BOOK OF ABSTRACTS

ASIA'S PREMIER CLIMATE AND AGRICULTURE CONFERENCE

THE INTERNATIONAL CONFERENCE ON CLIMATE CHANGE AND AGRICULTURE IN TROPICAL LATITUDES

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Message from the conference chair – CCATL 2025

Dear Colleagues, Researchers, and Global Partners,

It is with great enthusiasm and a sense of urgency that I welcome you to the International Conference on Climate Change and Agriculture (CCATL 2025). This gathering provides an exceptional opportunity to bring together thought researchers, leaders, innovators, and policymakers from across the world to address one of the most critical challenges facing our time: the intersection of climate change, food security, and agricultural sustainability.

As we stand at the forefront of an era defined by climate variability, resource constraints, and population growth, the responsibility to act is clear. Climate change is no longer a distant projection—it is a present reality that directly affects food security, food quality, water availability, and the livelihoods of millions of people, particularly in vulnerable tropical and subtropical regions.

CCATL 2025 is more than a conference—it is a collaborative platform to exchange ideas, share data-driven insights, and explore practical solutions. It brings together academics, scientists, practitioners, policy leaders, and students to engage in meaningful dialogue and foster partnerships that transcend borders.

As Chair of this conference, I am proud to see participation from a wide spectrum of disciplines and nations. Your contributions, whether through keynote lectures, technical sessions, or roundtable discussions, are vital in shaping a sustainable and resilient agricultural future.

Sri Lanka, with its rich biodiversity and unique microclimates, serves as a living laboratory for climate research and innovation. Through this conference, we hope not only to learn from global experiences but also to position our nation—and the region—as a hub for adaptive agricultural strategies in the tropics.

I encourage you all to engage actively, connect purposefully, and collaborate meaningfully. Let us turn our collective knowledge into transformative action to secure the future of our planet’s food systems.

I look forward to welcoming you all to CCATL and to a productive and inspiring conference ahead.

Warm regards,
Prof. Saman Seneweera
Conference Chair – CCATL 2025

Table of Contents Page No

ORAL PRESENTATIONS

Climate Adaptation Technologies and Their Role in Building Livelihood Resilience (A)			
A1	1.	Adaptation and Feedback of Soil Microbiome to Climate Change *Ge Y and Li Y*	2
A2	2.	The Impact of Citizen Voice and Action (CVA) Model in Empowering Youth for Sustainable Climate Actions in Tanzania *Mnyone C, Mwabulambo A, and Jackson H*	3
A3	3.	The Adaptation Triangle: A Multivariate Analysis of Vulnerability, Resilience, and Livelihood Strategies in Semi-Arid Regions of India. *Mannepalli BK, Gawhare AA, Kemboi EK,Yadav A, Deep P, Kamalvanshi V, Kushwaha S, Parida P and Pandey S*	4
A4	4.	Enabling Digital Public Goods for Climate-Resilient Agricultural System *Allina T and Vikram PS*	5
A5	5.	Sedimentary Carbon Sequestration Potential in Mangroves of Oriental Mindoro, Philippines: Quantifying Soil Carbon Stocks *Madrid DET, Bombio FCA, Angeles RA F, Ferreras MAE, Jumawan JH, Raganas AFM, Medina SM, Johnson B, Kumar P, Dasgupta R, and Macandog DBM*	6
A6	6.	Smallholder Farmers Resilience and Adaptation to Climate Change: Implication for Change Agents in Buffelspruit, South Africa *Agholor AI*	7
A7	7.	Climate Change, Food and Nutrition Security: Strategies for Adaptation *Nazrul IM, Wahiduzzaman AKM and Rownak FE*	8

A8	8.	Application of AI-based solutions for climate-smart agriculture to enhance the climate change resilience capacity of paddy farmers in the dry zone *Hearath HMBS and Nayanajith J*	9
Pest and Disease Management (B)			
B1	9.	PlantDRAW: a web tool for fast image-based phenomics recognition and analysis of disease in plant science *Wua X, Yuan Z, Wan X, Dong X, Wang Q and Hao G*	10
B2	10.	Developing Future Crops Using The "Faststack' Platform and Speed Breeding *Jambuthenne D, Liu1 D, Tong J,Alahmad S, Garrard T , Dadu H, Snyman L, Periyannan S, Hickey L, Hayes B , Kai P. Voss-Fells1, Dinglasan E*	11
B3	11.	Morphological and Symptomatic Identification of Two Emerging Pests in Rice: Hydrellia griseola (Rice Leaf Miner) and Hysteroneura Setariae (Rusty Plum Aphid) in Sri Lanka *Sarathchandra SR, Dilanka LBT, Jayaweera MPHK, Sandadevani KS, Senarath SATP, and Dissanayaka DMPS*	12
B4	12.	Effect of Different Crop Establishment Methods on Pest Abundance and Crop Damage in Rice *Jayaweera MPHK, Sarathchandra SR, Hemachandra KS, Sandadevani KS, and Dilanka, LBT*	13
B5	13.	Aphids (Aphididae) in The Garden of University of Peradeniya: Diversity, Distribution and Host Specificity *Dilanka LBT and Jayasinghe WH*	14
Soil Nutrient Management (C)			
C1	14.	An Innovative approach to Ameliorate Acid sulphate soils of Nilwala Basin *Senanayake N, Perera MTMDR and Weragoda A*	15

