52 vs 0.20 ± 0.39 times/day), while vegan women more frequently consumed fruit (1.92 ± 1.02 vs 1.59 ± 1.12 times/day) and nuts (1.03 ± 0.84 vs 0.73 ± 0.67 times/day) (Mann Whitney test, P-Value ≤ 0.05). Vegetarian women without versus those with moderate/severe risk of depression (PHQ-9: < 5 versus ≥ 10 points) more frequently consumed legumes (0.90 ± 0.81 vs 0.60 ± 0.64 times/day) and less frequently fermented dairy (0.51 ± 0.73 vs 0.57 ± 0.64 times/day). Similar associations were not found in vegan. In conclusion, statistically significant associations between frequency of consumption of plant foods and well-being were found especially in vegetarian women. There is a need for conducting big cohort studies to determine the cause-effect of plant-diet on well-being.

Keywords:

depression, vegan, vegetarian, well-being, women

O1.3.c**Evaluating Food Safety Institutions in Nigeria using Genetically Modified (GM) cowpea Market Introduction as a Case study***Rukayya M. Mahe, University of Hohenheim (UHOH), Stuttgart, Germany***StudyProgrammeLevel:** Master

Food safety is gaining attention due to the increasing challenges posed by longer food value chains in global trade. In 2018, Nigeria lost about \$6 billion in healthcare expenditure and lost productivity due to unsafe food. In the same year, the country introduces a Genetically Modified (GM) cowpea into the local market. Strengthening food safety regulations could reduce medical expenditures, boost a healthy labor force, and improve access to trade. Thus, the objective of this research is to: describe the structure of the national food safety regulatory institutions and assess their capacity to enforce compliance in-conformity with the Sanitary and Phytosanitary Standard (SPS) dimensions of risks analysis; review the follow-up process of the GM cowpea market introduction. The empirical strategy uses Toulmin's model of argumentation, to make implicit information behind the Nigerian government and the civil society arguments on the issue explicit. The research results reveal duplication of roles amongst the regulatory institutions as well as fragmentation of high risks areas including the informal market activities in digital data management. Issues affecting institutional capacity include inadequate funding, infrastructure, and technical know-how. Findings also reveal that the Nigerian government's aim for the GM cowpea release to the local market was to assist smallholders from seasonal losses. However, the process followed was not in conformity with the 2005 national biosafety law. This study recommends a clear distinction among the food safety regulatory institutions, in terms of their areas of coverage for the delegated roles. This would ensure efficient allocation of food safety regulatory budget and resources to reach all areas along the food supply chains from farm to fork. Moreover, openness in the policy decision-making process and provision for transparent risks communication would play a key role in building public trust in the regulatory institutions and acceptance of GM cowpea in Nigeria.

Keywords:

Nigeria, Food safety, Risks, Health, Institutions

O1.4 Innovations in Life Sciences: Green Technologies

O1.4.a

Machine learning and drone-based remote sensing for species identification

Adriana S. Riemenschneider, University of Hohenheim (UHOH), Stuttgart, Germany

StudyProgrammeLevel: Master

On-the-ground environmental and conservation monitoring can be expensive and time-consuming, often involving long-distance travel, extensively trained personnel, and transportation of sensitive equipment. Remote sensing technology can offer an alternative solution to this issue; however, conventional satellite images are broad in area coverage and spectral information but limited in terms of resolution and tailoring to individual requirements. Camera drones have become increasingly accessible and affordable and can be used to capture high-resolution images of selected areas at specific times or sequences to obtain the best bespoke product. In addition, machine learning tools allow much of the time-consuming image classification work to be automated. With that in mind, I set to explore the potential for using drone-captured images and machine learning techniques (Random Forest) in remote species identification. I used high-resolution (0.01 m x 0.01 m) orthophotos created from drone images of three study sites in the Cape Floristic Region of South Africa, and calculated summary statistics for each plant, describing each of the visible bands (RGB) as well as seven other derived indices (HSV, plus four vegetation indices). Part of this data was used to train the algorithm, and the rest to test its image classification accuracy, supported by ground-truth data collected by experts and by cross-validation to account for uncertainty. The results allowed me to determine which spectral variables best demonstrate the interspecific variance across study sites, and which were most important in image classification (species identification). I show that the algorithm can be used to classify new sites with different phenologies and photographed in different lighting conditions, enhancing the transferability of this workflow. Further, I show that affordable camera drones, combined with open-source software, can produce remarkably accurate species classification, promising time- and cost-effective remote sensing solutions for many applications.

Keywords:

remote sensing, machine learning, drone, image classification, vegetation indices

O1.4.b

Academics in the air - Analysing air travel behaviour and intentions to reduce air travel among university employees

Magdalena Lindgren, University of Copenhagen, Faculty of Science (SCIENCE), Copenhagen, Denmark

StudyProgrammeLevel: Master

By 2050 the aviation industry is predicted to have major impact on the global GHG levels, between 15 - 40 %, and flying is one of the high emitting behaviours people can change to reduce their ecological footprint regarding CO2 emissions. Universities have a specific opportunity to lead the way in terms of reducing air travel for business reasons since researchers often use a lot of air travel within their work. Although universities have extensive knowledge about how harmful flying is for the climate this way of traveling remains normalized within academia. At the University of Copenhagen (UCPH) sustainability is high on the agenda according to the Green Campus report 2020. Therefore, this study investigates how much and for what reasons employees at UCPH use air travel and by applying the theory of planned behaviour (TPB) analyses if there are any intentions to reduce air travel among the employees. Data was collected through a survey study presented to employees actively conducting research at UCPH. The data was statistically analysed by performing a Kendall's tau test and a logistical regression analysis. The results are predicted to display if age, gender or

faculty association impacts the three TPB factors (attitude, subjective norms, perceived behavioural control) and if these three factors can predict intentions to reduce air travel for business related reasons among the employees at UCPH. This study aims to create a possibility to implement travel policies that could benefit universities striving to become more sustainable. At the same time the results would create a possibility to take in consideration employee's conditions and needs regarding how much and what kind of travel is needed to produce high quality scientific research in these policies.

Keywords:

Air travel, Academia, Theory of Planned Behaviour, University of Copenhagen

O1.4.c**Response of Vermicompost and Gibberellin on Bitter Gourd Production in the Water Surface of Fish Pond**

Sourav Modak, University of Hohenheim (UHOH), Stuttgart, Germany

StudyProgrammeLevel: Master

A field experiment was conducted to determine the response of vermicompost and gibberellin on bitter gourd production in the water surface of the fish pond (variety- Rani pukur) from March to June 2019 at the Horticulture farm of Sher-e-Bangla Agricultural University, Dhaka. The experiment was considered by two factors. Factor A: vermicompost (3 levels) viz. (i) 90% coco peat + 10% broken bricks (V_0), (ii) 30% vermicompost + 60% coco peat/pot + 10% broken bricks (V_1) and (iii) 60% vermicompost + 30% coco peat/pot + 10% broken bricks (V_2) and Factor B: GA_3 (2 levels) viz. (i) 0 ppm GA_3 (Control) (G_0) and (ii) 40 ppm GA_3 (G_1). It was laid out in the two factors Randomized Complete Block Design (RCBD) with three replications. Regarding vermicompost, V_2 (60% vermicompost + 30% coco peat/pot + 10% broken bricks) showed higher growth and yield and resulted in the highest fruit yield (21.58 t ha^{-1}) compared to control (11.97 t ha^{-1}). In terms of GA_3 application, the highest fruit yield (19.35 t ha^{-1}) was found from G_1 (40 ppm GA_3) whereas the lowest (14.62 t ha^{-1}) was from control treatment G_0 (0 ppm GA_3). Considering interaction effect, V_2G_1 showed the highest fruit weight pot^{-1} (1783 g) and fruit yield (24.76 t ha^{-1}) whereas the lowest fruit weight pot^{-1} (945.60 g) and fruit yield (10.80 t ha^{-1}) were obtained from V_0G_0 . It can be concluded that a higher rate of vermicompost with the optimum level of GA_3 application was effective for bitter gourd cultivation in floating agriculture

Keywords:

Organic, Floating cultivation, Eco-friendly

O2.1 Green innovation and circular economy: Green Products**O2.1.a****Toward robust biodegradable food packaging materials**

Geertje Terhaerd, Wageningen University and Research Centre (WUR), Wageningen, the Netherlands

StudyProgrammeLevel: Master

Plastic waste is one of the greatest problems of our times. Bioplastics like poly lactic acid are proposed as alternative to their fossil counterparts, but their poor mechanical and barrier properties hamper application in food packaging. Addition of nanoparticles has been claimed to improve these properties most effectively when homogeneously distributed through the polymer matrix. This is a challenge due to poor compatibility between the nanoparticles and polymer matrix. In the current study, we aimed to improve the compatibility between PLA and chitin nanoparticles by surface modification. Various fatty acids with differing carbon chain length (C4-C18) and degree of saturation (only C18) were attached to the nanoparticles that were produced through acid hydrolysis of shrimp chitin powder. For the modification, we used Steglich esterification with coupling agent 1-ethyl-3-(3-dimethylaminopropyl)-carbodiimide and catalyst 4-dimethylaminopyridine. This combination is well-known for its efficiency under mild conditions, yet never applied for the modification of

biobased particles. Ester linkages with all fatty acids were formed, as confirmed with FT-IR spectroscopy. The hydrophobicity became higher upon modification, as shown via wettability tests in different solvents. These effects were more pronounced for the longer fatty acids. Fatty acid chains of ≥ 12 carbons seemed to form fewer ester bonds, and we expect that this is due to steric effects. Nevertheless, this was not shown in their phase behaviour, in fact an increased hydrophobicity was observed with increasing carbon chain length. Nanocomposites with modified NPs were produced via solvent casting. Modification improved the dispersibility, where modifications with C4:0, C8:0 and C12:0 seemed most promising. We have shown that direct esterification with fatty acids is an effective way to tune the hydrophobicity of chitin nanoparticles. In doing so, they become promising additives for PLA and can be seen as an essential step towards biobased packaging with improved functionality for food applications.

Keywords:

Nanoparticles, Bioplastic, Chitin, nanocomposite, hydrophobicity

O2.1.b**Evaluation of sustainable and safe lubricants from plant-feedstocks**

Rosa M. Eder, University of Natural Resources and Life Sciences, Vienna (BOKU), Vienna, Austria

StudyProgrammeLevel: Master

Due to the need to use energy efficiently, film-forming friction modifier additives are widely used in industrial machines to reduce friction and to decrease wear appearances. Ecologically harmless lubricants meant for skin contact have been available on the market for decades, as even in ancient times olive oil was used. Consequently, the question emerges why such lubricants are not yet widely used for machine application. This work aims at the evaluation of sustainable and innocuous lubricant additives used for different industrial applications, reaching from the automotive industry to devices used for e.g. food production. For this purpose, friction modifiers based on natural raw materials [FR1] were compared to conventionally used friction modifiers with petrochemical origin in lubricants. A set of step-by-step instructions leading to an internal standard operating procedure (SOP) was performed to obtain reliable data using the rheometer MCR302. The method was designed under variation of normal force [N], temperature [°C] and sliding speed [m/s]. Repeatability tests and accuracy determinations enclose the method development of the rheometer MCR302. Lab-based aging of these lubrication additives and re-analysis, provided information on the aging behavior. A biocompatibility assessment proposed information on lubricant additives and their influence on living organisms. The performed comparison is an important starting point, indicating the advantages and disadvantages of both bio-based and conventionally used friction modifiers and thereby presents a step in the right direction towards developing innovative sustainable technological solutions in lubricant research. Grant references: This work was funded by the project COMET InTribology, FFG-No. 872176 (project coordinator: AC2T research GmbH, Austria).

Keywords:

Lubricants, Lubricant additives, Friction modifier, Plant-feedstocks, Sustainable

O2.1.c**Breathable insulating composites from textile industry wastes - more sustainable economy in production plants**

Aleksandra Ježo, Warsaw University of Life Sciences (WULS-SGGW), Warsaw, Poland

StudyProgrammeLevel: Bachelor

The aim of the study is to produce thermally and acoustically insulating composites from textile industry wastes. Textile factories produce such wastes as: cotton, wool, flax, but also polyester, acrylic, polyamide, polypropylene. The Author wants to find the optimal technological process, that would be easy and cheap enough to adapt in textile factories, which could produce such insulation composites themselves, but the technology should be also ready to introduce in any other branch. The idea of technology is to mix textile fibers

with resin (both, fibers and resins of natural origin, but also other will be tested) and waste and/or post-used foamed polystyrene granulate (for example Styrofoam) and then form it into an appropriate shape. The produced composite advantage, when compared to regular foamed polystyrene, is, that the newly projected composite will combine the benefits of natural origin insulating materials, as moisture diffusion is, with foamed polystyrene advantage - high insulating properties. Such solution would allow not only to reduce wastes, improve materials recycling, but also to minimize the costs of insulation materials production and decrease polystyrene share in insulation-board manufacturing. Economic benefits for company, and ecologic advantages for Society, when apply mentioned technology: •the final product could be sold by the factory and provide additional financial benefits; •textile companies will reduce the waste transportation and costs of waste external utilization (environment-friendly itself). The advantage of this project will be sharing pro ecological and sustainable economy thinking and finding environment-friendly solutions in different industry-paths. This project is about to show that industry (in this case textile-industry) is able to upcycle and reuse its wastes on their own in easy and cheap way.

Keywords:

upcycling, textile industry waste, textile fiber reuse, insulation board, polystyrene

O2.2 Rural and urban development for thriving communities: Climate adaptation strategies in regional development

O2.2.a

Tracing the links between forests and terrestrial precipitation: Case of four city areas in the Czech Republic

Swati Surampally, Czech University of Life Sciences Prague (CZU), Prague, Czech Republic

StudyProgrammeLevel: Master

The regulatory ecosystem services of the forests and their influence on the atmospheric water cycle has been underestimated until recently. Hence there is an urgent need to draw the attention towards this function of the forests as it may help understand the current events of severe floods and draughts across the globe caused by disrupted hydrological cycles at both global and local scales. The main goal of this study is to analyse the relationship between the changes in the forest-cover and changes in the precipitation amount and patterns (at a local scale) within a 10 km buffer around four different cities in the Czech Republic - Most, Prague, Třeboň and Brno. Climatic trends were determined for each of the study areas based on 55 years (1961-2016) of climate data sourced from the Czech Hydrometeorological Institute and land-use changes were determined based on 28 years (1990-2018) of land cover data sourced from the Corine Land Cover project by European Environmental Agency. Statistical tests were employed to determine the annual and seasonal trends within each study area and then juxtaposed with the land cover data to ascertain the forest-precipitation correlation. Although the analyses revealed no statistically significant trends, neither for precipitation nor for forest cover, yet positive relationships were evident between the land-cover (typology and proportions) and local climatic conditions when the four study areas were compared, given that the climatic zones and elevation of the four study areas are similar. The analyses of land cover and precipitation trends done in this study are crucial to help shift our focus from carbon-centred role of the forests to hydrological based ecosystem service of the forests which will enable us to mitigate the water crisis by landscape planning strategies rooted from a sound understanding of the landscape ecology.

Keywords:

Urbanization, Hydrology, Land-cover, Climate, Forests

O2.2.b**The impact of meteorological conditions and spatial distribution on particulate matter concentrations in Vienna**

Inessa N. de Hartog, University of Natural Resources and Life Sciences, Vienna (BOKU), Vienna, Austria, University of Copenhagen, Denmark

StudyProgrammeLevel: Master

Ambient air pollution is one of the biggest threats to human health over the whole world. One of the most important forms of ambient air pollution is particulate matter (PM), within this the PM_{2,5} and PM₁₀ will be analysed. The concentrations of PM are highly impacted by weather conditions as well as local variations. This research aims to look at to what extent weather conditions and spatial distribution affect the PM₁₀ and PM_{2,5} concentrations, within the city of Vienna, Austria. The results show that certain weather conditions like wind direction, wind speed, cyclonic conditions, precipitation, and humidity have a significant impact on the PM₁₀ and PM_{2,5} concentrations. Furthermore, analysis has been done on the impact of spatial distribution on the PM concentrations, the results show differences in PM concentrations near green spaces compared to more dense urban areas with busy roads and built-up areas. These mobile measurements will be done in the winter months and the summer months to see if there is a difference in the PM concentrations with the seasons. The mobile measurements indicate that the location of the measurements is highly correlated to the PM concentrations. The results show that the combination of weather events and the spatial distribution of PM affect the concentrations significantly.

Keywords:

Air pollution, Particulate matter, Meteorological conditions, Spatial distribution

O2.2.c**Effects of afforestation and crop systems on the water balance in the Ethiopian Highland**

Rebecca N. ter Borg, Swedish University of Agricultural Sciences (SLU), Uppsala, Sweden

StudyProgrammeLevel: Master

Due to agricultural intensification the land use of the Upper Blue Nile is rapidly changing with potential effects on the water availability within- and downstream regions. Long-term downstream and within basin water management and trade-off could be better negotiated if calibration/validation data is available for modelling complex land use change and water balance impact. In the studied watershed in Fagita Lekoma, Ethiopia agriculture has changed significantly from an annual cropping to an afforestation system over a 20-year period. Today >45% of the watershed is covered with cultivated with the introduction of the *Acacia decurrens* together with 15 % of natural forest. The soil water assessment tool (SWAT), a distributed dynamic model was set up to analyse the effects of land use change on the landscape water balance and sediment yields. A control, a control with improved soil water conservation (SWC) practices and the land use with the afforestation were simulated. The modelling resulted in some unexpected changes on the actual evapotranspiration (ET_a) and surface runoff between the control and afforestation practices. A higher ET_a and a lower surface runoff were expected due to a high biomass density of the plantations. Both afforestation and the control+SWC for 30-year water balance results showed marginal runoff reduction, but substantial reduction in the overall sediment yields of the watershed from 26.5 to 15.5 t ha⁻¹ y⁻¹. However croplands remains prone to soil erosion. The water balance has shown to be sensitive to the designed growth response parameters of the *Acacia decurrens* and they have likely affected the modelled water balance. This work suggest that large benefits of afforestation or SWC can be gained in reduction of sediment loads downstream. Secondly, lack of long-term climatic and environmental monitoring at landscape scale hampers model application, especially water flows in surface and groundwater.

