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Preface

The Global Agri & Food Safety Congress 2026 (GAFSC2026) was successfully held on February 26-27, 2026, in Amsterdam, Netherlands. The congress brought together researchers, academicians, industry experts, and policy makers from around the world to share their latest research and innovations in agriculture, food safety, and sustainable food systems.

The conference provided a valuable platform for discussing key topics such as sustainable agriculture, food quality and safety, agri-technology, crop science, and global food security. The presentations and discussions reflected the growing need for collaborative efforts to address challenges in agricultural production and food safety.

I would like to sincerely thank all the speakers, authors, scientific committee members, and participants for their valuable contributions that made this congress successful. I also appreciate the efforts of the organizing committee for their dedication in making this event possible.

I hope the research and discussions presented during GAFSC2026 will encourage further collaboration and innovation in the fields of agriculture and food safety.

Prof. Tet Yeap

University of Ottawa, Canada

Conference Chair

Global Agri & Food Safety Congress 2026 (GAFSC2026)

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Food Security Through Machine Learning, Sustainable Precision Farming, and New Arable Land Creation

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Abstract

As the global population approaches 10 billion by 2050, ensuring food security has become one of humanity's most pressing challenges. This talk presents ongoing research at the Area X.O Smart Farm in Ottawa, Canada, focusing on data-driven and sustainable solutions to increase agricultural productivity. Leveraging machine learning and unmanned aerial vehicles (UAVs), the research explores yield prediction, early pest infestation detection, and seed-placed banding as sustainable precision farming techniques for enhancing yield and improving nutrient efficiency. Beyond improving existing farmland, the presentation also highlights the potential of transforming underutilized savanna ecosystems into productive farmland. As global arable land becomes increasingly scarce, the African savannas have emerged as a new frontier for sustainable agricultural development. The initiative aims to transform these regions using innovative precision planters and roller/crimper equipment that enable herbicide-free soil management and regenerative crop systems. Results from pilot operations covering 10,000-100,000 hectares near Kinshasa, Democratic Republic of the Congo (DRC) will be discussed, demonstrating how technological innovation and sustainable practices can work together to secure the world's future food supply.

Keywords

Precision Agriculture, Machine Learning in Agriculture, Unmanned Aerial Vehicles (UAVs), Yield Prediction, Pest Detection, Sustainable Farming, Seed-Placed Banding, Savanna Agricultural Development

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Starting the Cultivation of Outdoor Plants in Indoor Environments

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Abstract

More and more plants having problems growing outside. These problems have to do with changing in growing due to temperature, water, diseases etc. Because of these changes some crops give also problems with the water use efficiency, pollution with nutrients and chemical plant protection. In the same time the demands for healthy and sustainable food production increases. Protected cultivation could be one of the solutions to help to solve these problems. The presentation will be about the possibilities of protected growing, about creating growth protocols for protected growing, for crops that normally grown outside and there are some crops discussed, like vanilla, black pepper, passion fruit, coffee and cotton. Very important in creating growth protocols for news crops is the approach and most important point from that approach is that outside cultivation data should be transferred in a protocol for protected growing. The topics of a cultivation protocol are about origin, because the origin tells a lot about what to do with (sun)light, climate. Also information about production and quality, cultivation system, water and nutrition, substrates, pollination are needed to create research to decide if a crop could be grown successfully and profitable protected.

Keywords

Protected Cultivation, Greenhouse, Crops, Cultivation Protocol, Sustainability

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A Call to Action: Embracing Bioproducts for a Resilient Agricultural Future

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Abstract

As the agricultural sector faces increasing pressures from climate change, soil degradation, and growing food insecurity, the need for resilient farming systems has never been more urgent. "A Call to Action: Embracing Bioproducts for a Resilient Agricultural Future" aims to highlight the transformative potential of bioproducts in addressing these global challenges. Bioproducts, ranging from microbial inoculants to biocontrol agents and bio-based fertilizers, offer a science-driven solution to rebuild soil health, enhance crop resilience, and promote sustainable farming practices. This speech will outline the crucial role of bioproducts in regenerating agricultural ecosystems, improving soil fertility, and increasing the efficiency of farming systems, all while reducing dependence on chemical inputs. It will explore cutting-edge innovations and real-world examples of how bioproducts are already driving positive change in agricultural practices worldwide. However, the adoption of bioproducts cannot happen in isolation. It requires collaboration among scientists, farmers, industry leaders, and policymakers to create the right environment for scaling their use. This session will emphasize the need for a unified approach, with clear policy frameworks and industry incentives, to accelerate the transition to more resilient and sustainable agricultural systems. With a powerful call to action, the speech will inspire stakeholders to embrace bioproducts as essential tools for shaping the future of agriculture. By adopting these innovative solutions, we can build a food system that is not only more resilient to climate variability but also more capable of feeding a growing global population sustainably.