C2	15.	Agroecological Approaches for Enhancing Resilience and Sustainability in Rural Agri-Food Systems: Lessons from Kilimo Tija Kigoma Tanzania *Mnyone C, Mwabulambo A, Jackson H, Shabani G, Wamba A*	16
C3	16.	Factors Influencing the Soil Physicochemical Properties under different Land Use of Jhilmil Jheel Wetland Conservation Reserve, Haridwar – Uttarakhand, India *Mohd S and Mohd B*	17
C4	17.	Symbiosis for Surviving Environmental Stresses *Chen BD, Zhang X, Wu SL, Fu W and Zhu YG*	18
C6	18.	Production of Urea Intercalated Biochar from Agricultural Waste and Evaluation of Its Potential Benefits *Murugesapillai A, Kajeevan K and Gnanavelrajah N*	19
Climate Change, Food and Nutrient Security (D)			
D1	19.	Semi-Transparent Solar Canopy for Greenhouses *Siriwardena SJ, Nemindara WSN, Dissanayake D, Samaranayake BGLT and Ekanayake JB*	20
D2	20.	Remote Sensing and Computer Vision for Tea Agrovoltaic Optimization *Epakanda BAB, Navarathne JMTRB, Samarasekera TD, Ekanayake JB, Herath VR, Godaliyadda GMRI, Ekanayake MPB*	21
D3	21.	C4 crop millets hold with great promise for food security and nutrition under elevated CO2 concentration *Gong ZH, Dong LB, Wang J, Lam SK, Shi XR, Zhang DS, Zong YZ, Hao XY and Li P*	22
D4	22.	Impacts of climate variation on yields and prices of selected food crops in small islands: the case of Mauritius *Dowlut A, Brizmohun R and Ruggoo A*	23

D5	23.	Strategies for Climate Change Adaptation among Tea Growers in the Uva Region of Sri Lanka: An Assessment of Knowledge, Perceptions, and Resilience *Kumari KMNRN, Amarathunga MKSLD ,Shyamali HW, Kumarasingha KADP and Thibiha G*	24
D6	24.	Quantification of Post-Harvest Losses and Dietary Fiber Contents of Fruit and Vegetable Wastes Generated in Dambulla and Thambuththegama Economic Centers in Sri Lanka *Dharmaprema GADBS, Senevirathne KMDA, Shanuke DS, Buddhika DPRN, Silva ESM., Fathayee FM, Rathnayake HA, Bandara MD, Jayasundara YMJ, Illippangama IPAUNK and Gunathilaka UGSA*	25
D7	25.	Assessing the impact of the Indian Ocean Dipole (IOD) on Sri Lanka's rainfall patterns and agriculture: A GIS and RS based approach *Thilakarathne RWNN*	26
Farming Systems Approach to Climate Adaptation (E)			
E1	26.	Microplastics Pollution in The Bay of Bengal - A Call for Regional Policy Frameworks and Transboundary Collaboration *Harunur R*	27
E2	27.	Revitalizing The Milpa System in Northern Veracruz, Mexico: A Strategy to Combat Climate Change and Ensure Food Security *A Lammel, Aldana F C and Lopez MJ*	28
E3	28.	Funding Tree Planting in Lagos to Improve Greenery and Provide Nature-based Solutions to Natural Disasters Through the Land use Charge System *Adewunmi AA*	29
E4	29.	Assessment of Soil Rehabilitation Performance and Soil Carbon Stock Estimation in Tree Integrated System in Comparison to Tea Cultivation in Upcountry, Sri Lanka *Lakmali WAS, Perera PWDN, Aberathna WSSL, Senanayake FR,*	30