Keywords:

land use change, afforestation practices, landscape water balance, Fagita Lekoma, Ethiopia, SWAT modelling

O2.3 Food and health for the next generation: Plant production for healthy food

O2.3.a

Effects of an oil-in-water emulsion on the pathogenic interaction between *Metarhizium brunneum* and *Spodoptera littoralis* larvae

Nitsan Birnbaum, Hebrew University of Jerusalem, Robert H. Smith Faculty of Agriculture, Food and Environment (HUJI), Agriculture research organization, Beit Dagan, Israel

StudyProgrammeLevel: Master

Entomopathogenic fungi (EPF) are a polyphyletic group, occupying niches throughout the world from tropic to arctic. The genus *Metarhizium* (Hypocreales: Clavicipitaceae) is a well-studied EPF, widely used commercially, for its broad spectrum and its ability to grow both as a saprophyte and a hemibiotroph. As EPF infect insects by penetrating directly through its cuticle, low relative humidity may restrict them to favorable habitats, i.e. greenhouses or soil. The use of oil-based formulations improves EPF's efficacy under low humidity. This study examines the mechanisms of improved infection of *M. brunneum* formulated in paraffinic oil-in-water Pickering emulsion. Larvae of the model pest *Spodoptera littoralis* were exposed to leaves treated with *M. brunneum* conidia in an aqueous formulation, and in an oil in water emulsion in various humidities. Larval mortality and sub-lethal effects were scored, as well as fungal spatial distribution on the leaf, adhesion to the larval cuticle and fungal development over time. Conidia in emulsion induced significantly greater mortality than conidia in aqueous solution, reaching up to 95% mortality after five days at high humidity. Furthermore, the emulsion improved conidial dispersal on the leaf and induced greater adhesion to the larvae's cuticle. The emulsion caused significant lesser feeding of larvae and a stunted development. Though conidia in the aqueous formulation tended to develop more rapidly in the early stages of infection, conidia in emulsion developed significantly better in the later stages of infection. These findings show that emulsion formulations can improve the action of EPF by increasing conidial viability in low humidity, improving physical interface and by weakening the insect host. This study demonstrates the importance of formulations, as a physical carrier and an active agent for pest control.

Keywords:

Microbial pest management, Integrated pest management, *Metarhizium*, *Spodoptera*, Pickering emulsion

O2.3.b

Building knowledge for coffee agroforestry: preferred shade tree species and ecosystem services in Turrialba, Costa Rica

Hummer Katja, University of Copenhagen, Faculty of Science (SCIENCE), Copenhagen, Denmark

StudyProgrammeLevel: Master

Shade trees in coffee agroforestry systems deliver a range of ecosystem services that are important for climate change adaptation and climate resilient coffee production. Benefits provided by ecosystem services are especially important for smallholder coffee producers because of their potential to enhance agricultural production, households' food security and farmers' livelihoods. This study investigates farmers' local ecological knowledge about shade trees and the delivered ecosystem services by means of a survey in Turrialba, Costa Rica. The compilation of local preferences for shade tree species will be used to support future decisions and improve the on-farm tree composition in small-scale agroforestry systems. A great variety of tree species was found in the study area, for which farmers identified 12 ecosystem services and 6 disservices. Shade and soil improvement have been described as the most important ecosystem services and are provided by most of the shade tree species. The most common species were *Erythrina poeppigiana*, providing mainly shade and soil improvement, and *Musa* spp., providing predominantly shade and fruit. Preliminary results show that farmers value shade trees in coffee plantations because of the improved production conditions, economic value and potential for auto consumption. Furthermore, results indicate that farmers are aware of various ecosystem services while being less aware of disservices, suggesting that farmers have an overall positive image of the trees used in their plantations. *E. poeppigiana* contributes to an enhanced agricultural production while *Musa* spp. improves food security and provides economic benefits. The collected local ecological knowledge

suggests that within the study area, *E. poeppigina* and *Musa* spp. contribute either directly or indirectly to farmers' food security and livelihoods. Acknowledging the diversity of producers' needs, the species discussed above show the potential to secure a sustainable and climate resilient coffee production system.

The research grant by William Demant Fonden is greatly appreciated.

Keywords:

ecosystem services, coffee agroforestry, local ecological knowledge, food security, sustainable agriculture

O2.3.c

Spectral assessment of chickpea plant traits under different irrigation regimes

Roy Sadeh, Hebrew University of Jerusalem, Robert H. Smith Faculty of Agriculture, Food and Environment (HUJI);, **Assaf Avneri**, Hebrew University of Jerusalem, Robert H. Smith Faculty of Agriculture, Food and Environment (HUJI), **Yaniv Tubul**, Hebrew University of Jerusalem, Robert H. Smith Faculty of Agriculture, Food and Environment (HUJI);, **Ran Latif**, Department of Weed Research, Agricultural Research Organization (ARO), Neve Ya'ar Research Center, Ramat Yishay, Israel; **Shahal Abbo**, Hebrew University of Jerusalem, Robert H. Smith Faculty of Agriculture, Food and Environment (HUJI); **David Bonfil**, Field Crops and Natural Resources Department, Agricultural Research Organization, Gilat Research Centre, Gilat, Israel; **Zvi Peleg**, Hebrew University of Jerusalem, Robert H. Smith Faculty of Agriculture, Food and Environment (HUJI);, **Ittai Herrmann**, Hebrew University of Jerusalem, Robert H. Smith Faculty of Agriculture, Food and Environment (HUJI),

StudyProgrammeLevel: Master

Chickpea (*Cicer arietinum*) is an important legume crop worldwide. Chickpea seeds are an excellent source of proteins (>20%). Water-stress is a major constraint to the plant's productivity. Global climate change has led to greater aridity resulting in high fluctuation in precipitation. Thus, improved ability to spatially assess plants' water status and irrigation efficiency is a tool for breeders in the search for drought tolerant lines. The current study aimed to assess leaf water potential (LWP), leaf area index (LAI) and overall yield by space borne and ground spectral sensors. During the growing seasons of 2018-2019 and 2019-2020 field experiments were conducted in three locations, representing different climatic conditions in Israel. Five irrigation regimens were implemented in Gilat research station and commercial fields in Kibbutz Or-HaNer and Kedma. Plants were characterized weekly for LWP, LAI and dry matter while yield was determined at the end of the season by harvest. Canopy reflectance was measured with 11 spectral bands of the VEN μ S satellite and hyperspectral ground level, dual-field of view system. The spectral images and hyperspectral data were preprocessed to the level of reflectance and divided to calibration and validation datasets. The calibration datasets were analyzed to build models for traits assessment and the validation datasets were used for independent validation of these models. The PLS-R analysis for hyperspectral ground level data for LWP, LAI and yield from 2018-2019 models resulted in R² and RMSEV of 0.73 and 0.177 MPa; 0.80 and 0.896 m²m⁻²; and 0.77 and 0.504 tha⁻¹. The data for 019-2020 is being processed in order to validate the season's results. In conclusion, it appears that VEN μ S and hyperspectral ground level data are useful for measuring morpho-physiological traits and yield in chickpea and can potentially contribute to improved agricultural management.

Keywords:

hyperspectral, chickpea, irrigation, stelite, yield prediction

O2.4 Innovations in Life Sciences: Innovative approaches in food production

O2.4.a

Peptides Derived from Cereal Bran Protein and Their Functionality and Characterisation

Xi P. Gong, Lincoln University (LU), Christchurch, New Zealand

StudyProgrammeLevel: PhD (1st year)

During seed germination, proteases presented in seed are activated and cleave storage protein in aleurone layers into functional peptides which are required in the seed metabolisms. Based on a number of journal articles and literature reviews, the pepsin-pancreatin and pepsin-trypsin digestion model, the commercial enzymes and the natural plant enzymes were used to cleave bran storage protein to peptides exerting beneficial impacts on human health including antioxidant, anticarcinogenic, anti-diabetic, anti-inflammatory and angiotensin I converting enzyme (ACE)-inhibitory activities. Protein hydrolysis cleaves storage proteins at either C-terminal or N-terminal of peptide bonds producing unique peptide sequences with various nutritional and functional properties as well as amino acids with aromatic, hydrophobic and charged ends. The sequence and amino acid composition of peptides were considered as the primary cause of the beneficial properties. In my research, storage proteins in cereal bran were extracted at alkali conditions and the iso-electric precipitation was employed to collect the soluble protein concentrates. Enzymes and the simulated digestion trial were used on these protein concentrates to obtain hydrolysates with the optimum antioxidant activity. The degradation of the protein bands was clearly shown on the SDS-PAGE gel. The next phase of my research will be focusing on the interaction of the antioxidant properties of hydrolysates and their anti-diabetic properties. The inhibition property of hydrolysates will be investigated by conducting amylose, glucosidase and DPP-IV inhibition assay. Hydrolysates with the optimum activity will be separated and purified to obtain one or a pool of peptides for structure characterisation. The cell-line work and rodent model will be employed to discover the regulator role of bran peptides against diabetes.

Keywords:

Cereal bran peptides, Antioxidant, SDS-PAGE, Characterisation, Nutritional Benefits

O2.4.b**Extrusion of grass silage and its effect on feed intake, milk production and ingestive behaviour of dairy cows**

Markos Managos, Swedish University of Agricultural Sciences (SLU), Uppsala, Sweden

StudyProgrammeLevel: Master

Forage is the main crop in Sweden, however, its restrictive role on feed intake limits the total inclusion in the diet of a dairy cow. This study investigated the effect of extrusion on grass silage intake, milk production, ingestive behaviour and rumen pH. Eight Swedish Red dairy cows in mid/late lactation were fed grass silage of early or late harvest, extruded silage or control diet, in a 4x4 Latin square design with four periods of three weeks. Diets were supplemented with a mix of soybean meal, compound feed and minerals. Extrusion resulted in a significant increase in silage Dry Matter (DM) intake by 1.87 kg/d and a significant decrease in physical effective Neutral Detergent Fibre (NDF) intake by 1.37 kg/d. Milk yield and energy corrected milk increased significantly by 1.32 kg/d and 1.89 kg/d respectively. Extrusion resulted in decreased average rumen pH by 0,1 units, increased the time rumen pH was below 5.8 by 2.97 h/d but did not affect the area under the curve for this pH cut-off point. Extruded diets resulted in increased silage DM eating rate by 20.3 g/min, decreased silage daily eating time by 0.6 h/d and decreased rumination time by 1.96 h/d. Additionally, rumination and chewing time per kg of silage NDF intake decreased significantly by 18.9 min/kg and 26.3 min/kg respectively. Overall, extrusion increased silage intake, eating rate and milk production but decreased chewing activity.

Keywords:

Extrusion, Grass silage, Milk production, Rumen pH, Ingestive behaviour

O2.4.c**Effects of melatonin on cryosurvival of ram semen samples**

Lea Enenkelová, Swedish University of Agricultural Sciences (SLU), Uppsala, Sweden

StudyProgrammeLevel: Master

The composition of the ram sperm membrane creates problems during cryopreservation. Production of reactive oxygen species, which are by-products of metabolism, increases during freezing and thawing, causing

damage to sperm membranes and acrosomes as well as affecting mitochondrial activity. This results in a poor post-thaw yield of viable, morphologically normal spermatozoa for insemination. In the present study, we investigated the effect of melatonin addition and semen centrifugation through a single layer of a species-specific colloid (Ovicoll) on the quality of frozen/thawed ram semen samples. Ejaculates from autochthonous Jezerško-Solčava rams were available for this study (n=20). Melatonin in a volume of 1 mM was added to the Tris-based-egg yolk extender of half of the samples prior to freezing. Sperm motility, viability and morphology were analysed 0, 3 and 6 hours after thawing. Membrane integrity was evaluated by HOST (hypoosmotic swelling test). The recovery rate was significantly higher ($p < 0.01$) in the treatment group (melatonin addition) in comparison with the control group. Melatonin addition also significantly improves sperm motility ($p < 0.05$), progressive motility ($p < 0.01$), membrane integrity ($p < 0.001$) and normal morphology ($p < 0.001$). These parameters are indicators of functional spermatozoa, possibly being able to reach and fertilize the oocyte. However, melatonin did not improve viability and acrosome integrity. In conclusion, melatonin addition can help to protect ram spermatozoa against cryodamage, possibly by preventing attack by reactive oxygen species.

Keywords:

Melatonin, Single layer centrifugation, Cryopreservation, Jezerško-Solčava sheep, Spermatozoa

O3.1 Green innovation and circular economy: Green Resources

O3.1.a

Measurement of the stable isotopes of water in plant parts using the water-vapor equilibrium method

Sabrina Santos Pires, University of Natural Resources and Life Sciences, Vienna (BOKU), Vienna, Austria,

StudyProgrammeLevel: Master

Stable isotopes of hydrogen and oxygen ($\delta^2\text{H}$, $\delta^{18}\text{O}$) are widely used as effective tracers enabling the study of processes in the water cycle. Water is an important limiting factor for plant development, therefore, a better understanding of the ecosystem-water relations is crucial. Traditional methods for obtaining plant water sources information are laborious and challenging. The new water-vapor equilibrium method (WVEM) for measuring the stable isotopes of soil-water was adapted to plant-water in this study. Tomatoes and strawberries were grown in controlled conditions until fruiting, then plant material samples were analyzed by a laser spectrometer (Picarro L2130 -i). The project goals were: testing the use of this method to measure stable water isotopes of plants and establishing a protocol of best practice by analyzing different plant parts (roots, stem, leaves, and fruits), best preparation technique (cutting/grinding), ideal equilibrium time (24h, 48h, 72h), fruit parts isotopic difference, and the amount of material per sample to ensure accuracy. Biogenic gases and volatile organic compounds (VOCs) were analysed because their presence in the samples induces biased isotopic results. The most reliable results were: 24h of equilibrium time, cutting the material, 3g of roots/fruits, and 5g of leaves/stems per sample. Both plant species presented gradual isotopic enrichment of the irrigation water from roots to stem and leaves. Their fruits showed the inside isotopic composition more similar to the irrigation water than the outside. The intersection of the dual-isotope plot of the measured samples with the local meteoric water line plotted very close to the irrigation water enabling source water investigation. This project provides guidelines for measuring stable water isotopes in plants using the WVEM. These outcomes present a better understanding of the plant-water relations, enabling future efficient water management by knowing the plants' source water with the isotopic analysis from a single leaf or fruit.

Keywords:

plant water stable isotopes, $\delta^2\text{H}$, $\delta^{18}\text{O}$, water-vapor equilibrium method, laser spectroscopy

O3.1.b

How a stress sensor in plants paves the way for molecular farming

Janet Bakalarz, University of Natural Resources and Life Sciences, Vienna (BOKU), Vienna, Austria;

Stanislav Melnik, University of Natural Resources and Life Sciences, Vienna (BOKU), Vienna, Austria

StudyProgrammeLevel: PhD (1st year)

Molecular farming is the production of recombinant proteins using genetically engineered plants. Conventional production systems, such as mammalian cell cultures, are limited by the size of biofermenters, which additionally generate toxic waste. Being easily scalable and fully biodegradable, the production via plants is a more sustainable solution to meet future demands for therapeutic proteins, such as antibodies. However, the breakthrough of this green technology is halted by a major obstacle, low protein yields. One cause for low yields is a stress localized at the endoplasmic reticulum (ER), when high amounts of secreted proteins are produced in the plant cell. The main goal is therefore to develop a molecular sensor which can visualize ER stress in plants and thus allow us to learn more about the stress regulation in plants. The sensor was designed based on a molecule, which transduces the stress signal from the ER to the nucleus, including a fluorescent protein tag. The sensor was tested in *Nicotiana benthamiana* plants. After the stress was induced in plant leaves, fluorescent signals could be observed under fluorescent microscopes within hours. To test the functionality in a different plant species, the sensor was stably transformed into *Arabidopsis thaliana*. Here, the sensor proved to be also functional and the transgenic seedlings gave fluorescent signals after stress induction. These results demonstrate that the sensor reliably reports stress occurring in plant cells and is universally applicable in any plant. Nevertheless, the signals deriving from the sensor outlasted the resolved stress. Therefore, further optimizations are needed for a more sensitive sensor reporting actual stress dynamics, which should also be quantifiable. A molecular sensor allowing stress imaging in vivo on a cellular level has the potential to be a useful tool to study ER stress and eventually overcome the issue of low protein yields in molecular farming.

Keywords:

Plants, Molecular Farming, Stress sensor, Fluorescent signal, Protein production

O3.1.c**Enhanced dew formation as fresh water supply in arid climates - a real case investigation on a Greek island.**

Igor Luketina, University of Natural Resources and Life Sciences, Vienna (BOKU), Vienna, Austria; Thomas Ertl, University of Natural Resources and Life Sciences, Vienna (BOKU), Vienna, Austria; Helmut Schabschneider, Alchemia-Nova - Institute for phytochemistry and closed loop processes, Vienna, Austria

StudyProgrammeLevel: Bachelor

When a surface cools down below the dewpoint, water droplets form out of humid air. In nature, this form of water is called dew and can be observed on grass and leaves. This study provides new implications of enhanced cooling for greater water yield under real conditions. Despite climate change and a global rise in water stress, little attention has been paid to condensation as an innovative water source for arid areas. Even though there is a growing body of literature on specific materials and geometry, which significantly increase dew formation, much uncertainty exists about the use of active cooling technology. For the purpose of analysis, two nearly identical funnel shaped devices made of aluminium sheet metal serve as condensers. Design and material are based on conceptual framework proposed by Beysens and colleagues in 2013. One condenser (ACTIVE) was enhanced with Thermoelectric Coolers while the other served as comparison to natural dew formation (PASSIVE). The condensers were operated under real conditions at the same location on Tinos, a Greek Island in the Mediterranean. Actual water yield was monitored constantly, and weather data collected continuously to better understand dependencies of dew formation on meteorology. A significantly larger water yield was observed for the ACTIVE with respect to the PASSIVE condenser. Despite the larger water yield, the power consumption for cooling considerable. For research purposes a time-based control was adequate, but a natural progression of this work is to analyse reactive cooling according to environmental conditions, resulting in less energy consumption. These experiments provide further support for the hypothesis that condensation represents a reasonable source of fresh water for decentral areas with high relative humidity. Hereafter investigations lead us to combining water condensation and solar power in one device combatting both energy and water issues with innovative and sustainable technological solutions.

