

**ABSTRACT  
BOOK**



**SCIENTIFIC SUMMITS**

# **WSCSE-2025**

Paris, France | March 27-29, 2025

**WORLD SUMMIT ON  
CROP SCIENCE AND ENGINEERING**

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## FOREWORD

Dear Colleagues

Immerse yourself in the essence of **WSCSE-2025**, the World Summit on Crop Science and Engineering, slated to convene in Paris, France from March 27-29, 2025.

At **WSCSE-2025**, a diverse array of leading experts, researchers, professionals, scientists, scholars, delegates, businessmen, students, and industrialists will come together. With a legacy of innovation, our conference serves as a crucial platform for advancing knowledge, fostering innovation, and addressing contemporary challenges in Crop Science and Engineering.

Our mission is to provide an immersive forum for discussions, technical sessions, and networking opportunities that inspire and empower those passionate about Crop Science and Engineering. Attendees can anticipate dynamic exchanges of ideas, experiences, and expertise through keynote addresses, technical sessions, panel discussions, and networking events.

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# PLENARY ABSTRACTS

# **SUSTAINABLE AGRICULTURE: MITIGATING GREENHOUSE GAS EMISSIONS THROUGH ENHANCED STRIP-TILLING**

**Tet Yeap**

University of Ottawa, Canada

## **ABSTRACT**

Agriculture plays a substantial role in greenhouse gas emissions, and finding environmentally friendly and economically viable practices is crucial for addressing climate change and ensuring the long-term sustainability of the farming industry. This talk presents an enhanced strip-till farming practice that integrates the benefits of conventional strip-tilling with advanced fertilization techniques by distributing fertilizer evenly throughout the tilled strip using either a shank or coulter strip-till unit. Compared with the traditional broadcast farming practice, the new farming practice can achieve more than a 90% decrease in nitrous oxide emissions, a 33% decrease in fertilizer use, and a 26% increase in yield. Adopting and promoting such a sustainable farming practice is essential for the agricultural sector to transition towards more environmentally friendly and economically viable models. It's a positive step forward in balancing food production with environmental conservation, aligning with the goals of sustainable agriculture and responsible resource management.

## **BIOGRAPHY**

Tet Yeap is a professor at the School of Electrical Engineering and Computer Science at the University of Ottawa and the School of Automation at the Beijing University of Posts and Telecommunications. He received a B.A.Sc. in electrical engineering from Queen's University in 1982, followed by a master's and a doctorate in the same field from the University of Toronto in 1984 and 1991, respectively.

He is also the inaugural director of the Bell Advanced Research Laboratory in Ottawa (BARLO). He directed the BARLO Laboratory from 1996 to 2010, focusing on telecommunications research and development. He has published three book chapters, 35 journal and transaction papers, and 71 conference papers. He is also the holder of 75 patents. He was also the holder of the Bell Canada IP award in 2004 and the Joseph Whitward Award, Institute of Mechanical Engineers in 2005.

# **IMPROVING FOOD SECURITY IN THE WORLD BY SUSTAINABLE PRODUCTION OF FOOD CROPS IN THE DEVELOPING COUNTRIES**

**Mohammad Babadoost**

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## **ABSTRACT**

The first step for establishing food security in the world is improving sustainable production of food crops. Despite losing some of the productive agricultural lands to urban developments throughout the world, there are still considerable land areas with plenty of water for crop production. Two major factors negatively impacting global food security are inadequate protection of food crops and product and failure in reliable distribution of produced food products. In spite of vast efforts on crop protection, more than 30% of food crops and products in the world are lost to plant pests (diseases, insects, and weeds) and poorly handling yields and products. The losses are much higher in the developing countries than developed countries. To improve crop production and minimize losses, establishing/strengthening national agricultural programs throughout the world is vital. Such programs require strong teaching, research, and extension/outreach programs in every country. In most of the developing countries, none or limited connections exist among teaching, research, and extension/outreach programs. External helps are valuable; however, establishing sustainable production of food crops without local research and understanding the local social cultures by outside helpers may not succeed. Thus, problem-solving in production of food crops in any area should be based on the credible teaching program and reliable local research complimented with the timely information-delivery by local professionals to the end users.

## **BIOGRAPHY**

Mohammad Babadoost is a professor of plant pathology and extension specialist at University of Illinois, Urbana-Champaign, United States of America. His program focuses on improving production of food crops for establishing food security in the world. In the past 20 years, Dr. Babadoost has participated in teaching, research, and extension/outreach programs in 43 countries; provided more than 4,000 publications to 127 agricultural institutes/centers in 71 developing countries; provided more than 120 invited presentations to scientists in more than 100 countries; trained/mentored 36 graduate students from 9 countries who are now servings at universities, research

centers, and extension/outreach programs throughout the world; and supervised 17 visiting scholars in his program and assisted supervising more than 30 visiting scholars in other programs.

# KEYNOTE ABSTRACTS

# **A THEORETICAL FRAMEWORK “3MP” TO IMPROVE THE ADOPTION OF GREEN INTEGRATED PEST MANAGEMENT TACTICS AND TO CONSIDER ENVIRONMENT AND CLIMATE BENEFITS**

**Peng Han<sup>1\*</sup>, Cesar Rodriguez-Saona<sup>2</sup>, Myron P. Zalucki<sup>3</sup>, Shu-sheng Liu<sup>4</sup> & Nicolas Desneux<sup>5</sup>**

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## **ABSTRACT**

Sustainable agriculture relies on implementing effective, eco-friendly crop protection strategies. However, the adoption of these green tactics by growers is limited by their high costs resulting from the insufficient integration of various components of Integrated Pest Management (IPM). In response, we propose a framework within IPM termed Multi-Dimensional Management of Multiple Pests (3MP). Within this framework, a spatial dimension considers the interactive effects of soil-crop-pest-natural enemy networks on pest prevalence, while a time dimension addresses pest interactions over the crop season. The “synergy” and “coverage” effects of various management options on insect pests shall be increased. The Climate-Mitigation-Adaptation-Agricultural Practices (CMAAPs) that favor IPM via bottom-up effects are encouraged to be promoted as they could further bring environment and climate benefits. Overall, the 3MP framework aims to bolster the adoption of green IPM tactics, thereby extending environmental benefits beyond crop protection. In the presentation, I am going to show how 3MP has been put forward and how it is applied in tomato system.

## BIOGRAPHY

Dr. Peng Han (ORCID: 0000-0002-5941-9362) is currently a professor at Yunnan University, the head of the team “Ecological Entomology and Biological Invasion Management - EEBIM”. His current research is to understand how climate-mitigating and adaptation agricultural practices (e.g. reduced nitrogen fertilization and organic matters addition, field margin management practices) could surprisingly favor IPM from the "soil-crop-pest-natural enemies" multitrophic interactions perspective under semi-field conditions, so that a “win-win” ("green" crop protection and climate mitigation & adaptation) might be achieved at one shot. More broadly, he has proposed a new theoretical framework called “Multidimensional Management of Multiple Pests (3MP)” together with his key collaborators from France, the United States and Australia, aiming to increase the adoption of “green” IPM tools and enhance environment and climate benefits.

He obtained his PhD degree in insect ecology from University of Nice (France) (2011-2014), and used to work in INRAe (2014-2017) and Chinese Academy of Sciences (2017-2021). He has yielded over 50 publications (h-index as 31; over 2400 citations) with some key ones being published in Journal of Ecology, Journal of Chemical Ecology, Entomologia Generalis and Annual Review of Entomology. He is active in international collaborations, acting as the leading scientist for an international joint lab “Yunnan Fruit-Vegetable-Flower IPM Joint Lab” (starting in 2023) in which 20 active participants from Asia, Europe, and the United States are involved. He also serves as the associate editors for Journal of Pest Science and Entomologia Generalis since 2018.

## **FUTURE SC FORMULATION DESIGN AND PERFORMANCE FOR EMERGING UAV, VLV, AND PRECISION APPLICATION TECHNOLOGIES.**

**Malcolm A. Faers**

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### **ABSTRACT**

Agriculture is undergoing rapid developments with the introduction of unmanned aerial vehicles (UAV), spray application at very-low volumes (VLV),\* and precision application technologies which bring new requirements concerning the performance of crop protection products. It is therefore important to ensure that future crop protection formulations are designed to perform reliably and efficiently with these fast-evolving technologies, and adjuvants/formulants built into the formulation are essential for this. In this regard, lower efficacy has been reported with decreasing spray volumes at VLV with UAV application.<sup>1</sup>

To investigate formulation performance at VLV, a range of SC formulations with different biodelivery mechanisms were prepared and tested. SC formulations containing relatively low dose rates (g/ha) of formulants (adjuvants) that enhance spreading on the leaf surface, including organosilicone based surfactants, maintained good spreading at VLV on leaf surfaces containing epicuticular wax crystals, both in the lab and in field. In associated experiments, SC formulations containing certain nonionic surfactants also at relatively low dose rates (g/ha), showed enhanced uptake at VLV through the presence of coffee ring spray deposit microstructures which enhanced the association between the surfactants (adjuvants) and active substance particles.<sup>2</sup> Both cases demonstrated enhanced biological efficacy against fungal disease in the greenhouse, while reference SC formulations without these formulants had poorer coverage, poorer uptake and poorer efficacy at VLV.<sup>3</sup> Furthermore, these performance advantages were observed in field tests at VLV.

These formulations with enhanced spreading and enhanced uptake overcame the biodelivery limitations at VLV of reference SC formulations without these formulants. This result is unexpected and surprising when the low dose rate of formulants (adjuvants) used (g/ha) is considered, where these VLV designed formulations can, for example, typically use  $\frac{1}{4}$  of the adjuvants compared to higher spray volumes and yet

still achieve x5 the concentration in the spray liquid. This offers unprecedented control of the properties of the spray liquid at VLV that can deliver enhanced performance, reduce off-target losses, offer improved sustainability opportunities, and enable future VLV precision application technologies such as automated unmanned ground vehicles (UGV) and UAV.

\*VLV = 5 to 50 L/ha (field crops).