		De Zoysa D and Weerakkody WJSK	
E5	30.	Integrating Remote Sensing and Machine Learning for Urban Carbon Footprint Estimation in Colombo District *Fonseka HPU, Marasinghe BS and Mohemed Rila AR*	31
E6	31.	Carbon Sequatration in Sand Dune Habitats of *Spinifex Littoreus* and *Ipomoea Pes-Caprae* in the Eastern Coast of Sri Lanka *Wathsala KAV, Ukwattage NL and Udagedara S*	32
Native Food Crops in Tackling Food Security (F)			
F1	32.	Drought Resistance in "Niyan Wee" – A Local Rice Landrace *Fernando KIH and Ariyarathna HACK*	33
F2	33.	Physiological And Metabolomic Responses of Foxtail Millet (*Setaria italica*) To Elevated CO2 Concentrations *Wang J, Hao XY and Li P*	34
F3	34.	Mitigation of GHGs and Ammonia Emissions in Rice Paddy in Floodplain Soils *Jahangir MMR and Jahiruddi M*	35
F4	35.	Effect of Different Planting Methods on Growth and Yield Performance of Rice Variety BG 366 *Saththiyavahini K, Pradheeban L and Senthilkumaran S*	36
F7	36.	Utilization of Banana (Musa Acuminata × Balbisiana) Peels for Fermented Native Swine Feed: A Case Study on Material Recycling Efficiency and Economic Benefits in Markaduke R and D Center, Marinduque, Philippines *Mascarenas DR, Dulay HA, Paez AR, Robles CRM, and Mayores, MA*	37
F8	37.	Exploring the CIS Regulatory Element Diversity in Abiotic Stress Response-Related Genes of Rice *Kulasekara KMLB and Herath HMVG*	38

Poster Session (P)			
P1	38.	Analysis of Sustainability Impact Assessment Criteria for Organic Food Supply Chains in Sri Lanka *Marasinghe MMTS, Mahakalanda I and Navaratne N*	40
P2	39.	Optimizing Spectral Bands and Vegetative Indices for Early Detection of Banana Fusarium Wilt: A Systematic Review *Pandipperuma PANP, Karunadasa MC , Samaraweera MDS Ariyawansha T, Mendis P and GY Jayasinghe*	41
P3	40.	Silicon alleviates salt stress in rice (*Oryza sativa*) through the modifications of physiological and biochemical attributes. *Rupasinghe MGN, Hanafi MM, Yusop MR, Ismail R, Azizi P, Liyanage LRMC, and Mayakaduwa AP*	42
P4	41.	Morphological And Symptomatic Identification of Two Emerging Pests in Rice: *Hydrellia griseola* (Rice Leaf Miner) and *Hysteroneura setariae* (Rusty Plum Aphid) in Sri Lanka *Sarathchandra SR, Dilanka LBT, Jayaweera MPHK, Sandadevani KS, Senarath SAT.P, and Dissanayaka DMPS*	43
P5	42.	Effect of Different Crop Establishment Methods on Pest Abundance and Crop Damage in Rice *Jayaweera MPHK, Sarathchandra, SR, Hemachandra, KS, Sandadevani KS, and Dilanka, LBT*	44
P6	43.	Evaluating The Potential of Underutilized Parts Produced in The Processing of Cinnamomum Zeylanicum Blume Cultivated in Sri Lanka *Ranaweera RPDDD and Weeratunge HD*	45
P7	44.	Elevated atmospheric CO2 concentration enhances drought resistance of maize (*Zea mays* L.) by regulating cell membrane structure and phenylpropanoid metabolism *Dong LB ,Li P and Hao XY*	46
P8	45.	Unpacking The Determinants of Food Insecurity Among Households in Kabokweni, South Africa *Mgwenya LI, Ludidi NN, and Agholor AI*	47