Keywords:

dew, condensation, fresh water, green energy, decentral water supply

O3.2 Rural and urban development for thriving communities: Monitoring the rural and urban development

O3.2.a

Monitoring and evaluation in rural tourism communities - Case Studies from the Danube region

Alice Wanner, University of Natural Resources and Life Sciences, Vienna (BOKU), Vienna, Austria

StudyProgrammeLevel: PhD (1st year)

From 2017 - 2019 INSIGHTS assisted 8 regions in the Interreg Danube Transnational Programme area in developing sustainable tourism visions and strategies which address the regional unique selling propositions including aspects of the local natural, cultural and historic heritage. Now, a year after the project ended, the question arises how successful the implementation has been, to what extent sustainability indicators are still being used and whether or not stakeholder involvement processes are being upheld. An important question to ask, considering that the project intended to carry long term development but funding and support through knowledge providers ceased at the end of the project in 2019. Additionally, COVID 19 has caused upheaval in the tourism branch. The rural case areas under investigation have had to adapt at least their short term strategies as a reaction and disrupt the implementation plans they had been following for less than a year. Questionnaires and Interviews were used to follow up with former project partners to gain information on strategy implementation progress. An indicator analysis determined which indicators are useful specifically for monitoring and evaluating sustainable development in rural settings. Through this methodology, it could also be determined which strategies were resilient and adaptable in times of crises such as the pandemic. It also became evident that continuous stakeholder participation process was beneficial to ensuring both strategy implementation and necessary short term adjustments.

Keywords:

rural development, sustainable tourism, stakeholder involvement

O3.2.b

Observed price difference between organic and conventional products at farmers' markets around Stuttgart

Theda Schmitz, University of Aarhus, Aarhus, Denmark; Tim Ruwe, University of Aarhus, Aarhus, Denmark

StudyProgrammeLevel: Master

Farmers' markets are very popular in Germany. Especially in urban areas they constitute an option for urban residents to purchase fresh and regionally grown food. Furthermore, farmers' markets present a platform for direct exchange between producers and consumers, which may strengthen the connection between rural and urban communities. However, little is known about product pricing at farmers' markets: Do organic farmers charge substantially higher prices than conventional farmers at the farmers' markets? Do price differences vary according to product type, and do supermarkets in walking distance affect prices at farmers' markets? In order to clarify these questions, a detailed price analysis on different product groups was conducted considering both, conventional and organic produce and its marketing at several markets around Stuttgart, Germany. The price analysis considers the difference between organic and conventional produce, the difference and dependencies on and between farmers' markets and supermarkets and the difference between two seasons (winter and spring 2020). As part of data collection, prices of different organic and conventional vegetables, fruit, bread, and cheese were recorded in January and April on farmers' markets and the surrounding supermarkets in Stuttgart. In general, when comparing the prices of conventional and organic products on farmers' markets and in supermarkets, a price markup on farmers' markets can be observed for almost all categories. Considering the two seasons of data collection, a price increase from January to April was found for almost all categories on both, farmers' markets and supermarkets, with a tendency to be higher in supermarkets. Purchasing the selected conventional products at farmers' markets without surrounding supermarkets tends to result in lower average prices. However, for organic produce this can be observed in the spring season only. Except from apples and organically grown potatoes, prices in supermarkets were always lower for both production methods, conventional and organic.

Keywords:

Price differentiation, farmers' markets, organic food, Price development

O3.2.c**Assessment of the sanitary situation of rural communities in the Bajo Lempa Area, Municipality of Tecoluca, El Salvador**

Elke Wiesmair, University of Natural Resources and Life Sciences, Vienna (BOKU), Vienna, Austria

StudyProgrammeLevel: Master

In the Municipality of Tecoluca, El Salvador, urine-diverting dry toilets (UDDTs) are the main toilet type, making up 60% of existing facilities. Especially in its coastal communities located in the area of Bajo Lempa, where the risk of groundwater contamination and inundations are high, this type of on-site infrastructure can be a viable solution. However, safe management along all steps of the sanitation service chain, from toilet capture to disposal or reuse, is needed to reach safely managed services, as defined in the global indicator for Target 6.2 of the Sustainable Development Goals. The objective of this master's thesis is to assess the current sanitary situation of 6 coastal communities of Tecoluca with a focus on use, operation, and maintenance of UDDTs. Data was collected by a household survey with a systematic random sample and a UDDT assessment and was complemented with information from key informant interviews. The data collection was carried out together with community members and staff of the local health clinic and municipality. Results show that 85% of the excreta in households with a UDDT is not managed safely. Reasons for that include, among others, open defecation, leaking dehydration vaults, and a lack of treatment due to high humidity in the vaults and an insufficient storage time. In 50% of the assessed UDDTs, no drying material was present in the toilet. Further, in some cases, the user interface did not allow for urine diversion. Thus, unsafely managed UDDTs pose significant health risks to users, households, and communities. While the focus of the Municipality of Tecoluca has been on constructing and providing access to UDDTs, a shift towards ensuring proper use and reliability is needed to provide safely managed services for all.

Keywords:

Urine-diverting dry toilets, rural communities, On-site sanitation, Operation & Maintenance, Excreta Flow Diagram

O3.3 Food and health for the next generation: Environmental impacts of food production**O3.3.a****Genotype by Environment interaction of Chickens tested in Ethiopia using body weight as performance trait.**

Maud A. de Kinderen, University of Natural Resources and Life Sciences, Vienna (BOKU), Vienna, Austria, University of Wageningen, Netherlands

StudyProgrammeLevel: Master

The African Chicken Genetic Gain (ACGG) project (<https://africacgg.net/>) aims to achieve optimization of smallholder poultry production by introducing commercial dual-purpose breeds into a new African environment. Different breeds may be best suited for different environments of Ethiopia, which is a country with a wide range of agro-ecological zones (AEZ). This study performed genotype environment interaction (GxE) analyses for body weight (BW) of growing male and female chickens, using ACGG data. Hence, research questions of this study were to investigate; 1) if a GxE interaction does take place for BW, 2) which breed performs best in which environment in terms of predicted BW. Analyses was performed using predicted BW at four different ages (90, 120, 150 and 180 days) of five introduced breeds (Horro, Koekoek, Kuroiler, Sasso-Rhode Island Red and Sasso) located in five Ethiopian regions (Addis Ababa, Amhara, Oromia, South Region and Tigray) being part of three AEZ (cool humid, cool sub humid and warm semi-arid). 999 females and 989 males were

present. GxE interaction was strongly significant ($p < 0.0001$) for all analysis combinations. In line with previous research, Sasso was shown to have the highest predicted BW, especially at early age, followed by Kuroiler. Due to the young breeding program of Horro, it was often observed to be the worst performing breed. Best performances were observed in Tigray, Oromia, and Amhara regions, all mainly being part of the cool sub humid AEZ having highest predicted BW. Koekoek and Kuroiler were performing well in Amhara at late age, which can potentially be explained by high precipitation. For making final conclusions on which breed is preferable in which environment, the social context of breeding for smallholder farmers, their preferences, which will not only be related to BW of the animals, and difficulties while collecting on-farm data must be considered.

Keywords:

Ethiopia, smallholder farming, poultry, body weight, genetic gains

O3.3.b

SMART sustainability assessment of organic coffee farming systems in the indigenous community of Ñagazu, Peru

Moritz Egger, University of Natural Resources and Life Sciences, Vienna (BOKU), Vienna, Austria

StudyProgrammeLevel: Master

Peru is the second biggest producer of organic coffee worldwide and organic coffee farmers are considered to be the backbone of the agroecological movement in the country. This research analyzed the sustainability performance of organic coffee farming systems in the indigenous community of Ñagazu, Peru by application of the SMART Sustainability Monitoring and Assessment Routine. The SMART Method is based on the SAFA-Guidelines established by the FAO, which proposes 4 dimensions to define sustainability: "Ecological Integrity", "Economic Resilience", "Social Well-Being" and "Good Governance". These 4 dimensions are divided into a total of 21 themes and 58 subthemes and for each of these subthemes sustainability performances can be assessed against defined standards based on 327 indicators. Those indicators have been evaluated on-site by semi-structured interviews including farm visits with 30 organic coffee farmers from Ñagazu. Score achievement has been calculated at the theme and subtheme level on a scale from 0-100%.

Excellent scores were achieved in the dimension of environmental integrity (79,64%) due to the high agrobiodiversity managed in the agroforestry systems and the integration of small plots into the rainforest. Weaknesses could be identified in various subthemes of the dimensions economic resilience (63,07%) and good governance (59,86%) respectively. The lowest score could be observed in the dimension of social wellbeing (54,19%) especially in the themes: Labor rights (44%), fair trading practices (29%), and equity (40%).

As a means of respect and to tackle some of the most predominant issues that came up during the investigation, a workshop has been organized for the stakeholders involved at different levels of the coffee value-chain and the local authorities. Apart from a presentation of the results and the issuing of a certificate, interventions have been developed through a participatory approach by involving all actors of the coffee production and commercialization in Ñagazu.

Keywords:

Coffee, Sustainability, Organic, SMART

O3.3.c

Diet as a potential climate change mitigation measure: Comparing various dietary scenarios in terms of nutritional and environmental impacts in Denmark.

Maja Michalewska, University of Copenhagen, Faculty of Science (SCIENCE), Copenhagen, Denmark

StudyProgrammeLevel: Master

According to the Special Report by IPCC on Climate Change and Land (2019) shifting to a more sustainable diet is one of the major opportunities for adaptation and mitigation of climate change. The aim of this project

is to investigate the cost-effectiveness of different dietary scenarios in Denmark as climate change mitigation measure when taking into account consumer expenditures and various environmental impacts (e.g. CO₂ emissions, eutrophication, land occupation). The research questions are: What is the compatibility between a reduction in diet-related GHGE and nutritional adequacy, acceptability and affordability dimensions of a Danish diet? What is the lowest level of GHGE that may be reached if fulfilling dietary recommendations while staying as close as possible to the current diet? Subsequently, could this diet be relevant as a climate change mitigation measure and be promoted among other measures from an economic perspective? This is achieved by using linear programming to model different diets and maximize the objective with a set of nutritional and environmental constraints. To determine the baseline diet, data was obtained from National household survey. The expected outcome is to obtain a diet which could be used as a climate mitigation measure for policy-makers in Denmark.

Keywords:

sustainable_diets, linear programming, environmental_impact, climate_mitigation_tool, nutrition

O3.4 Innovations in Life Sciences: Socio-economic innovations in urban and rural areas

O3.4.a

Connecting cities, agriculture and food: How can cities transform regional agri-food systems to more sustainability?

Lisa M. Ketzer, University of Hohenheim (UHOH), Stuttgart, Germany

StudyProgrammeLevel: Master

There are many transformative theories and concepts to reach the Sustainable Development Goals of the United Nations within agri-food systems. Still, the Common Agricultural Policy in the European Union, but also national strategies are lacking behind. Adverse environmental and socio-economic impacts are caused. In the past, the agri-food system got more and more invisible to and decoupled from consumers, but also from urban planning. Recent studies found that there are many potentials of cities as “experimental spaces” to shape the system actively by taking influence e.g. on actors, procurement measures, regional and urban agriculture or education. However, not only research highlights the transformative potentials of cities and communities to sustainably change the agri-food system. The new European “Farm to Fork” strategy stresses urban communities’ relevance, too – particularly, in situations of crisis and pandemics. Thus, my main research questions are how urban agri-food systems and their actors can contribute to sustainable agri-food transformations, which related political instruments are existing and which role actors play. First, answers are given by providing deep insights in recent literature, socio-political theories and sustainability definitions in agri-food systems. Second, a case study is conducted in Stuttgart, in which important experts and actors from agricultural production, retailing, urban administration, politics and civil society are interviewed. The literature and interviews are analysed using MAXQDA. In particular, it is focused on the importance of urban planners, networks and platforms. The latter are needed to connect relevant actors from different sectors to pool knowledge, influence and reach real and deep change. Thus, it is specifically assessed whether platforms such as the food policy councils act as transformative and innovative food policy instruments to enhance the sustainability of local value chains.

Keywords:

urban food planning, sustainability transformations, agri-food policy instruments, multi-actor analyses, food policy councils

O3.4.b**Economic impact of members' commitment to rice cooperatives in Western Zambia**

Ebenezer Donkor, Czech University of Life Sciences Prague (CZU), Prague, Czech Republic

StudyProgrammeLevel: Master

The first cooperative that was established in Zambia was in the year 1914. The Government of Zambia through local provincial authorities uses cooperatives as a means of reaching smallholder farmers in the province. The main objective of the study was to analyse how social attributes in the cooperative influence member commitment and determine the economic benefits (price, gross margin, access to market) that cooperative members obtain in the Western province of Zambia. 215 rice farmers (72 active and 143 passive members) were purposively selected from the Limulunga and Mongu districts. Probit regression model was used to analyse the influence of social attributes on member commitment. Propensity score matching technique was used to estimate the economic benefits members obtain from being committed to the cooperative. The results of the study showed that members' perception about the social attributes (acceptance, voice, reciprocity, leadership competence and market incentives) in the cooperative have positive influence on member commitment to the cooperative. However, perception about trust in the cooperative have negative influence on member commitment. Both unmatched and all propensity score matching algorithms indicate that members who are actively committed to the cooperative have significant higher economic benefit (price of produce, market access, gross margin) than the passive members.

The author wishes to acknowledge the Faculty of Tropical AgriSciences, Czech University of Life Sciences Prague for the mobility grant to students for this research.

Keywords:

Gross margin, Market orientation, Price, Trust, Capacity building

O3.4.c**Livelihood and market prospects of shea caterpillars in Northern Ghana**

Krishnanunni Mavinkal Ravindran, University of Copenhagen, Faculty of Science (SCIENCE), Copenhagen, Denmark

StudyProgrammeLevel: Master

Shea caterpillar is an edible pest species found associated with the shea trees during the rainy season. Shea caterpillars are gaining market value in West African countries, and it is foreseen to cause changes to its access in these countries. Free access to these caterpillars in private lands are increasingly being questioned in countries like Togo. With the Ghanaian government recognizing the importance of shea parklands as a means to uplift the women folks of northern Ghana, it is imperative to know the contribution of this pest species to rural livelihoods in the country. A household survey was conducted in two villages of northeast Ghana to find the share of shea caterpillars to the total household income and the changes in access to these caterpillars over the past five years. Also, a semi-structured questionnaire survey was employed in the five key markets to identify its market potential in the region. Shea caterpillars were largely used for subsistence (subsistence income from shea caterpillars constituted 74% of the total income from shea caterpillars) and constituted 2.45% of the total household income. 79% of the respondents (n=78) have been restricting outsiders from collecting caterpillars from their croplands. Shea caterpillar trade is largely a woman's business which 62% (n=19) of the vendors think is more profitable than selling shea nuts. 49% of caterpillar vendors opined that there has been a decline in the availability of shea caterpillars over the past five years. 49100 kg of shea caterpillars is estimated to be traded annually in the five key markets of northeast alone. This study intends to guide policymakers and researchers in developing shea based community development projects.

Keywords:

Shea caterpillars, subsistence income, entomophagy, Edible insects, Ghana

POSTER PRESENTATIONS

P1.1 Green innovation and circular economy: Green Plants

P1.1.a

Genomic Prediction of Stripe Rust Resistance in Wheat - Opportunities, Limitations and Lessons Learned from a Breeders Population

Hermann Gregor Dallinger, University of Natural Resources and Life Sciences, Vienna (BOKU), Vienna, Austria

StudyProgrammeLevel: Master

Wheat is one of the most important food crops worldwide and stripe rust is one of the most devastating diseases of wheat, especially in temperate climates. Recent epidemics, caused by newly evolved pathogen races are rendering breeding efforts void and demand novel solutions. Resistance breeding relies on phenotypic and marker-assisted selection to combine resistance genes in high yielding genotypes. New genotyping methods and improved statistical methods enable prediction and selection based on a large number of markers in plant breeding. The goal of this thesis was to use these tools and methods, to improve quantitative, non-race-specific resistance against stripe rust using data from wheat breeding trials in the years of 2013, 2014, 2015 and 2016, as well as genotyping by sequencing (GBS) markers. The genetic architecture was analysed and two large effect QTL were found, one on chromosome 2A, largely fixed in the population and one on 2B, found in low frequency and therefore highly interesting for future breeding efforts. Evidence was found that the QTL on chromosome 2A might be associated with the translocation 2AS-2N. Genomic best linear unbiased predictor (GBLUP) models were employed to predict stripe rust within- and across-years. Prediction performance was medium to high within-years, but predictions largely failed across-years. There was some variability across years (and across trials), possibly due to different races of stripe rust, that impaired genomic prediction. A prediction model can only perform as well as the data that was used to train the model and when a model is trained with conflicting data the predictions will not be reliable. This thesis concluded, that breeders' data may bear strong variation ultimately impairing the power of genomic prediction models. Data has to be investigated thoroughly, and only the most informative trials should be chosen to build prediction models.

Keywords:

Resistance Breeding, Genomic Prediction, Wheat Breeding, Bioinformatics

P1.1.b

Impacts of an agriphotovoltaic system on microclimate and crops yield in Southwest Germany

Tracy Hügel, University of Hohenheim (UHOH), Stuttgart, Germany

StudyProgrammeLevel: Master

Within the transition to a more sustainable economy the production of renewable energy increases. The rise of ground-mounted photovoltaic systems on arable land leads to a land use conflict especially in densely populated countries. One opportunity to tackle this challenge would be the use of agriphotovoltaic (APV) systems, allowing both food and energy production in the same area. In this system solar panels are e.g. mounted on a substructure at a height of 6 m, allowing agricultural machinery to pass below. Changes in microclimate conditions and available solar radiation due to the APV construction can be expected which may influence crop yield. An APV pilot plant was installed in Southwest Germany, in order to investigate soil moisture and temperature, air humidity and temperature as well as precipitation in an APV system. Moreover, photosynthetically active radiation below the panels was analyzed. From December 2018 until October 2019 celeriac, potato, winter wheat and clover grass were cultivated underneath the APV facility and on a reference field. The objectives were to assess crop yield and to detect under which circumstances altered microclimatic conditions have an impact on crop yield. Crop yields for clover grass, wheat and celeriac were reduced significantly under APV by 15%, 28% and 33% respectively compared to the reference field. For potatoes a significant increase in potato yield of 83% under APV could be detected. However, this cannot be attributed to

the impact of APV as weed pressure was high on the reference field and underneath the APV facility and therefore yields were reduced by 44% and 73% respectively compared to the year before. Rain distribution and soil moisture underneath the APV facility were heterogeneous, causing uneven crop growth. The results show that APV can result in lower yields, but nevertheless, the land use efficiency might be still increased.