## BIOGRAPHY

Malcolm Faers is a formulation scientist and Senior Science Fellow at Bayer. He studied chemistry at the University of Sheffield (BSc) and then colloid science at Imperial College (PhD), and his research interests include the application of colloid science to flowable formulation design and innovation, including biodelivery and stability of suspensions, especially with future UAV/VLV technologies. He has designed and developed many products that help grow the crops that ensure food security and feed our planet's ever-growing population, which is a critical challenge facing our world today. He was awarded the Best Formulation Innovation award at the Crop Science Forum & Awards (2019), has many papers, patents, and patent applications, is chair of the SCI Formulation Forum and is a Fellow of the RSC.

# **MATHEMATICAL MODELS AS MANAGEMENT TOOLS FOR SUSTAINABLE GRAIN STORAGE: HISTORY AND TREND**

**Fuji Jian, PhD, P. Eng.**

Department of Biosystems Engineering, University of Manitoba, Winnipeg, MB, R3T 5V6, Canada

## **ABSTRACT**

Any stored grain bulk is a combination of the biotic community and its nonliving environment interacting with each other as a functioning system of complementary relationships, including the transfer and circulation of energy and materials. To effectively manage the storage grain with minimum input and safely maintain grain quality and quantity, an ecosystem approach to storage grain management is required. Mathematical modelling is one of the best approaches for grain storage management. Different mathematical models to simulate the grain storage ecosystems have been developed. From the historical view, this study reviewed the developed single-factor models, multi-factor models, and the current trend. These models mainly focus on the following areas: grain temperature and moisture content, stored grain insect population dynamics, insect movement in stored grain bins, safe grain storage time, aeration, natural air-drying, dockage segregation and distribution, fumigation, high temperature drying, and fan control. The models used for industrial practice and challenges have been also outlined.

## **BIOGRAPHY**

Dr. Fuji Jian is a professional engineer and a professor in the Department of Biosystems Engineering at the University of Manitoba. Dr. Jian received his MSc at Henan University of Technology (ZhengZhou Grain College), China in 1992; Master of Engineer at University of Greenwich, UK in 1996; and PhD at the University of Manitoba, Canada in 2003. Excellence of his Ph.D. studies was awarded as “Governor General’s Gold Medal for outstanding graduate studies academic achievement in Canada” and the “CSAE/SCGR 2004 Ph.D. Thesis Award”. After working for a grain management company (OPI System, Calgary, Canada) for 5 years, he returned to academia in 2010. He is the recipient of the prestigious 2019 John Clark Award of CSBE/SCGAB, and the Merit awards in the category of research, scholarly work and creative activities, University of Manitoba, 2020. He is the two-time winner of John Ogilvie Research Innovation Award, CSBE/SCGAB and other awards.

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Fuji's research interests are in the area of post-harvest grain quality, stored-product protection, sensor development, and stored product insect control with the sole purpose to enhance food safety and security. He is the leading authors in 76 of 123 referred journal papers, two book chapters, two books, and authorized and co-authored more than 50 conference papers. He is the associate editor of the Biosystems Engineering, and editor board member of the Journal of Stored Products Research and Biosystems Engineering.

# **GREENING THE FUTURE: ADVANCING SUSTAINABLE PRODUCTION SYSTEMS FOR A RESILIENT FUTURE**

**Bhim Bahadur Ghaley**

Associate Professor University of Copenhagen, Denmark

## **ABSTRACT**

The industrial agriculture has contributed to production of food, fodder and bioenergy. However, the environmental costs due to intensive use of fertilizers and chemical inputs in industrial agriculture have necessitated to rethink and adapt our production system, more benign to the environmental and human health and to maintain ecosystem integrity for provision of ecosystem services. To contribute to this sustainable journey, there is lot of focus on sustainable practices like intercropping, agroforestry, regenerative agriculture etc. to reverse and contain the adverse impacts on environment and to improve the supporting and regulating ecosystem functions like water and nutrient regulation, biodiversity enhancement and carbon sequestration. As an attempt to quantify the benefits of agroforestry and intercropping, dedicated field trials were implemented at the experimental farm at the university of Copenhagen in Denmark. The key findings were that the cereal-legumes like pea-barley and pea-barley-fababean intercrops were higher yielding in terms of grain yields, aboveground biomass accumulation and land productivity. Further, the pest incidence were lower in the intercrops and agroforestry systems compared to the conventional monoculture practice. The soil health was improved in the fields with sustainable practices compared to the conventional monoculture practice. With sustainable practices, there were multiple benefits in terms of productivity and lower incidence of pests with minimum or no external inputs. Hence, the way forward for sustainable production will require a synthesis of production practices, that is locally relevant and can include a whole spectrum of production practices from controlled environment agriculture to agroforestry, depending on the context. These sustainable production initiatives need to be augmented with policies that can support not only production but environmental and social performance so that the entire value chain agents in the food chain from production to consumption benefits through pricing, new business models and governance. Hence, there is a need to provide evidence of the sustainable practices on improved productivity and ecosystem service provision under diverse socio-economic contexts to bring on-board the different stakeholders within the food system for a combined paradigm shift in food system transformation, that supports agroecological principles for the betterment of

ecosystem, animal, plant and human health.

## **BIOGRAPHY**

Dr. Bhim Bahadur Ghaley is employed as Associate Professor at the Department of Plant and Environmental Sciences at the University of Copenhagen. Dr. Ghaley has a background in molecular plant breeding and agronomy and key tasks are research and teaching at the University of Copenhagen.

My research areas are agroecology, agroforestry, soil health, regenerative agriculture, plant and soil process modelling, multispecies and companion cropping, waste valorization, ecosystem service quantification and valuation, container-farming of mushrooms and microgreens, urban farming, hosting living labs and controlled environment agriculture viz. hydroponics and aquaponics. I teach MSc. courses on climate change and land use and supervise Bachelor and Master thesis and course reports.

Currently, I am a partner in 2 Horizon Europe funded projects viz. REFOREST and ECOTWINS and 1 national project (SMARTHARVEST) funded by Danish Agency for Higher education and Science under the call Global Innovation Network Program.

## **NO-TILL EQUIPMENT DEVELOPMENT FOR SUSTAINABLE CONSERVATION AGRICULTURE USING COVER CROPS**

**Ted S. Kornecki**

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### **ABSTRACT**

Cover crops are a vital part of conservation agriculture to reduce soil erosion, runoff, and increase soil organic carbon, soil moisture, and water infiltration. Effective management of cover crops is key for successful planting of main cash crops directly into the previously terminated cover crop (flat mat of desiccated residue). Typically, in the Southern United States, the time between cover crop termination and primary crop planting is three weeks after reaching termination rates above 90%, which is required to eliminate competition with main crop for water and nutrients.

Current USDA recommendations encourage producers to utilize and adopt cover crops to protect the soil surface from rainfall energy, focusing on sustainable farming practices that maintain yields in conservation systems. To help producers increase utilization of cover crops in conservation agriculture, several rollers/crimpers for cover crop management have been developed at the USDA-ARS, National Soil Dynamics laboratory (NSDL) in Auburn, Alabama USA. This effort provides solutions for different farm scales including small operation types.

A higher consumer demand for healthy, locally grown produce can have an impact on increasing production of fruit and vegetable crops. However, farming activities on these farms (from planting to harvesting crops) are labor intensive and are still based on conventional tillage practices. Small farms typically operate limited power walk-behind tractors with conventional tillage tools since no specialized no-till equipment is commercially available in the marketplace. A lack of no-till equipment hinders cover crop use and inhibits adoption of sustainable cropping systems.

At the NSDL, several field tests with experimental equipment were conducted. This included: patented rollers/crimpers to determine effectiveness of powered active coulter drills to plant cereal rye cover crop (*Secale cereale*, L.) seeds; a patented PTO powered roller/crimper to flatten and crimp cereal rye; and a patented no-till transplanter (operated by single person) to transplant tomato seedlings (*Solanum lycopersicum*, L.)

into flattened cereal rye residue. Two different soil types (sandy loam soil and clay soil) were selected to evaluate the performance of these no-till equipment prototypes.

Results indicated that cereal rye seed emergence using an active PTO powered coultter drill was 83% of the total calculated emergence, generating an average cereal rye biomass production of 10200 kg ha<sup>-1</sup> and 7300 kg ha<sup>-1</sup> for clay and sandy loam soils, respectively. Three weeks after rolling, cereal rye termination rate by the experimental powered roller/crimper was 95%, which allowed for transplanting tomato seedlings into a flattened and desiccated cereal rye residue cover. The patented no-till transplanter generated an acceptable uniform plant spacing for tomato seedlings with variation less than 10%.

Tomato yield also collected during each growing season produced 15,900 kg ha<sup>-1</sup> to 28,300 kg ha<sup>-1</sup>, which was associated with different weather conditions. Average tomato yield was 25,300 kg ha<sup>-1</sup> and 21,000 kg ha<sup>-1</sup> on clay soil and sandy loam, respectively. This difference could be related to higher available water and lower weed pressure from higher cereal rye biomass on clay soil compared to sandy loam.

Based on experimental results, design changes to no-till implements prototypes were made to further improve functionality while simplifying prototypes for small farm operations. Particularly, a new patented 2-stage roller/crimper was adopted for a walk behind tractor as a ride-on version, consequently an operator does not need to walk behind the tractor and instead rides-on the roller. This technology reduced operator physical exertion and improved roller effectiveness in terminating cover crops by adding weight to the roller and reduced rolling/crimping operation time due to faster tractor speeds.

The no-till transplanter for the walk-behind tractor was simplified by replacing a complicated mechanical drive and control with variable RPM 12-Volt DC electric motor capable of reversible rotation. Replacing the mechanical drive and moving control mechanisms with the electric motor allowed for making unlimited plant spacings by only changing motor RPM while maintaining a constant tractor speed; this was done without replacing physical gears as was required with the mechanical drive system. The modified transplanter version had less mechanisms and weighed only 83 kg (20 kg decrease (19%) vs the original) and was easier to handle by the operator. Also, this integrated design allows for much faster and simpler transplanter fabrication, provides the producer an opportunity to fabricate their own transplanter, and increased adoption

of conservation vegetable production with cover crops.

