In memory of Dr. Carolina Chiellini

INTERNATIONAL WORKSHOP

Strengthening cross-sectors to integrate humans-animals-ecosystems: a ONE HEALTH approach declined in agriculture science

Department of Agriculture, Food and Environment (DAFE)

University of Pisa

Aula Magna Polo Piagge – Via G. Matteotti 11, Pisa, Italy

22nd – 23rd November 2023

Contents

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Preface

The international workshop “Strengthening cross-sectors to integrate humans-animals-ecosystems: a One Health approach declined in agriculture science” is organized by the PhD candidates of the Department of Agricultural, Food and Environment of University of Pisa. The organization of an international workshop is a yearly activity of the PhD candidates aimed to favour the scientific interaction among young researchers belonging to a wide range of disciplines in the agricultural science field. PhD candidates propose the interdisciplinary topic, find the invited speakers, arrange the logistic and the timing of the workshop and manage also the financial aspects of the organization by applying for a specific call for funding, opened each year by the University of Pisa. This is an excellent opportunity to develop advanced skills in the organization of scientific events, an important aspect in the training and education of young researchers.

The workshop proposed this year is about the “one heath” concept, a very hot topic that includes large part of the research activities carried out in our department. During the two days workshop, the one health concept is declined in the whole food value chain: from the soil to plants, animal, food and humans. During the first day, after a first session about the general definition of the one-health concept, the most recent innovations and technologies available for enhancing sustainability of agricultural and food production are discussed with the contribute of both national and international experts. The second day, the gender perspective in agricultural science is deeply discussed with an intersectional approach. Finally, the science dissemination is the topic of the last session, presenting a case study as innovative and emerging approach. During the two days, also interactive activities and a specific session dedicated to the PhD candidates for the presentation of the main results of their PhD projects are scheduled.

Marcello Mele – Director of the Department of Agriculture, Food and Environment (DAFE) University of Pisa

Program

Strengthening cross-sectors to integrate humans-animals-ecosystems:

a ONE HEALTH approach declined in agriculture science

1st DAY: Wednesday, November 22, 2023

08:40 Registration and badges distribution

09:15 Remembering Dr. Chiellini & Welcome address

Prof. Lorenzo Guglielminetti, University of Pisa (Italy)

Prof. Marcello Mele, Director of the Department of Agriculture Food and Environment, University of Pisa (Italy)

SESSION I: **One Health: an overview**

09:30 Roundtable: "What is One Health?"

- ***Chair**: Prof. Valentina Mangano, University of Pisa (Italy)*

Prof. Giacomo Lorenzini, Dr. Lara Tavoschi, Prof. Marcello Mele, University of Pisa (Italy)

SESSION II: **Harnessing the power of high technology in agriculture**

- ***Chair**: Prof. Sabrina Sarrocco, University of Pisa (Italy)*

10:00 Talk 1: "Legal issues in applying new technologies"

Prof. **Eleonora Sirsi**, University of Pisa (Italy)

10:25 Talk 2: "Viral vectors to facilitate CRISPR-Cas genome editing in plants"

Prof. **José-Antonio Daròs**, IBMCP-CSIC-Universitat Politècnica de València (Spain)

10:50 Talk 3: "Translational research: the use of biostimulants in agricultural plants"

Dr. **Leonardo Dragoni**, Vicepresident of HelloNature (Italy)

11:15 Break

SESSION III: **Food system: innovation, health and sustainability**

- ***Chair**: Dr. Antonio Pompeiano, University of Pisa (Italy)*

11:45 Talk 4: "Supporting the One Health approach in the food system: A contribute from the socio ecologic system analysis"

Prof. **Francesco Di Iacovo**, University of Pisa (Italy)

12:10 Talk 5: "Let's 'MEAT' the future: a new approach to the development of plant-based meat analogues"

Dr. **José Martín Ramos-Díaz**, Natural Resources Institute Finland (LUKE) (Finland)

12:35 Talk 6: "Beneficial fungi for a sustainable management of plant diseases: The One Health perspective"

Prof. **Sabrina Sarrocco**, University of Pisa (Italy)

13:00 Lunch break

14:30 <u>3-minute Speech</u>: PhD student's presentations

SESSION IV: **One Health in action**

- ***Chair**: Dr. Alberto Mantino,* University of Pisa (Italy)

15:00 DiSAAA-a Debate: a conversation on **cell-based meat**

Dr. Ermolaos Ververis, EFSA

Prof. Andrea Serra, Prof. Eleonora Sirsi, Prof. Francesca Galli, Dr. Michele Moretti, Prof. Roberto Giovannoni, University of Pisa (Italy)

17:30 Discussion and Conclusions

<u>2nd DAY: Thursday, November 23, 2023</u>

08:40 Registration

09:15 Summary of the first day: What we have learned

SESSION I: **Science with an intersectional lens**

- ***Chair**: Dr. Sabrina Arcuri, University of Pisa (Italy)*

09:35 Talk 1: "Intersectionality: an introduction"

Dr. **Alice Dal Gobbo**, University of Trento (Italy)

10:00 Talk 2: “Women in the field: current situation and future prospects”

Dr. **Carolina Perna**, PhD candidate University of Florence (Italy) & CIA-Donne in campo (Italy)

10:25 Talk 3: “BioLaw, health and scientific innovation: a gender perspective”

Prof. **Elettra Stradella**, University of Pisa (Italy)

10:50 Break

11:20 <u>3-minute Speech</u>: PhD student's presentations

SESSION II: **Science dissemination: beyond the academy**

- ***Chair****: Dr. Alice Dal Gobbo, University of Trento (Italy)*

11:50 Talk 4: “Social edutainment a new way for science popularization”

Dr. **Marco Martinelli**, Sant’Anna School of Advanced Studies (Italy)

12:15 Talk 5: “One Health education: bridging disciplines through participatory learning and design innovation”

Dr. **Sonia Massari**, University of Pisa (Italy)

Dr. **Diletta Damiano**, PhD candidate Tor Vergata University of Rome (Italy)

12:40 Lunch break

SESSION III: **One Health in action**

- ***Chair****: Dr. Sonia Massari, University of Pisa (Italy)*

14:30 Open Space Technology

16:00 Discussion and Conclusions

16:30 Close of the workshop

Organizing Committee

DAVINI Anna (anna.davini@phd.unipi.it)

Anna is a PhD student at the Department of Agriculture, Food and Environment at the University of Pisa. She started her PhD program in November 2022 in agricultural chemistry with a research project entitled “The role of halophytic plants in the context of climate change: molecular, biochemical, and physiological strategies behind their adaptation to saline soils and their potential use as crop”. The main goal of her PhD project is the study and exploitation of halophytic plants, particularly belonging to the genus *Salicornia*, to address the problem of salinization of agricultural soils, and to valorize such edible plants as source of important health-promoting phytochemicals. In December 2019, Anna graduated in Agricultural Sciences at the University of Pisa. Afterwards, she got a one-year research fellowship at the Biology Department in University of Pisa. In October 2022, she got her Master’s Degree in Plant and Microbial Biotechnologies at the University of Pisa with a thesis about the modifications of the secondary metabolism, particularly the volatile organic compounds, of basil plants in response to monochromatic light supplementation. Anna possesses skills mainly related to biochemical techniques on plant matrices (e.g., spectrophotometric analyses), as well as data management and statistical analysis.

DE CONNO Arianna (arianna.deconno@phd.unipi.it)

Arianna started her PhD program in November 2022. She is a member of PAGE research group in the department of Agriculture, Food and Environment at the University of Pisa. She is currently working on sustainable transformation of food systems, with a focus on the dimension of food environments. In this framework, she dedicates a specific attention to the role of Public Food Procurement in this sustainable transformation process, especially in the dimension of urban food policies. Her research activity contributes to the Horizon 2020 project called “FOODCLIC”, focusing on local food policies and the empowerment of marginalized groups. In March 2021, she graduated in Law at the University

of Pisa, with a thesis on the role of consumer law in fighting greenwashing practices. Subsequently, she attended advanced training courses on European project management and sustainable development, including a traineeship with the Institute of Management of the Sant'Anna School in Pisa, from May to August 2022. She has also experience as a facilitator in participatory processes and in educational projects on sustainability and active citizenship.

FORZONI Letizia (letizia.forzoni@phd.unipi.it)

Her academic background is in economics, with a bachelor's degree in economics and management and then a Master's degree in Economics, a joint course at the University of Pisa and the Scuola Superiore Sant'Anna (Pisa). For the final dissertation of both degrees, she focused on sustainable economic development and natural resource management. In particular, the thesis in Economic Sciences was carried out in collaboration with the CNR of Pisa and the Department of Agricultural, Food, and Agro-Environmental Sciences of Pisa. Since 2019 she has been part of Economy of Francesco, an international movement of young economists, entrepreneurs, and change-makers committed to building a new economy. Letizia's interest in EU agricultural and food policies in general, and the livestock sector in particular, emerged through an experience of working on a family farm in the summer of 2020 and 2021. Her current research project investigates future scenarios for livestock farming in Europe and Tuscany in the light of the European strategy 'Farm to Fork Strategy'. Her interests deal with the complex topic of sustainability, declining in the livestock sector, with a focus on the evaluation of technologies for climate change mitigation and adaptation.

GRASSI Arianna (arianna.grassi@phd.unipi.it)

Arianna received her MA in Biosafety and Food Quality in 2018 at the Department of Agriculture Sciences, Food and Environment (DAFE), University of Pisa. In 2019 she won a research grant in the field of food microbiology, and she worked for two years in the same Department (DAFE). The activity was mainly focused on study of the molecular and functional biodiversity of microorganisms from spontaneous fermented food and beverages. In 2021 she won a research grant (DAFE) and in the 2022 a research fellowship (DAFE) to study the beneficial microbial

communities characterizing different environmental matrices for their use in sustainable agriculture. These research projects were mainly focused on the isolation and morpho-physiological and molecular characterization of beneficial soil microorganisms such as arbuscular mycorrhizal fungi (AMF) and plant growth promoting bacteria (PGPB). Author of 9 papers on international journals, of which 8 ISI and 1 contribution to an international conference. Currently she is a PhD student in Agricultural Sciences, Food and Environment and the PhD activity is relating to the use of microorganisms as biofertilizers and biostimulants for the improvement of plant use efficiency of water and soil natural resources.