Keywords

Bioproducts in Agriculture, Soil Health Regeneration, Biofertilizers, Biocontrol Agents, Sustainable Agriculture, Crop Resilience, Climate-Smart Farming, Agricultural Ecosystem Restoration

Animal Welfare as the Basis of One Health: A UN Convention on Animal Welfare, Health, and Protection Poses a Realistic Solution to Improved Animal Welfare and Human Health

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Abstract

There would describe Animal welfare as the basis of One Health: A UN convention on animal welfare, health, and protection poses a realistic solution to improved animal welfare and human health. Through a legally binding UN Convention on Animal Health and Protection, the One Health approach will benefit all of society by strengthening animal welfare nationwide and globally, taking also the AMR and pandemic prevention aspects into account. In the plenary session I would present the (to be expected) doubts worked out in the special session and address the proposal also to be in the best interest of the agri and food saftey sector. Since your scientific events help in bringing a massive change in this field, a further step in a well-orchestrated global level with legally binding impact might fit perfectly.

Keywords

One Health, Animal Welfare, Animal Health Protection, United Nations Convention, Antimicrobial Resistance (AMR), Pandemic Prevention, Public Health Policy, Food Safety

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Microplastics in the Field: Hidden Drivers of Soil and Plant Change

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Abstract

Micro plastics (MPs, <5 mm) are increasingly accumulating in agricultural soils, potentially affecting soil health and crop performance. This study assessed short-term impacts of polypropylene (PP) and polyethylene (PE) fragments, introduced via mulch films at 0.05–0.5%, on soil properties and the growth of *Fagopyrum esculentum* (buckwheat) in carbonate-rich Cambisol. Low PP levels (notably 0.1%) promoted shoot and root elongation, while higher doses reduced biomass and leaf number. PE showed predominantly negative effects, significantly suppressing root growth and leaf development from 0.3%. Both plastics increased soil pH (up to + 0.67), without major effects on soil macro elements or nutrient uptake, except for nitrogen trends under PE. Microbial biomass declined at early stages, though PP stimulated microbial activity at flowering. These results demonstrate that MPs rapidly alter soil–plant interactions, with effects varying by polymer type and concentration, highlighting the need to evaluate plastic use under real agricultural conditions.

Keywords

Buckwheat, Endocalcari-Epihypogleyic Cambisol, Microplastics, Plastic Mulch Films, Polyethylene, Polypropylene, Soil

Revealing Spatiotemporal Transmission of Aflatoxin-Related Health Burdens: A Deep Reinforcement Learning Framework for Optimizing Food Safety Monitoring

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Abstract

Aflatoxin B1 (AFB1), a Group 1 carcinogen, is among the most hazardous naturally occurring chemicals, yet its effective management remains challenging due to the dynamic and spatial complexity of modern food supply chains. Conventional monitoring frameworks focus mainly on legal-threshold compliance, but they fail to capture mycotoxin transmission across regions and seasons, limiting their effectiveness under resource constraints. We propose FRAME (Foodborne hazard Risk Assessment and Monitoring Enhancement), a mycotoxin monitoring optimization framework that integrates source-attributed disease burden estimation with reinforcement learning–based (Deep Q-Network, DQN) allocation of monitoring resources for AFB1. Based on more than 110,000 monitoring records from China's peanut and peanut oil supply chains (2015–2022) with other multi-source datasets, our analysis shows that interprovincial production sources contribute 52% more to local disease burdens than local production, and spring/autumn contamination increases risks by 24%. Optimizing monitoring through FRAME achieves a 25–percentage point improvement in burden reduction compared with conventional programs, using fewer resources. Beyond AFB1, FRAME is transferable to other mycotoxin hazards such as ochratoxin A in cereals, fumonisins in maize, and zearalenone in edible oils, offering policymakers an outcome-oriented and resource-efficient framework for hazard governance.