Overall, these innovative no-till equipment developments for small, garden type sustainable farming systems in the USA and abroad can provide farming communities with machinery solutions and represents a tangible value of this research for agricultural and equipment industry professionals to transfer this technology to producers.

**Keywords:** *conservation agriculture; cover crop, roller/crimper; no-till transplanter; walk-behind tractor*

## **BIOGRAPHY**

Dr. Ted Kornecki, an Agricultural Engineer received his Ph.D. from the Biosystems Engineering Department at Oklahoma State University in Stillwater. Since 1997 he has worked as a Research Scientist for the USDA-Agricultural Research Service. Initially, Dr. Kornecki worked at the Soil and Water Research Unit in Baton Rouge, Louisiana conducting field research on improving water quality exiting from dryland sugarcane systems. From 2003 to the present, he has been conducting research at the National Soil Dynamics Laboratory in Auburn, Alabama developing no-till equipment for conservation systems with cover crops.

His focus was to design equipment for different farm scales, including small farm operations. Examples were designs of different rollers/crimpers for managing cover crops, no-till seed planters, and no-till transplanters for direct placement of seeds or seedlings into flattened and desiccated residue cover. Dr. Kornecki is an inventor, has eight U.S. Patents of unique farming equipment, and has published 134 publications and 5 book chapters. He is a registered Professional Engineer and an Affiliate Faculty member in the Biosystems Engineering Department at Auburn University, Alabama. Dr. Kornecki is a nationally and internationally recognized expert in development of no-till agricultural machines, a member of the ARS National Patent Committee, and an Associate Editor of the American Society of Agricultural and Biological Engineers.

## **MONITORING TECHNOLOGIES IN PADDY RICE FIELDS, AIMING FARM DEVELOPMENT AND WATER RESOURCES PROTECTION.**

**J. M. Gonçalves**<sup>1</sup>, V. Carantino, L. Pascal, M. Nunes, S. Oliveira, S. Ferreira<sup>1</sup>, O. Filipe, J. Hastwell, H. Phan

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### **ABSTRACT**

Rice is a strategic crop for food security. Due to factors such as climate change, population growth and increased civil society attention on environmental impacts of human activities, there is pressure on the rice production sector to reduce water consumption, methane emissions and soil and water pollution. New solutions are envisaged that provide real-time access to a wide range of soil, water and crop data, with the potential to optimise crop management and irrigation automation. As a contribution to solving this problem, an experimental field work is being developed in the Lower Mondego Valley, in Portugal. Monitoring technologies are being applied in paddy rice systems, using sensors and telemetry, to evaluate their performance. The aim is to develop an effective solution for the improvement and sustainability of rice farming. The preliminary results already obtained are very positive. They indicate that the simplification of field operations and the use of a digital platform will allow a high degree of automation of monitoring in obtaining data and its application in decision support. The use of sensors with telemetry and data processing in real time will be tested to support the management of water on farms, aiming at the automation of irrigation, and the reduction of salinization risks, especially in areas where this water is reused for irrigation. This study is developed within the scope of the project PROMEDRICE-PRIMA-0007-2022 (<https://doi.org/10.54499/PRIMA/0007/2022>): “Effective farming practices to protect water resources in Mediterranean rice-based agroecosystems”.

**Keywords:** *Rice irrigation; environmental sustainability; water saving; best management practices; water management automation.*

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## **BIOPGRAPHY**

José Manuel Gonçalves is Ph.D. in Agricultural Engineering by Lisbon University, currently associate professor with habilitation at College of Agriculture of Polytechnic Institute of Coimbra, Portugal (IPC-ESAC, [www.esac.pt](http://www.esac.pt)), and researcher of CERNAS – Research Centre for Natural Resources, Environment and Society (<https://cernas.org/>).

He is Honorary Vice-President of CIGR, by the International Commission of Agricultural and Biosystems Engineering (CIGR.org), and Associate Editor of the Land and Water Engineering Section of “Agricultural Engineering International: CIGR Journal” ([www.cigrjournal.org](http://www.cigrjournal.org)). He is President of the Specialized Commission of Water, Agriculture and Forest of Portuguese Association of Water Resources ([www.aprh.pt/en/comissoes/aguas-e-agricultura](http://www.aprh.pt/en/comissoes/aguas-e-agricultura)).

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**INVITED  
ABSTRACTS**

# **DYNAMICS OF RURAL SETTLEMENT PATTERNS IN THE YELLOW RIVER DELTA IN RESPONSE TO RIVER DIVERSION AND AVULSION SINCE 1855**

Yu Ye

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## **ABSTRACT**

To explore the unique human-water interaction patterns in the Yellow River Delta since 1855, based on historical river channel data and historical village data, the patterns of villages in the Yellow River Delta and their responses to river channels were analyzed. The number of new villages in the Yellow River Delta showed an 'inverted V'-shaped curve after 1855, and the cumulative number of villages showed an 'S'-shaped curve. The pattern change of villages was influenced by the change in the river system, which expanded to the northwest and southeast directions with the old Tiemenguan River Course as the axis. During this period, differences in riverbed morphology and fluvial areas, the natural evolution of soil in the river delta, and even the guidance of official policies were the key controls of the developing settlement pattern in the delta. Flooding often leads to the formation of new river channels and the abandonment and silting of old river channels. For the dried-up old courses and former flood basin, because the Yellow River sediment has the effect of improving soil structure and fertilizing land, the soil in these areas becomes suitable for farming and settlement. For the active new course, the freshwater from the river can replenish the groundwater and reduce the degree of soil salinization in the surrounding area, thus attracting people to settle. In general, although the Yellow River causes harm from a course change, it also benefits from silted land.

**Keywords:** *environmental change; historic settlements; rural living environment; diversion of the Yellow River*

## **BIOGRAPHY**

Dr. Yu Ye, born in 1979, is an Associate Professor at the School of Geography, Beijing Normal University, China. Her research focuses on historical land use and cover change, the carbon cycle, historical climate change, and human sustainability adaptation.

# POTENTIAL MITIGATION OF CARBON EMISSIONS THROUGH CONSERVATION AND PRECISION AGRICULTURE TECHNIQUES IN WINTER CEREALS. RESULTS FROM THE PRECONAGRI PROJECT

**C. Cavalaris<sup>1</sup>, C. Karamoutis<sup>2</sup>, V. Giouvanis<sup>2</sup>, S. Koukou<sup>2</sup>, A.T. Balafoutis<sup>3</sup>, M. Kosti<sup>3</sup>, A. Zamidis<sup>4</sup>, Ch. Lampropoulos<sup>5</sup>**

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## ABSTRACT

The PreConAgri project aims to demonstrate the co-benefits of Conservation and Precision Agriculture techniques applied in winter wheat production on soil quality, crop productivity and climate change mitigation. The project established four pilot fields, two at the region of Thessaly, central Greece (Nikaia field and Rachoula field) and two at the region of western Macedonia (Krokos field and Ano Komi field). Each pilot consisted of four plots: 1) Conservation agriculture (CA), 2) Precision agriculture (PA), 3) Conservation and Precision agriculture (CPA) and 4) Control (C). Conservation agriculture included no-till planting with permanent soil cover. Precision agriculture was based on variable rate fertilization with two technologies, an AI sensor (Augmenta technologies) placed onboard the tractor's top, monitoring in real time the crop and alternating respectively the nitrogen dosage (at West Macedonia fields) and a Decision Support System - DSS (Farm-B) generating prescriptions maps based on satellite information (at Thessaly fields). In both cases, a fertilizer spreader with an ISOBUS connection was used to perform the variable rate application. The present study focuses on the GHGs emissions from each treatment for the 2023-2024 period. To that end, all the farm inputs and tasks were registered in detail while the final yield was harvested separately on each plot. The data were inserted on the Coolfarm tool to estimate the GHGs emissions addressed in CO<sub>2</sub> equivalents (CO<sub>2</sub>eq). The results showed that the

treatments including conservation agriculture treatments (CA and CPA) demonstrated considerable potential for reduction in carbon emissions mainly due to elimination of fuels in the production phase as also to the opportunity of fixing carbon into the soil through biological processes. On average, CA presented 21.8% lower CO<sub>2</sub>eq emissions per ha compared to the Control (C) while CPA had 24.8% lower emissions. The fertilizer savings through the precision agriculture (PA) treatments was less efficient in reducing GHGs emissions. Compared to the control C, PA reduced at average the CO<sub>2</sub>eq by 3%. Nevertheless, the treatments induced also an important effect in crop yield. The average yield in the CA treatment was 2.46% higher for CA, 3.69% lower for the PA and 4.91% lower for CPA compared to the control C. As though, the CO<sub>2</sub>eq per kg of wheat grain was 315.3 for CA, 321.1 for CPA, 394.8 for C and 406.5 for PA. The present study continuous for another two years and is funded by the Greek Ministry of Rural Development and Food under the Measure 16 action.

**Keywords:** *Conservation agriculture; precision agriculture; carbon; climate change*

## **BIOGRAPHY**

Dr. Chris Cavalaris is an Agricultural Engineer working as a Teaching and Research Associate at the Department of Agriculture, Crop Production & Rural Environment of University of Thessaly in Greece. His expertise covers the subject of Sustainable Farm Mechanization through the topics of: Conservation agriculture / Precision agriculture / Farm machinery management / Assessment of energy and carbon fluxes in agriculture and / environmental protection by the optimum use of Pesticide application equipment. Lately he has also worked a lot with drone remote sensing and spraying. He has been engaged for over 25 years in numerous national and international research projects and has over 100 publications in international and national peer reviewed scientific journals and conferences. He is the President of the Hellenic Association for Promotion of Conservation Agriculture (HACA), member of the European Conservation Agriculture Federation (ECAAF) and a board member of the Hellenic Society of Agricultural Engineers (EGME).