HUARANCCA REYES Thais

(thais.huarancca@phd.unipi.it)

Thais is a plant biologist. She received her BSc in Chemistry from the Pontifical Catholic University of Peru in 2006. In 2015, Thais received her PhD in Life Science from Hokkaido University, where she studied as a MEXT and JASSO Scholar and then held different Postdoc Fellowships at University of Pisa from 2015 to 2021. In that period, Thais dedicated her research to understanding plant adaptation mechanisms to abiotic stresses, gaining competence in molecular biology, genetics, and physiology. Following her recent interest in wastewater bioremediation, she graduated from the Federal University of Grande Dourados with a MSc in Environmental Science and Technology in 2022. Currently, Thais is a PhD candidate at University of Pisa specializing in the sustainable recycling of cigarette butts, the most littered item in the world, as growth substrate for ornamental plants. She has twenty-six scientific publications and has participated in many domestic and international conferences showing oral/poster presentations. Despite being a hard worker with dedication towards her professional and personal goals, Thais enjoys life and appreciate running, music and literature.

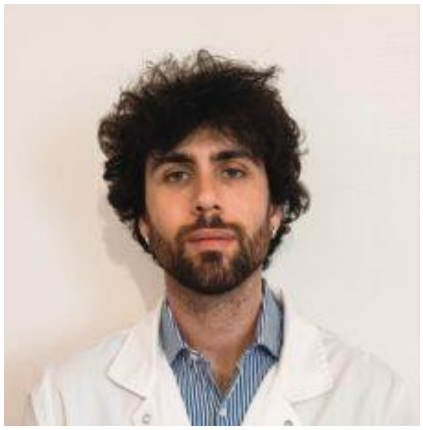
LUGLIO Sofia Matilde

(sofiamatilde.luglio@phd.unipi.it)

Sofia is a PhD student specializing in Agriculture Science and Technology, specifically in Mechanics and Robotics in agriculture. The main aspect of her project is the analysis and application of robotic and AI solutions for weed detection and biodiversity assessment. She took a Bachelor's Degree in Agricultural Science and Technology at the University of Turin and a Master's Degree in Planning and Management of Urban Green and Landscape at the University of Pisa. Her thesis was about the development of original software to track a robot mower cutting frequency in three different gardens. The main goal of her MA studies was to point out the advantage of robotic solutions in green area maintenance. After her MA she worked for one year as a research fellow on a project for digitalization in sustainable precision agriculture at the DAGRI Department of the University of Florence. Her research focused on the robotic application and biodiversity tracking in viticulture and olive cultivation. She has also been involved in the writing and revising of scientific and divulgation articles. She would like to explore the world of digitalization and programming applied to sustainable agriculture. Her passions regard literature, art and music. She is involved in volunteer activities with special needs children.

MEESALA Harika (harika.meesala@phd.unipi.it)

Harika holds a bachelor's degree in agricultural sciences and a master's degree in agricultural economics from India, where she also worked as a research fellow and project assistant in diverse projects. Besides, she holds an international master's degree in rural development from Ghent University, University of Nitra and University of Pisa funded by the European Union. Her research interests include food system sustainability, agricultural digitalisation, agroecological transitions, sustainable food security and nutrition and food policy analysis. Her current research focuses on analysing the impacts of agricultural digitalisation particularly from an agroecological perspective. She is associated with the Horizon Europe project CODECS which aims to build digital ecosystems that maximise the net benefits of digitalisation.



MERCANTI Nicola (nicola.mercanti@phd.unipi.it)

Nicola was born in Carrara in 1997. Once enrolled at the University of Pisa, he became very interested in the world of research, which resulted in a 6-month laboratory extension at the genetics laboratory of the Department of Agricultural Sciences at the University of Pisa. In 2020, he graduated in "Viticulture and Oenology" at the Department of Agricultural Sciences and in 2022 he graduated with a master's degree in "Sustainable Innovation in Viticulture and Oenology" (*cum laude*) with a thesis entitled "Innovative Technologies for the Study of Diffusion Mechanisms that Influence the Evolution of Wine". The focus of this thesis concerned the biophysical characteristics that determine the evolution of a wine by exploiting innovative and non-destructive methods, such as sensors and laser spectroscopy. In November 2022, he become a PhD candidate at the same department where he conducted research on liquid matrices (wine, oil, and beer) studying optimal methodologies to reduce the use of chemical additives and extend the shelf-life of the product reducing food waste. In collaboration with FT-System (Antares Vision Group) he analyses the process and storage phases of the product, verifying their criticality and, in collaboration with the INFN and CERN, develops and uses sensors that will monitor the product refinement.

NARRA Federica (federica.narra@phd.unipi.it)

Federica is a PhD student in Agricultural, Food and Environmental Science at the Department of Agriculture, Food and Environment (DAFE), University of Pisa. She started the PhD program in March 2023 on research and innovation network on food and nutrition sustainability, safety and security (Partenariato esteso 10 "On Foods"). The aim of her PhD project is the identification of the cooking technology able to enhance the bioaccessibility of bioactive compounds and antioxidant properties of plant-based food (*Brassica rapa* L. subsp *rapa* and *Solanum lycopersicum* L.), reduce the bioaccessibility of the anti-nutritional markers developed during the cooking process in meat-based food (beef meat) and the evaluation of cooking methodologies on intestinal barrier function and absorption (by INFOGEST method) simulating human in vitro digestion. In December 2019, Federica graduated in Biological Sciences at the University of Pisa and in September 2022 she received her master's degree in Food Biosafety and Quality at the University of Pisa, spending six months at the University

of Life Science Prague (CZ) at the faculty of Agrobiology working on the experimental thesis project concerning the study of biochemical changes in four varieties grape berries subjected to UV-B radiation using ^{1}H NMR spectroscopy.

NORBOEV Oybek (oybek.norboev@phd.unipi.it)

Oybek is a member of the PAGE (Pisa Agricultural Economics) research group in the University of Pisa. He began his Joint PhD program in November 2022, which is co-hosted by the Department of Food, Agriculture and Environment at the University of Pisa in Italy and the Faculty of Business and Economics at the University of Antwerp in Belgium. He holds his bachelor's degree in Agricultural Economics from Uzbekistan and had a chance to be an Erasmus exchange student at the University of Giessen in Germany. Also, he obtained the International Master of Science in Rural Development – Erasmus Mundus Joint degree from the University of Ghent in Belgium, Slovak University of Agriculture in Slovakia, and the University of Pisa in Italy in 2022. Oybek has research experience from a short period internship at the department of Agricultural Policy in Leibniz Institute of Agricultural Development in Transition Economies (IAMO) in Germany. His current PhD research focuses on analyzing the economic impact of climate change on Italian agriculture and developing transition pathways towards climate adaptation strategies.

PETRUCCI Arianna (arianna.petrucci@phd.unipi.it)

Arianna is an Italian graduate student who obtained (*cum Laude*) her Master Degree in Plant and Microbial Biotechnologies at the University of Pisa, with a thesis in Plant Pathology on the ecology of fungi related to wheat diseases. Her main research interest is the kingdom of Fungi with emphasis on their ecology and interaction mechanisms. She experienced a three-month period at the University of Ljubljana, during an ERASMUS+ traineeship. She worked on extremophile yeasts testing how the desiccation process could improve resistance to abiotic stress. At present, she is enrolled in a three-year PhD project, co-tutored by the University of Pisa and the University of Copenhagen. The PhD research project focuses on the molecular interactions that occur in the tripartite interactions including cereals, plant

pathogenic *Fusarium* spp., and the two potential biocontrol agents *Trichoderma gamsii* and *Clonostachys rosea*. Within the context of the Agenda 2030 and the "Farm to Fork Strategy" (European Green Deal) aim of the project goal is to provide an sustainable, alternative tool to manage plant diseases in order to protect crop production and to ensure safe food to an increasing human population.

ROGO Ugo (ugo.rogo@phd.unipi.it)

Ugo is a Ph.D. candidate in Agricultural Food and Environmental Science at the University of Pisa. He earned his master's degree in Vegetable and Microbial Biotechnology (LM-7) with 110 *cum laude* at the University of Pisa, in October 2022. He is fascinated by genetics and its potential in the agronomic field. Ugo's Ph.D. thesis is entitled "Genome editing approaches in *Lactuca sativa*". The project has two goals. The first one focused on the phenotyping and genotyping of edited lettuce plants, through CRISPR/Cas9, in genes involved in the recycling pathway of ascorbic acid (vitamin C). The second is to perform a novel approach to deliver all the CRISPR/Cas components into lettuce plants using viral vectors.

ROSSI Alessandro (alessandro.rossi@phd.unipi.it)

Alessandro obtained his master's degree in Agrifood Production and Agroecosystem Management at the Department of Agriculture, Food and Environment of the University of Pisa, with a thesis on the agronomic and environmental characteristics of biosolids for winter cereals fertilization. Afterwards, he performed research activities as fellow researcher in the same Department. His research activities focused on the valorisation of minor oilseed crops, such as linseed, camelina, safflower and hemp, within regional and national projects (COBRAF, SIC-OLEAT, Prin-Argento). Alessandro's PhD project aims to obtain innovative fertilizers, starting from local industrial by-products as main raw material, in a circular economy prospective. Working closely with industry (his PhD is co-funded by FerroDuo company), the obtained formulations will be evaluated on agronomic trials on different scales, like pots and field plots. During tests, physiological, morphological, productive, and qualitative performances of some herbaceous crops chosen as models, will be evaluated. After

agronomic validation, an environmental assessment of the innovative formulations will be performed, using LCA methodology. The main motivation that encouraged Alessandro to address his PhD topic, is the impact that the application of circular economy principles can have on the environmental impact of our societies: the recovery of resources from waste materials can greatly reduce the need for virgin raw materials, increasing the efficiency of production systems and sustainability of agricultural productions.