Keywords:

agrivoltaic, microclimate, land use efficiency, agricultural yields, renewable energy

P1.1.c

Optimal habitat conditions and individual growth patterns of a population of *Margaritifera margaritifera* (Linnaeus, 1758) in the Beça river (Douro basin)

Daniel Garrido López, University of Natural Resources and Life Sciences, Vienna (BOKU), Vienna, Austria

StudyProgrammeLevel: Master

The freshwater pearl mussel *Margaritifera margaritifera* is a holarctic distributed species that is experiencing difficulties to maintain its European populations in an adequate status mostly due to the action of human activities in riverine ecosystems. For this reason, it is included in the Habitats Directive and listed as Critically Endangered in Europe. Currently, *M. margaritifera* is distributed in Western Europe, reaching Russia and Baltic countries in North, Central Europe and the Iberian Peninsula, where the farthest southern population in Europe is found. These populations present local adaptations to live in warmer habitats than the populations located in Central and Northern Europe.

The studied population comprises over a thousand individuals in the Beça river, a medium-size river in Northern Portugal (Tâmega tributary, Douro basin) that is being analysed to obtain information about its population dynamics, as well as the current status of the population.

This study will focus on the analysis of environmental variables that will be used to determine the optimal habitat of the species in its adult stage and in this specific southern location. The information obtained about the population, including the ecological conditions that the individuals may require to live, as well as the conditions where they are currently distributed, is essential to accomplish several adequate conservation measures. Using data from capture-and-recapture techniques and shell length from consecutive years, it is possible to analyse growth patterns, theoretical maximum length and theoretical age using von Bertalanffy's equation, being possible to apply them as quality indicators of the different mesohabitats where the population is distributed along the studied area.

Keywords:

Environmental variables, Growth patterns, *Margaritifera margaritifera*, Optimal habitat, Portugal

P1.1.d

Triboelectric activation of wood surfaces by mechanical friction

Lena M. Leiter, University of Natural Resources and Life Sciences, Vienna (BOKU), Vienna, Austria

StudyProgrammeLevel: Master

Previous own research has shown that mechanical friction applied on wooden surfaces is creating electrical surface charges. In this research, triboelectric activation of wood surfaces by using a wood brushing machine is investigated. Wood samples from spruce, pine, fir, beech and oak have been processed with a TWINGO 300 B brushing machine. Afterwards the electrical surface charges were detected using an EFM 115, a small electric field meter with high sensitivity for measuring the electric direct voltage field. Machine settings such as feed speed and brush-pressure were varied to understand the effects on obtained surface charges. The interactions between wood species, wood density, wood moisture and surface roughness on the surface charge status are investigated. First data are showing that softwood is receiving a strong positive surface charge, while hardwoods have the tendency to be less but also positively charged. It is further investigated whether or not these differences can be explained by wood density differences, which are known to be directly

connected to the obtained wood particle sizes while brushing. Another factor could be resin content, or the orientation of growth rings, i.e. vertical versus flat-grain orientation. We suggest that targeted triboelectric activations of wood surfaces could be a novel factor to improve the durability of wood coatings, especially for outdoor applications.

Keywords:

triboelectric surface charge, wood machining, brushing, electrical charge, different wood species

P1.2 Rural and urban development for thriving communities: Specific aspects of rural and urban development

P1.2.a

The risk associated with glacier retreat due to climate change in the glacier lake 513 and the city of Carhuaz in Cordillera Blanca, Peru.

Celia Sancho de Pablo, University of Natural Resources and Life Sciences, Vienna (BOKU), Vienna, Austria

StudyProgrammeLevel: Master

High-mountain environments with snow and ice are particularly sensitive to climatic changes, especially in the tropics. Glacier hazards threaten societies in mountain regions worldwide. Special concern is cascading mass movement processes impacting glacier lakes and triggering glacier lake outburst floods (GLOFs). The Cordillera Blanca in the Peruvian Andes is the most glaciated mountain range in the tropics. The risk of GLOFs from lakes that have formed at the base of retreating glaciers is very high in these areas. GLOFs are often triggered by avalanches falling into glacial lakes, initiating a chain of processes that may culminate in significant inundation and destruction downstream. Despite these risks, populations are established in these areas due to the strong dependency on water resources from glacier melt because of the pronounced dry season in the region. In this mountain range, the glacier lake 513 was formed in the late 1960s due to glacier retreat and was declared highly dangerous in 1988. This report aims to simulate different scenarios of a GLOF process derived from glacier retreat induced by climate change in lake 513. A mass flow simulation software is used to produce risk maps in the near downstream city of Carhuaz and give recommendations for policymakers.

Keywords:

Climate change adaptation, Cryosphere, Glacier retreat, Mass flow simulation, Peruvian Andes

P1.2.b

The bridge between inner and outer Transition in the Transition movement: Outline of a tree of life model

Natascha Effenberger, University of Natural Resources and Life Sciences, Vienna (BOKU), Vienna, Austria

StudyProgrammeLevel: Bachelor

This work deals with the bridge between inner and outer Transition as defined in the Transition movement. It aims at identifying the inner motivations within people and how these are realized in their environment. The study is based on a literature review, complemented by two interviews with persons who are involved in Transition and environmental activism. The review showed that inner Transition tends to be more neglected than outer, which seems to be the basis for many group related conflicts, as well as personal problems. Therefore, an existing model called "the tree of life" was adapted and extended for communities in Transition and it proposes a structure on which inner Transition groups can reflect their ongoing process. My hypothesis is that groups which manage to follow this model will experience a more robust Transition community. Moreover, in this work it is discussed what and how inner Transition is contributing to the shift in mindsets, which is needed for the Transition to work as intended. I join the assumption of other people who have worked

with the topic that a balance between inner and outer Transition is needed in order to set up a sustainable community.

Keywords:

transition movement, inner transition, connection and balance

P1.2.c

Transition of manorial parks into public parks as element of rural communities life quality improvement

Konrad Wasik, Warsaw University of Life Sciences (WULS-SGGW), Warsaw, Poland

StudyProgrammeLevel: Master

Manorial parks a part of former grange are indispensable component of cultural landscape in Poland nowadays. Style of polish manor have been forming for many ages – since medieval to beginning of 20th century. It was a symbol of the polish culture. Manor and park complex have witnessed private and public lives of its owners and sign of wealthiness as well as knowledge in art history of its founder and successors. Grange complex in Prażmów is example of valuable spot on the map of Poland and one of the most precious in county of Piaseczno (neighbour of capital of Poland – Warsaw). Revalorization of park in Prażmów is attempt of restoring old face as living and material piece of garden art. It is also tribute to house of Ryx and Prażmowski family. The conclusion of this study is to bring social, health, natural and economics benefits for whole community. This combination of benefits has special dimension in the scale of village and surrounding landscape – Manor and park complex simultaneously the social core of village and its natural border, landmark made by river and complex. Moreover it aims to get round an idea of life quality improvement which facilitate redeeming many suchlike objects in Poland and Europe and solving problems of rural communities during transition.

Keywords:

court park, village park, rural community, life quality improvement, social integration

P1.2.d

The fate of abandoned small-scale biogas plants - case of Vietnam

Kseniia Paramonova, Czech University of Life Sciences Prague (CZU), Prague, Czech Republic

StudyProgrammeLevel: Master

Biogas production through anaerobic digestion process has been promoted in Vietnam as an appropriate technology for cooking activities within rural households (replacing traditionally used firewood and LPG). Despite the large quantity of small-scale biogas plants being built and promoted, there were increasingly reported cases of abandonment of biogas technology. Therefore, this study attempted to present the state of the art of small-scale biogas plants abandonment issue including reasons leading towards it. The primary data were collected in province Thua Thien Hue in Vietnam in August 2019, including semi-structured interviews with small-scale biogas plants owners who abandoned biogas technology (minimum 6 months before the survey) (n = 37) and with small-scale biogas plant owners who continually use this technology (n = 62). Using a logistic regression analysis of various cross-sectional data (with software SPSS), key forces were uncovered in order to find out reasons behind the abandonment of biogas technology. The findings showed that the households with more members working on the farm and more satisfied with the maintenance of the biogas plant are less likely will abandon it. Reported reasons of abandonment included the failure of organic waste supply (from pig production) as a substrate for biogas production. Households were not able to keep pigs due to the difficulties such as reduced availability of family labour or African swine fever in the area. Furthermore, technical problems were reported as reasons too. Abandoned plants are usually not used for any other purposes but some of digesters (initially connected to the toilet) are used only for human excreta storing. In accordance with the findings of study, it can be concluded that the dis-adoption of biogas technology leads to

the return of rural households to conventional energy for cooking, resulting in waste of investments to biogas technology and its possible advantages.

Keywords:

Vietnam, small-scale biogas technology, anaerobic digestion, biogas plant maintenance, technology dis-adoption

P1.2.e

Partnership of Convenience or Opportunity for Growth? - Investigating the role of retailers in expanding local food schemes in the case study of EDEKA branches in northern Germany

Esther Lutz, Swedish University of Agricultural Sciences (SLU), Uppsala, Sweden

StudyProgrammeLevel: Master

In the past years growing interest in alternative forms of food supply chains has incentivised researchers to investigate the role of retailers in Short Food Supply Chains (SFSC) mainly in the United States, Canada and the EU, with little attention paid to SFSC retailer interaction in the German context specifically. In this thesis I aim to contribute to the existing literature by investigating how the country's presumed institutional conditions affect the viability of selling via retailers to a certain type of SFSC producer. The location of the study was northern Hamburg, Germany. Six semi-structured interviews, substituted with four questionnaires, were conducted with micro- to large-scale producers involved in local SFSC schemes and selling via branches of the supermarket chain Edeka, and a group of producers who did not sell via this retailer. A document analysis of statements of producers and other stakeholders on the cities intention to support local agriculture by creating additional demand provided an overview of the effects of agricultural circumstances and policies had on SFSC. The interviews were analysed by applying Stevenson and Pirogs 'values based supply chain' framework and showed that only micro- or mid- to large scale producers profited from the cooperation, which in the latter case was more of a partnership of convenience. In combination with the document analysis, which found limited land and capital access, expensive certification, as well as the need for more training and demand to impact local farmers, this conclusion indicates that additional outlets are not the only tools the city has to support local, especially small scale, agriculture.

Keywords:

Values Based Supply Chain, local food, Hamburg, Germany, Short Food Supply Chain

P1.2.f

Consumer Attitude towards Processed Organic Food

Karlotta Maria Katherina Koch, UHOH

 *Winner of the ELLS Prize for Excellent Master Theses*

StudyProgrammeLevel: Master

The organic food market is growing globally and the demand for processed organic food is increasing in Germany and Switzerland. Processing enhances food safety and extends its shelf life, but it may also have negative consequences for the quality, healthiness, naturalness, taste, nutritional value, and the environmental impact of food. The European Council (EC) Regulation No. 834/2007 regulates organic food production and processing in the European Union (EU). However, suitable processing methods for organic food are not clearly defined and mandatory standards for the processing of organic food have not yet been established by the EU. Thus, the transnational project ProOrg aims to develop a Code of Practice for the processing of organic food to guide operators in their choice for the most suitable processing methods for organic food. This Code of Practice is expected to be based on a high level of consumer acceptance. Consumers perceive organic food as healthier, tastier, more natural, and more environmentally friendly than conventional food. However, there is a knowledge gap about the attitudes of organic consumers towards processed organic food. The aim of this study is to identify consumer attitudes towards processed organic food. Since the organic concept builds on

the principle of care and careful processing is considered one of the main aspects that determine market success of organic food, this study, first, identifies consumer expectations of carefully processed food. Then, this research investigates consumer attitudes towards processed organic food. The research was carried out in collaboration with the Research Institute of Organic Agriculture FiBL in Frick, Switzerland, within the ProOrg project. To figure out consumer attitudes towards processed organic food, the following research questions (RQ) were developed: First, this study investigates what role processing and careful processing play in consumers' food purchase behavior (RQ 1) and, second, what consumers expect from carefully processed food (RQ 2). Third, this study examines how consumers evaluate processing technologies with respect to processing strength (RQ 3) and, fourth, what consumers expect from carefully processed organic food (RQ 4). Fifth, this study investigates whether consumers would ban certain processing technologies from the processing of organic food (RQ 5) and if they are willing to pay more for carefully processed food and carefully processed organic food (RQ 6).

Furthermore, the effect of processing information on consumers' food purchase behavior (RQ 7) is studied. Last, this study elaborates the differences in preferences and acceptance of processing methods between different consumer groups (RQ 8). To answer the research questions of this study, an online questionnaire was distributed to milk consumers (18 to 75 years old) in Germany and German-speaking Switzerland (n = 1287). The questionnaire focuses on consumer attitudes towards milk processing technologies, careful processing, and the processing of organic food. Milk was chosen as object of research since organic milk is among the most popular products in the German and Swiss organic market. To examine the effect of processing information on consumer attitudes, respondents were randomly split into two groups and provided with differing information about milk processing. Differences between the German and the Swiss sample and the effect of gender, age, information treatment, XII organic purchase frequency, food technology neophobia, and product specific consumption behavior on respondents' attitudes and perceptions were analyzed using inferential statistics. The results showed that, first, careful processing of food and careful processing of organic food are important to German and Swiss consumers. Although respondents did not consider processing an important criterion for their milk purchase, many of the selected milk purchase criteria depend on processing. Second, respondents expressed high expectations of carefully processed food in terms of taste, nutritional quality, and environmental impact.

Third, respondents' expectations of carefully processed food and processed organic food were high in terms of processing information on food packaging and environmentally friendly packaging. A long shelf life was rated less important. Fourth, respondents accepted established and new technologies for the processing of organic food if they perceived these technologies as careful. However, they were neutral or undecided in their acceptance of processing methods that involved hot temperatures. Furthermore, beneficial information about a processing method positively impacted respondents' attitudes towards this processing method. Negative information affected their attitudes negatively. Additionally, ready-made organic food and heavily processed organic food were considered to contradict the concept of organic food. Nevertheless, respondents expressed trust in the processing of organic food. Furthermore, respondents' were willing to pay more for carefully processed food in general and for carefully processed organic food. Moreover, careful processing of food and carefully processed organic food were especially important to frequent organic consumers and respondents with a high food technology neophobia. Additionally, the expectations of organic consumers, older consumers, and females towards certain aspects of carefully processed food and processed organic food were particularly high. Compared to other consumers, frequent organic consumers had a similar level of acceptance and, in Germany, a higher level of acceptance for the use of certain processing technologies for organic food. Last, consumers with a high food technology neophobia and, in German-speaking Switzerland, with a high organic purchase frequency were most averse to ready-made and heavily processed organic food. This study provides valuable information about consumer attitudes towards careful food processing and the processing of organic food for the creation of a Code of Practice on organic food processing. The research shows that consumers have high expectations towards careful processing and the processing of organic food. Thus, careful processing can be an opportunity for producers and processors of organic food as well as labelling organizations to improve the market positioning of their products. If consumers are provided with information on processing methods, their acceptance of these methods is high. Consequently, processors can increase consumer acceptance by providing information about processing methods and their beneficial effects. The results of this study can only be generalized to milk consumers in Germany and German-speaking Switzerland. Further studies must be conducted to confirm these findings for consumers in general, to test consumer attitudes towards processing in a neutral context, and to expand the field of research to other European countries.

P1.3 Food and health for the next generation: Impacting soils & crop management

P1.3.a

Heavy metal mobility in seasonally wet soils: Influence of land use and paleoglacial environment

Glenna Thomas, University of Copenhagen, Faculty of Science (SCIENCE), Copenhagen, Denmark

StudyProgrammeLevel: Master

Pseudogleys are soils that experience periodic water stagnation due to an underlying clay-rich horizon impeding infiltration. They are often found in moraine till landscapes where fine material has been glacially deposited. Pseudogley soils offer unique environments to study soil and water pollutant dynamics because of complex reduction and oxidation behaviors at a subhorizon level. Heavy metal contamination of groundwater has become a concerning obstacle for maintaining safe drinking water standards on a global scale. While moraine till soils were originally thought to filter out contaminants before reaching groundwater levels, more recent reports on heavy metal concentrations above threshold values found in wells stationed within these clay-rich, moraine till soils suggest otherwise. This study investigates the mobility of heavy metals in four soil profiles in Denmark that exhibit pseudogleyic features, and examines the role of both soil age and land use on heavy metal redistribution and translocation. With climate change and higher rates of precipitation predicted for much of northern Europe, a greater variety of soils will be subjected to conditions of water stagnation, which will alter the behavior and transport of metals in soil. This has implications for both geogenically and anthropogenically sourced metal concentrations, and the behavior of metals in these pseudogley soils can offer insight into the risk associated with agricultural versus forest land as well as old versus new glacial soils.

Keywords:

heavy metals, soil, groundwater, land use

P1.3.b

Phytodiversity in response to farming type, cover crop management and landscape structure in Austrian vineyards

Ricarda Weitzl, University of Natural Resources and Life Sciences, Vienna (BOKU), Vienna, Austria; Stefan Möth, University of Natural Resources and Life Sciences, Vienna (BOKU), Vienna, Austria; Bozana Petrovic, University of Natural Resources and Life Sciences, Vienna (BOKU), Vienna, Austria

StudyProgrammeLevel: Master

Viticulture is a land use form that requires a particularly high use of pesticides, work input and special machinery. Plant communities in vineyards are strongly influenced by soil cultivation intensity (Hall et al. 2020), green cover management (Kazakou et al. 2016) and soil type. Soil cultivation frequency and cover crop type also influence plant functional traits (Hall et al. 2020). Moreover, the farming type (conventional or organic) influences phytodiversity. For this study, commercial vineyards in the Leithaberg region (Burgenland) were selected based on the farming type (organic/conventional) and cover crop management (species-rich/species-poor cover crops and spontaneous vegetation). Plant communities were investigated twice, once in spring and once in summer, in 32 vineyards. The number of species and their coverage according to Londo (1976) were determined for each vineyard in four 1 x 1 m plots. Furthermore, the number of vascular plant species was recorded on three 25 m long transects per vineyard to detect less abundant species. Landscape composition was analysed within a 500 m radius around 16 paired organic and conventional vineyards. Diversity data was analysed with generalized linear mixed models (lme4 package) and community data with multivariate methods of the vegan package in R. The aim of the work was to find out (i) whether farming type influences local plant diversity, (ii) whether there exist main effects or interactions of cover crop type with farming type, and (iii) how landscape structure mediates local management effects on plant communities.

Funding organisations of the research project SECBIVIT: Agencia Estatal de Investigación (Ministerio de ciencia e innovación/Spain), Austrian Science Fund (grant number I 4025-B32), Federal Ministry of Education and Research (BMBF/Germany), DLR Projektträger, French National Research Agency (ANR), Netherlands

Organisation for Scientific Research (NWO), National Science Foundation (NSF) and Romanian Executive Agency for Higher Education, Research, Development and Innovation Funding (UEFISCDI).