Keywords

Aflatoxin B1 (AFB1), Mycotoxin Risk Assessment, Food Safety Monitoring, Reinforcement Learning, Deep Q-Network (DQN), Food Supply Chain Risk, Disease Burden Analysis, Peanut Supply Chain Safety

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Impact of US Tariffs and the Make America Healthy Again Agenda on Agriculture, Food Safety, and Food and Beverage Companies

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Abstract

The imposition of US tariffs and the implementation of the Make America Healthy Again agenda have significant implications for the agricultural sector, food safety standards, and food companies operating within and outside the United States. Tariffs will affect the cost and availability of imported agricultural inputs, disrupt supply chains, and influence export opportunities for American farmers. These economic pressures may lead to shifts in production practices, pricing strategies, and international competitiveness. Meanwhile, the Make America Healthy Again (MAHA) agenda, focused on improving public health through nutrition and regulatory reforms, introduces new expectations for food safety and quality. This initiative encourages food companies to innovate, reformulate products, and enhance transparency in sourcing and labeling to meet evolving consumer demands and regulatory requirements. Collectively, these policies shape the landscape of American agriculture by driving changes in market dynamics, fostering improvements in food safety, and challenging companies to adapt to a more health-conscious and regulated environment. The interplay between tariffs and health-focused policy underscores the complexity of balancing economic interests with public health objectives in the food industry. What will the effect of these competing priorities be on the U.S. economy and how can agriculture companies and farmers, as well as food and beverage manufacturers compete effectively in the global market under these conditions.

Keywords

Agricultural Trade Policy, Food Safety Regulations, Import Tariffs, Make America Healthy Again (MAHA), Agricultural Competitiveness, Food and Beverage Industry, Supply Chain Resilience, Public Health Nutrition

Crop Harvest Bottle Technology

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Abstract

A kind of medicine is invented by Dr. Zhu Weiping in Conghua District, Guangzhou in 2018 and has been continuously developed and improved for all kinds of crops. This medicine uses gas phase information transmission technology to significantly increase flowering and fruiting rate of crops, promote crop growth, reduce pests and diseases, enhance plant vitality, and achieve increased crop yield and harvest through the scent emitted by Chinese herbal medicine liquid. This medicine is made from pure Chinese herbal liquid, which is safe and environmentally friendly. It is an environmentally friendly postmodern agricultural new technology.

Keywords

Chinese Herbal Medicine, Sustainable Agriculture, Plant Growth Promotion, Crop Yield Enhancement, Eco-Friendly Agricultural Technology, Biostimulants, Pest and Disease Management, Green Farming Practices

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Hydrophilic Microporous Matrix Hosting a Symbiotic Microbial Consortium for Crop Resilience Enhancement

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Abstract

This work introduces a novel hydrophilic microporous matrix, synthesized via High Internal Phase Emulsion (HIPE) polymerization, uniquely engineered to host a living symbiotic microbial consortium of endophytes and PGPR. Unlike conventional polymeric HIPE materials, which are typically inert, this matrix is specifically designed to preserve microbial viability, enable colonization, and support direct plant–microbe interactions in soil environments. The process integrates chemical reaction engineering principles kinetic modelling, emulsion thermodynamics, and semi-continuous reactor operation with microbial compatibility constraints, representing an uncommon and innovative convergence between polymer engineering and agricultural biotechnology. Controlled shear emulsification and residence-time optimization were critical to maintaining matrix porosity while protecting embedded microorganisms. SEM imaging provides direct evidence of novelty, revealing microbial colonization within the matrix, root-hair penetration into the porous structure, and migration of endophytes from the matrix into plant tissues. Field trials across five crops (coffee, banana, Miscanthus, palm oil, maize) demonstrated consistent improvements in growth, biomass, chlorophyll retention, and reduced symptoms associated with *Fusarium oxysporum*. By coupling the matrix with the Symbiotic Rhizosphere Simulated (SRS) system, this work establishes a new integrated platform for agro-process intensification, offering a scalable, biologically active material for next-generation sustainable agriculture.

Keywords

Hydrophilic Microporous Matrix, HIPE Polymerization, PGPR, Endophytes, Rhizosphere Engineering, Process Intensification, Sustainable Agriculture, SRS System, Crop Resilience, Fusarium Suppression

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Interdepartmental Coordination: A Mechanism for Governing Cross-Cutting Issues Toward Sustainable Dairy Development in Kenya