SCAPPATICCI Giulio (giulio.scappaticci@phd.unipi.it)

Giulio, born in 1997, graduated with a bachelor's degree in food science and technology at the University of Teramo in 2019, where he later continued with a Master's degree in Food Technology (110 *cum laude*). He has carried out internships in various companies in the sector of industrial bread and pizza base production. He worked as a research fellow at Defens (University of Milan). He is currently a PhD student at DAFE (University of Pisa), with a topic on industrial bread quality and shelf-life increase in collaboration with the Barilla© company. His PhD project involves the study of innovative ways of reusing food by-products, in order to obtain alternative bakery products, containing a high quantity of functional ingredients, and therefore with better characteristics in terms of rheology and shelf-life. The focus is on all stages of the production process, i.e., leavening, baking, and cooling and, finally, storage. In particular, it collaborates on the development of innovative on-site and on-time sensors with experts from INFN and CERN, to monitor the thermal profile and water migration. These data are used as markers of the changes that occur during the various stages of preparation and storage of bakery products. It also carries out preservation tests using modified atmospheres and innovative packaging methods. At the same time, it carries out consultancy work for companies and private individuals in the field of R&D bakery products in cooperation with major manufacturers of raw materials made from wheat.

SCIMONE Giulia (giulia.scimone@phd.unipi.it)

Giulia is a PhD student at the Department of Agriculture, Food and Environment (DAFE), University of Pisa. She graduated in October 2022 in “Agri-food Production and Agro-ecosystems Management” at the University of Pisa discussing a thesis related to plant pathology discipline. In November 2022, she started a PhD course in Agriculture, Food and Environment with a project entitled “Investigation of the mechanisms of action of natural bioactive compounds: antifungal activity and induction of plant defence responses” at the Plant Pathology laboratory of DAFE, University of Pisa, co-funded by KWIZDA Agro GmbH. The aim of the PhD project consists in testing bioactive compounds on *Vitis vinifera* cv Sangiovese plants grown under controlled and field conditions, inoculated with grapevine major pathogens, and to verify if their application induces defence responses by the evaluation of hormonal mechanisms, and identify defence-related genes which play a pivotal role in grapevine’s adaptive response. For her research, she principally performs identification of plant pathogens (using stereo-microscope and optical microscope), ecophysiological (gas exchange and chlorophyll *a* fluorescence approaches), and biochemical analyses (through high performance liquid and gas chromatography of primary and secondary metabolites, spectrophotometric and spectrofluorimetric techniques).

SCIUSCO Giuliano (giuliano.sciusco@phd.unipi.it)

Giuliano started his PhD program in November 2022. His research project is mainly focused on sustainable management in natural turfgrass systems. For his dissertation project he will be studying more sustainable and socially accepted turfgrass management practices, using innovative technologies and exploring alternative low-maintenance species. In 2014, he took part in the Erasmus Lifelong Learning Program spending 6 months at the University of Prague (CULS). In 2019, he received his Master’s Degree in Management and Planning Urban Green Areas at the University of Pisa. In 2018, he spent 6 months abroad in the United States, cooperating with the New Mexico State University on several turfgrass research projects, mainly concerning the use of waste waters as irrigation in turfgrass systems. In 2020, he obtained a grant at the University of Pisa to work on natural turfgrass managed with autonomous mowers in residential and professional sports areas.

SENATORE Elena (elena.senatore@phd.unipi.it)

Elena comes from Caserta, in the south of Italy, and she moved to Pisa in 2015 where she obtained her Bachelor's Degree in Animal Science and Production at Department of Veterinary Science of University of Pisa. The Bachelor's degree thesis dealt with feed composition and formulation and was carried out in collaboration with "Mangimi Liverini", an important feed company in the South of Italy. Elena completed her education in animal science achieving her Master's Degree in Animal Production with a thesis about the evaluation of dairy cattle welfare using an integrated checklist named ClassyFarm approved by the National Health Ministry. This method was applied to carry out a survey about the current situation of the welfare of dairy cows in a representative sample of dairy farm in Tuscany. Currently, Elena is PhD student at the Department of Agriculture, Food and Environment of the University of Pisa, carrying out a project aimed to investigate different tools and technologies to monitor the enteric methane emissions of dairy ruminants, such as handle laser detector introduced by Professor Chagunda in 2009 or GreenFeed system produced by C-lock company.

TOSI Vincenzo (vincenzo.tosi@phd.unipi.it)

Vincenzo is a PhD student and a winemaker. He obtained his bachelor's degree in viticulture and enology at the University of Pisa, and he continued studies at the University of Turin obtaining his master's degree in Viticulture and enology science. Before starting PhD, he worked as fellow researcher at CREA-VE, at the Arezzo office studying the effect of inter-row soil management on vine physiology and on berry quality. Moreover, he worked on the recovery and conservation of Tuscan grape germoplasm, helping to re-catalog the CREA-VE collection vineyard at Scurtarola Cellar, in Northern Tuscany. In addition to the conservation of grapevine biodiversity, Vincenzo main research interests regard the effect of abiotic stress on grapevine physiology and on berry quality. He is working also on agronomic techniques to mitigate the effects of Climate Change in vineyards. In particular, in his PhD project he evaluates the effect of canopy management techniques to postpone technological maturation, resynchronizing it with phenolic maturity. These techniques, as severe shoot trimming and apical leaf removal, are tested also to evaluate their effect on secondary

metabolites like phenols and volatile organic compounds (VOCs) and in function of different water availability to understand the interplays between canopy management and water availability, in a context of Climate Change in which the water resource will be more and more precious.

TRINCHETTI Tommaso

(tommaso.trinchetti@phd.unipi.it)

Tommaso is a PhD student. He is currently involved in the GRANULAR project, which focuses on developing new data and indicators to characterize the diversity of rural areas in support of policies. During his studies at the University of Pisa, he obtained a bachelor's degree in peace sciences and a bachelor's degree in natural and environmental sciences. During that time, he had the opportunity to study rural communities in India and indigenous communities in Colombia. He also had experience in international cooperation in Mexico and Peru. In Italy, he worked for four years in reception centres for asylum seekers. For his master's degree in environmental sciences, he did a thesis on mapping ecosystem services for spatial planning. Later, he further explored this topic in a regional research project focusing on mountain areas. Currently, his main research interest is the development of indicators to map and assess ecosystem services at territorial level. In a broader sense, he would like to explore new approaches to the study of human-nature relationships made possible by an integral ecology.

Roundtable: “What is One Health?”

Speakers’ Profile

LORENZINI Giacomo

(giacomo.lorenzini@unipi.it)

Professor of Plant Pathology at the Department of Agriculture, Food and Environment of the University of Pisa, Italy. 2001 to 2003: Deputy-Dean, Faculty of Agricultural Sciences of the University of Pisa. 2005 to 2006: Director, Leonardo - Istituto di Ricerca su Territorio e Ambiente. 2005 to 2008: Director, CIRAA, Interdepartmental Agro-environmental Research Centre of the University of Pisa. 2017 to 2021: Director, CIRSEC, Research Centre for Environmental Impact of Climate Change of the University of Pisa. 2021 to 2022: Director, MSSCC, Master Course on “Sustainable Development and Climate Change” at the University of Pisa. He has served for 10 years as Dean of the Laurea Degree on “Management of urban vegetation and of landscape” at the University of Pisa. In 2015, the University of Pisa awarded him the Ordine del Cherubino. He was an elected member of the Academic Senate of the University of Pisa from 2016 to 2020. He is a member of the Accademia dei Georgofili, Florence and of the Scientific Committee of the Pisa University Press. His research activities mainly concern the interactions between air pollutants and plants (effects on plant metabolism, physiology, and productivity) in agricultural and forest ecosystems, as well as the plant-based monitoring of air pollutants. In addition, he has interests in basic and applied traditional plant pathology.

MANGANO Valentina

(valentina.mangano@unipi.it)

MS-degree in Epidemiology and PhD in Immunology. She is an Associate Professor in Parasitology at the Department of Translational Research and New Surgical and Medical Technology of University of Pisa. Currently, she is Director of the Interdisciplinary Centre of Peace Sciences of University of Pisa, and Responsible Research and Innovation group member. She is professor of the courses of Parasitology for students in Medicine and Surgery (MD), Biomedical Laboratory (BSc), Microbiology and Virology (postgraduate), and Immunology for students in Medicine and Surgery (MD) at the University of Pisa. She has published 40 articles (h-index 20) in peer-reviewed international journals covering the main research areas of malaria, molecular

epidemiology and laboratory diagnostics of parasitic diseases. Besides articles, she has published book chapters and guidelines, and has been invited to different domestic and international seminars. Since 2005, she actively participates to different research projects financed by Italian and EU agencies in collaboration with research institutions in malaria endemic countries, international networks and non-governmental organizations.

MELE Marcello

(marcello.mele@unipi.it)

MS-degree in Agricultural Science and PhD in Animal Science. He is a full Professor in Animal Science at the Department of Agriculture, Food and Environment of the University of Pisa. Currently, he is Director of the Department of Agriculture, Food and Environment of the University of Pisa and a member of the Academic senates. From 2016 to 2002, he was Director of the Agri-Environmental Research Centre “Enrico Avanzi" of the University of Pisa, one of the largest centres dedicated to applied research in agricultural science. In the last ten years his research activity was focused on 1) animal derived food quality, with emphasis on fatty acid composition and on nutritional and functional properties of fat; 2) effect of genetic and environmental factors on milk and meat quality; 3) rumen metabolism and rumen microbiota composition as affected by feeding regimen; 4) sustainable livestock systems and mitigation of the methane and ammonia emission; 5) application of agroforestry systems in livestock farming production.
He was an expert nominated from EU commission in the Focus Group “Reducing Emission from Cattle Farming” for the European Innovation Partnership (EIP-AGRI). He participates in several international research and cost-action projects financed by the EU. Since 2017 he is editor in chief of the ISI journal “Italian Journal of Animal Science”. He is an ordinary member of the Accademia dei Georgofili.