# CLONING TECHNOLOGY FOR THE MASS PRODUCTION OF DATE PALM AND COCONUT PLANTLETS

**Sundaravelpandian Kalaipandian<sup>1,2</sup>, Eveline Yee Yan Kong<sup>2</sup>, Amirhossein Bazrafshan<sup>1</sup>, Magnolia Hu<sup>1,2</sup>, Naga Prafulla Chandrika Nulu<sup>1</sup>, Steve Adkins<sup>1,2</sup> and Victor Galea<sup>1</sup>**

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## ABSTRACT

Arecaceae is the palm family which contains several economically important species. Among them, date palm and coconut are individually referred as the tree of life because of their versatile uses. Date palm (*Phoenix dactylifera* L.) is an important cash crop for the arid and semi-arid regions of the world. Global consumption of fresh and dried dates is constantly increasing every year. In 2023, the global dates market was valued at over \$26 billion and estimated to reach to \$36 billion by 2028. Dates are a nutrient rich fruit containing essential vitamins, minerals, and fibre. They also contain anticancer, antioxidant, anti-inflammatory, antimutagenic, antidiabetic and antianemia compounds. Dates are a popular food across the world and are on the list of emerging healthy snacks. Similarly, coconut is an important commercial crop across the tropical and sub-tropical regions of the world. coconut and its byproducts have a market valued about \$20 billion in 2022. These factors forecast an enormous increase in the consumption of dates and coconut in the future. Mass production of high-quality seedlings is one of the major constraints for these industries worldwide. Tissue culture technology offers a pathway for mass production of desirable high-quality true-to-type seedlings. In this present study, tissue culture methods with various plant growth regulators and concentrations are employed to standardize the protocol for rapid multiplication of good quality plantlets. The results from our recent studies on date palm and coconut towards the commercial application will be presented.

**Keywords:** *Date palm; Coconut; Cloning; Plantlets*

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## **BIOSGRAPHY**

Currently, Dr Sundar Kalaipandian is an Advance Queensland Industry Research Fellow at The University of Queensland, Australia. He obtained his B.Sc. (Agriculture) and M.Sc. (Plant Breeding and Genetics) from Tamil Nadu Agricultural University, India. He obtained his PhD in Biotechnology from Academia Sinica, Taiwan. He received postdoctoral fellowships from Academia Sinica (Taiwan) and then from Commonwealth Scientific and Industrial Research Organisation (Australia). He has developed expertise in genetics, plant breeding, biotechnology, genomics, and bioinformatics during his career. He is interested in commercialization of scientific technologies for farmers and bringing various technologies from the lab to the field.

# **COMBINING BIOPHYSICAL AND SOCIOECONOMIC DATA TO REFINE TARGET POPULATION OF ENVIRONMENTS (TPES) FOR MAIZE CROP IMPROVEMENT**

Muongani Dean

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## **ABSTRACT**

Increasing productivity in small-scale farmers' fields offers a viable option to feed a growing population in an environmentally sustainable manner in sub-Saharan Africa. Achieving this requires small-scale farmers to adopt new technologies. However, adoption has been slow, partly due to the variable net benefits farmers experience. In this study, we estimate the magnitude and variability of net profits that farmers can achieve by adopting combinations of genotypes and management practices (G×M), also referred to as crop designs. Using crop simulation modeling data for maize and soybeans, we estimate projected net profitability for various combinations of genotypes and fertilizer levels, tailored to specific locations and seasonal conditions in Zimbabwe. We used weather data from Copernicus and CHIRPS, along with publicly available soil data. A nutrient response function was applied to estimate maize and soybean yields. Using the estimated yields and their nutrient components, we calculated revenue and input costs. We adjusted revenue to net income by subtracting outbound transaction costs and adjusted input costs by adding inbound transaction costs.

We then identified the optimal G×M combination for each theoretical maize and soybean field and generated spatial maps to illustrate the spatial variability of profits. This approach helps bridge productivity gaps, increase farmers' profits, and manages risks by predicting the best G×M combinations for expected growing conditions. It enables farmers to improve yield stability and reduce downside risks through simple, actionable guidelines.

## **BIOGRAPHY**

I am currently the Product Manager for Grain Crops in IITA. I am a holder of a Master's Degrees in Business Administration and Plant Breeding & Seed Systems obtained from the University of Zimbabwe and University of Zambia in 2013 and 2010 respectively and a BSc Honors degree in Agriculture (Crop Science) obtained from the University of Zimbabwe in 2003.

I started my career as a Maize Breeder (Research Officer) with the Crop Breeding Institute, under the Department of Research & Specialist Services (DR&SS) in the Ministry of Lands, Agriculture & Rural Resettlement in 2003 after which I joined Agriseeds (Pvt) Ltd., a Zimbabwean private seed company, to establish a Research Department in 2007. Prior to joining IITA, I worked for Seed Co, initially as a Senior Maize Breeder in 2014, then Head of Stapleford Research Centre in 2015, and finally Head of Product Development in 2016.

## HOW AGRICULTURAL INTENSIFICATION IMPACTS NITROGEN DYNAMICS IN AFRICAN SMALLHOLDER FARMS

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### ABSTRACT

The intensification of agricultural systems in sub-Saharan Africa (SSA) is necessary to reduce poverty and improve food security, but requires increased nutrient applications in smallholder systems, which could have negative consequences for water and air quality. We tracked nitrogen (N) inputs and measured maize (*Zea mays*) biomass, grain yields, N leaching, and nitric oxide and nitrous oxide fluxes from a clayey soil in Yala, Kenya, and a sandy soil in Tumbi, Tanzania, with application rates of 0–200 kg N ha<sup>-1</sup>yr<sup>-1</sup> over two cropping seasons. Maize yields were 4.5 times higher in Yala than Tumbi, but yields plateaued at both sites with fertilizer applications at or above 100 kg N ha<sup>-1</sup>yr<sup>-1</sup>. Partial N budgets in Yala were typically negative, meaning more N was exported in maize biomass plus grain or lost from the system than was added in fertilizer. In Tumbi N budgets were negative at lower fertilizer levels but positive at higher fertilizer levels. At both sites most (96%) of the N was lost through maize biomass/grain removal and leaching. These results show on these two contrasting sites, fertilizer additions at or below 50 kg N ha<sup>-1</sup>yr<sup>-1</sup> do not lead to major losses of N and may be recommended at a range of sites across SSA in maize agroecosystems. At optimum N application rates, NO and N<sub>2</sub>O emissions were low and should not be a primary concern for smallholder farmers, unless current thresholds are exceeded in the future.

**Keywords:** *African Green Revolution; fertilizer; nitrogen losses; partial nutrient budget*

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## **BIOGRAPHY**

Patrick K. Mutuo, Ph.D. is the Country Representative for IITA in Burundi, and previously worked with the University of Florida (UF) focusing on fertilizer recommendations in Eastern and Southern Africa. For three years (2013 to 2016), he was the Africa Field Director at Conservation International, overseeing the development and implementation of an ecological monitoring system (Vital Signs) in Tanzania, Ghana, Rwanda, Kenya and Uganda. Before then, he headed the International Center for Tropical Agriculture (CIAT) office in the DRC, where he researched on Integrated Soil Fertility Management. During the early 6 years of his career, he served an agriculture specialist and Science Coordinator at the Millennium Development Goals Centre and leading the first Millennium Villages Project site in Sauri, Kenya.

Dr. Mutuo holds a BSc degree in Forestry and an MSc degree in Environmental Sciences from Moi University, Kenya, and a PhD in Soil Science from Imperial College, The University of London, U.K. His leadership and research experience spans over 20 years across the African continent, gaining valuable skills in managing research and development programs, fundraising, and undertaking research in agroecology, sustainable agricultural intensification and agricultural value chains. His scientific output is evidenced in over thirty (30) articles in refereed journals, book chapters and proceedings.

## **HYDROPHOBIC BIOBASED COATING FOR SPRING FROST PROTECTION**

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### **ABSTRACT**

Protecting crops against Spring frosts has become increasingly crucial over the years. For example, the April 2021 frost was devastating for wine producers in France, with over 80% of French vineyards reporting damage and resulting in €2 billion in lost sales. Due to climate change, these extreme events are likely to occur more frequently. The rise in winter temperatures leads to an earlier start of the growing season, extending the period during which plants are vulnerable to cold spell.

During a frost episode, ice on plant buds is induced by external ice nucleators that can be either organic (bacterial proteins) or inorganic (ash, dust). The ice layer formed causes mechanical damage to the plant, bringing extracellular water into contact with the ice crystals. This triggers internal freezing of the water, leading to cell bursting and oxidative stress. Additionally, as the surface ice layer damages plant tissue, bacteria and fungi can infect crops more easily.

Hydrophobic, or super-hydrophobic, surfaces possess unique properties that could prevent ice formation on plants. Firstly, water will not remain on hydrophobic surfaces if they are sufficiently tilted. Moreover, the roughness of these surfaces traps air pockets between water droplets and the surface, causing the droplets to roll off the plant rather than slide. As these droplets roll, they collect external particles and microorganisms from the plant and finally wash the plant surface removing external ice nucleators. Consequently, applying a hydrophobic film to plants could prevent frost injuries.

In this work, hydrophobic films based on chitosan and stearic acid-treated clay platelets were developed and their antifreeze efficacy on plants tested. A new environmentally friendly method for hydrophobizing kaolin with stearic acid was developed and the structures of the films were studied. Their antifreeze properties were measured by infrared thermography.

**Keywords:** *Spring frost; Hydrophobic; Kaolin; Chitosan; Ice nucleator*

## **BIOGRAPHY**

Romain Maury received his engineer's degree in Biobased Chemistry in 2021 from the ENSIACET (Toulouse, France). He worked on 3D printable non-isocyanate polyurethanes via vat photopolymerization in Marseilles University with the ICR before reaching the LCPO and Bioboone Agrolgy in Bordeaux (France) to prepare his PhD. Now Romain works on agricultural spring frost protection to avoid crop loss in vineyards.