Keywords:

phytodiversity, vineyard, cover crops, tillage intensity

P1.3.c

Glyphosate adsorption onto clay minerals

Vivian I. Remlinger, University of Natural Resources and Life Sciences, Vienna (BOKU), Vienna, Austria; *Maria Rechberger*, University of Natural Resources and Life Sciences, Vienna (BOKU), Vienna, Austria; *Daniel Tunega*, University of Natural Resources and Life Sciences, Vienna (BOKU), Vienna, Austria; **Franz Zehetner**, University of Natural Resources and Life Sciences, Vienna (BOKU), Vienna, Austria; **Martin H. Gerzabek**, University of Natural Resources and Life Sciences, Vienna (BOKU), Vienna, Austria

StudyProgrammeLevel: Master

Glyphosate (N-(phosphonomethyl)glycine) is a widely used herbicide which is currently discussed because of its side effects on health and environment. In soils, glyphosate may be strongly adsorbed to clay mineral phases. Its adsorption can depend on soil clay content and its specific surface area, content of aluminium and iron oxyhydroxides, pH, and organic carbon content. Many clay minerals have already been investigated regarding their sorption behaviour, but information on minerals commonly found in volcanic soils, such as allophane, halloysite and imogolite is still lacking. Recent studies showed that glyphosate can be found in relevant concentrations in some volcanic soils. The aim of this study is to investigate adsorption behaviour of glyphosate on allophane and halloysite. Prior to experiments, allophane was synthesised. For both minerals, adsorption is measured with 6 different concentrations of glyphosate at 3 different pH values (5, 6, and 7). The minerals are equilibrated in glyphosate solutions at a mineral : solution ratio of 1:100 for 24 h by shaking end-over-end. 0.01 M KCl is used as a background electrolyte. After centrifugation, the supernatants are derivatised with ninhydrin and subsequently analysed colorimetrically at a wave length of 570 nm. Pre-experiments showed that there was a significantly higher adsorption of glyphosate onto allophane than onto halloysite. Glyphosate adsorption onto halloysite was greater than onto kaolinite and, according to literature values onto other clay minerals in non-volcanic soils. The adsorption of glyphosate was depending on the concentration and the pH. The results of this study will contribute to a better understanding of the behaviour of glyphosate in volcanic soils.

Keywords:

glyphosate, allophane, halloysite, adsorption, volcanic soils

P1.3.d

Comparison of different phosphorus extraction methods: Which method is most suitable for arable soils on biodynamic and organic farms with low stocking densities or no animal husbandry?

Jasmin Heichel, University of Hohenheim (UHOH), Stuttgart, Germany

StudyProgrammeLevel: Master

Due to the constant specialisation, even in biodynamic and organic farming, the share of stockless farms or farms with low stocking densities increases. This leads to a shift in fertiliser use, because farmyard manure is no longer available as a fertiliser. In earlier samples derived from biodynamic or organic farms with low stocking densities or no animal husbandry at all, P concentrations (PCAL) showed a significant P deficiency and low amounts of plant-available P in the soil. But these low amounts of P did not result in insufficient yields, according to the farmers. Therefore, I am investigating the P amounts of 21 soil samples, collected from biodynamic and organic farms, with eight different extraction methods (CAL, Olsen, Mehlich III, Bray 1, Bray 2, NaOH, Water and Total P) and compare those with the P amounts within the biomass of the plants, established in a small pot trial with ryegrass. This comparison should be able to give a conclusion, if P extraction methods in the laboratory are able to extract as much P from the soil, as the ryegrass plants do. If

the plants are able to extract more P from the soil than the extraction methods in the laboratory, fertiliser amounts could be adapted to reduce the use of P and therefore extend the life of its limited amount.

Keywords:

P-supply, P-efficiency, classification of P status

P1.3.e

Effects of different soils and drought conditions on yield and water use efficiency of East African green leafy vegetables

Taewan Park, University of Hohenheim (UHOH), Stuttgart, Germany

StudyProgrammeLevel: Master

Most research on crops, and interactions with soil fertility and water availability, has focussed on staple and cash crops. Green leafy vegetables, vital for food and nutrition security and human health, have been neglected. In a time when intensive agriculture is degrading soils, and climate change is causing increasing cases of erratic weather, this lack of knowledge can be harmful. The main aim of this research was to evaluate the effect of (i) soil fertility and (ii) drought on yield and water use efficiency of East African green leafy vegetables. For this purpose, the green leafy vegetables cowpea (*Vigna unguiculata*), black nightshade (*Solanum nigrum*), and Sukumawiki (*Brassica oleracea* var. *viridis*) were cultivated in a greenhouse trial. The vegetables were subjected to three watering regimes, i.e. 25% (severe drought), 50% (mild drought) and 75% pot capacity (control), and cultivated on two soils (low vs. high fertility). The vegetables were evaluated on above- and belowground biomass, yield, nodulation in cowpea, total water use, water use efficiency of yield (WUE_Y) and Vitamin A, B1, C and E. The yield of cowpea and nightshade was higher in the fertile soil under all watering regimes than in the infertile soil. Severe drought resulted in the highest WUE_Y of all vegetables in fertile soil (cowpea: 14.6 g L^{-1} , nightshade: 19.0 g L^{-1} and Sukumawiki: 34.8 g L^{-1}). Sukumawiki had the highest WUE_Y in all treatments. In conclusion, cowpea and nightshade were more dependent on soil fertility than Sukumawiki in terms of yield, and Sukumawiki was the most productive vegetable under drought conditions. In rural areas, green leafy vegetables often represent the main source of nutrients in the diet. The results can be used to suggest better-quality and -quantity diets in rural areas and understand the effects of drought and soil fertility on food and nutrition security.

Keywords:

Soil fertility, Drought, Productivity, Green leafy vegetables, Food and nutrition security

P1.3.f

Use of natural substances with fungicidal effect in the hop production

Jan Řehoř, Czech University of Life Sciences Prague (CZU), Prague, Czech Republic

StudyProgrammeLevel: Master

The aim of this research was to monitor the influence of the treatment of hops with selected natural substances with antifungal effect and their uses in the hop production. As natural substances were selected seaweed extracts, orange terpenes, thyme and hop extracts. Prerequisite benefit of these substances could be a low phytotoxicity without the consequence of decreasing yields and quality of hop cones. For a test were selected: Alginate, Prev B2, thyme oil and hop extract. Experiment was set up in 2017 on locations of Činová and Liběšovice. In addition to monitoring the quality parameters (alpha fatty acid content), the yield of dry hop, hop cones health and chlorophyll content in grape and pappus leaves after the application of selected substances were also monitored. The results showed that all the used preparations had a positive effect on the chlorophyll content of the leaves. The biggest yield of the hop cones had a hop extract variant. All preparations also positively influenced the alpha bitter acid content as well as the total production of alpha bitter acids per hectare. Raising trend of content of alpha bitter acids were recorded by all the preparations and the biggest had a variant of hop extract and thyme oil (statistically significant). The application of all selected substances

has positively influenced the yield and quality of hop cones, so it is therefore possible to recommend preparations for use in practice.

Keywords:

hop, antifungal effect, natural substances, *Pseudoperonospora humuli*, quality of hops

P2.1 Green innovation and circular economy: Green Innovations

P2.1a

Ecosystem services in the Inner Niger Delta under full development scenario of water resources management

Shassy E. Cahyani, Wageningen University and Research Centre (WUR), Wageningen, the Netherlands; Teun V. Werf, Wageningen University and Research Centre (WUR), Wageningen, the Netherlands; Rea Yellowlees, Wageningen University and Research Centre (WUR), Wageningen, the Netherlands; Enya Ramirez, Wageningen University and Research Centre (WUR), Wageningen, the Netherlands

StudyProgrammeLevel: Master

The Niger River Basin in West Africa has been a major asset to the nations within its catchment. For many communities, the Niger River is a lifeline; supporting their livelihoods and thus existence. Many countries which display this dependence of the river are considered water resource consumers due to their reliance on spatial and temporal patterns in rainfall and river flow for economic activity. Considering this vulnerability brought on by the variability and uncertainty of climate conditions, alongside satisfying the demands of population growth; further development and cooperation within the region was considered of critical importance. The vulnerability stimulated the design of a sustainable management strategy for the new Fomi dam in Upper Niger Basin to successfully achieve both electricity generation and increased crop production. This paper aims to assist in decision-making processes concerning future development within the Inner Niger Delta. More specifically, it will aim to inform decisions regarding the proposed dam construction and irrigation expansion, as to determine whether full development is a feasible recommendation. Each ecosystem services were valued using direct and indirect valuation methods. The total economic value was calculated, and discounting was applied for 20 years period to shows the economic benefits and costs of applied scenario. A stakeholder analysis was used to determine stakeholder interests. Multicriteria analysis and trade-off analysis were used to determine the relevance of each ecosystem services to stakeholders. The results indicate intensive scenario has the potential to ensure water, food, and electricity security which now has been a focus in Inner Niger Delta. Even though some stakeholders will lose their benefits from the ecosystem services, a policy and financing system could be implemented for the future development of Inner Niger Delta.

Keywords:

Dam, Ecosystem services, Multicriteria analysis, Cost-benefit analysis, Trade-off analysis

P2.1b

Deconstructing paradigms: national bioeconomy policies and their capacity to break the fossil era

Ezgi Ari, University of Hohenheim (UHOH), Stuttgart, Germany

StudyProgrammeLevel: Master

In recent years, there has been an increasing interest in bioeconomy to cope with global sustainability challenges. Nevertheless, it seems that existing policies fall short of the goal to drive a fundamental system change towards an economy that can be considered as a sustainable bioeconomy. It has been argued that such systemic change requires a deconstruction of existing regimes to facilitate the creation of new ones. Such capacity of bioeconomy strategies was empirically examined in the cases of Germany and Finland to identify the likely policy gaps. An additional case study on climate change mitigation policy and measures provides more specific data on the implementation of bioeconomy related policies. The analytical framework developed

by Kivimaa & Kern (2016) based on the concept of “motors of creative destruction”, is used to empirically map the existing national policies. Two policy dimensions (creation and destruction) are distinguished for providing an illustration of the policy mix profiles of both countries. The results indicate that bioeconomy policies mainly serve a niche supportive function, while climate change mitigation policies are more oriented towards regime destructive measures. Overall, the allocation of the policy measures within the creative and the disruptive sides are imbalanced. This study offers a strong argument as to why bioeconomy policies of Finland and Germany might not sufficiently succeed in prompting the required transition towards a sustainable bioeconomy. The following policy recommendations may be drawn from these insights: more diverse policy instruments must be put in place; the support for dominant non-renewable regimes must be decreased; imbalances and contradictions among bioeconomy policy measures must be avoided. In other words, the creation and development of niches must be accompanied by the simultaneous destabilisation of existing regimes. This will support the development of more concrete bioeconomy policies that are effective beyond a mere provision of strategies.

Keywords:

Bioeconomy Strategies, Sustainability Transition, Creative Destruction, Policy mix

P2.1c**A comparison of quality strategies of selected producer organisations from Austria and Germany**

Marie Christine Meyer-Jürshof, University of Hohenheim (UHOH), Stuttgart, Germany

StudyProgrammeLevel: Master

This thesis studied the public image of agricultural producer organizations in Austria and Germany, using content analysis by means of a created codebook. Therefore, the communication of different marketing strategies of German and Austrian producer organisations were analysed based on the content of their websites. Special attention was given to the question what kind of information these organisations reveal about themselves as well as to what extent this information is shared. On the basis of perceived injustice of the farmers regarding the unequal distribution of power in the value chain and the changing demands, expressed information from the organisations were examined. Findings from a literature review indicated that five created indices needed particular attention in order to be able to develop sustainable marketing strategies: brand strategy, product quality, additional benefits, regionality and trends. The results show that Austrian agricultural producer organisations use slightly more variables that on the one hand correspond to the demand and wishes of the consumers and on the other hand improve the brand image. On average, Austrian organisations have a better web presence; for instance, they show their regionality more obviously, disclose labels and make use of their own brand more often. These results indicate that there have been more efforts in Austria to implement efficient and sustainable marketing strategies than in Germany. However, findings demonstrate also that the surveyed agricultural producer organisations in the two countries have different structures. Therefore, different specializations with respect to products and different location factors have to be taken into account. Findings also indicate that marketing strategies based on the changing demand of consumers should be given more emphasis in view of the unequal distribution of power along the value chain, and a convincing digital presentation of firms and products is becoming ever more important for agricultural producer organizations.

Keywords:

agricultural producer organisation, external presentation, marketing strategy, communication

P2.1d**Validation of an integrated robotic platform for in-situ quality monitoring of surface water**

Dominik Rapberger, University of Natural Resources and Life Sciences, Vienna (BOKU), Vienna, Austria

StudyProgrammeLevel: Master

The monitoring of water quality is challenged with providing the limit for safeguarding the protection of the environment from harmful biological effects of anthropogenic chemical pollution from diffuse and point sources.

To meet this challenge, the European Union has taken the first steps with the promotion of the Water Framework Directive (WFD). With it, one goal of the WFD is the improved monitoring of water quality to measure quality problems faster and more effectively. Nowadays measurement needs a lot of time because of a high workload for each parameter. This leads the European Union to launch the project "INTCATCH". The participating project partners come from six different countries from universities and companies. Their task is to monitor the quality of surface water with new ways. Both the parameters of the Quality Target Ordinance Chemistry - Surface Waters and those of eutrophication must be observed. The necessary classification of this system can be carried out with validation according to the international standard. Tests are carried out which simulate the real state as well as possible. Particular attention is paid to the measurement of the parameters for determining the eutrophication since these measurements can only be measured around the year 2017 with online monitoring. Another challenge is to test the functionality of the system (boat). Communication skills play a major role here since everything had to work so that clear recording was possible. The system turned out to be very good except for a few small details, and the measurement of the eutrophication parameters showed good results. In the future, this form of measurement will be widely used because it ensures excellent continuous monitoring of surface waters.

Keywords:

Validation, UV/VIS Spectroscopy, Eutrophication, Calibration, Online water quality monitoring

P2.1e

Improving drought forecasting using data assimilation

Irina Georgievova, Czech University of Life Sciences Prague (CZU), Prague, Czech Republic

StudyProgrammeLevel: Master

Data assimilation (DA) methods have been extensively used in hydrology in recent decades due to their convincing results. The definition of DA can be summarized as a method of incorporating observations of the system over time into the model to obtain improved estimates of the system states. This thesis focuses on the implementation of sequential DA into the conceptual hydrological model BILAN, used in the system for monitoring and forecasting of drought in the Czech Republic named HAMR. Said system was developed based on amendments to the Water Act, which entails the assembly of the operative management committee in case of water deficiency. The system is intended to serve as a comprehensive information source for their decision-making. Two possible concepts of DA implementation were proposed: (a) combination of predictions from several models using Kalman Filter to improve forecasting performance, (b) improvement of BILAN simulation results by modifying model parameters using partitioned update scheme based on the Ensemble Kalman Filter (PU_EnKF). Concept (a) combines predictions of BILAN and AR(1) models and has been tested on air temperature, precipitation and potential evapotranspiration. Results were evaluated on one hundred Czech catchments using MASE. Proposed methodology succeeded in reducing the error on average by 7.15% to 10.3% compared to BILAN predictions. Concept (b) was evaluated on six catchments by cross-validation. The evaluation showed a reduction in RMSE by 48.7% - 88.4% compared to the simulation methodology with constant parameters. Thus, both proposed concepts managed to improve the accuracy of simulations and predictions compared to the usual procedures of the HAMR system. Therefore, their future implementation could contribute to better water management in extreme hydrological situations such as drought as well as in its essential monitoring routine.

Keywords:

drought, BILAN, HAMR, data assimilation

P2.2 Rural and urban development for thriving communities: Bio-science studies in rural and urban environment

P2.2.a

Spatio-temporal dynamics of the greater flamingo (*Phoenicopterus roseus*) movement in the Mediterranean region: The case of Saline di Comacchio

Anastasiia Siretckaia, Czech University of Life Sciences Prague (CZU), Prague, Czech Republic

StudyProgrammeLevel: Master

The study represents graphical and statistical analysis of the greater flamingo (*Phoenicopterus roseus*) movement in relation with climatic variations at the most frequently used colonies Parc Ornithologique de Pont de Gau in Camargue (France) and Saline di Comacchio (Italy). The colony in France is located in the natural salty wetlands and Italian one is the former commercial saltpan. The analysed georeferenced data of the ringed individuals was created in the scope of the monitoring programme organized in the Mediterranean region. It was used for the analysis in combination with other datasets (Climatologies at high resolution for the earth's land surface areas) with resolution 30 arc.sec.). The main aim of the thesis was to analyse the greater flamingo movement in relation with climatic variations at the most frequently used natural and former commercial lagoons. The results concluded that the weather is a crucial driver of movement patterns of the flamingo species in the Mediterranean region. In terms of instant weather conditions, temperature was more important factor impacting the presence of individuals in Comacchio site. However, time-lag effect of weather on flamingo presence is more complex: in former commercial site, Saline di Comacchio, none of the weather variables have the significant effect except precipitation in winter time, but in the natural site, Parc Ornithologique in Camargue, both temperature and precipitation have the significant influence on the species presence in winter or breeding period. Among weather parameters experience-dependent natal philopatry plays the crucial role in the presence of individuals as well as the habitat characteristics. Even though some significant results during the data analysis were achieved, more likely there are other drivers influencing the flamingo choice to where, when and how to disperse and migrate.