TAVOSCHI Lara

(lara.tavoschi@unipi.it)

MS-degree in Public Health and PhD in Molecular Pathogenesis, Immunology and Control of Pathogens. In 2008, she was appointed technical expert in the framework of the bilateral program “Program to support the Ministry of Health of South Africa in the implementation of a national program of global response to HIV & AIDS”, financed by the Ministry of Foreign Affairs and coordinated by the ISS, based in Cape Town, South Africa. In 2013, she joined the European Center for Infectious Disease Control (ECDC) in Stockholm as a Scientific Coordinator. She has participated in numerous international working groups, including the development of the WHO guidelines for early diagnosis of hepatitis B and C, and the steering committee of the Health in Prison Project of the WHO European Office. Currently, she is a Senior Researcher of General and Applied Hygiene at the Department of Translational Research and new Technologies in Medicine and Surgery of the University of Pisa, and coordinates several research projects at regional, national and European level in the area of communicable diseases prevention and control, especially among people experiencing situations of vulnerability. She is author of more than 80 articles (h-index 20) published in national and international scientific journals as well as numerous technical reports.

DiSAAA-a Debate:
a conversation on Cell-Based Meat

Speakers' Profile

GALLI Francesca

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Associate Professor of Genetics at the Department of Biology, University of Pisa. His research is focused on the production and characterization of experimental *in vitro* and *in vivo* models for human diseases using innovative biotechnological approaches for cells, tissues, organs and organisms. Throughout the years, his activity has allowed him to develop a profound knowledge of several expression

and genetic engineering systems, both *in vitro* and *in vivo*, including multi-cistronic expression vectors and CRISPR-Cas9 models. Recently he coordinated the following international collaborative research project: the development of innovative drug delivery systems by means of engineered novel foods for the treatment of inflammatory disorders (Romano et al, Intern J Cardiol, 2018; Giovannoni et al, Patent No. PCT/IB2017/054646, 2016). He is co-founder and co-owner of the following startup companies: GRG Gene Technology SA, a Swiss-based biotech company, aimed at the development of advanced nutraceutical therapeutic approaches for cardiovascular and inflammatory disorders; BiOnSil srl, a spin-off company of the University of Milano-Bicocca, aimed to the development and commercialisation of diagnostic tools for colorectal carcinoma. He is a member of the Academic Senate of the University of Pisa and Vice-President of the Bachelor Degree in Biotechnologies, the Master Degree in Molecular Biotechnologies and Coordinator of the Master Degree in Biotechnologies and Applied Artificial Intelligence for Health. His research and teaching activity have been funded by the European Commission ("AI and Health", project Nr. 101083880), by the Minister of Research and University (PRIN2022, PRIN2022-PNRR) and by Foundation of Cardiovascular Research and Education.

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He is an Assistant Professor at the University of Pisa with about 8 years of experience in international and multidisciplinary projects. He holds a PhD in "Agri-Food Economics" obtained from the University of Bari. In his PhD work, He focused on the analysis of agricultural sustainability by developing an operational framework for the integration of biophysical and monetary sustainability assessment methods. Prior to joining the PAGE group, He has worked at Gembloux Agro-Bio Tech – the University of Liege in the project "Low-Cost Water Desalination and Sensor Technology Compat Module". Since 2019, He has carried out evidence-based research at the Department of Business Engineering and the Department of Bioscience Engineering at the University of Antwerp. His field of research includes sustainability, socioeconomic impacts of sustainable agriculture, support policies for small farming and rural development at local and regional level, life cycle impact analysis, techno-economic assessment, agriculture economics, biophysical and economic models' integration, climatic changes. His research focuses on integrated assessments frameworks of sustainability challenges by sound

scientific analysis to reduce uncertainty in the transition to a sustainable society. He is involved in several EU-funded projects on the sustainable agri-food value chains, agricultural climate science economics, sustainable innovation, and rural transition. His research work is regularly published in scientific papers in peer-reviewed journals, book chapters, academic reports, and conference papers.

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Full Professor of Agricultural Law in the Department of Law, University of Pisa; Member of the Doctoral Council in Legal Sciences; former Chair of the Bachelor's and Master's Degree Courses in Peace Sciences; Academic Senator; Deputy Director of the Department of Law; Former National GDL RUS-Food Coordinator; Member of UNIPI's Internationalization Group; Member of the Group for RRI (Responsible Research and Innovation) in UNIPI. Editor-in-chief of the "Journal of Agricultural Law. Agriculture Food Environment". She is on the Scientific Committee of Sector Journals (Journal of EU Agrarian Law), has been on the Editorial Board of National Journals (Journal of Food Law), and is a member of the main associations of national and international agri-food law scholars. She has taught in various Degree and Master Courses at University of Pisa and

has been invited as speaker in numerous conferences in Italy and abroad (EU and extra-EU). She has collaborated with the Tuscany Region and with the Ministry of Agriculture for the drafting of some regulations and has been heard by the Senate of the Republic in view of a regulatory intervention on New Biotechnologies in Agriculture. She has published four monographs and more than 100 articles under her own name in national and international Journals and in collected works on various topics of agricultural, agri-environmental, and agri-food law. The main objects of research have been agro-industrial contracts, biodiversity protection, the use of new biotechnologies in agriculture and genome editing, and alternative meats.

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He is a Chemist specializing in Biochemistry, Biotechnology & Foods. He obtained his BSc and first MSc (Food Chemistry & Technology) from the Aristotle University of Thessaloniki, and a second MSc in Animal-derived Foods (University of Copenhagen/Helsinki University). He participated in various food research & development projects, within Europe and overseas. Since 2016, he has joined EFSA and under his current role as a scientific officer in the Nutrition & Food Innovation Unit, he works on the risk assessment of Novel Foods. In the team, he coordinates activities regarding insect- and cell culture-derived foods, as well as food compositional characterization. For his Ph.D. at the School of Medicine of the National and Kapodistrian University of Athens, he investigated the public health impact of substituting red meat with novel or traditional protein sources, through the development and implementation of Risk-Benefit Assessment methods.

First Day Speakers' Abstracts

LEGAL ISSUES IN APPLYING NEW TECHNOLOGIES

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Abstract

Reflection on the legal implications of technological development in agriculture with specific reference to techno-science takes place in the context of the ecological transition and in the presence of instances related to the climate crisis while the demand for food security in the dual dimension of security and safety grows. New technologies in agriculture - "emerging technologies driven by the fourth industrial revolution" (WEF) - from the point of view of law involve the general issues of control and responsibility that translate, among other things, into the rules for risk analysis and the identification of principles for the protection of public interests and those involved producers and consumers. A reflection on new technologies cannot, on the other hand, evades the questions that led to the Responsible Research and Innovation (RRI) approach such as “transparent, interactive process by which societal actors and innovators become mutually responsive to each other with a view to the (ethical) acceptability, sustainability and societal desirability of the innovation process and its marketable products (in order to allow a proper embedding of scientific and technological advances in our society)” [von Schomberg R., 2013. DOI:10.1002/9781118551424.ch3]. The goal of this contribution is, once emerging technologies in agriculture are highlighted, to identify how law, with specific reference to EU law, responds to concerns coming from the world of research and production and from citizens in the current context.

Keywords: Techno-science, Agriculture, Law

VIRAL VECTORS TO FACILITATE CRISPR-CAS GENOME EDITING IN PLANTS

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Abstract

Technologies derived from bacterial and archaeal CRISPR-Cas systems are having an unprecedented impact in agricultural biotechnology. The capacity of these technologies to precisely modify plant genomes or to regulate gene expression is opening amazing possibilities to obtain more nutritive and productive cultivars, resistant to pests and pathogens, and better adapted to adverse environmental conditions. However, application of CRISPR-Cas technologies in plants still entails some limitations; possibly the most relevant is the difficulty to express the CRISPR-Cas reaction components in plants, which usually requires stable genetic transformation. Viral vectors arise as a promising alternative to express the components of the CRISPR-Cas reaction based on the ability to self-replicate and to move systemically through the plant. Virus-induced gene editing (VIGE) was first demonstrated in *Nicotiana benthamiana* plants stably expressing SpCas9 in which the guide RNAs were delivered using a vector derived from tobacco rattle virus (TRV). From this initial achievement, several plant viruses have been repurposed as CRISPR-Cas vectors to express guide RNAs, but also Cas nucleases. In our research group, we contributed to this goal by the development of a potato virus X (PVX) vector able to express multiplex guide RNAs. This vector was later adapted to gene expression regulation using a catalytically inactive SpCas9 derivative. We also successfully combined the PVX and a tobacco etch virus (TEV) vectors to co-express the LbCas12a nuclease and cognates guide RNAs. More recently, we have recreated mutations of agronomic interest in tomato plants using the PVX vector.

Keywords: CRISPR, Genome editing, Viral vector, Potato virus X, Tobacco etch virus

TRANSLATIONAL RESEARCH: THE USE OF BIOSTIMULANT IN AGRICULTURAL PLANTS

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Abstract

The enhancement of soil microbial activity involves the synergy between quality soil organic matter and the use of formulations based on mycorrhizal fungal inocula. The final aim is to find a balance among the diverse microorganisms (fungi, bacteria, actinobacteria, protozoa, etc.) living in close association in the soil ecosystem. The balance of the soil holobiont refers to the stability and the interactions among the diverse components, affecting plant health, soil fertility and ecosystem functionality. The compatibility among the different fungal species and the density of infective propagules are at the basis of inoculum success. The clarity of label information of the commercial formulations, concerning the percentage and the spore number of the mycorrhizal fungi is of fundamental importance, as well as the specification of *Trichoderma* species and the number of Colony Forming Units (CFU). As to the quantity of microorganism to be inoculated, it is also important to consider the pedoclimatic conditions. For instance, asphyxial saline soils with extreme pHs need a higher number of fungal spores. It is possible to utilize diverse grain size formulations based on the diameter of fungal spores. The main aim is represented by spore placement as close as possible to plant roots, in order to promote the development and the protection of root systems. The implementing rules of mycorrhizal inocula (including mycorrhizal fungi, bacteria and *Trichoderma*) are simple and low-cost. The diverse techniques for products implementation will be discussed during the talk, as well as the results obtained with different crop plants.