## **ROLE OF LEGUME CROPS IN SUSTAINABLE AGRICULTURE**

Silvia Pampana

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### **ABSTRACT**

Legumes are edible seeds from the Leguminosae (Fabaceae) family, the third largest family of flowering plants and the second most important of agricultural crops, including 800 genera and 20,000 species. Plants have pods with double rows of ovules and flowers with five fused sepals and petals and develop a symbiosis with nitrogen-fixing bacteria in their roots.

European farming has shifted towards high-yield systems for crops like cereals and oilseeds, creating barriers for legume cultivation and increasing the reliance on imported feed protein, primarily soybean. These simplified systems negatively impact energy efficiency, greenhouse gas emissions, nitrogen cycles, and agricultural biodiversity. Thus, introducing legumes offers social and ecological benefits and aligns with sustainability initiatives like the EU Green Deal's "Farm to Fork strategy".

Legumes can be incorporated into various cultivation methods, including sole crops in rotation with cereals and oilseeds, intercropping, and mixed cropping. These practices maintain soil fertility through biological nitrogen fixation (BNF), benefiting soil organisms and increasing subsequent crop yields. Legumes can also be used as green manure or cover crops to regenerate soil nitrogen fertility, reduce N leaching, and control herbicide-resistant weeds.

Legumes provide multiple ecosystem services, classified into provisioning, supporting and regulating services.

Provisioning services comprise i) foods which include oilseed legumes like soybeans and peanuts, and non-oilseed legumes comprising pulses, such as chickpeas, cowpeas, dry beans, dry peas, and lentils used for their dried seeds; and undried legumes like snap beans and snap peas, harvested fresh and eaten whole or processed; and ii) feed for ruminants, pigs, poultry and fish; forage can be grown on permanent grasslands, temporary grasslands rotated with arable crops (leys), and as dedicated forage legume crops like lucerne (alfalfa), various clovers, and bird's-foot trefoil, grown for grasslands

or silage.

Supporting services include i) BNF through the symbiotic relationship with soil bacteria collectively called rhizobia who introduce dinitrogen (N<sub>2</sub>) into the biosphere as chemically triple bonded N— —N and subsequently utilize it for the biochemical synthesis of amino acids and proteins which are temporarily stored in microbial or plant biomass, and can after death be mineralized, releasing nitrate that can be absorbed by plants and other soil microbes; and ii) rotational effects to the component and subsequent crops, such as enriched nutrient status, increased organic matter levels and improved soil structure. They also serve as break-crops, breaking plant pest cycles and reducing the disease inoculum.

Regulating services involve i) nutrient management, ii) soil erosion prevention, and iii) climate stress mitigation. For example, legumes improve soil structure, water holding capacity, and carbon sequestration, reduce greenhouse-gas emissions. Legumes support pollinators by providing high-quality forage and enhance soil microbial diversity, contributing to nutrient cycling and soil health.

Despite their benefits, legumes face challenges such as abiotic stress, disease and weed susceptibility and farmers may encounter obstacles like limited seed supply, financial constraints, and lack of knowledge regarding optimal cultivation practices.

Legumes' impact on ecosystem services depends on temporal and spatial scales, requiring analysis and evaluation to maximize benefits, and their suitability within agricultural systems is context dependent.

**Keywords:** *intercropping; legumes; rotation; sustainability*

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## **BIOGRAPHY**

Silvia Pampana graduated magna cum laude in agricultural science and then earned a PhD in agronomy and crop science from University of Pisa, the oldest school in the field worldwide (established on March 1st, 1844). She is a researcher at the Department of Agriculture, Food and Environment of the University of Pisa, Italy with 26 years of experience in agronomic research. She is also part of the Center for Agro-environmental Research “Enrico Avanzi” and of the Centre for Climate Change Impact of the University of Pisa. Silvia is also the nominated Editor in Chief of Agronomy Journal, the flagship journal of the American Society of Agronomy.

Her understanding of most cropping systems is comprehensive, and she has a clear understanding of rigorous agronomic research. Her research centers around the physiology of yield development in field crops, with special attention to cereals and legumes to identify agronomic strategies for sustainable intensification of cropping systems i.e., allelopathy, intercropping, crop association and rotation, mineral, and organic nitrogen fertilization, biosolids, and resilience to abiotic stress due to climate change, such as waterlogging.

She has also worked within the European Union focus group on crop associations, including milpa and protein crops to integrate crop associations into existing cropping systems and farm landscapes to increase farm resilience and efficient use of natural resources while reducing the dependency on external inputs.

Silvia is especially committed to raise awareness of the leadership position agronomy holds within science in the search for sustainability.

# **ETHYLENE-MEDIATED STRESS RESPONSES AND CROSSTALK WITH AUXIN IN PLANTS**

**Abdul Wakeel Umar**

BNU-HKUST Laboratory of Green Innovation, Advanced Institute of Natural Sciences, Beijing Normal University at Zhuhai (BNUZ), Zhuhai City People's Republic of China

## **ABSTRACT**

Abiotic stressors, including heavy metal toxicity and nanoparticle exposure, significantly impact plant growth and development. Ethylene, a crucial phytohormone, modulates plant stress responses by regulating auxin transport, reactive oxygen species (ROS) accumulation, and antioxidative defense mechanisms. This review synthesizes findings on ethylene's role in stress mediation, emphasizing its interaction with auxin, ROS, and cellular processes under chromium (Cr(VI)) and zinc oxide (ZnO) nanoparticle-induced stress. Genetic studies using *Arabidopsis* mutants provide insights into ethylene's dual role as both a stress signal activator and a modulator of oxidative damage. Future directions highlight the need for integrating genetic engineering approaches to enhance plant resilience against environmental pollutants.

**Keywords:** *Ethylene; Auxin; ROS; Stress Response; root and shoot development*

## **BIOGRAPHY**

Dr. Abdul Wakeel Umar is a biotechnology and molecular biology expert with a Ph.D. from Zhejiang University, China, and an MPhil from Quaid-I-Azam University, Pakistan. He is currently an Associate Research Fellow at Beijing Normal University. Dr. Umar has served as a Brain Pool Invited Scientist at the Korea Research Institute of Bioscience and Biotechnology and an Outstanding Postdoctoral Fellow at Henan University. His expertise includes hormonal crosstalk, secondary metabolite biosynthesis, and plant tissue culture. He has received prestigious grants and published extensively in peer-reviewed journals, showcasing his dedication to scientific research.

# EMBEDMENT PROPERTIES OF CROSS-LAMINATED TIMBER FOR GREEN CONSTRUCTION

Qian Wang

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## ABSTRACT

Cross-laminated timber (CLT) has emerged as a promising material for sustainable and high-performance construction, offering excellent structural capabilities alongside environmental benefits. A critical factor influencing the design and safety of CLT structures is the embedment strength, which governs the load-bearing performance of dowel-type connections. This study investigates the embedment properties of CLT with a focus on dowel-type fastener connections. Experimental tests were conducted to evaluate embedment strength in different loading direction: parallel, perpendicular to the grain. The effects of key parameters such as fastener diameter, layer orientation, and geometry were examined. The outcomes highlight the significance of layer orientation and fastener placement in achieving optimal connection performance. This research contributes to improved design practices for CLT connections and supports the broader use of timber in green building systems through enhanced understanding of embedment behavior.

**Keywords:** *Embedment Properties; Cross-Laminated Timber; Green Construction*

## BIOGRAPHY

Dr. Qian Wang is an Assistant Professor of Hunan University of Technology and Business, specializing in sustainable materials, with a focus on timber and bamboo. She earned her Ph.D. from Sapienza University of Rome, where her research centered on optimizing mechanical and structural properties of eco-friendly materials.

Currently, Dr. Wang investigates bio-based alternatives to carbon-intensive construction materials, employing advanced computational modeling and experimental techniques to evaluate their durability and performance. She is a committee member of the Biomass Branch at the Architectural Society of China and a member of the Hunan Artificial Intelligence Society. Joining the Intelligent Engineering Management Lab, she mentors students in sustainable civil engineering.

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Her contributions include over 10 peer-reviewed articles and six software copyrights. Dr. Wang currently directs a project funded by the Hunan Provincial Education Department's Science Foundation, aiming to improve the long-term mechanical resilience of timber and bamboo. Her work underlines the role of natural resources in building zero-carbon infrastructure.

**YOUNG  
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## **DEVELOPING A CEREAL VARIETY SELECTION DECISION SUPPORT SYSTEM FOR ARABLE FARMERS**

**Conor J. Kehoe**<sup>1</sup>, Gary D. Gillespie<sup>2</sup>, Kevin P. McDonnell<sup>1,2</sup>

<sup>1</sup>UCD School of Biosystems and Food Engineering, University College Dublin, Belfield, Dublin 4, Ireland.

<sup>2</sup>UCD School of Agriculture and Food Science, University College Dublin, Belfield, Dublin 4, Ireland.

### **ABSTRACT**

Variety selection is a critical decision in cereal crop production, influencing all subsequent crop management practices and ultimately determining economic and agronomic success. This decision is taken by farmers based upon farm location, local trial results, previous experience, local knowledge; Department of Agriculture recommended variety listings, weather factors, market opportunities, and crop priorities. This leaves farmers with an overload of information that can cause confusion and create uncertainty. The decision-making process requires complex multi-factor analyses which are nearly impossible to execute accurately without automation. To overcome this, decision support systems (DSSs) have been created around the world to support this decision-making process. However, these DSSs are typically localised in nature and often present challenges in terms of user interaction. The aim of this work is to create a user-centric autonomous DSS to guide farmers in choosing the most appropriate variety for their field and priorities. To do this, relevant independent variety evaluation data, which are often published as “Recommended Lists” by national authorities, are used. A use case is taken from the Irish Department of Agriculture, Food, and the Marine “Recommended List” for winter wheat (*Triticum aestivum*). Characteristic scores for each variety were normalised and weighted according to farmer priorities and field location. A field’s yield history with each variety can also be included, where available. This results in a revised overall ranking of varieties on the Recommended List based on local input, from which a farmer can choose depending on seed availability, market demands, and their own preference.