Keywords:

spatial distribution, spatial ecology, population ecology, natal philopatry, migratory behaviour

P2.2.b

Dilated cardiomyopathy in Doberman Pincher

Daria Aleksandrowicz, Warsaw University of Life Sciences (WULS-SGGW), Warsaw, Poland

StudyProgrammeLevel: Bachelor

Dilated cardiomyopathy (DCM) is the loss of myocardial contractility that progresses with the disease. It causes a decrease in the minute capacity. Congestive heart failure develops, which is a direct cause of death. Doberman Pinchers are among the dogs particularly exposed to the development of DCM (in Europe 58%). Approximately 10% of the population is ill from the first to the fourth year of life. Among 1/3 of all Doberman Pinchers, sudden death occurs in the preclinical phase. The aim of this study was to propose simple molecular tests to identify the DCM responsible mutations in the Doberman Pincher breed. DCM in Dobermans is inherited in an autosomal dominant manner with incomplete penetration. A study conducted on the American Dobermans population (66 cases) proved that the higher for DCM than for controls. The difference between the populations (American and European) may be due to different genetic pools and founder's effect of American population of Doberman Pincher. Subsequent studies in the European population have indicated a *locus* on chromosome 5 showing single nucleotide polymorphism (SNP) of "allele c" and its increased incidence in dogs with cardiac arrhythmias. deletion of 16 nucleotides in the 5' donor splice site of intron 10 of the PDK4 (location in dog in 14 chromosome) coding gene is related to the development of DCM. Expression analysis showed a decrease in the expression of exon 10 and 11 (especially in a homozygous dog), resulting in decreased activity of PDK4 protein. However, studies carried out on the population from Germany (71 cases) and Great Britain (15 cases), denied studies that indicate the effect of 16 nucleotide deletion on DCM development. The results indicate that the PDK4 allele variant showing deletion occurs in DCM cases and controls with an overall frequency of 16%. The frequency of deletion is only slightly

Keywords:

DCM, dilated cardiomyopathy, Doberman Pincher, PDK4

P2.2.c**Mass loss of diversity and abundance of freshwater invertebrates in fish ponds**

Anna-Marie Poskocilova, Czech University of Life Sciences Prague (CZU), Prague, Czech Republic

StudyProgrammeLevel: Master

Agricultural intensification is nowadays the main cause of the loss of aquatic invertebrate species in farm ponds. The vast majority of our ponds are used for fish breeding, predominantly carps, and are often overfished. Homogenous fish stock and minimal cover of littoral vegetation negatively affects the population of aquatic invertebrates. Consequently, the predation pressure on aquatic invertebrates is enormous, and because of the lack of littoral vegetation, aquatic invertebrates have no shelters. Aquatic invertebrates are the main food source for carps in our ponds. And although they are equipped with various defense strategies against fish predators, they struggle in habitats where predation pressure level is so high. An in situ experiment was established to analyze whether small isolated habitats with rich vegetation could be more attractive to aquatic invertebrates in comparison to open homogeneous ponds. The literature review summarises the issue of intensive agricultural management and its impact on aquatic invertebrates. Furthermore, it analyses the influence of aquatic vegetation on aquatic invertebrates and equally summarises the antipredation mechanisms of aquatic invertebrates. The experiment took place at twelve ponds used for intensive fish farming in three regions of the Czech Republic. The aim was to create alternative fish-free zones within homogeneous ponds (using fences) and plant vegetation artificially installed in half of them. The experiment has demonstrated that only several invertebrate groups proved more abundant in cages without fish (*Gerridae*, *Notonectidae*, *Noteridae*), and that aquatic hemiptera preferred microhabitats with rich natural vegetation. Moreover, the experiment has shown that species composition did not differ significantly between the researched localities. All invertebrate groups captured during the field experiment were pioneer species, which tend to quickly colonise new environments, and they were not particularly selective in their habitat preferences. In the following years, however, we are expecting gradual changes in species composition.

Keywords:

freshwater invertebrates, diversity loss, fish predation, freshwater ponds, intensive farming

P2.2.d**Sexual behavior in butterflies and its importance for survival strategy**

Anna Pilařová, Czech University of Life Sciences Prague (CZU), Prague, Czech Republic

StudyProgrammeLevel: PhD (1st year)

The aim is to analyze the available data on the reproductive behavior of diurnal butterflies and the factors that affect it. The goal of the evaluation is to find the relationship between promiscuous behavior in butterflies (repeated mating with other individuals) and the endangered status of the evaluated species. Furthermore, the study of the issue of elements of reproductive behavior, which may affect the ability of individuals to spread and generally affect the spatial distribution of the species. Hypotheses: 1. Species which show a higher level of promiscuous behavior are not among the species classified in higher risk categories. 2. Males show a higher degree of promiscuity. 3. Individuals of butterflies that copulate repeatedly migrate less. Methodology: Information on sexual behavior in selected species will be collected as part of a literature review and analysis of our own data obtained in the field using studies of recapture of marked individuals. Thanks to this method, it is possible to find out who copulated with whom, which part of the day butterflies prefer for copulation, the interval between copulation and laying, whether individuals migrated after copulation, which sex is more promiscuous. These informations then can be linked to the known distribution of species and their classification in the red lists, and appropriate conclusions can be drawn to confirm or refute the hypotheses. Basic statistical data processing will be performed in the environment of the Statistica program, and processing in the Mark

program version 2.0 and higher, possibly using Virtual Migration. The expected outputs will be useful in the practical protection of some species of butterflies and in the design of modifications within the landscape permeability (ÚSES). At the same time, we assume a significant contribution to basic research into the ecology of butterfly populations.

Keywords:

reproduction, promiscuity, distribution, ecology, diurnal butterflies

P2.2.e

Homozygosity indicators in canine MHC region of the great poodle and leonberger populations

Mary Heydie Geena Cartick, University of Natural Resources and Life Sciences, Vienna (BOKU), Vienna, Austria

StudyProgrammeLevel: Master

Dog breeds are the leading examples of artificial selection, with sometimes extreme changes between the wolf-like phenotypes and current breeds. This increased selection pressure manifest in increased homozygosity throughout the genome, including the major histocompatibility complex (MHC) with large influence on the immune system. The MHC region in 98 Leonberger and 37 Great Poodle dogs was examined using single nucleotide polymorphism (SNP) data. The SNPs data for both dog breeds, went through quality control (QC) following parameters to remove any data that could affect further analysis, i.e. include only SNPs and individuals with at least 90% genotyping rate and individuals which were complying to the p-value threshold of 0.00001. Chr 12 and Chr 18 were deliberate choice as the canine MHC region and DLA-79 are positioned on the respective Chromosome. Furthermore, the same genomic region was extracted from three random Chr 3, Chr 20 and Chr 32 as a control. The overall homozygosity levels and via the runs of homozygosity (ROH) were calculated as indicators to assess the MHC regions, compared to other random parts of the dog genome. High proportion of homozygosity was observed in all examined Chromosomes, ranging from 58 to 78 percent. While the overall level of homozygosity in the MHC region of Chr 12 was 0.71 and 0.78, the exact segments of the MHC Class I and Class II showed homozygosity proportion of around 0.3 using the ROH approach. Recombination brake points could be detected with ROH. The homozygosity was even lower at the locations of the genes with a known effect on the immune response, confirming previous findings. In conclusion, the ROH measures were favoured to assess the MHC regions, as it gave more insight into the variability of homozygosity in the region, in particular at the location of MHC genes.

Keywords:

ROH, SNP, Canine, DLA, MHC

P2.3 Food and health for the next generation: Food Systems for the Future

P2.3.a

Identifying drivers, constraints and stakeholders for innovations in diversified agriculture, nutrition and value chains

Magdalena Nertinger, University of Hohenheim (UHOH), Stuttgart, Germany; Luisa Pereira Goss, University of Hohenheim (UHOH), Stuttgart, Germany

StudyProgrammeLevel: Master

The research project "Education and Training for Sustainable Agriculture and Nutrition in East Africa" (EaTSANE) uses an integrated approach for innovation and capacity strengthening to facilitate systemic change in the food system. The main research areas are: Diversified Agriculture, Nutrition and Value Chains. It is an international research project with cooperation among research and development institutions in Kenya, Uganda, Germany and the Netherlands. Within the project, the research work is based on multiple research disciplines, of which each applies a participatory action research approach to engage farmers and other value

chain actors. Therefore, there was a need for a study to look at these areas from an interdisciplinary point of view. Likewise, we conducted, together with students from partner universities in Kenya and Uganda, an interdisciplinary study in order to identify innovations that were implemented by farmers within the last years and related drivers, constraints and stakeholders. Our aim was to frame an enabling environment for farmer innovation and use the results to provide a basis for policy dialogue. Four Focus Group Discussions were held in each research site (Teso South in Kenya and Kapchorwa in Uganda) with farmers that participate in the EaTSANE project. The participants were asked about their innovations in agriculture, nutrition and value chains within the last year. Drivers, constraints and stakeholders were identified and discussed by creating a stakeholder map together with farmers. In order to achieve a better understanding of the relations between the stakeholders and the innovations, follow-up interviews with identified stakeholders were held. We summarized our findings in an overall stakeholder map for each study site, and discussed the maps in workshops with policy makers and other stakeholders in Kenya and Uganda. Preliminary findings conveyed that knowledge was an important driver for all mentioned innovations.

Keywords:

Innovation, Diversification, Food System

P2.3.b

In vitro cultivation of Caucasian whortleberry (*Vaccinium arctostaphylos*)

Denisa Kovarova, University of Natural Resources and Life Sciences, Vienna (BOKU), Vienna, Austria

StudyProgrammeLevel: Master

The area of distribution of the *Vaccinium arctostaphylos* is from Western Asia, Caucasus to Southeastern Europe. The plant can stand winter temperatures as low as - 20°C, therefore could be grown in the Northern and Central part of the Europe. Its reaction to winters without any freezing is not very well understood, thus it may not be suitable for Mediterranean areas. *Vaccinium arctostaphylos* is a 2-5 m high shrub with fruits 6-8 mm in width. This *Vaccinium* species is protected in Europe by the Bern Convention and in Bulgaria has the status of endangered species. Caucasian whortleberry is flowering from May to July and fruits are ripening till September. Fruits of the Caucasian whortleberry are rich in anthocyanins, which can be used for fruit extracts and as a nutritional supplement. There were some clinical trials for treating of human diseases such as diabetes, atherosclerosis, hyperlipidemia and high blood pressure with interesting results, therefore *Vaccinium arctostaphylos* may have certain market potential as food or nutritional supplement. In the fruit breeding the techniques of in vitro propagation are used for obtaining virus and disease-free planting material, for breeding of selected genotypes. In the frame of my Master Thesis I will first try to establish the axenic cultures of Caucasian whortleberry, based on previous work carried out in the PBU, BOKU. Successfully established single seed descendant lines will be multiplied and maintained in tissue culture. In a second step, effort will be undertaken to map genetic variability within the *Vaccinium* population and search for interesting difference in their phenotype or genotype.

Keywords:

caucasian whortleberry, in vitro culture, genetic variability

P2.3.c

Assessment of dietary intake and food groups consumption among Syrian women of reproductive age and identification of nutritional gaps based on income levels

Georgiana Cocuz, University of Hohenheim (UHOH), Stuttgart, Germany; *Joana Abou-Rizk*, University of Hohenheim (UHOH), Stuttgart, Germany; *Theresa Jeremias*, University of Hohenheim (UHOH), Stuttgart, Germany

StudyProgrammeLevel: Master

Suboptimal intake of critical nutrients during the reproductive age and pregnancy can lead to micronutrient deficiencies, malnutrition, and negatively affect the fetus through epigenetic mechanisms. Therefore,

addressing maternal nutrition is of crucial importance in order to improve the health and nutrition situation of present and future generations. This study was conducted among Syrian refugee non-pregnant non-lactating mothers (n=135) aged 15-49 years in Greater Beirut, Lebanon. The objective was to assess their dietary intake, identify nutritional gaps, and examine food groups consumption. A multi-component questionnaire was used to examine socio-economic and household characteristics. Dietary intake was measured using a 24-hour dietary recall and food frequency questionnaire. Analysis was also conducted according to the monthly income levels of study subjects. Results showed that the majority of the participants failed to reach the Dietary Reference Intakes (DRIs) for energy, macro- and micronutrients. However, mothers from the high-income group had higher intakes of saturated fatty acids, total sugar, pantothenic acid, and vitamin B12 and a better adherence to the DRIs, as compared to the low-income group. The main food groups consumed among all respondents were grains, starchy staples, fats, oils, sugar, and sweets. Highly nutritious food groups such as fruits, vegetables, eggs, pulses, nuts, fish, and meat were consumed very modestly. In addition, mothers from the high-income group consumed higher amounts of red meat, milk, cheese, dessert, and chocolate, while those from the low-income group had higher intakes of bread, processed meat, and Zaatar. Accordingly, two meal plans were developed to cover the nutritional gaps identified using traditional recipes, highly nutritious yet cost-friendly food groups. Low dietary diversity can provide one explanation for the nutritional gaps identified among Syrian refugee mothers. Income levels played a role in dietary intake and food groups consumption, as nutrients inadequacy was predominant among the low-income group.

Keywords:

women of reproductive age, nutritional gaps, food groups consumption, income groups

P3.1 Food and health for the next generation: Food Technology

P3.1.a

Gluten-free extruded snack using rice, cowpea and whey protein concentrates: Bioactive compounds, antioxidant properties and predictive glycaemic response

H. N. Nadeesha Dilrukshi, Lincoln University (LU), Christchurch, New Zealand

StudyProgrammeLevel: PhD (1st year)

The demand for ready-to-eat and convenient snack products is increasing at a dramatic pace as the lifestyle continues to become more engaged. Snacks are predominantly made from refined cereal flours and, treated as high glycaemic index foods with low nutritional value. The aim of this research was to the fortification of cowpea; a legume and whey protein concentrate (WPC) with rice flour and develop snacks with high protein, fibre and bioactive phytochemicals. A co-rotating twin-screw extruder was used to obtain rice-based extrudates containing cowpea and WPC in five different combinations and used rice as control. Process conditions were screw speed at 252 rpm, feed rate at 7.98 kg h⁻¹, water rate at 90.67 kg h⁻¹, and die diameter was 3 mm. Extrudate composition was assessed by analysing predictive invitro glycaemic response, insoluble dietary fibre, resistant starch, α -galactosyl oligosaccharides, total phenolics and antioxidant potential. Analysis of variance revealed that the incorporation of legume and WPC significantly decreased the starch degradation and the area under the curve (AUC) of reducing sugars released during digestion. At the same time, the total phenolic content and antioxidant capacities of samples increased. Compared to control, fortified extrudates have more functional food components; insoluble dietary fibre, resistant starch and α -galactosyl oligosaccharides were significant. These results suggest the potential of developing gluten-free snacks with high protein, dietary fibre content and low predicted glycaemic index with the blend of the rice, cowpea and WPC, and these gluten-free snacks can be used as an alternative to obesity problems in the general population and celiac community.

Keywords:

Ready-to-eat snacks, protein, fibre, bioactive phytochemicals, glycaemic response

P3.1.b**The effect of fortifying rice crackers with oyster and green-lipped mussel powder on the glycaemic impact and protein bioaccessibility of gluten-free crackers**

Limin Sui, Lincoln University (LU), Christchurch, New Zealand

StudyProgrammeLevel: PhD (1st year)

Rice crackers are popular cereal snacks and have considerable demand among consumers in modern society. From a nutritional point of view, most rice products are made from white rice flour. This food may lead to nutritional and health problems associated with the high glycaemic index, due to the high content of readily digestible carbohydrates but low in protein and dietary fibre. With the trend towards a well rounded, healthy diet and the development of nutritious foods, strengthening dietary fibre, antioxidants and protein in crackers formulas is currently viable options. Brown rice has high levels of fibre and bioactive molecules, such as polyphenols, which can reduce the risk of chronic diseases. In contrast, black rice is especially rich in anthocyanin pigments, phytochemicals, which are essential for memory and the immune system. Especially in terms of protein content, it can enhance the nutritional value of inferior products and play a key role in alleviating malnutrition worldwide. As New Zealand's most iconic seafood, Oyster and green lipped mussel are sources of high quality essential amino acids of protein, essential vitamins and minerals, as well as long chain polyunsaturated fatty acids. The purpose of this study is to strengthen the nutritional composition of rice crackers and to analyze the effects of the addition of oyster powder and mussel powder on the physicochemical properties, antioxidant capacity, in vivo and in vitro digestion and sensory acceptability of the products, as well as the effect of these ingredients on gut immunity sensitivity.

Keywords:

glycaemic response, rice crackers, antioxidant, digestibility, inflammatory

P3.1.c**Changes in the stability of food against rancidity after microwave treatment**

Petra Škvorová, Czech University of Life Sciences Prague (CZU), Prague, Czech Republic

StudyProgrammeLevel: PhD (1st year)

Dry shell fruits are common parts of our diet. On the other hand, there are some problems with their stability during the storage. Attacks of pests and microorganisms are very common. Microwave treatment represents a modern preservation technique enabling drying, pasteurization, sterilization, defrosting, tempering or sealing of food materials. The aim of my research was to evaluate the effect of microwave treatment on the quality and oxidation stability of dry shell fruit during their storage. The effect of the radiation was monitored by colour changes, dry matter content and peroxide value (PV) determination. Three types of dry shell fruit (peanuts, almonds and hazelnuts) were treated in the IKB Trade company microwave line. The content of dry matter and the colour of fruits were analysed immediately after the treatment. Oxidation stability was observed for three months during the storage at temperatures 20, 40 and 60°C. There were statistically significant differences in dry matter content and colour between treated and untreated samples. Significant effect of the microwave radiation treatment on PV was observed in peanuts. There was also significant influences of temperature and the time of storage on PV. Our results showed, that microwave radiation treatment and higher storage temperature resulted in the increase of PV of tested samples. The hypothesis, that the microwave radiation causes the changes of dry shell fruit stability against rancidity was accepted. It was also proved, that the range of the changes depends mainly on treated kind of fruit, length and intensity of the radiation and then on the storage conditions. However, it was found that the quality of nuts and almonds treated with microwave radiation was still acceptable throughout storage even at elevated temperatures. We can therefore assume that it will be preserved until the expiration date on the shelves in stores.

Keywords:

microwave treatment, rancidity, colour, dry matter, nuts

P3.1.d**Degradation of Amylase-Trypsin inhibitors by lactic acid bacteria**

Martin Ladurner, University of Natural Resources and Life Sciences, Vienna (BOKU), Vienna, Austria; **Vera Fraberger**, University of Natural Resources and Life Sciences, Vienna (BOKU), Vienna, Austria; **Stefano D'Amico**, Austrian Agency for Health and Food Safety (AGES), Vienna, Austria; **Konrad J. Domig**, University of Natural Resources and Life Sciences, Vienna (BOKU), Vienna, Austria

StudyProgrammeLevel: Bachelor

Within the last few years the prevalence of wheat related disorders like celiac disease (CD) or non-celiac wheat sensitivity (NCWS) has increased. Beside fermentable oligo-, di-, monosaccharides and polyols (FODMAPs), the protein family of α -amylase-trypsin inhibitors (ATIs) is assumed to be a main trigger of NCWS. Sourdough processing contributes to better digestible wheat based bakery products, especially due to the proteolytic activity of lactic acid bacteria (LAB). Therefore, sourdough-related LAB were screened for their capacity to degrade potential immunogenic proteins. Firstly, a broad range of LAB isolates was screened to evaluate the growth on a gluten based medium. Further, the break-down of ATIs by selected LAB isolates was determined. ATI degradation after 72 h of incubation within an ATI-based medium was investigated by means of acidification (pH, free amino nitrogen, organic acids), HPLC, and competitive ELISA analysis. Results revealed the potential of each LAB strain to degrade ATIs in a high degree. However, even a strain dependent effect on the degradation capacity of ATIs was observed. Hence, specific starter cultures can be used in sourdough processing for wheat based bakery products with reduced ATI content, and further, better tolerated products for patients suffering from NCWS.