Keywords: Mycorrhizal fungi, Soil fertility, Arbuscular mycorrhizal fungi

SUPPORTING THE ONE HEALTH APPROACH IN THE FOOD SYSTEM: A CONTRIBUTE FROM THE SOCIO ECOLOGIC SYSTEM ANALYSIS

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Abstract

One Health is an umbrella not new concept mainly consolidating in the beginning of this century in connection with outbreak of emerging zoonosis and consolidating with the emerging impacts of climate change and related challenges. From the medical and veterinary domains, the concept has been progressively extended to other scientific areas of knowledge in biology, socio-economic, agricultural, and political science. The concept is considered as a unifying approach able to balance and optimize the health of people, animals, and the environment and so to prevent, predict, detect, and respond to global health threats. From the concept definition to its application, the debate moved from more specific technical-scientific aspects to the more socio-economic and political scientific components, also to raise more effective approaches in the implementation of coherent attitudes, rules, and procedures in a multisectoral and multilevel governance approach. The presentation based on emerging literature, official documents and cases will reflect toward the socio-ecological system analysis to elaborate on the One Health concept and its application in the food system. The conclusive reflections focus on both the space for a better organization of the existing domains of knowledge, a stronger connection among research(ers), practices(tioners), and institutional reorganization to better tackle the existing lacks in the One Health implementation in the routinary approaches in the organization of the food system, but also on the possible role played by innovative co-creative models to support prosperity and a better organization of the economic, societal and environmental values in the society in a One Health perspective.

Keywords: One Health, Socio-ecological system, Transition, Value co-production

LET'S 'MEAT' THE FUTURE: A NEW APPROACH TO THE DEVELOPMENT OF PLANT-BASED MEAT ANALOGUES

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Abstract

The study, development and consumption of meat analogues has risen considerably in the past five years, particularly in the Global North. This responds to an increasing awareness (e.g., millennials, generation Z) of the environmental and nutritional challenges, as well as the ethical conundrum surrounding meat production. Interestingly, the large proportion of consumers of meat analogues are neither vegetarian nor vegan but habitual meat-eaters themselves, or so-called 'flexitarian'. In view of this, companies went to great lengths to develop meat analogues with meat-mimicking properties (e.g., juiciness, color). While this technological development showed a rapid commercial appeal, there was a considerable trade-off on the product's nutritional profile and environmental sustainability (e.g., soybean, palm oil); in some cases, performing worse than some meat sources. All in all, this presentation suggests an evidence-based guideline for the development of meat analogues in accordance with the Sustainable Development Goals (SDG). Emphasis is given to (1) locally sourced or repurposed raw materials [SDG 2], (2) nutritional profiles to satisfy community-specific needs [SDG 3; SDG 10], (3) adoption of one-step or minimum step production process [SDG 9], (4) reduction of packaging material (in particular, fossil fuel-based) by favoring wholesale rather than retailing practices [SDG 12; SDG 13]. Changing the current approach could take meat analogues from a fading trend into a solid yet evolving industry that brings together nature, science, and tradition.

Keywords: Meat analogues, Flexitarian, Global North, Sustainable Development Goals

BENEFICIAL FUNGI FOR A SUSTAINABLE MANAGEMENT OF PLANT DISEASES: THE ONE HEALTH PERSPECTIVE

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Abstract

Inspired by Lady Eve Balfour who stated in 1943 that "*The health of soil, plant, animal and man is one and indivisible*", the One Health approach is becoming more and more relevant for food security and safety, with plant health occupying a pivotal place. The main threat to crop production - mostly related to staple food - is the plethora of biotic and abiotic stresses qualitatively and quantitatively affecting yields and commodities for human and animal nutrition. Among plant diseases, those caused by mycotoxigenic fungi affecting cereals is of great concern since traditional strategies, such as the use of agrochemicals, are under discussion in the framework of a sustainable defense. A valid alternative to the use of fungicides is represented by beneficial fungi, whose exploitation as commercial biocontrol agents (BCAs) is increasingly gaining a foothold in the market.

In the present contribution, an overview of the actual situation and the future trend of commercial BCAs on the global market will be given, focusing on the use of beneficial fungi against mycotoxigenic fungal plant pathogens. Particular attention will be devoted to the use of atoxigenic *Aspergillus flavus* on maize and the potentiality of a *Trichoderma gamsii* isolate for the control of Fusarium head blight on wheat, aimed to reduce the risk associated with aflatoxins and trichothecenes contamination of grains, respectively.

Within this context, beneficial fungi are destinated to give their contribution to overcome the challenge of a sustainable agriculture and of the availability of safe and safety food for all.

Keywords: One health, Biological control, Beneficial fungi, Mycotoxigenic plant pathogens, Food security and safety

Second Day Speakers' Abstracts

INTERSECTIONALITY: AN INTRODUCTION

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Abstract

The concept of “intersectionality” is gaining momentum both in social movements and in academic research. Coined in 1989 by the jurist Kimberlé Crenshaw to describe how different forms of oppression intersect in the subjective experiences of domination of different subjects, “intersectionality” has nowadays expanded and become more complex. An intersectional approach to societal problems is one that recognizes that at the heart of the different crises of the present are different intersecting forms of domination (gender, race, species, class, ableism) that mutually reinforce one another and are yet specific and irreducible. The idea of intersecting axes of oppression has been criticized because it tends to promote an “additive” logic without proposing an overall framework whereby all these oppressions might be understood in a systemic way. Still, its non-deterministic character enables to criticise different and shifting “matrixes” of domination. It is useful when looking at socio-ecological issues because it allows to emphasize how “environmental” matters are not external to society but rather part of a wider system where labor, value, resources are organized according to the axes of privilege and inequality. As part of an intersectional perspective, environmental health is co-emergent with human health: human bodies are part of ecosystems, which are in turn understandable as both human and non-human, social and natural. The promotion of human and ecosystem health therefore requires an interrogation over the different axes of oppression that shape more-than-human relations, introducing questions around justice, equality and (re)distribution of resources, harms, and risks.

Keywords: Intersectionality, Health, Political ecology, Justice, Domination

WOMAN IN THE FIELD: CURRENT SITUATION AND FUTURE PROSPECTS

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Abstract

Research in agriculture is tightly related and interconnected with the final user and practitioner of the innovation driven from research itself: the farmers. Creating innovation, sharing new knowledge, and searching for new solutions, should be an all-embracing process, in which all the actors are listened to and considered. This is because being a farmer is not only about production, but it also comprehends ancillary but fundamental activities to preserve and protect the environment, for the present and the future generations. Farmers understood that to obtain such objectives, sharing and creating a net between themselves is strategic. Consequently, many associations were born. One of those associations comprehends female farmers and has the objectives to create strong local-based relationships between women in the field, to help their commitment in the environment preservation, safe food production, and in acting as keepers of traditions. Considering those points, how can we manage to create meaningful relationships between research and farmers in order to reach the strategic objectives of One Health approach?

Keywords: Female entrepreneurship, Preservation, Sharing

BIOLAW, HEALTH AND SCIENTIFIC INNOVATION: A GENDER PERSPECTIVE

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Abstract

There are various areas in which technology affects bodies, and its rapid evolution transforms the very dimensions of life, death and health. Within the framework of the relationship between technology and body, this contribution aims at discussing some of the numerous challenges posed to BioLaw today. In particular, it will focus on the gender perspective of this relationship, believing that it is very significant today in order to build an innovative and constitutional-oriented BioLaw, gender-oriented. From this point of view, the relevance especially concerns two moments: that of reproduction, in terms of assistance to reproduction and voluntary interruption of the reproductive process, and that of the self and hetero-determination of the sex-gender system.

Keywords: BioLaw, Gender, Sexual & reproductive rights, Technological innovation

SOCIAL EDUTAINMENT A NEW WAY FOR SCIENCE POPULARIZATION

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Abstract

The way we communicate is changing, from letters and papers to phones and TV. Moreover, nowadays we are all connected through different social media exposing ourselves to countless information and point of views. Consequently, we are in the middle of a general information overload often contaminated by fake news. Therefore, if social media have a role in disseminating fake news, good researchers, professors, journalists and science communicators can load the system spreading correct information.

How do we use social media to communicate science? How did it all start? What are the best social networks to use? How can I be a science content creator? Are there any ethical boundaries when we communicate science on social? What tools should I use? In this seminar, we combine theory and practical approach to understand the key factors for communicating science on social media.

Keywords: Social media, Science, Dissemination, Tools

ONE HEALTH EDUCATION: BRIDGING DISCIPLINES THROUGH PARTICIPATORY LEARNING AND DESIGN INNOVATION

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Abstract

This contribution explores the integration of One Health concepts into formal education using challenge-based learning, participatory approaches, design methods and co-creation techniques. Through the use of innovative pedagogies, our research aims to improve students' understanding of the interconnectedness of human, animal and environmental health at all levels. The Tenuta Lab case study will be presented. Tenuta Lab was a 5-day co-creation training course involving doctoral students from the Department of Agriculture, Food and Environment of the University of Pisa, held last September at Suvignano, a farm confiscated from the Mafia. The pedagogical and design experiment carried out at Suvignano made it possible to assess the effectiveness of interactive learning strategies in doctoral courses, emphasizing active participation, collaboration and co-creation of knowledge among doctoral students. Through a transdisciplinary lens, the research not only enriched the educational experience, but also helped to train a generation of future professionals with holistic perspectives on global health challenges. The learning environment in Suvignano was an interesting field investigation for case studies of new models to improve social sustainability in food systems and businesses (e.g., through 'living labs' experiments). This is one of the themes of ONFOOD's Spoke 01 'Global Sustainability'.