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## **BIOGRAPHY**

Conor Kehoe achieved a bachelor's degree in Agricultural Science, specialising in Animal and Crop Production, at University College Dublin (Ireland). Currently, he is a PhD candidate at University College Dublin's School of Biosystems and Food Engineering, based at UCD Lyons Farm. His research focuses on using digital data to create decision support systems for cereal crop production systems, ensuring there is a real benefit to farmers from using digital systems. This research is part of a Horizon Europe funded project, DIVINE, which aims to develop an agri-data ecosystem, allowing farmers to take control of their data, make more informed decisions, and decide upon which aspects they would like to share with interested stakeholders. UCD is one of 4 pilot partners in this project, implementing the proposed solutions in an Irish cereal crop production system. His research interests include variety selection, farmer decision-making, crop establishment systems, crop rotation, soil moisture, soil compaction, crop management, digital agriculture, and precision agriculture.

# **PRODUCTION OF AMARANTHUS SEEDS IN FRANCE AND CHARACTERIZATION OF THE WHOLE SEED QUALITY TRAITS**

**Ahlem AZRI**, Mohamed DEBOUBA, Samir AYDI, Jalloul BOUAJILA, Sameh SASSI AYDI, Romain VALENTIN, Muriel CERNY, Anne LUNG, Othmane MERAH

Institut National Polytechnique de Toulouse, France

## **ABSTRACT**

Cultivation of amaranth represents a strategic challenge for European countries both economically and environmentally. This crop could contribute to enhancing food security and optimizing the use of agricultural resources. Indeed, the incorporation of renewable resources into industrial food production seems to be the most effective way to achieve sustainable development. The present study aimed to produce amaranth in France by adopting a global approach to adding value to seeds. The objective is to follow a screening of amaranth seed composition from farm to fork. In the first step, the bioactive lipid composition of a wide collection of *Amaranthus* seeds was evaluated by refining genotypes. Based on the availability of seed amounts, four genotypes were cultivated in Southwest France and have been selected to assess the chemical composition. Subsequently, following the extrusion of the lipid component, the residual cake has been used in the bakery sector to produce fortified bread with high nutritional value and the biological activities of fats and seed cake fractions were evaluated. Finally, the available genotypes were cultivated under harsh conditions of high salinity to assess their tolerance. Lipid, protein, and total fiber contents were assessed. The chemical composition of amaranth seeds was performed using a CPG-FID and GC-MS. Total polyphenol and reducing sugar contents were measured by chemical assay. Seed cake and seed were exploited to produce fortified bread, in which the physicochemical and rheological properties of amaranth seed flour mixed with wheat flour were examined before the bread-making process. The antioxidant and cytotoxic properties of the oils and seed cake extracts were also investigated *in vitro*. Results showed that the lipids and squalene content ranged from 1.8 to 9.4% and 1.7 to 7.7%, within the collection, respectively. The protein content ranged from 14.8 to 16.9% while, total fiber content ranged from 7.1 to 8.0%. Moreover, triglycerides were the major constituents. Oleate, linoleate and palmitate were the most abundant fatty acids in amaranth seed oils. Forty-four chemical compounds were identified for both fat and seed cake fractions. Furthermore, the overall finding showed that adding amaranth

seed and seed cake flour can optimize the overall quality of bread particularly the nutritional and health value added to foods. The findings demonstrated that amaranth exhibits strong adaptability to cultivation under rainfed conditions in France and under salinity with significant agronomic potential. Our study outlined a global evaluation of total amaranth seed for versatile application in the agronomic, food, and pharmaceutical sectors.

**Keywords:** *amaranth; oil; squalene; protein; fortified bread; seed cake; biological activities*

## BIOGRAPHY

Ahlem AZRI is a PhD student in the 3rd year of a cotutelle doctoral program between the Université de Toulouse (Institut National Polytechnique de Toulouse, France - INPT) and the Université de Gabès (Faculté des Sciences de Gabès, Tunisie). She holds a master's degree in Cellular and Molecular Biology at the Faculté des Sciences de Gabès. She carried out her master's research at the Laboratoire de Génie Chimique (Faculté de Pharmacie de Toulouse, France), she has studied the chemical and biological characterization of prune seeds. Her doctoral research is conducted in collaboration with the Laboratoire de Chimie Agroindustrielle (LCA) and the Laboratoire de Génie Chimique (LGC) in France, as well as at the Laboratoire de Biodiversité et Valorisation des Bioressources and the Laboratoire de Biodiversité, Molécule et Applications in Tunisia. Her doctoral research focuses on the chemical characterization of a collection of seeds by refining genotypes to follow a screening of the seed composition from farm to fork. Her research is intended for biorefinery applications, particularly emphasizing the valorization of bioactive molecules and seed by-products in the nutritional sector. This involves the study of the production of seed under different climatic conditions. She is passionate about plants and their essential role and has a strong interest in agronomy and biochemistry research.

# IMPACT OF GRIDDED WEATHER DATASET SOURCES AND BIAS CORRECTIONS ON MAIZE IRRIGATION REQUIREMENTS AND YIELD ESTIMATIONS

**Daniela Soares**, Maria Almeida, João Rolim, Teresa A. Paço, Paula Paredes

LEAF – Linking Landscape, Environment, Agriculture and Food Research Center, Associate Laboratory TERRA, Instituto Superior de Agronomia, Universidade de Lisboa, Tapada da Ajuda, 1349-017 Lisboa, Portugal.

## ABSTRACT

Maize is the second most widely grown crop in the world. It currently covers around 74470 ha in Portugal (PT) and 200376 ha and in Bosnia and Herzegovina (BiH). The agricultural sector is highly dependent on natural resources and the climate. To consider an entire region, the use of gridded weather datasets is a must. In the current research two gridded weather datasets were considered for different regions and periods – E-OBS (Coruche, in PT and Banja Luka (BL), in BiH, 1971-2000) and AgERA5 (Sorraia-Coruche and Minutos-Évora Irrigation Schemes, in PT, 1979-2023). The E-OBS is a daily gridded (10 km x 10 km) observational dataset covering all Europe while AgERA5 is a reanalysis gridded data set (11 km x 11 km) that combines model data with observations from across the world into a globally complete and consistent dataset. In PT maize is irrigated while in BiH it is rainfed. In this research, AquaCrop-OSPy was selected to estimate crop net irrigation requirements (NIR) and yield. This model uses agronomic and climate data as input. Quality control was performed before using all the weather datasets. The gridded datasets were evaluated using weather station data. To check weather data quality, the nearest grid point was used and a set of statistical indicators were applied. The weather variables considered were air temperature (Tmax and Tmin), Relative humidity, shortwave radiation and wind speed, precipitation (Pre) and the reference crop evapotranspiration (FAO-PM-ETo). Results show that corrections are needed: E-OBS tends to over-estimate Tmin, in Coruche, while precipitation (Pre) tends to be under-estimated in both regions. The results also show over-estimation biases in ETo in BL, although both Tmin ( $b_0=0.98$ ) and Tmax ( $b_0=0.97$ ) have good correlations, but influence ETo estimations. The results of AgERA5 show that upfront corrections in Pre are required for both PT regions. The other variables have minor biases resulting in no under- or over-estimation tendency in ETo ( $b_0=1$ ), so corrections can be omitted. Two options were considered for estimating maize NIR and yields: DS1) the original gridded datasets and DS2) the bias corrected datasets using the linear-scaling approach. Results for Coruche show that using DS1 with E-OBS the maize NIR averages about

485 mm, while in DS2 it increases to 505 mm. This is due to the biases in both Pre and Tmin as well as in the crop cycle duration, estimated using GDD. Yield results show no difference between DS1 and DS2. For rainfed Maize in BL, results show 3.4 vs 8.9 t/ha respectively for DS1 and DS2. These results are mainly due to the under-estimation of Pre, in the original dataset. Results for Sorraia-Coruche show that when DS1 is applied the NIR value for AgERA5 maize is about 575 mm while in DS2 it decreases to 540 mm. For Minutos-Évora, the NIR is around 600 mm in DS1, while it decreases to 590 mm in DS2. There is no significant difference between original and bias corrected datasets and regions in terms of maize yield.

**Keywords:** *E-OBS; AgERA5; data quality analysis; bias correction*

## **BIOGRAPHY**

Daniela Jorge Soares is a PhD candidate in Agronomic Engineering at the Instituto Superior de Agronomia, University of Lisbon. Her research focuses on assessing the water use and productivity of maize crops under changing agro-climatic scenarios in contrasting climatic regions. Her PhD research incorporates advanced topics such as remote sensing, GIS, crop water modelling, and decision-making processes for farmers, all aimed at enhancing sustainable agricultural practices in the face of climate change.

Daniela holds a bachelor's degree in Zootechnical Engineering and a master's degree in Agronomic Engineering. Her master's thesis involved extensive fieldwork, laboratory research, and modelling efforts. Daniela has actively participated in various projects, including the national PDR2020-2023046306 project and the international one SMARTWATER project- Promoting SMART agricultural WATER management in Bosnia and Herzegovina (H2020-WIDESPREAD-2020-05-9523967), an European project that aims to boost the adoption of new agronomic strategies and intelligent water management techniques in Bosnia and Herzegovina's agriculture to address issues such as climate change and drought, which currently hinder the improvement of national agriculture. Currently, she is a member of the LEAF (Linking Landscape, Environment, Agriculture, and Food) research centre at ISA.

In addition to presenting posters and delivering presentations at national and international conferences, Daniela has published four scientific articles, three of which she is the first author. She is committed to advancing knowledge in agronomy and contributing to the development of innovative strategies for water management in agriculture.