Keywords:

sourdough, lactic acid bacteria, α -amylase-trypsin inhibitors, wheat sensitivity

P3.1.e**Influence of different primary production conditions on the concentration of clostridial spores in raw milk**

Tamara Rudavský, University of Natural Resources and Life Sciences, Vienna (BOKU), Vienna, Austria

StudyProgrammeLevel: Master

Butyric acid producing clostridia, above all *Clostridium tyrobutyricum*, can excrete excessive amounts of gas and organic acids during fermentation. The presence of clostridial spores in raw milk can lead to grave quality constraints during the several months lasting maturation process of semi-hard and hard cheese. The level of contamination of the raw milk with butyric acid producing clostridia can be controlled via good farm management practices, such as barn and milking hygiene as well as the feed quality. The aim of this study was to determine the impact of primary production conditions on the content of these spore-forming bacteria in raw milk.

To accomplish this, samples of eight Austrian dairy farms on three consecutive seasons were collected. The samples collected were raw milk samples and teat skin swabs of lactating cows. Additionally, at each sampling, data of the prevalent hygienic conditions and the general management style (number of lactating cows, farming method etc.) were gathered.

Interestingly, spore concentrations of all sample types succumbed to seasonal fluctuations. Additionally, it can be stated that teat cleaning lead to a significant reduction of spore concentrations. Furthermore, a strong positive correlation between the spore concentration of the teat skin swabs and the raw milk samples could be determined. Diverse impacts on the spore concentration were observed, for instance the milking technique seemed to be crucial. Furthermore, by identifying bacterial isolates, disparities in the microbiota of the raw milk samples and the teat skin swabs as well as seasonal shifts could be determined.

Keywords:

clostridia, *Clostridium tyrobutyricum*, late blowing, teat cleaning, raw milk

P3.1.f**Quantification of minor fatty acids in milk products**

Gregor Wailzer, University of Natural Resources and Life Sciences, Vienna (BOKU), Vienna, Austria

StudyProgrammeLevel: Master

Containing over 400 different fatty acids, milk fat is one of the most complicated naturally occurring fats. The content of some minor fatty acids varies between cow's milk from different feeding- and farming systems, which can be used for food authenticity purposes. The aim of this study was the development of a gas chromatography/mass spectroscopy method for the simultaneous quantification of phytanic-, pristanic- and lactobacillic acid in milk products. Phytanic- and pristanic acid are synthesized by rumen bacteria out of chlorophyll and could be used to differentiate between organic and conventional dairy products. Cyclopropane fatty acids like lactobacillic acid are produced at the fermentation of silage, thus shouldn't be present in hay milk. The milk fat was extracted using an adapted Röse-Gottlieb method and 10-undecenoic acid methyl ester and 10,11-dichloroundecanoic acid methyl ester were added afterwards as a quantification standard. 10,11-dichloroundecanoic acid was synthesized out of 10-undecenoic acid by adding sulfuryl chloride, which leads to the electrophilic addition of chlorine at the double bond of the carbon chain. The standards were methylated via acid-catalyzed methylation with HCl/methanol, and were purified in a silica gel column. The methylation of the milk samples was carried out by adding sodium methanolate, obtained by dissolving metallic sodium in water-free methanol. The samples were analyzed by GC/MS, using single ion monitoring (SIM) to scan for the characteristic mass fragments of the demanded fatty acids.

Keywords:

milk fat, gc/ms, fatty acid methyl ester

P3.2 Rural and urban development for thriving communities: Specific aspects of sustainable development (Backup Oral)**P3.2.a****THE DARK SIDE OF THE BOG - Estimating environmental degradation of a raised bog by assessing plant and fungal communities via eDNA metabarcoding**

Janin Salzger, University of Copenhagen, Faculty of Science (SCIENCE), Copenhagen, Denmark, {75732CAF-1E48-4D3E-A62B-245A2AB8E40E}

StudyProgrammeLevel: Master

Conserving valuable ecosystems with their associated services and reducing the rate of biodiversity loss are international goals supported by widespread political agreement. To provide fundamental knowledge for successful conservation and restoration projects, it is essential to assess the biodiversity status of target ecosystems and monitor changes over time. Traditional biodiversity studies via morphological surveys usually focus on the producing side of the ecosystem, and the decomposing side is largely left out of the evaluation. To gain a more balanced picture of the whole system, this study aims to assess the changes in plant and fungal communities and compare their turnover rates along a hydrological gradient in Tofte Mose, an active raised bog in Denmark. To overcome the shortcomings and limitations of traditional methods new, more rapid survey approaches for biodiversity monitoring are necessary. In this context, the metabarcoding of DNA derived from environmental samples (eDNA) has become a valuable tool for ecological studies and environmental management. In this study the results of a traditional morphological vegetation survey are compared to an eDNA metabarcoding analysis. Changes of environmental parameters are reflected well by both, plant and fungal communities. However, the responses of fungi are more direct. Both approaches, eDNA metabarcoding as well as the morphological vegetation survey, are suitable for describing community turnover along environmental gradients. Nevertheless, eDNA metabarcoding outperforms classic morphological surveys regarding the correlation with environmental gradients.

Keywords:

biodiversity, conservation, restoration, eDNA metabarcoding, raised bog

P3.2.b**Social innovations in marginalized rural areas. An analysis of five successful Italian case studies**

Dori Zantedeschi, University of Natural Resources and Life Sciences, Vienna (BOKU), Vienna, Austria

StudyProgrammeLevel: Master

With my thesis, I analyse the emergence of five case studies of social innovation in Italy that deal with the problem of people moving to cities abandoning rural areas. In Italy, the marginalised rural areas are mostly identified in the mountain areas, which have been subjected to a phenomenon of depopulation since 1938. However, people in the high towns are needed to monitor and contain the erosion to prevent floods and landslides, and to protect the hydrological heritage. Moreover, since 60% of the Italian territory is characterized by the presence of little municipalities, developing them has a big share in developing the whole country. Given this introduction, the research question I will investigate is: which factors made these case studies successful? For each case study, interviews were carried to know about the motivation to start the innovation, all the actors involved, the interactions between the actors, hindering factors, funds, and the information needed to start and carry out the innovation. The conclusion remarks the intrinsic meaning of social innovation, namely, it increases the well-being of a certain group of people, and that no innovation could happen alone, but needs collaboration from different actors. In this perspective, policies and regulations assume a crucial role in the proliferation of social innovations and in their support.

Keywords:

Social innovation, Societal well-being, Depopulation, Italy, Rural development

P3.2.c**Overgrowing heritage - Warsaw Fortress**

Marta Anusz, Warsaw University of Life Sciences (WULS-SGGW), Warsaw, Poland

StudyProgrammeLevel: Bachelor

When we think about forts not immediately we associate them with greenery - in our minds we have got rather a picture of black&white photographs with soldiers and rust-coloured brick ruins than plants. However, in spite of appearances fortress areas "live" in symbiosis with topography, local climate conditions and vegetation. Warsaw Fortress is a comprehensive defensive system built by Russian Empire in XIX cent. which includes near 30 forts located in two circles run through the city. After World War II their situation has become even less convenient - some of them were handed over the military forces, others went private, further ones were disassembled and the rest was transformed into different kinds of green areas. Although most of them have been undergone devastation Warsaw Fortress has got still an enormous potential as a valuable monument located in capital of Poland. I decided to analyse Sadyba Fort IX. Sadyba Fort was built on a plan of close-to-pentagon shape with wet moat. After the war in 1945, it was decided to cut the fort through one of the main streets of the district. Currently, in the eastern part of the fort there is a park, and in the west there is the Museum of Polish Military Technology - somewhat forgotten and neglected. To redefine the cultural and natural functions of the western part of the fort, I prepared a design of the courtyard of the Sadyba fort in the form of a green area with the aspect of military culture tourism. Thanks to such an attitude it is probable to get a combination of protection and conservation of fort area and creation of freely available park, which corresponds to its history, while increasing the share of greenery in the district.

Keywords:

fort, Warsaw, green area, military tourism

P3.2.d**Tackling heat in urban canyons in Copenhagen and Vienna with sustainable urban drainage systems**

Anna Leitner, University of Copenhagen, Faculty of Science (SCIENCE), Copenhagen, Denmark, University of Natural Resources and Life Sciences, Vienna (BOKU), Vienna, Austria; Tuan Ngoc Ngo, University of Copenhagen, Faculty of Science (SCIENCE), Copenhagen, Denmark

StudyProgrammeLevel: Master

Climate change and the Urban Heat Island effect lead to increasingly high summer temperatures in many European cities. Expanding green space is one strategy for reducing the thermal discomfort of pedestrians and the public health impact of heat stress. Plants indirectly cool the air by evapotranspiration. This process alters the energy balance by increasing latent in favour of sensible heat flow. The evapotranspiration rate depends, among others, on water availability, but urbanization has changed the hydrological cycle through soil sealing. Instead of infiltrating into the ground, rainwater runoff is directly discharged through sewage systems or stormwater drains. This leads to a lack of water for evapotranspiration. Consequently, urban vegetation requires cost-intensive irrigation to survive in summer. This study analyses whether Sustainable Urban Drainage Systems (SUDS), such as rain gardens and green facades, are suitable solutions for mitigating this imbalance in the urban hydrological cycle. This research used the energy and water balance of exemplary urban canyons of the two typical European city centres of Vienna, Austria and Copenhagen, Denmark to calculate how much surface area needs to be converted to SUDS to balance rainwater supply and plant water requirements for evapotranspiration throughout the vegetation period. Surface temperatures in urban canyons in both cities were measured using hand-held infrared cameras to evaluate the cooling effect of urban vegetation. The results of the calculation are predicted to show the required amount of SUDS and water storage per running meter of the urban canyon that is necessary to achieve a balance between water provision and need. This amount depends on the targeted cooling efficiency and the climatic context. Including SUDS in urban planning on the street level can contribute to local climate change adaptation and Urban Heat Island mitigation by improving the hydrological cycle and restoring near-natural conditions of the energy balance.

Keywords:

Sustainable Urban Drainage Systems, Urban Heat Island Effect, Climate Change Adaptation, Evapotranspiration, Energy Balance

P3.2.e**Assessing BOKU WASH research in Tecoluca: Encountered difficulties, proposed solutions and possible paths for the future**

Lena Ortega Menjivar, University of Natural Resources and Life Sciences, Vienna (BOKU), Vienna, Austria

StudyProgrammeLevel: Master

In 2015, a research cooperation was started between BOKU's Institute of Sanitary Engineering and Water Pollution Control, the Austrian NGO INTERSOL and the El Salvadorian municipality Tecoluca. The objective of this cooperation was to create baseline data on Tecoluca's WASH situation. This master's thesis contributes to this by strategically assessing the research program. The program is assessed on challenges students faced while conducting their field research, the local stakeholders' level of knowledge about and usage of created results and tools, and the stakeholders' visions and recommendations on the future of the research program. To do this, 54 semi-structured interviews were held with (former) master students, former and current municipality staff and decision makers, community councils and water boards, and others such as local branches of government and other NGOs working in WASH in Tecoluca. The analysis of these interviews showed that students faced mostly organizational challenges, challenges in cooperation with other partners and ethical challenges during their field work. The level of knowledge about BOKU results and tools is generally low, and very few instances of usage of them could be found. Stakeholders mainly cited the lack of knowledge about the research program, late or incomplete data delivery and lack of political backing of the program by the municipality as the reasons for this. For the future of the research program, interviewees most frequently recommended to take measures towards awareness raising and publication. The organization of a symposium or another form of round table, where stakeholders in Tecoluca's WASH sector can sit down together to form long-term goals, could serve as a platform for awareness raising and dissemination of BOKU WASH results,

as well as strengthening the inter-organizational and inter- and inner-institutional cooperation on WASH in Tecoluca.

This thesis was supported by the 2019 BOKU grant for final study projects.

Keywords:

impact assessment, water, sanitation and hygiene, development cooperation

P3.2.f

Facilitating next generation's entrepreneurship through legacy - How family farms' succession-processes influence their ambidexterity

Wilmes Rolf, UHOH

 Winner of the ELLS Prize for Excellent Master Theses

StudyProgrammeLevel: Master

While family businesses are known for their tendency to exploit rather than exploring new business opportunities, the process of succession allows a balance to be established between both directions. Focusing on the process of intra-family succession, this article investigates the level of the firm's ambidexterity as a result of possessing an entrepreneurial legacy, including the succession-process in terms of an entrepreneurial-friendly organizational context, mentoring quality, and family cohesion. Based on a sample of 303 agricultural family farms in western Germany, the results highlight the importance of an entrepreneurial succession-process for family firms: While organizational ambidexterity is more likely when successors possess an entrepreneurial legacy and perceive an organizational context appropriate for entrepreneurship, a tight mentoring relationship between predecessor and successor and a strong cohesiveness among family members constrain organizational ambidexterity. Despite that, family cohesion magnifies the positive relation between entrepreneurial legacy and organizational ambidexterity.

P3.3 Food and health for the next generation: Gardening System for the Future

P3.3.a

Effect of zinc and titanium dioxide nanoparticles on in vitro micropropagation of *Monarda didyma* L. from nodal segments.

Rohit Bharati, Czech University of Life Sciences Prague (CZU), Prague, Czech Republic; Přemysl Landa, Institute of Experimental Botany of the Czech Academy of Sciences, Prague, Czech Republic

StudyProgrammeLevel: PhD (1st year)

Monarda didyma L. is a widely used ornamental plant with medicinal properties that have been used against several diseases like colic, diarrhea, asthma, etc. In recent times, the extracted oils from this plant have shown potential anticancer activity. This has increased the demand for its production. To complement the conventional production method recent research suggests the use of metal nanoparticles with *in-vitro* micropropagation as a promising option. In recent times, zinc oxide & titanium dioxide nanoparticles are widely used. Zinc oxide and titanium dioxide have shown positive results in improving the physiological parameters of several plants. This study was conducted to observe the effect of zinc oxide and titanium dioxide nanoparticles on the *in-vitro* micropropagation of *M. didyma* using the nodal segment as explant. A series concentration of nanoparticles was used with the basic MS medium. Data on the number and length of regenerated nodules, roots, and sprouts were observed and were taken routinely. At concentration 40 and 60 mg/L zinc oxide nanoparticles showed a positive effect on the number of regenerated nodules, roots, and sprouts whereas in contrast titanium dioxide nanoparticles showed adverse effects and retard the growth of nodules, roots, and sprouts of *M. didyma*. This result suggests zinc oxide could be used to increase the production of

M. didyma. Further, studies should be done with a higher concentration of nanoparticles and or with the mutual application of plant growth regulators.

Keywords:

Monarda didyma, Nanoparticles, Titanium dioxide, Zinc oxide, Micropropagation

P3.3.b

School garden planning in Poland for environmental education

Bartosz Wojtasik, Warsaw University of Life Sciences (WULS-SGGW), Warsaw, Poland

StudyProgrammeLevel: Master

School gardens can offer the opportunity of implementing tasks instituted by Ministry of Education, resting during day long lessons and enjoying free time after school. Nowadays school territory is marginalized not only as environmental park but it is also disqualified as student development site. It gets problematic to bring one-size-fits-all model of school garden which could be used to reestablish its environmental and landscape advantages. School garden should be kind of addition to school's classrooms. It also ought to enable perpetuating book-learning with practice surrounded by nature. Forming and working within school setting are kind of pedagogical process which learns systematicity, responsibility and teamwork towards common goal themselves. Today it is also a form of environmental education. School garden development enables cross-curricular and multi-sensory education. School fields can also be helpful in realization mission determined in curriculum for example outdoor activity and adventure education, experiment lessons. Moreover redesigning of school surrounding areas will improve educational, natural, ecological, aesthetical advantages of landscape. This study is aimed at showing way of school field development which will facilitate students consider environment by learning crop, use of edible plants, food and plant material production and what is more important - gaining positive impact of horticulture.

Keywords:

environmental education, school field, curriculum, playlike learning, edible plants

P3.3.c

Urban homegardens: agrobiodiversity, food security, and commercialization - A review

Laura N. Rojas Pardo, Czech University of Life Sciences Prague (CZU), Prague, Czech Republic; Vladimir Verner, Czech University of Life Sciences Prague (CZU), Prague, Czech Republic; Patrick Van Damme, Faculty of Bioscience Engineering, Ghent University, Ghent, Belgium

StudyProgrammeLevel: PhD (1st year)

Considering that in the future urban populations are only expected to grow, agricultural production spaces, such as homegardens, within cities play a crucial role in the provision of food security and social well-being for city dwellers. Homegardens, characterized by presenting structural complexity, are multifunctional spaces through which urban citizens may secure diversified, year-round food production while establishing a connection with nature and developing feelings of fullness and happiness. They are as well spaces with the potential to contribute to the conservation of crop wild relatives and threatened plant species. The agrobiodiversity found in homegardens increases the variety in the diet, constitutes an alternative income and improves the livelihood of households. Studies carried out in different countries indicate that plant species richness and diversity are mainly dependent on homegarden characteristics, i.e., size, terrain, location, or age, and household resources, i.e., capacity, ownership, or negative association to a higher level of commercialization of the homegardens. Although being generally of small size, homegardens can, apart from food security, provide opportunities for small-scale marketing as well. In this context, this contribution portrays the role of homegardens in ensuring food security, enhancing the livelihood of households, and commercialization in various agro-ecological regions worldwide and provides first insights into the urban areas in Latin America, particularly in Bogota, Colombia, where scientific data are still scarce. [Grant provided by the Faculty of Tropical AgriSciences, project number 20205011]

Keywords:

household resources, diversity, diet, livelihood, sustainability

P3.3.d**Viability of profitable Market Gardening in Austria**

Johannes Waltner, University of Natural Resources and Life Sciences, Vienna (BOKU), Vienna, Austria

StudyProgrammeLevel: Bachelor

Due to climate change, an alarming rate of worldwide biodiversity loss and a growing world population, actors in agriculture are looking for an alternative and resilient agrosystem. In the meantime, the number of agricultural and silvicultural holdings in Austria has strongly decreased for the last 60 decades, while the average cultivated area of holdings has increased.