Keywords: Co-creation, Design, Creativity, Education

PhDs' Abstracts

POSSIBLE COMBINED USE OF *TRICHODERMA GAMSI* T6085 AND *CLONOSTACHYS ROSEA IK726* IN A BIOCONTROL STRATEGY VS FUSARIUM HEAD BLIGHT IN WHEAT

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Abstract

Human population is widely increasing in a scenario dominated by climate change effect, thus boosting governments and researchers to face the biggest challenge to ensure safe and sustainable food. This is in line with the *One Health* approach and the *Farm to Fork Strategy*. Wheat is a staple food (FAO) and its supply is threatened by plant pathogens and recently by a tricky geopolitical scenario. Fusarium Head Blight (FHB) is the main responsible for wheat yield loss and mycotoxins contamination, thus affecting both food safety and security. Biological control – a sustainable approach for plant diseases management – of FHB has been already proven by single beneficial isolates such as *Trichoderma gamsii* T6085 (*Tg*) and *Clonostachys rosea* IK726 (*Cr*). Here, we run biological tests to check their possible combined use. The effect of specialized metabolites (SM) - diffusible and volatile - on mutual mycelial growth and spores germinability has been investigated on solid and liquid media, respectively. In addition, *Cr* has also been tested for the ability to endophytically colonize wheat roots and to modulate defense-related genes, as already demonstrated for *Tg*. Results revealed any inhibition during the mycelial interaction while *Cr*'s SMs affected *Tg* spore germination. Additionally, the complete (100%) colonization of wheat roots resulted in a significant up-regulation of *pgip2* (polygalacturonase inhibition protein) and *pr1* (pathogenesis-related protein) genes. These results leave open the possible combined use of the two BCAs. Further investigation on the molecular cross-talk occurring during the interaction between the two isolates is currently running.

Keywords: Biocontrol, Trichoderma, Clonostachys, Fusarium Head Blight, Wheat

GENOME EDITING APPROACHES IN *LACTUCA SATIVA* L.

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Abstract

CRISPR-Cas9 stands out as an effective genome editing tool for precise DNA manipulation in plant cells, holding promise for advancing our understanding of key pathways related to nutritional components and plant morphology, including ascorbic acid (AsA) and shoot and inflorescence architecture. However, the delivery of CRISPR-Cas components to plants presents challenges, with multiple methods available, including Agrobacterium-mediated, floral-dip, biolistic, and PEG-mediated protoplast methods. A new method uses transgenic plants constitutively expressing Cas9 infected through *Agrobacterium tumefaciens*, while a plant RNA virus is used as transient delivery of the gRNAs, following the so-called virus-induced genome editing (VIGE). In this study, we are characterizing *modehydroascorbate reductase 1-4* lettuce mutants (M1-M4) regarding their ascorbic acid levels and gene expression (qRT-PCR) in 14–28-day-old plants. Further investigations will employ RNA-seq and biochemical analyses to gain deeper insights into the role and significance of each isoform in this intricate ascorbic acid recycling pathway. Additionally, our research aims to establish a VIGE protocol in *Lactuca sativa* using two viruses in four different cultivars, focusing on knocking out *CHLI1* and *ANS* genes to induce a phenotyping effect. Successful implementation of this system will enable the editing and analysis of the *REGULATOR OF AXILLARY MERISTEM FORMATION-LIKE* (*ROXL*) gene, which plays a crucial role in shoot and inflorescence architecture.

Keywords: CRISPR-Cas9, Genome editing, *Lactuca sativa*, Virus-Induced-Genome-Editing

THE “FOCUS” PROJECT FOR THE ONE HEALTH SOLUTION THROUGH THE RECYCLING OF CIGARETTE BUTTS

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Abstract

Cigarette butts (CB) are one of the most abundant types of waste in the world and due to their inappropriate disposal, they can be found everywhere. When it occurs, the toxic compounds in CB leach into the environment, affecting terrestrial and aquatic ecosystems. Despite their toxicity, CB are not yet categorized as special waste and their conventional disposal systems include landfilling and incineration. A novel solution to tackle this waste was recently proposed as an ambitious project named FOCUS. It consisted of the recycling of CB filters into a soilless substrate for growing ornamental plants at early stage. Indeed, *Spartium junceum* L., *Lavandula angustifolia* Miller, *Salvia rosmarinus* Schleid., and *Salvia officinalis* L. could well establish and grow in recycled filters’ substrate. Moreover, the contaminated wastewater resulting from the cigarette butt cleaning process was treated with microalgae. The application of this biological wastewater treatment had the potential to remove up to 70% of organic pollutants depending on the microalgal strain. Ongoing experimental strategies in order to maximize the advantages of the FOCUS project will be discussed in the presentation of this study.

Keywords: Cigarette butt pollution, Environment, Microalgal-based wastewater remediation, Recycling, Soilless substrate

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THE MICROBIOTA OF AMF SPORES ASSOCIATED WITH *AMMOPHILA ARENARIA*: A RICH SOURCE OF BENEFICIAL BACTERIA

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Abstract

The aim of this study was the isolation and characterization of the microbiota associated with the arbuscular mycorrhizal fungi (AMF) colonizing the roots of *Ammophila arenaria*. Rhizosphere soil from three *A. arenaria* plants was collected from a stable dune system in the Migliarino-San Rossore-Massaciuccoli Natural Park, on Tuscan coast. The dominant AMF species retrieved were *Racocetra persica, Racocetra fulgida, Acaulospora scrobiculata, Rhizoglomus irregulare* and *Glomus* spp*.* In particular, the genus *Racocetra* was the most abundant (68%) in *A. arenaria* rhizosphere. Illumina MiSeq sequencing of bacteria associated with *R. fulgida* spores allowed the detection of 9 phyla, mostly represented by Bacillota (89.9%), Actinomycetota (5.5%) and Pseudomonadota (3.4%). Interestingly, most sequences were identified as *Mollicutes*/mycoplasma-related endobacteria. A richer bacterial community was found associated with *R. persica* spores. In particular, sequences belonging to 13 phyla were mostly represented by Bacillota (46.6%), Pseudomonadota (39.7%), Actinomycetota (10.4%) and Bacteroidota (2%). Here, the two most abundant genera were represented by two endobacteria (45.4%), while the remaining sequences belonged to 87 different genera, the majority of which known as plant growth promoters. Culture-dependent approaches allowed the isolation of 203 and 81 bacterial strains from *R. persica* and *R. fulgida* spores, respectively. Interestingly, diverse bacterial communities were associated with the spores of the two AMF, although originated from the same host plants and environmental conditions, showing that each AMF isolate recruits on its spores a different microbiota. Such bacterial isolates will be further analysed for their functional properties, to be used as plant beneficial microbial inocula

Keywords: Arbuscular mycorrhizal fungi, Mycorrhizosphere bacteria, *Ammophila arenaria*, Microbioma

CANOPY MANAGEMENT TECHNIQUES TO MITIGATE THE EFFECT OF CLIMATE CHANGE IN GRAPEVINE (*VITIS VINIFERA* L.)

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Abstract

Environmental conditions are pivotal in modulating grapevine physiology and grape berry quality. Due to global warming, vineyards are more frequently subjected to long periods of high temperature and drought, inducing earlier and faster berry ripening and generally reducing yield and grape quality. Hence strategies to contain early berry ripening maintaining it in a cooler period were studied. Among these, the apical leaf removal is a canopy management technique consisting in defoliating the upper part of the canopy, reducing at least 30-35% of the vine total leaf area. We tested apical leaf removal in Banfi estate, in Montalcino, in 2023. We performed this technique at two different stages of berry development: i) during lag-phase (early leaf removal, E-ALR) and ii) at full veraison (16 °Brix, late leaf removal, L-ALR). We monitored vines from lag-phase until harvest measuring stem water potential, leaf gas exchange, canopy architecture and fruit yield. The main berry technological parameters were determined during ripening whereas at harvest, we analyzed berry phenols and volatile organic compounds. Preliminary results highlighted that E-ALR increased stem water potential and the sugars accumulation as well, anticipating harvest of one week. Conversely, L-ALR reduced berry sugar content (-0,9 °Brix) compared to control ones. In both treatments there was no other effect on the main technological parameters. Limited or contrasting effects with previous literature can be partially explained with the peculiar seasonal trend. Hence a second experimental year will be carried out to understand the specific treatments effects rather than that induced by the climatic characteristics of the season.

Keywords: Grapevine, Canopy management, Leaf removal, Climate change

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RESEARCH AND IMPLEMENTATION OF ROBOTIC, DIGITAL AND AI SOLUTIONS FOR THE MANAGEMENT OF AGRICULTURAL AND URBAN GREEN SPACES

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Abstract

In the current eco-sustainable transformation of agroecosystems, the fundamental role of the landscape and its components is recognized. The landscape is the result of natural, cultural, anthropogenic and productive factors, which makes it a complex substrate to modify and preserve to increase the resilience of agroecosystem. The support of different technologies, if properly combined with farming and maintenance practices, could allow the achievement of a real digital transformation. Among the possible areas of application there are also the environment protection, the urban management and the smart agriculture, which must be approached in a more environmental and economic sustainable way with correlated added values for the quality of people life and for the environment itself. With this purpose, different studies and preliminary trails were mainly focused on the big major issue of digital and AI application declined in two big objectives: the development of a reliable weed detection system and the definition of method to assess the biodiversity level in urban and agricultural contexts. A preliminary weed detection system was set up to acquire images from an RGBD camera (Realsense D435F), to catalogue them based on the GPS position, date and time of acquisition, and finally save them on a USB pen drive. For this purpose, a Jetson dwarf was chosen. 1400 depth, infra and RGB images were collected on the hard surface, because it is the basic and easiest level for the future YOLO models training. Robotic platforms performances evaluation protocol was first conceived and then realized with a special focus on the timeline and on all the necessary operation to set up a fitting experimental design for autonomous weeding robots performance evaluation based on the objectives benchmarks: functionality BenchMark (FBM) of plant discrimination and field navigation. During the competition, a mobile rover was employed to perform the functionality BenchMarks. 2069 depth, infra and RGB images were collected of main crops and weeds to train YOLOv5.