# **EVALUATION OF THE PERFORMANCE OF DRIP IRRIGATION SYSTEMS AND SOIL WATER DISTRIBUTION IN TOMATO AND STRAWBERRY CROPS IN SÃO LOURENÇO DOS ÓRGÃOS, SANTIAGO ISLAND, CAPE VERDE**

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## **ABSTRACT**

One of Cape Verde's (CV) biggest problems over the years has been the country's limited availability of water resources. Water-saving irrigation systems, like drip irrigation, must be introduced to meet the growing demand for better water management in agriculture. The CV government launched a drip irrigation support program (MAA, 2023) to help farmers with the installation costs, covering half of the costs and aims to increase the rate at which drip irrigation are adopted. Three plots were considered located in the municipality of São Lourenço dos Orgãos, Cape Verde. Two with tomatoes and one with strawberries. They were used to assess the performance of drip irrigation systems in this region. In each plot 16 drippers, four in each of four lines, were evaluated in order to determine the coefficient of distribution (CUD). Using the gravimetric method, the soil water content was measured at three depths (20, 40, and 60 cm) and three distances from the dripper (0, 15, and 30 cm) at three points in each plot, the day before and the day after each irrigation application. To determine the wet bulb dimensions several empirical and semi-empirical models were used, and were compared with the soil samples taken at the three different depths. The goal was to validate and choose the model that best suited the island of Santiago conditions. The CUD values ranged between 57% and 89%. The amount of water in the soil varied from 10–29% the day before irrigation to 14–40% the day after. The three types of soil textures identified in the plots were loam, loamy loam, and sandy loam. The organic matter content observed ranged between 0.5% to 4.1%. Initial findings from the analysis to the variation of soil water content, accounting for the drippers' flow rate, the timing of each irrigation application, and the root depths of each crop, indicate that water losses through percolation range from 13% to 17%. However, more field data collection will be necessary to confirm these findings.

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The results show that there is an uneven distribution of water in some plots, indicating the need for adjustments in irrigation management, namely proper maintenance of irrigation systems and the redefinition of the irrigation scheduling.

**Keywords:** *irrigation; wet bulb; distribution uniformity; soil moisture*

## **BIOGRAPHY**

He has a degree in Agronomic Engineering from the ISA and a master's degree in Agronomic Engineering with a specialization in Rural Engineering from the same institute. He works in the areas of Agricultural Sciences and Natural Sciences, with an emphasis on Rural Engineering, particularly irrigation and Water Resources Management. His PhD thesis is entitled 'Evaluation of water losses in irrigated plots in Santiago Island, Cape Verde'.

# POSTER PRESENTATION

## **GALL-INDUCING MITES: ERIOPHYES TILIAE WITH KLEPTO-PARASITOID (APROSTOCETUS ERIOPHYES: HYMENOPTERA: EULOPHYDAE) FEEDING WITH MITE LARVAE IN THOSE GALLS**

**Renata Gagic-Serdar**, Miroslava Marković, Suzana Mitrović, Bojan Konatar, Aleksandar Lučić, Ljubinko Rakonjac  
Institute of Forestry, Belgrade, Serbia

### **ABSTRACT**

Existing as microecosystems in urban greenery, for usefull and in precise time applied integral protection of trees in cities, many, even more than just phenophase of host plants and their pests, should be in proper condition, coexisting almost like synchronous and harmonious - exactly like in symbiosis. Concerning all of included agents, at the exact period we were obligated in to check some in a first look regular, ordinary trees features. Severity of host plants Limes Mortality. Severity of Gall-inducing mites: Eriophyes tiliae mites living, healthy existence or dieback. Finally the most important is surviving or eventually Dieback or Severity of abundance - consider the main „member“ of amasing trio: Aprostocetus eriophies: Hymenoptera: Eulophydae) feeding with mite larvae in those galls (with clepto-parasitoid role I had been observing first for three season in late April 2002, for the first time, again in 2022. This is also some pairs for which has been monitored their inter functioning in real pairs. Host plant list of affected tree speciec are or was recently, and of course Fagus moesiaca. The fallowing and pests influencing on foredsts ecosystems in 2024 so intencily have been studied as relationships beetween pairs: Rhynchaenus fagi L. Finded by exident, those predator wasp – Aprostocetus, are barely 0.4-0.5 mm long, and after it has been checked again and again over 4 growing seasons all is very solid evidence for now – especially because literature about this duo, doesn't exist at all. After (by accident just my graduation thesis, when from 2002 to 2004), I have determined this for the first time.

**Key words:** *Aprostocetus eriophies; symptom; gall midge; trio-symbiosis; mite predator*

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## BIOGRAPHY

Renata Gagić-Serdar is an accomplished researcher in the fields of biotechnical sciences and forest protection. In December 2020, she successfully defended her doctoral dissertation titled “Bruhines (Coleoptera: Chrysomelidae; Bruchinae) – pests of woody leguminous seeds and the biopotential of false indigo bush seed pest in the reduction of the invasive species *Amorpha fruticosa* L.,” earning her the title of Doctor of Biotechnical Sciences. Demonstrating her continued dedication to academic excellence, she was promoted to Doctor of Science in Biotechnical Science on 9th July 2021 (R. No. from the record of issued diplomas 94-D-51/16).

Further advancing her career, on 23rd December 2021, Renata was selected for a scientific title at the Institute of Forestry in Belgrade, where she has served as both a scientific and research associate. Between 2008 and 2021, she made significant contributions to the Institute’s Department for GIS and Forest Policy, actively participating in international projects such as FOPER I and FOPER II while addressing legislative conflicts between forestry and other sectors of the economy.

Since 2021, she has been a research associate in the Forest Protection Department of the Forestry Institute in Belgrade, focusing on the diagnostics of organisms and the comprehensive protection of forests against harmful biotic factors. Her expertise spans entomology, integral forest protection, the impact of cross-border air pollution on forest desiccation in Serbia, plant protection diagnostics, rehabilitation of urban green areas, and forest policy and legislation. With over 120 published papers, Renata’s work continues to shape both scientific inquiry and practical approaches in forestry management.

## **OPTIMUM SUBSTRATE ACIDITY FOR MAXIMUM MYCELI- AL MASS PRODUCTION SHIITAKE - LENTINULA EDODES (BERK.) PEGLER (1976)**

**Miroslava Markovic**, Renata Gagic-Serdar, Ljubinko Rakonjac  
Institute for Forestry, Kneza Visislava 3, Belgrade, Serbia

### **ABSTRACT**

One of the main factors relevant for the occurrence of the infection is the pH substrate. The impact of this factor on the growth and production of mycelial mass was examined under laboratory conditions. The aim of the research was to determine the optimal conditions for the development of the fungus *L. edodes*. The results showed optimal acidity of the substrate that stimulates the growth of this fungus, compared to the conditions under which the rival microorganisms develop. The highest weight of mycelial dry mass was formed at the substrate pH values between 3.00 and 3.63, which means that this fungus can easily perform spontaneous infection. The changes in pH of the substrate where the examined strains of the fungus *L. edodes* grew shifted toward acidic reaction (5.15 to 3.52), which suggests that such acidity favours the development of the fungus investigated. The fungus cannot thrive in an alkaline environment at pH 7.3, which halts its development.

**Key words:** *Shiitake; substrate acidity; mycelial mass production*

### **BIOGRAPHY**

Miroslava Markovic was born in Belgrade, Serbia on February 13, 1962. Since 1987, she was employed at the Institute of Forestry, Forest Protection Department. On December 09th, she defended her doctoral dissertation entitled Monitoring of Powdery Mildew *Microsphaera alphitoides* Griff. et Maubl. (1910) in Serbia and its Suppression by means of Alternative Protection Measures in the field of Biotechnical Sciences. On May 25th, 2011 she was selected as Research Associate for Ministry of Education and Science and On April 24th, 2023 she has been promoted to Senior Research Associate for Ministry of Science, Technological Development and Innovation.

Miroslava's key areas of work are Phytopathology, Ecology, Integral Forest Protection, the influence of cross-border air pollution on the drying of forests in Serbia - ICP Forests, Report-diagnostic work in the field of plant protection - forest protection in the area of the headquarters of Serbia. She has more than 200 published papers (all categories and ratings).

# **EXAMINING THE CAUSE-EFFECT RELATIONSHIPS OF THE CRITERIA AFFECTING FOOD SECURITY, CLIMATE CHANGE WITH AN EMPHASIS ON ENVIRONMENTAL RESILIENCE: DIMTEL'S ANALYTICAL APPROACH**

**Azadeh Dogani**

Ferdowsi University of Mashhad, Iran

## **ABSTRACT**

Every year, climatic hazards in different regions of the world lead to the vulnerability of many environmental resources and undeniably different people. In some cases, it leads to the displacement of people in search of suitable places and food. Resilience is one of the approaches to adapt to the dangers of climate change and its impact on food security, which has received a lot of attention recently. Therefore, the purpose of this research is to identify and extract the cause-effect relationships of the components of food security, climate change, with an emphasis on environmental resilience. This research is considered to be of an applied type in terms of the research method based on the purpose, and in terms of the data collection method (library and questionnaire) and descriptive-analytical in nature. Questionnaire techniques and interviews with experts and fields related to climate change and food security have been used to perform hierarchical evaluation and analysis. Therefore, the scope of this research will be the community of experts in this field, and considering that the research plan is of the type of evaluation and ranking of climate change and food security criteria in line with environmental resilience, it will be used by applying the Dimtel method. The results of the research showed that the criterion of reforming irrigation methods is the most effective criterion and social institutions are the most effective one among the criteria of food security, climate change in the direction of making the agricultural environment resilient. According to the research findings, among the research criteria, diversity of non-agricultural resources and non-agricultural activities are the most effective and at the same time the most important criteria. Also, the highest intensity of impact is related to the intensity of the impact of the measure of diversity of non-agricultural activities (6.24) and the intensity of the impact of social institutions (7.12), which indicates that the greatest intensity of impact is on the measure of diversity of non-agricultural activities.

**Keywords:** *food security; climate change; environmental resilience; Dimtel; cause-effect relationships*

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## **BIOGRAPHY**

Dr. Azadeh Dogani holds a Ph.D. in Agricultural Economics from Ferdowsi University of Mashhad, Iran, with a focus on resilience modeling of water resource depletion using System Dynamics and Multi-Objective Programming. She earned her M.Sc. and B.Sc. in Agricultural Economics in 2011 and 2008, respectively.