Small-scale market gardening in scarce available scientific literature and anecdotal evidence is described as a highly productive and sustainable farming concept. The aim of this paper is to examine the economic viability of market gardens in Austria in order to highlight chances and risks of reaching economic viability. A mixed method approach was applied by conducting an extensive literature review and qualitative expert interviews. This case study of two micro-farms shows that holding A was able to create an annual net income of 21.000 € on a cultivated acreage of 2.400 m² as well as holding B created an annual net income of 60.000 € on a cultivated acreage of 10.000 m². High economic yields were reached through precise cultivation planning, low investment costs, building up direct sales channels that permit higher prices, and optimizing operational procedure.

More research is needed to further analyse the economic viability of Austrian market gardeners with an increased sample. This study is the first of its kind, that investigated the profitability of market gardens in Austria therefore adding first bits of credibility to the anecdotal evidence that has been around.

Keywords:

market gardening, economic viability, micro farming, direct selling, Austria

AUTHOR INDEX

A

Abbo, Shahal: **O2.3.c**
Abou-Rizk, Joana: **P2.3.c**
Aleksandrowicz, Daria: **P2.2.b**
Anusz, Marta: **P3.2.c**
Ari, Ezgi: **P2.1b**
Avneri, Assaf: **O2.3.c**

B

Bakalarz, Janet: **O3.1.b**
Bharati, Rohit: **P3.3.a**
Birnbaum, Nitsan: **O2.3.a**
Bonfil, David: **O2.3.c**

C

Cahyani, Shassy E.: **P2.1a**
Cartick, Mary Heydie Geena: **P2.2.e**
Cocuz, Georgiana: **P2.3.c**

D

Dallinger, Hermann Gregor: **P1.1.a**
D'Amico, Stefano: **P3.1.d**
de Hartog, Inessa N.: **O2.2.b**
de Kinderen, Maud A.: **O3.3.a**
Dilrukshi, H. N. Nadeesha: **P3.1.a**
Domig, Konrad J.: **P3.1.d**
Donkor, Ebenezer: **O3.4.b**

E

Eder, Rosa M.: **O2.1.b**
Effenberger, Natascha: **P1.2.b**
Egger, Moritz: **O3.3.b**
Enenkelová, Lea: **O2.4.c**
Ertl, Thomas: **O3.1.c**

F

Fraberger, Vera: **P3.1.d**

G

Garrido López, Daniel: **P1.1.c**
Georgievova, Irina: **P2.1e**
Gerzabek, Martin H.: **P1.3.c**
Gong, Xi P.: **O2.4.a**
Górecka, Weronika E.: **O1.3.a**

H

Heichel, Jasmin: **P1.3.d**
Herrmann, Ittai: **O2.3.c**
Hügel, Tracy: **P1.1.b**
Hummer, Katja: **O2.3.b**

J

Jeremias, Theresa: **P2.3.c**
Ježo, Aleksandra: **O2.1.c**

K

Kelblerova, Radka: **O1.1.c**
Ketzer, Lisa M.: **O3.4.a**
Kizerwetter-Świda, Magdalena: **O1.3.a**
Koch, Karlotta Maria Katherina: **P1.2.f**
Kovarova, Denisa: **P2.3.b**

L

Ladurner, Martin: **P3.1.d**
Landa, Přemysl: **P3.3.a**
Lati, Ran: **O2.3.c**
Laux, Monika: **O1.1.a**
Leiter, Lena M.: **P1.1.d**
Leitner, Anna: **P3.2.d**
Lindgren, Magdalena: **O1.4.b**
Łożyńska, Katarzyna: **O1.3.b**
Luketina, Igor: **O3.1.c**
Lutz, Esther: **P1.2.e**

M

Mahe, Rukayya M.: **O1.3.c**
Managos, Markos: **O2.4.b**
Mavinkal Ravindran, Krishnanunni: **O3.4.c**
Melnik, Stanislav: **O3.1.b**
Meyer-Jürshof, Marie Christine: **P2.1c**
Michalewska, Maja: **O3.3.c**
Mircea, Diana-Maria: **O1.2.b**
Modak, Sourav: **O1.4.c**
Möth, Stefan: **P1.3.b**

N

Nertinger, Magdalena: **P2.3.a**
Ngo, Tuan Ngoc: **P3.2.d**

O

Olborska, Paulina: **O1.2.a**
Ortega Menjivar, Lena: **P3.2.e**

P

Paramonova, Kseniia: **P1.2.d**
Park, Taewan: **P1.3.e**
Peleg, Zvi: **O2.3.c**
Pereira Goss, Luisa: **P2.3.a**
Petrovic, Bozana: **P1.3.b**
Pilařová, Anna: **P2.2.d**
Pławińska-Czarnak, Joanna: **O1.3.a**
Poskocilova, Anna-Marie: **P2.2.c**

R

Ramirez, Enya: P2.1a
Rapberger, Dominik: **P2.1d**
Rechberger, Maria: P1.3.c
Řehoř, Jan: **P1.3.f**
Remlinger, Vivian I.: **P1.3.c**
Riemenschneider, Adriana S.: **O1.4.a**
Rojas Pardo, Laura N.: **P3.3.c**
Rolf, Wilmes: **P3.2.f**
Rudavský, Tamara: **P3.1.e**
Ruwe, Tim: O3.2.b
Rzewuska, Magdalena: O1.3.a

S

Sadeh, Roy: **O2.3.c**
Salzger, Janin: **P3.2.a**
Sancho de Pablo, Celia: **P1.2.a**
Santos Pires, Sabrina: **O3.1.a**
Schabschneider, Helmut: O3.1.c
Schmitz, Theda: **O3.2.b**
Siretckaia, Anastasiia: **P2.2.a**
Škvorová, Petra: **P3.1.c**
Sui, Limin: **P3.1.b**
Surampally, Swati: **O2.2.a**
Szabó, Ondřej: **O1.1.b**

T

ter Borg, Rebecca N.: **O2.2.c**
Terhaardt, Geertje: **O2.1.a**
Thomas, Glenna: **P1.3.a**
Tubul, Yaniv: O2.3.c
Tunega, Daniel: P1.3.c

V

Van Damme, Patrick: P3.3.c
Verner, Vladimir: P3.3.c

W

Wailzer, Gregor: **P3.1.f**
Waltner, Johannes: **P3.3.d**
Wanner, Alice: **O3.2.a**
Wasik, Konrad: **P1.2.c**
Weitzl, Ricarda: **P1.3.b**
Werf, Teun v.: P2.1a
Wiesmair, Elke: **O3.2.c**
Wojtasik, Bartosz: **P3.3.b**

Y

Yellowlees, Rea: P2.1a

Z

Zantedeschi, Dori: **P3.2.b**
Zehetner, Franz: P1.3.c
Zhang, Xiaowen: **O1.2.c**

KEYWORD INDEX

α -amylase-trypsin inhibitors: P3.1.d

$\delta^{18}\text{O}$: O3.1.a

$\delta^2\text{H}$: O3.1.a

A

Academia: O1.4.b

adsorption: P1.3.c

afforestation practices: O2.2.c

agricultural producer organisation: P2.1c

agricultural yields: P1.1.b

agri-food policy instruments: O3.4.a

agriphotovoltaic: P1.1.b

Air pollution: O2.2.b

Air travel: O1.4.b

allophane: P1.3.c

anaerobic digestion: P1.2.d

antifungal effect: P1.3.f

Antioxidant: O2.4.a, P3.1.b

Austria: P3.3.d

B

BILAN: P2.1e

bioactive phytochemicals: P3.1.a

biodiversity: P3.2.a

Bioeconomy Strategies: P2.1b

biogas plant maintenance: P1.2.d

Bioinformatics: P1.1.a

biological protection: O1.1.b

Bioplastic: O2.1.a

body weight: O3.3.a

brushing: P1.1.d

C

Calibration: P2.1d

Canine: P2.2.e

Capacity building: O3.4.b

caucasian whortleberry: P2.3.b

Cereal bran peptides: O2.4.a

Characterisation: O2.4.a

chickpea: O2.3.c

Chitin: O2.1.a

classification of P status: P1.3.d

Climate adaptation: O1.2.c

Climate change adaptation: P1.2.a, P3.2.d

Climate: O2.2.a

climate_mitigation_tool: O3.3.c

clostridia: P3.1.e

Clostridium tyrobutyricum: P3.1.e

coffee agroforestry: O2.3.b

Coffee: O3.3.b

colour: P3.1.c

communication: P2.1c

Concept: O1.2.b

condensation: O3.1.c

connection and balance: P1.2.b

conservation: P3.2.a

Cost-benefit analysis: P2.1a

court park: P1.2.c

cover crops: P1.3.b

Creative Destruction: P2.1b

Cryopreservation: O2.4.c

Cryosphere: P1.2.a

curriculum: P3.3.b

D

Dam: P2.1a

data assimilation: P2.1e

DCM: P2.2.b

decentral water supply: O3.1.c

Depopulation: P3.2.b

depression: O1.3.b

Design: O1.2.b

designing horse trails: O1.2.a

development cooperation: P3.2.e

dew: O3.1.c

diet: P3.3.c

different wood species: P1.1.d

digestibility: P3.1.b

dilated cardiomyopathy: P2.2.b

direct selling: P3.3.d

distribution: P2.2.d

diurnal butterflies: P2.2.d

Diversification: P2.3.a

diversity loss: P2.2.c

diversity: P3.3.c

DLA: P2.2.e

Doberman Pincher: P2.2.b

drone: O1.4.a

Drought: P1.3.e, P2.1e

dry matter: P3.1.c

E

Eco-friendly: O1.4.c

ecology: P2.2.d

economic viability: P3.3.d

ecosystem services: O2.3.b, P2.1a

Edible insects: O3.4.c

edible plants: P3.3.b

eDNA metabarcoding: P3.2.a

electrical charge: P1.1.d

Energy Balance: P3.2.d

entomophagy: O3.4.c

Environment: O1.2.b

environmental education: P3.3.b

Environmental variables: P1.1.c

environmental_impact: O3.3.c

Ethiopia: O3.3.a

Eutrophication: P2.1d

Evapotranspiration: P3.2.d

Excreta Flow Diagram: O3.2.c
external presentation: P2.1c
Extrusion: O2.4.b

F

Fagita Lekoma, Ethiopia: O2.2.c
farmers' markets: O3.2.b
fatty acid methyl ester: P3.1.f
fibre: P3.1.a
fish predation: P2.2.c
Floating cultivation: O1.4.c
Fluorescent signal: O3.1.b
Food and nutrition security: P1.3.e
food groups consumption: P2.3.c
food policy councils: O3.4.a
Food safety: O1.3.c
food security: O2.3.b
Food System: P2.3.a
Forests: O2.2.a
fort: P3.2.c
Fractal geometry: O1.2.b
fresh water: O3.1.c
freshwater invertebrates: P2.2.c
freshwater ponds: P2.2.c
Friction modifier: O2.1.b

G

gc/ms: P3.1.f
genetic gains: O3.3.a
genetic variability: P2.3.b
Genomic Prediction: P1.1.a
Germany: P1.2.e
Ghana: O3.4.c
Glacier retreat: P1.2.a
glycaemic response: P3.1.a, P3.1.b
glyphosate: P1.3.c
Grass silage: O2.4.b
green area: P3.2.c
green energy: O3.1.c
Green leafy vegetables: P1.3.e
green technology: O1.1.a
Gross margin: O3.4.b
groundwater: P1.3.a
Growth patterns: P1.1.c

H

halloysite: P1.3.c
Hamburg: P1.2.e
HAMR: P2.1e
Health: O1.3.c
heavy metals: P1.3.a
hop: P1.3.f
horse riding trails: O1.2.a
household resources: P3.3.c
Hydrology: O2.2.a
hydrophobicity: O2.1.a
hyperaccumulator plants: O1.1.a
hyperspectral: O2.3.c

I

identification: O1.3.a
image classification: O1.4.a
impact assessment: P3.2.e
in vitro culture: P2.3.b
income groups: P2.3.c
inflammatory: P3.1.b
Ingestive behaviour: O2.4.b
inner transition: P1.2.b
Innovation: P2.3.a
Institutions: O1.3.c
insulation board: O2.1.c
Integrated pest management: O2.3.a
intensive farming: P2.2.c
irrigation: O2.3.c
Italy: P3.2.b

J

Jezerko-Solčava sheep: O2.4.c

L

lactic acid bacteria: P3.1.d
land use change: O2.2.c
land use efficiency: P1.1.b
land use: P1.3.a
Land-cover: O2.2.a
landscape water balance: O2.2.c
Landscape: O1.2.b
laser spectroscopy: O3.1.a
late blowing: P3.1.e
legumes: O1.1.b
life quality improvement: P1.2.c
linear programming: O3.3.c
livelihood: P3.3.c
local ecological knowledge: O2.3.b
local food: P1.2.e
Lubricant additives: O2.1.b
Lubricants: O2.1.b

M

machine learning: O1.4.a
Macrocooccus: O1.3.a
Margaritifera margaritifera: P1.1.c
market gardening: P3.3.d
Market orientation: O3.4.b
marketing strategy: P2.1c
Mass flow simulation: P1.2.a
Melatonin: O2.4.c
Metarhizium: O2.3.a
Meteorological conditions: O2.2.b
MHC: P2.2.e
micro farming: P3.3.d
Microbial pest management: O2.3.a
microclimate: P1.1.b
Micropropagation: P3.3.a
microwave treatment: P3.1.c
migratory behaviour: P2.2.a

military tourism: P3.2.c

milk fat: P3.1.f

Milk production: O2.4.b

Molecular Farming: O3.1.b

Monarda didyma: P3.3.a

multi-actor analyses: O3.4.a

Multicriteria analysis: P2.1a

N

nanocomposite: O2.1.a

Nanoparticles: O2.1.a, P3.3.a

natal philopatry: P2.2.a

natural substances: P1.3.f

Nature-based solutions: O1.2.c

Nigeria: O1.3.c

Norway spruce: O1.1.c

nutrition: O3.3.c

Nutritional Benefits: O2.4.a

nutritional gaps: P2.3.c

nuts: P3.1.c

O

Online water quality monitoring: P2.1d

On-site sanitation: O3.2.c

Operation & Maintenance: O3.2.c

Optimal habitat: P1.1.c

organic food: O3.2.b

Organic: O1.4.c, O3.3.b

outdoor recreation: O1.2.a

P

Particulate matter: O2.2.b

PDK4: P2.2.b

P-efficiency: P1.3.d

Peruvian Andes: P1.2.a

phytodiversity: P1.3.b

phytomining: O1.1.a

Pickering emulsion: O2.3.a

Place-based approach: O1.2.c

plant water stable isotopes: O3.1.a

Plant-feedstocks: O2.1.b

Plants: O3.1.b

playlike learning: P3.3.b

Policy mix: P2.1b

polystyrene: O2.1.c

population ecology: P2.2.a

Portugal: P1.1.c

poultry: O3.3.a

Price development: O3.2.b

Price differentiation: O3.2.b

Price: O3.4.b

Productivity: P1.3.e

promiscuity: P2.2.d

Protein production: O3.1.b

protein: P3.1.a

Pseudoperonospora humuli: P1.3.f

P-supply: P1.3.d

Pythium oligandrum: O1.1.b

Q

quality of hops: P1.3.f

R

raised bog: P3.2.a

rancidity: P3.1.c

raw milk: P3.1.e

Ready-to-eat snacks: P3.1.a

red clover: O1.1.b

remote sensing: O1.4.a

renewable energy: P1.1.b

reproduction: P2.2.d

Resistance Breeding: P1.1.a

restoration: P3.2.a

rice crackers: P3.1.b

Risks: O1.3.c

ROH: P2.2.e

Rumen pH: O2.4.b

rural communities: O3.2.c, P1.2.c

rural development: O3.2.a, P3.2.b

S

school field: P3.3.b

SDS-PAGE: O2.4.a

seed orchard: O1.1.c

Shea caterpillars: O3.4.c

Short Food Supply Chain: P1.2.e

Single layer centrifugation: O2.4.c

smallholder farming: O3.3.a

small-scale biogas technology: P1.2.d

SMART: O3.3.b

SNP: P2.2.e

Social innovation: P3.2.b

social integration: P1.2.c

Societal well-being: P3.2.b

Soil fertility: P1.3.e

soil: P1.3.a

sourdough: P3.1.d

Spatial distribution: O2.2.b, P2.2.a

spatial ecology: P2.2.a

Spermatozoa: O2.4.c

Spodoptera: O2.3.a

SSR markers: O1.1.c

Stakeholder involvement: O1.2.c, O3.2.a

Staphylococcus aureus: O1.3.a

stelite: O2.3.c

Stress sensor: O3.1.b

subsistence income: O3.4.c

sustainability transformations: O3.4.a

Sustainability Transition: P2.1b

Sustainability: O2.1.b, O3.3.b, P3.3.c

sustainable agriculture: O2.3.b

sustainable tourism: O3.2.a

Sustainable Urban Drainage Systems: P3.2.d

sustainable_diets: O3.3.c

SWAT modelling: O2.2.c

T

teat cleaning: P3.1.e
technology dis-adoption: P1.2.d
textile fiber reuse: O2.1.c
textile industry waste: O2.1.c
Theory of Planned Behaviour: O1.4.b
tillage intensity: P1.3.b
Titanium dioxide: P3.3.a
Trade-off analysis: P2.1a
transition movement: P1.2.b
triboelectric surface charge: P1.1.d
Trust: O3.4.b

U

University of Copenhagen: O1.4.b
upcycling: O2.1.c
Urban development: O1.2.c
urban food planning: O3.4.a
Urban Heat Island Effect: P3.2.d
Urbanization: O2.2.a
Urine-diverting dry toilets: O3.2.c
UV/VIS Spectroscopy: P2.1d

V

Validation: P2.1d
Values Based Supply Chain: P1.2.e
vegan: O1.3.b
vegetarian: O1.3.b
vegetation indices: O1.4.a
Vietnam: P1.2.d
village park: P1.2.c
vineyard: P1.3.b
volcanic soils: P1.3.c

W

Warsaw: P3.2.c
water, sanitation and hygiene: P3.2.e
water-vapor equilibrium method: O3.1.a
well-being: O1.3.b
Wheat Breeding: P1.1.a
wheat sensitivity: P3.1.d
women of reproductive age: P2.3.c
women: O1.3.b
wood machining: P1.1.d

Y

yield prediction: O2.3.c

Z

Zinc oxide: P3.3.a