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Abstract

Navigating the interactions among Sustainable Development Goals (SDGs), manifesting as both synergies and trade-offs, requires mechanisms that facilitate coordinated responses among the multiple actors involved in governing Kenya's dairy sector. This study investigates existing mechanisms that facilitate coordination between Ministries, Departments, and Agencies (MDAs), and how they contribute to governing the SDG interactions. The analysis draws on insights from 31 semi-structured interviews with selected officers situated in different MDAs, complemented by a review of relevant policy documents. The findings reveal that several institutional arrangements function as mechanisms of coordination to govern the interactions that characterize Kenya's dairy sector. These mechanisms include the centre of government efforts, interdepartmental coordination, policy integration, and regulatory impact assessment—each operating through a set of sub-mechanisms including inter-ministerial committees, sector working groups, thematic task forces and joint planning platforms. Collectively, these mechanisms ensure cross-cutting gender (SDG 5) and climate (SDG 13) issues are mainstreamed into dairy-related policies and programmes. Through these same mechanisms, issues of productive employment and fair wages (SDG 8), as well as equitable access to resources and recognition of inequalities faced by smallholder dairy farmers (SDG 10), are increasingly prioritized by actors across the MDAs as key considerations that could guarantee the sector's long-term sustainability. While the identified mechanisms have limitations in ensuring effective governance of SDG interactions, this study provides supporting evidence of their contribution towards governing the dairy sector across its social, economic, and environmental dimensions. Nonetheless, there remains a window of opportunity to further strengthen the identified coordination mechanisms.

Keywords

Governance, Sustainable Development Goals, Sustainable Dairy Development, Coordination Mechanisms, The Kenyan Dairy Sector

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Effect of Management System on the Physico-Chemical Properties of Soil in an Organic Pedro Ximenez Vineyard

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Abstract

Soil management by traditional tillage has been commonly used over the years as a cultivation practice, combined with herbicides. This is the case of the Montilla-Moriles wine protected designation of origin (PDO) in southern Spain. Since the use of this practice can lead to decreases in the physical and chemical stability of the soil, more sustainable management is being considered, to minimise these problems. One of these practices is no-tillage with vegetation cover which could improve the physical structure of the soil by decreasing the mineralisation of organic matter and erosion, among other advantages. This is why this strategy is gaining more and more popularity in Spanish and world viticulture, as it is also perfectly adapted to the measures taken by European governments to improve environmental quality. The aim of this work was to evaluate the effect of management system on grapes yield and physical and chemical properties of the soil in a white grape vineyard (var. Pedro Ximenez). The treatments studied were traditional tillage and no-tillage with vegetation cover at different soil depths. The experiment was carried out in an experimental vineyard of the Andalusian Institute for Research and Training in Agriculture, Fisheries, Food and Organic Production located at Cabra (IFAPA, Cordoba, Spain). It was found that some physical properties were not affected, such as texture and humidity. However, improvements were observed in the concentration of organic carbon, nitrogen and phosphorus in the soil with a no-tillage management system with cover crop. In addition, significant differences were found in the content of some macronutrients with the depth of the soil profile studied. Finally, regarding vineyard yield, grape production was higher in the traditional tillage system, which could lead to a future study on improving production in vineyards that use cover crops.

Keywords

Tillage, Cover Crop, Soil, Vineyard

Acknowledgments

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Plant-based Probiotic Beverages with Lactiplantibacillus Pentosus LPG1 from Table Olives

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Abstract

Probiotics are beneficial live microorganisms that promote health when the host consumes them in adequate amounts. Nowadays, the development of plant-based foods with this type of microorganism is increasing because they can be an alternative to dairy products, offering a significant advantage for lactose-intolerant people. However, the physical, chemical, and organoleptic characteristics of these beverages, and therefore consumer acceptance of these products, are influenced by the adaptation of the probiotic strain and the selection of the substrate. In this study, four innovative formulations were developed by blending fruits and vegetables with the incorporation of a unique probiotic strain, Lactiplantibacillus pentosus LPG1, isolated from the olive processing industry. The results demonstrated that it is possible to reach an average probiotic count of 6.45 log10 CFU/mL at 52 days of storage at 4°C without detection of Enterobacteriaceae, fungi/molds, or pathogenic bacteria such as Staphylococcus, Listeria, or Salmonella spp. Moreover, to comprehensively determine the potential healthpromoting properties of the formulated products, the research encompassed an analysis of their nutritional composition, antioxidant capacity, and organoleptic characteristics. In this sense, the beverages obtained can be considered high-value functional products due to their notable antioxidant activity-reaching up to 33% DPPH inhibition-and significant total polyphenol content exceeding 0.5 g gallic acid/L, along with a balanced nutritional profile. Sensory evaluation, including flash profiling, acceptance, and affective testing, indicated positive consumer responses regarding aroma, flavor, and appearance, supporting their potential for commercialization as ready-to-drink probiotic beverages.