Additional studies on trajectories tracking through RTK devices were conducted to evaluate their application on robotic autonomous platforms.

Keywords: Weeds, Artificial intelligence, Sustainability, Robotic, Digital transformation

ON-FARM STRATEGIES TO DETECT AND EVALUATE METHANE EMISSIONS OF DAIRY COWS

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Abstract

In dairy cattle systems, enteric methane emissions constitute a significant portion of the total greenhouse gas emissions. To effectively evaluate the impact of methane mitigation strategies, smart techniques are essential. The Laser Methane Detector (LMD) is a cost-effective handheld device that does not interfere with the animals' routine or behaviour. Globally, several experiments are currently underway to assess the LMD's ability to measure methane emissions in dairy cattle. Our first experiment, conducted in February 2023, was aimed to understand the methane emission patterns in dairy cows and to identify optimal times for measurements during the day. At this aim, we selected four late-lactating cows. Laser measurements started two hours after morning feeding and concluded just before afternoon milking, every hour for eight times on each cow. Our second experiment was aimed to evaluate the LMD's capacity to measure methane emission as affected by a methane-reducing feed additive. For that, we took measurements from nine lactating cows over a ten-week's span, at the start date and after ten weeks for three consecutive days, each time five hours after afternoon feeding. Preliminary findings showed significant differences between the two testing periods, revealing a significant 14% reduction in daily methane emissions per cow. In conclusion, the LMD is a valuable tool for quantifying methane emissions in dairy cattle, enabling the assessment of mitigation strategies and the effectiveness of feed additives in reducing methane emissions.

Keywords: Sustainability, Climate change, Animal product, Environmental impacts, Milk

NEW SOURCES OF FERTILIZERS FROM INDUSTRIAL WASTES AND INNOVATIVE AGRONOMIC SOLUTIONS TO IMPROVE SOIL FERTILITY AND PLANT NUTRIENT USE EFFICIENCY FOR SUSTAINABLE AND HIGH-QUALITY AGRICULTURAL PRODUCTION

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Abstract

Agriculture is one of the human activities with the highest impact on the environment. Both at scientific and legislative level, it is believed that the reduction of agriculture impact can be reached through the adoption of sustainable models and circular economy practices. Since the industrial sector produces a large amount of waste that could be recycled, the aim of this research project is to valorize industrial byproducts for the formulation of fertilizers. After a bibliographic screening on agronomic and normative characteristics of different wastes, research activities focused on the formulation of fertilizers from gypsum derived from Tuscan industries. Most promising formulations, obtained from granulation tests, were used for agronomic trials aiming to evaluate their fertilizing effects. At this regard, field-plot trials were set up, for assessing gypsum potentiality as sulfuric fertilizer. At the same time, the biostimulant effect of a mixture of gypsum and ammonium lignosulfonate was evaluated at mesocosm level. *Camelina sativa* (L.) Crantz was used as a plant model. Preliminary findings suggested that sulfur application as gypsum had a positive effect on camelina in terms of seed yield, yield components, seed protein and glucosinolates content. Results from the mesocosm trial are still under analysis. During the second year of experimentation is planned to perform granulation trials using biochar, while agronomic trials will be carried out using different nitrogen and sulfuric fertilization strategies on camelina and common wheat, both at field and mesocosm level, to assess crop yield and quality, nutrient use efficiency, and environmental impact.

Keywords: Circular economy, Sulfuric fertilization, Sustainable intensification in agriculture, Camelina

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ECONOMIC IMPACT OF CLIMATE CHANGE ON AGRICULTURAL LAND VALUES

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Abstract

Global warming is the main concern on social, economic and environmental sectors. Specifically, the climate change is posing a threat to the agriculture in terms of the productivity and profitability. There is pressing demand for the understanding of complexity in the climate change and its drivers on agriculture sector, as the awareness of the issue supports policymakers and stakeholders in developing effective strategies to mitigate risks and adapt to the climate change. There have been many studies carried out in the context of climate change impacts. However, the gap in the area is often mentioned that the long-term impact assessment is needed because the current studies rely on the short-term solutions. Ricardian method in the climate change studies gained its popularity due to its strength in long-run impact assessment, and this study relies on this method. Ricardian approach examines the relationship between climate variables and land values, considering the long-term impact. The study examines the impact of climate change on agricultural land values in Italy, and predicts the future trends based on climate model simulations in the long run. The results indicate that the impact of climate variables on land value has a negative effect on the long-period analysis and across different farming types and regions. The vulnerability and sensitivity to climate change are almost consistent with previous studies, and Southern Italy is found to be more vulnerable compared to the northern part of the country. The significance of climate variables is found to be higher in all types of farms, regardless of irrigation or crop. The study underscores the need for policymakers and farmers to develop strategies to mitigate the impacts of climate change on farmland value in Italy. Overall, the study contributes to the understanding of climate change's implications for Italian agriculture and provides valuable insights for policymakers and stakeholders in formulating effective adaptation and mitigation strategies.

Keywords: Ricardian analysis, Climate change, Italian agriculture, Farmland value

LASER SPECTROSCOPY AS A TOOL TO STUDY FOOD SHELF LIFE

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Abstract

The shelf life of a food depends on many factors, such as light, storage position, humidity, and oxygen. This latter is one of the key factors influencing the durability of the product.
There are various methods for determining the oxygen exposure and the consequent risk of oxidation of a product but many of these are destructive analyses that are done post-packaging and resulting in food waste.
Realizing that you have a good packaging system becomes crucial if you want to increase the efficiency of your in-line system and if you want to reduce food waste. Laser spectroscopy could be a solution because, if set on a specific wavelength, it allows the sample to be examined without opening it and analyzed over time, thus considerably reducing food waste.
Laser spectroscopy has been applied to monitor the effectiveness of a new oil packaging system called bottle in bag with modified air condition..

Keywords: Wine, Oil, TDLAS, Laser spectroscopy

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INNOVATIVE TECHNOLOGIES FOR SHELF-LIFE EXTENSION AND MONITORING OF PHYSICAL PARAMETERS DURING INDUSTRIAL BREAD PRODUCTION

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Abstract

The extension of the shelf-life of bakery products is one of the main challenges of the food industry with the aim of waste reduction and a circular economy through the re-use of waste from other production chains. In order to achieve this goal, it is necessary to investigate which factors most influence food perishability. Technological innovation and sensoristic science play a key role in monitoring of parameters that affect the shelf-life of food. Nowadays, it is possible to adopt non-destructive and continuous monitoring strategies to assess the physical evolution of a sample over time without destruction method. Since the degradation phenomena that most influence the shelf-life of bread (staling and microbial change) are dependent on factors such as temperature, humidity and water activity, all these parameters were analysed during the experiment in order to understand which of them had a greater delaying effect on the appearance of alterations. To do this, innovative polymer-based sensors were used to monitor temperature and humidity, relative and absolute, during all the various stages of leavening, baking and also during storage. To monitor this parameter during the bread shelf-life, SHT+ type sensors were developed. The sensor is a condenser in which the dielectric consists of a polymer capable of absorbing or releasing water, depending on the relative humidity in the environment in which it is installed. Thus, the capacitance of the capacitor changes and this change can be measured electrically, so that the humidity level can be determined by an embedded microprocessor that is part of the sensor. This microprocessor also has a digital communication interface, which simplifies its operation and

can be placed in any microprocessor-based system, such as Arduino. Thanks to the use of increasingly miniaturized and efficient sensors, it was possible to detect physical parameters which are very useful for monitoring the phenomenon of water migration both inside the packaging and inside the bread.

Keywords: Shelf-life, Bakery products, Bread, Natural additives

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EFFECT OF COOKING TECHNOLOGIES ON NUTRITIONAL AND ANTINUTRITIONAL COMPOUNDS IN PLANT- AND MEAT-BASED FOOD

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Abstract

In view of the growing demand for healthy food, consumers are increasingly concerned about the effect of cooking technologies on organoleptic and nutraceutical properties of food. Phytochemicals such as phenols, carotenoids, flavonoids and glucosinolates have demonstrated antioxidant, antibacterial, antiviral activities, enzyme modulation and immune system stimulation, preventing some human chronic and neurodegenerative diseases. Bioaccessibility of these nutraceuticals in the human body depends on multiple factors including cooking process. For instance, boiling can reduce the content of phytochemicals when compared with raw plant-based food due to the diacylation or glycosylation of the bioactive molecules or their leaching in the boiling water. In *Brassicaceae* plant family the myrosinase enzyme, which is able to hydrolize glucosinolates, is inactivated by cooking treatments, resulting in a decrease in the production of beneficial hydrolytic compounds named isothiocyanates.

At the same time, meat-based food contains a wide variety of nutrients such as essential amino acids, minerals, and vitamins. Moreover, the cooked meat flavor is composed by a mixture of volatile compounds derived from various reactions induced by heat treatments, such as the Maillard reaction, lipid peroxidation and degradation of nitrogen compounds. It is also important to beware of the production of antinutrients generated by meat cooking process since it can develop substances with mutagenic and carcinogenic activity such as polyaromatic hydrocarbons, heterocyclic aromatic amines, acrylamide, and products of lipid and protein oxidation.

Keywords: Cooking technologies, Bioaccessibility, Phytochemicals, Plant-based food, Meat-based food, Hazardous compounds

THE USE OF WHEAT *TRICHODERMA* ENDOPHYTES AS A SUSTAINABLE PLANT PROTECTION

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Abstract

The use of plant endophytic fungi is gaining attention as a sustainable alternative to chemical fertilizers and pesticides, given that some endophytes have proven to protect plants against biotic and abiotic stresses. *Trichoderma* spp. are recognized as biological control agents (BCA) of important pathogens in agriculture, and some strains promote plant growth and protect them against abiotic stresses. Besides, *Trichoderma* spp. are able to colonize the rhizosphere and become endophytes. We have focused on the search and characterization of endophytic fungi from healthy wheat plants (*Triticum aestivum*) obtained from a rain-fed field trial, for their use as BCA and/or biofertilizer under drought conditions. We obtained 54 morphologically different isolates, four of them belonging to *Trichoderma*: *T. harzianum* T136, *T. simmonsii* T137, *T. afroharzianum* T138 and *T. harzianum* T139. These four isolates were included in different assays led to study their biocontrol potential against the wheat pathogen *Fusarium graminearum*, and their ability to protect wheat against water stress. Strain T136 showed the best biocontrol potential against *Fusarium graminearum* and strain T137 was the best strain to help the plants to overcome water stress.