Dr. Dogani currently serves as Vice-President of Futuristic Modern City Technical and Engineering Consulting Company and Vice Chairman of the Board at Radzist Toos Waste Management Co. Since 2019, she has been involved in marketing research and project feasibility studies on catalyst and carbon management. From 2021 to 2023, she led a water resource management project at Khorasan Razavi Regional Water Company. Her research areas include optimization algorithms, resilience, climate change, food security, and water management, with publications in prestigious journals. Dr. Dogani is skilled in Vensim, SPSS, GAMS, Stata, R, and Python programming.

# ECOLOGICAL INTENSIFICATION: EVALUATING GRAIN, ABOVEGROUND BIOMASS, AND WEED INCIDENCE IN INTER-CROPPED COMPARED TO SOLE CROPS

Saad Mir<sup>1</sup>, Vaibhav Pradip Chaudhary<sup>1</sup>, Albert M. Colom Bauza<sup>1</sup> and Bhim Bahadur Ghaley<sup>1</sup>  
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## ABSTRACT

Ecological intensification is defined as cereal-legume intercropping to harvest the synergies for resource uptake and use in aboveground and belowground components for enhanced productivity. In our field research, 3-crop species viz. fababean, pea and barley were grown either as sole crops, 2 crop intercrop (IC) and 3 crop IC, totaling 7 cropping systems. The objective of the study was to quantify the crop yields, aboveground and weed biomass to investigate productivity and weed incidence under 7 cropping systems. There were significant differences in crop yields between the cropping systems and the highest crop yields were recorded in pea-barley-fababean IC (6.11 t/ha), followed by fababean-barley IC (5.17 t/ha) and the least in pea sole (4.60 t/ha) (Figure 1a). Similarly, the highest aboveground dry biomass at harvest was measured in pea-barley-fababean IC (10.73 t/ha) system, followed by fababean sole (9.92 t/ha) and least in barley sole (7.52 t/ha). The weed biomass were significantly different between the cropping systems and the highest weed biomass was recorded in pea sole (1.47 t/ha), followed by fababean-pea IC (1.00 t/ha) and least in fababean-barley IC (0.29 t/ha) (Figure 1b). The results showed that the 3 crop IC were more productive in terms of grain yield and aboveground biomass compared to the sole crops. The field study provided robust evidence that resources like water, nutrients and solar radiation are used more efficiently in 3 crop ICs producing more output per unit of resource available without any external inputs. Further, the weed incidence was more in sole crop compared to the ICs demonstrating the benefit of IC. These production systems can be adapted to local contexts to produce food, fodder or bioenergy depending on the local market and context, which can contribute to adoption of ecological intensification practices by the farmers.

**Keywords:** *multispecies intercrop; field trial; grain yield; aboveground biomass and weed incidence*

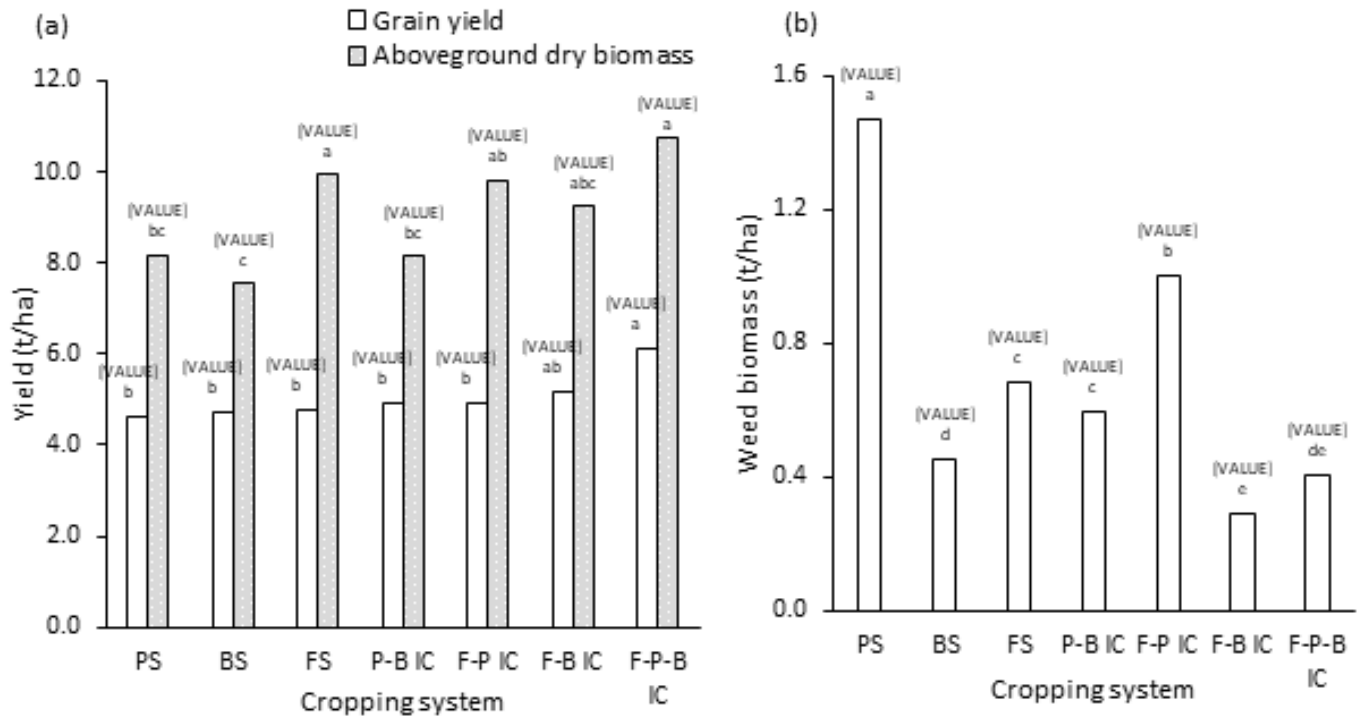


Figure 1: Grain yields and aboveground dry biomass (a) and weed biomass (b) in 7 cropping systems consisting of monocrops, 2 crop IC and 3 crop IC. Mean values followed by the same letter are not significantly different at  $p < 0.05$  (R statistical package).

## BIOGRAPHY

Dr. Vaibhav Pradip Chaudhary is a Postdoctoral fellow working at Department of Plant and Environmental Sciences at University of Copenhagen in Denmark. Dr. Vaibhav's research work was on "Assessment of maize (*Zea mays* L.) genotypes for combining ability, new favorable alleles and inbreeding tolerance for yield and productivity traits" during his PhD research work. He holds master's degree in agriculture with specialization in genetics and plant breeding. Currently, his research focuses on agroforestry and intercropping systems.

## **OREGANI BY-PRODUCTS AS ANTIFUNGAL TOOL AND SOIL AMENDMENT IN EGGPLANT SEEDLINGS**

**Kalliopi Kadoglidou<sup>1</sup>**, Papa Eleni<sup>1</sup>, Dimitrios Katsantonis<sup>1</sup>, Paschalina Chatzopoulou<sup>1</sup>, Ifigenia Mellidou<sup>1</sup>, Maria Irakli<sup>1</sup>, Apostolos Kalyvas<sup>1</sup>, Aiki Xanthopoulou<sup>1</sup>, Michalis Genitsargiotis<sup>2</sup>

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### **ABSTRACT**

Two of the major biotic stresses of vegetables are the fungi belong to genera *Fusarium* and *Verticillium* causing the diseases ‘vascular wilts or adromycosis’. Thus, the ultimate goal of this study is the development of an improved protocol related to the potential of incorporated oregano residues used in horticulture as antifungal agent—since the control against these pathogens is notably expensive and often unfeasible—and as soil amendment also. For this reason, we studied the effects of soil incorporated oregano dried residuals on growth and physiological traits of eggplant seedlings inoculated with two soilborne pathogens: *Fusarium oxysporum* f.sp. *melongenae* and *Verticillium dahliae*, causing adromycosis. Additionally, oregano residuals were subjected in a Clevenger-type hydrodistillation and the obtained oil was analyzed by gas chromatography coupled to mass spectrometry. Growth and physiological parameters of tomato seedlings (plant height, leaves number, chlorophyll content index, water potential, leaf area index and dry biomass), as well as disease severity were assessed repeatedly, in 15, 30 and 45 days after the inoculation. Results revealed that incorporation of both 1% and 2% (w:w) oregano residuals into the growth substrate enhanced growth and physiological parameters of both healthy control and inoculated eggplant seedlings, whereas a significant lower degree of infection, almost up to full recovery at 45 days, was observed in seedlings treated with both fungi. The herein results demonstrate that incorporating at least 1% oregano dry residuals into the soil improves the production of robust eggplant seedling and could be used as an alternative tool for the protection against these soilborne diseases. This approach is fully harmonized with the European environmental policy regarding the reduced-input agricultural systems (adoption of good agricultural practices), whereas it falls in the scope of the integrated/sustainable management and in the frame of the circular economy through the exploitation of an oregano by-product.

## FUNDING

This project was funded under the "Measure 16 'Cooperation'" in the framework of the National Rural Development Programme and it is co-financed by the European fund for rural development (EAFRD) and national budgets. Project code: M16S 2-00047.

## BIOGRAPHY

Dr. Kalliopi Kadoglidou is an independent researcher in Horticulture at the Institute of Plant Breeding and Genetic Resources of ELGO-DIMITRA in Thessaloniki Greece. She possesses experience and knowledge, encompassing aspects from a wide range of areas due to the subject of her studies and her participation in several research programs. Her research interests focus on vegetables cultivation, including the plant physiology under biotic/abiotic stress, the exploitation of biological action of plant's secondary metabolites in sustainable production, the recycling of crop residues in sustainable and organic cultivation systems, the sustainable greenhouse production, the agro-ecophysiology. She has published 25 papers within the Science Citation Index with h-index-15, two book chapters and 23 publications in international and national conferences. During the period 2005-2019 she was also lecturing of theory and laboratory courses in Faculties of Agriculture in Higher Education Institutions in Greece.



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