Keywords

Probiotics, Plant-Based Beverages, Lactiplantibacillus Pentosus, Functional Foods, Antioxidant Activity, Polyphenols, Consumer Acceptance, Ready-to-Drink Products

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A Time-dependent Compartmental Model for PFAS Uptake and Tissue Distribution in Tomato Plants Across PFBA–PFUnA

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Abstract

Background & Objective: Understanding how per- and polyfluoroalkyl substances (PFAS) accumulate in different tissues of food crops is essential for evaluating food safety risks in the circular food system. However, quantitative models that capture time-dependent PFAS uptake remain limited. In addition, most studies often focus on the influence of compound properties, while the influence of the plant-related factors were underexplored. To address this, this study developed and evaluated a time-dependent, mass-balance-based compartmental model predicting uptake and distribution of PFCAs (PFBA-PFUnA) in tomato plants, with differentiation of root, stem, twig, leaf, and fruit concentrations. *Methods*: The model incorporates compound hydrophobicity, transpiration-driven transport, carrier-based active transport, and tissue-specific accumulation behaviors. Model predictions were evaluated against data from an experiment measuring the uptake of multiple PFAS in a hydroponic system. *Results & Conclusion*: Predicted PFAS concentrations across plant tissues ranged within one order of magnitude from the experimental data. The model successfully reproduced characteristic chain-length patterns, including higher mobility of short-chain PFAS and increased retention of long-chain PFAS in roots. However, concentrations in roots were underpredicted for long-chain PFAS (C9-C11). This study provides a mechanism-based yet tractable model, contributing to improved comprehensive exposure assessment and supports future risk evaluation for PFAS uptake in crops in circular food system.

Keywords

PFAS, Perfluoroalkyl Carboxylic Acids (PFCAs), Tomato Plants, Food Safety, Crop Uptake Modeling, Mass-Balance Model, Environmental Contaminants, Circular Food Systems

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Sustainable Global Phosphorous Inputs in View of Crop Yields and Water Quality

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Abstract

Sustainable management of phosphorus (P) requires inputs at such a level that the (soil) P supply does not limit the required food production for the growing global population (just boundaries) while keeping P losses by erosion and runoff within limits to avoid adverse impacts on water quality (safe boundaries). We developed and applied a method to assess the medium-term (period 2015-2050) and long-term (period after 2050) required amount of P fertilizer in view of a target crop P uptake for food production, in combination with acceptable P losses. The 'medium-term required' amount is defined as the amount that brings all cropland soils to a target soil P status that does not limit crop growth (build-up or mine) in addition to the target crop P uptake in view of global food P demand and acceptable P losses in view of water quality. The 'long-term required' amount is set equal to the target crop P uptake and acceptable P loss only, thereby maintaining the adequate soil P level that has been built-up or mined during the medium term period. The target crop P uptake was calculated as the P uptake at a target crop yield, defined as 80% of the crop yield potential, corrected for the global food P consumption demand. This demand was derived by multiplying the global population with an advised annual P intake, and dividing it by the share of crop uptake that is consumed by humans. The current (year 2015) global P budget includes a P input of 39.4 Tg P yr^{-1} of which 27.2 Tg P yr^{-1} is taken up, while the P surplus of 12.2 Tg P yr^{-1} is divided over a soil P accumulation rate of 10.9 Tg P $yr^{-1}$and a runoff rate of 1.3 Tg P yr^{-1}. Sustainable global P inputs imply that the world population can be fed while P losses to surface water stay below a critical limit. The required P uptake to feed a global population of 10 billon people is 32.5 Tg P yr^{-1}. In a situation in which the soil has attained a target P status, which does not limit the P uptake, the required P surplus to maintain that P status is equal to an estimated runoff of 1.1 Tg P yr^{-1}, thus implying a sustainable P input of 33.6 Tg P yr^{-1}. To avoid P losses that exceed water quality criteria, the current P erosion rate, however, needs to be reduced from a current 4.0 Tg P yr^{-1} to 1.6 Tg P yr^{-1} by erosion control. In addition, the gap between the current soil P status (base year 2015) and the target soil P status at global scale can be filled to ensure a crop yield increase while accounting for the P sorption capacity. The total global gap is estimated at 797 Tg P, implying a global annual P requirement of 22.7 Tg P yr^{-1} between 2015 and 2050 reach the target soil P status for all soils. However, the increase in soil P fertility can best be attained in soils with limited P sorption capacity to limit the soil P investment.

Keywords

Phosphorus Management, Sustainable Agriculture, Soil Phosphorus Fertility, Phosphorus Fertilization, Crop Nutrient Uptake, Water Quality Protection, Global Food Security, Nutrient Cycling

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