Keywords: *Trichoderma*, Endophytes, Wheat, *Fusarium graminearum*, Drought stress

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MOLECULAR, BIOCHEMICAL, AND PHYSIOLOGICAL STRATEGIES OF HALOPHYTIC PLANTS IN ADAPTING TO SALINE SOILS, AND THEIR POTENTIAL APPLICATION AS CROPS WITHIN THE FRAMEWORK OF CLIMATE CHANGE

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Abstract

Soil salinization, one of the main threats to land degradation, leads to significant productivity losses and desertification, impacting agriculture, environmental health, and food security. In Europe, about 3.8 million hectares of land are affected by salinity, concentrated in the Mediterranean basin. Halophytic plants, which can tolerate moderate to high saline conditions, hold promise for soil remediation and desalination. In addition, they represent valuable food sources thanks to their high content of health-promoting phytochemicals. My PhD project focuses on the study of halophytic plants, particularly *Salicornia perennis* Mill., for soil remediation and human nutrition purposes. In this work, *Salicornia* plants were exposed to different concentrations of sodium chloride (NaCl; 150 mM, 300 mM, 600 mM) in peat-filled pots up to 30 days. For each sampling time (every 10 days), biometric, physiological, and biochemical analyses were conducted on the plants, as well as biochemical analyses on the substrates. The substrate showed a decrease in pH and an increase in electrical conductivity (EC) over time in all salt treatments. Plant dry weight increased, and fresh weight decreased over time, and, concerning the physiological analyses, chlorophyll fluorescence unveils that the photosystem II (PSII) maximum photochemical efficiency (Fv/Fm) progressively declined regardless the salt treatment. The quantification of Na^+ concentration in substrates, plant shoots, and roots is ongoing, to check the effectiveness of the plant to desalinate the substrate. Further evaluation will include analysis of photosynthetic pigments and nutritional composition, particularly fatty acid profiles.

Keywords: Innovative crop, Nutraceutical, Salicornia, Salinity, Soil remediation

NEW YEAST EXTRACT FORMULATE FOR GRAPEVINE DEFENCE AGAINST *BOTRYTIS CINEREA*

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Abstract

Grapevine (*Vitis vinifera* L.) represents one of the most economically important and widespread crop at global scale, but with an intense environmental impact. Therefore, new and eco-friendly tools against fungal pathogens are needed for a more sustainable viticulture. The antifungal effect of a new yeast extract (YE) formulate (developed by Kwizda Agro GmbH) against *Botrytis cinerea* (*Bc*) Pers., causal agent of gray mold in grapevine, was evaluated through in *vitro* and in *vivo* tests. Inoculated potato dextrose agar (PDA) amended with YE, at the concentration suggested by the company, showed a significant reduction in terms of fungal growth starting from 48 hours post inoculum (hpi) until the end of the experiment (-40%, as average compared to control). Spray applications of YE at foliar level were performed on 16 *V. vinifera* cv. Sangiovese potted plants following the dose recommended by Kwizda, while other 16 plants were treated with sterile water and catalogued as control. From the 2 sets, 8 plants were then artificially inoculated with *Bc*; fresh material was sampled at 1, 3, 24 and 48 hpi, and lactophenol-cotton blue stained for microscopic observations. In YE^+/Bc^+ leaves, germ tubes did not elongate well, and their hyphae were slightly spread after 48 hpi, if compared to YE^-/Bc^+. As expected, uninoculated leaves did not show the presence of stained fungal structures. The mycelium growth reduction registered in amended PDA together with the microscopic symptoms observed, confirm the antifungal activity of YE against *Bc* in grapevine..

Keywords: *Vitis vinifera*, Gray mold, Sustainable plant protection

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DIVERSE VALUES OF WATER IN THE CECINA RIVER BASIN

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Abstract

More concentrated rainfall causes risk of flooding and scarcity of water storage. The need is to manage rural territories to avoid the impacts of extreme events and ensure constant water availability. Different management strategies exist, but implementing concrete actions is challenging, because it requires collaboration across sectors and levels of governance. Policymakers and rural actors need the support of rigorous information to find shared solutions to address the challenges of increasing water insecurity. Robust hydrological measures, models, and accounts are fundamental, but also information on environmental needs and limits, and social and economic demands and uses are needed to reveal the different benefits and values of water. Not fully representing the value of water is considered a primary reason for limited successes and failures in water governance. Recognizing and considering a full range of water values can be achieved through the inclusive and meaningful participation of all relevant stakeholders in a valuation process, and by using diverse biophysical, economic, and socio-cultural approaches and methods. By engaging with a multi-actor platform including the Val di Cecina Rural District, which aims to generate new data and tools to support shared land and water management, this research project will seek to understand what information and knowledge rural actors most need to facilitate this type of decision-making. The expected results will help us to better understand the necessary improvements in information and knowledge, e.g., on biophysical, economic, and socio-cultural indicators, or on instrumental, intrinsic, and relational values, or on broad values and worldviews, and possible ways to achieve them.

Keywords: Water resources, Decision support systems, Ecosystem services, Diverse values, Participation

DRONES IN AGROECOLOGY: A REVIEW OF CURRENT LITERATURE

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Abstract

Fundamentally military technology, drones are expanding their wings in the farming sector and their applications in agriculture are numerous. Notable applications include crop monitoring and mapping, yield estimation, pest and disease identification and farm management through precision spraying. Until today, many of the digital technologies including drones are mostly restricted to conventional farming systems. Nevertheless, with the emerging sustainability objectives and alternative approaches to farming such as agroecology, the role of remote sensing technologies such as drones in the agroecological farming systems need to be investigated. Drones can offer multiple opportunities for simplifying the existing complexity in agroecological farms. They can assist in understanding the behaviour of the existing components and thereby accordingly optimize their interactions with the environment in an agroecological farm. They are also considered as promising technologies for biodiversity monitoring and management. Likewise, there are many other entry points for drones in agroecological farming systems that are yet to be explored. However, there is an argumentation in the scientific literature on the application of digital technologies including drones in agroecological farming systems. Given the evidence on the possible repercussions such as social exclusion and power shifts among the stakeholders, the adoption of drones in agroecological farming is still a challenge. Even though it is apparent from the literature that drones could aid in enhancing the efficiency of the farm, the inherent challenges at the field level need to be considered while informing stakeholders on the usefulness of drones. Henceforth, future research must focus on identifying the actual practicalities at the local level to improve the digital conduciveness

Keywords: Drones, Agroecology, Challenges, Opportunities

FUTURE OF LIVESTOCK IN EUROPE IN THE ERA OF THE FARM TO FORK STRATEGY: SOCIO-ECONOMIC SUSTAINABILITY ASSESSMENT

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Abstract

Nowadays, the livestock sector is tackling complex sustainability challenges, being at frontier of ecological transition and representing a keystone of one-welfare system. In this context, the Farm to Fork (F2F) strategy expresses the EU commitment to reconcile the European food system with the Earth's planetary boundaries. In the F2F framework, the chosen scale of study and intervention is not the farm but the whole value chain, recalling the system thinking approach. At the state of art, there seems to be an abundance of tools developed to assess the impact of livestock activity at the farm level, with an environmental focus; instead, at the value chain scale, the information is more difficult to be integrated and usually falls within the interest of multinational firms. The emerging gap is the lack of a tool to assess at different scale the multi-dimensional impacts of the various steps of the value generation process, tailored for the animal production sector. The present work aims to adapt the existing sustainability assessment methodologies in order to obtain a novel metric, based on reviewed tools and frameworks. The path to go from a list of indicators to a new metric will be made using a participative method, including the stakeholders from dairy and cattle sectors. The idea is to implement a Delphi study, to let experts prioritize indicators using a discrete choice experiment (e.g., using Best-Worst-Scaling) in multiple survey rounds. Then, through the implementation of the new metric on case studies, it will be validated.

Keywords: Livestock, Sustainability Assessment, Value Chain, Multi-scale Metric, Delphi Method

SUSTAINABLE TRANSFORMATION OF FOOD SYSTEMS: THE ROLE OF URBAN FOOD POLICIES

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Abstract

The concepts of “food system(s)” and “food system(s) transformation” have rapidly entered into the global and EU policy discourse. This was demonstrated lastly by 2021 and 2023 UN Food Systems Summits, but also by the Farm-to-Fork Strategy and the EU Commission’s proposal for a legislative framework for sustainable food systems. This agenda emerged along with at least a decade of interdisciplinary research which has widely discussed the need to approach food-related sustainability issues as part of complex socio-ecological systems. Despite this growing consensus on the need to adopt a system approach, both political and academic discussions on how to turn food systems thinking into practice still need stronger empirical backing. To contribute to fill this gap, this research will focus on the urban scale, which is receiving an increasing attention by scholars and institutions. Therefore, this research will investigate the role of urban food policies in sustainable transformation of food systems in Europe, and in particular how they can contribute to sustainable and healthy urban food environments. Two case studies will be analyzed: the municipality of Capannori, a fundamental member of the Plain of Food and the first intermunicipal food policy in Italy, and the municipality of Ede, one of the first cities to adopt an urban food policy in the Netherlands. This research aims to provide a more empirical basis to the academic and political discussion regarding food systems approach, highlighting the concrete potential of urban food policies and the strategies to overcome the barriers to the full expression of this potential.

Keywords: Food system, Urban food policy, Food environment

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We express our sincere gratitude to all speakers involved in this workshop.

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