P9	46.	The Impact of Economic Crisis on Food Security Among Urban Poor Households in Colombo District: A Multi-Indicator Assesment *Karunarathne MDH*, Koralagama DN and Harshana PVS*	48
P10	47.	New Insights into The Decline of Grain Protein of Rice and Wheat Under Elevated CO2 Levels Using Meta-Analysis *Thennakoon UPPT, Liyanage NDL, Lam SK, Bandara A and Senaweera S*	49
P11	48.	Evaluate the Effect of Gamma Irradiation Induced Mutation in M2 Generation of Vigna Mungo (Var. Mi- 1) *Aththanayake AMAS, Begum MMSFT and Sutharsan S*	50
P12	49.	Isolation And Identification Of Novel Fungal Strains With Potential Application In Food Industry From Sinharaja Forest Reserve Of Sri Lanka *Wickramasinghe D, Divisekera DMWD, Madage SSK, Perera GMDA, Jayawardena TMDA, Perumpuli PABN*	51
P13	50.	Investigating the Role of Neeramulliya (Hygrophila Auriculata) in Phytoextraction: A Study on Copper Remediation in Contaminated Soil *Dhanusha R, De Silva HCC and Rajawatta KMW*	52
P14	51.	Synthesis of Organic Hydrogels and Their Effects on Soil Properties and Seed Germination *Kirushnarajah V, Kajeevan K and Gnanavelrajah N*	53
P15	52.	The Effect f Low Dosage Gamma Irradiation on The Growth and Yield Of Vigna Mungo (Var. Mi-01) *Lalanjana, BHA and Sutharsan S*	54
P16	53.	Identification of White Leaf Disease on Sugarcane (Saccharum Officinarum L.) Using Drone-Based Multispectral Images *Gunawardhana SWRV, Kumara JBDAP, Piyasena NMPM, Vithanage PADV, Lekamge ALKD, Karunathilaka KAIK, Kulathilaka WDPD*	55
P17	54.	Farmer Perception of Climate Change in Relation to Adaptation in Anuradhapura District *Dilshani HKT and de Silva T*	56
P18	55.	Insecticidal Activities of Selected Botanical Extracts Against Larvae of Rice Leaf Folder *Cnaphalocrocis medinalis* *Jahan ASS, Sujarajini V and Haroon MH*	57

P19	56.	Garvicin Q-producing Lactococcus garvieae LG3092: Its Role in Mitigating Dysbiosis and Hp-Associated Gastritis *Li Y, Zhang J and Wu Q*	58
P20	57.	Probiotic Levilactobacillus brevis SR52-2 as a Novel Therapeutic Agent Against HPV Infection: Mechanistic Insights and Therapeutic Efficacy *Zhang Y, Liu Z and Li Y*	59
P21	58.	Assessing the Relationship Between Participatory Learning and Action (PLA) Approach on Climate Smart Agriculture (CSA) Adoption in Dry Zone of Sri Lanka *Dilrukshi MWKK and Gamage KC*	60
P22	59.	Assess the Suitability in Application of Easily Accessible Organic Amendments as A Nursery Soil Pre-Treatment Under Anaerobic Soil Disinfestation According to Their Carbon Releasing Efficiency in Upcountry Wet Zone Tea Ecosystem Sri Lanka *Gamage KC and Amarasinghe SR*	61
P23	60.	Comparative analysis of the antioxidant mechanisms in lycopene isomers: DFT study *Gunawardhana TK, Gajasinghe GMST, Wanniarachchi JD, Jayakody RS, Govender KK, Karunarathna BSW*	62

ORAL PRESENTATIONS

A1 **[01]**

ADAPTATION AND FEEDBACK OF SOIL MICROBIOME TO CLIMATE CHANGE

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ABSTRACT

Climate change poses a severe threat to global ecosystems, with soil ecosystems being particularly vulnerable despite their essential roles in carbon storage, nutrient cycling, and agricultural productivity. The soil microbiome, consisting of diverse microorganisms, is integral to maintaining these ecosystem functions. However, its responses, adaptive mechanisms, and feedback processes under climate change remain inadequately understood. Advancing research in this field is critical for mitigating the impacts of climate change on soil ecosystems and ensuring global food security by leveraging microbiome-based technologies. Our previous field and laboratory experiments have demonstrated that drought and warming—two major stressors driven by climate change—disrupt soil microbial composition and interactions, thereby altering soil nutrient cycling, soil resilience, and aboveground productivity. Furthermore, we investigated how ecological factors, such as plant diversity, regulate microbial responses to climate change by influencing resource availability. This was achieved through a field manipulation experiment that factorially controlled the plant diversity gradient. Existing evidence indicates that microbial communities adapt to climatic stressors through shifts in community structure and metabolic pathways. These adaptive mechanisms can further affect their roles in carbon sequestration, greenhouse gas regulation, and soil health maintenance. Notably, our study created microbial diversity gradients in microcosms at two different temperatures using soils from a 2000- km field survey. We foundthat a 23% to 43% losses in microbial diversity can weaken the thermal adaptation of soil respiration, constraining the capacity of soils to mitigate climate change. Understanding the adaptation and feedback of soil microbiome to climate change is crucial for predicting soil ecosystem responses under future climate scenarios and developing sustainable agricultural practices to support ecosystem resilience and productivity.

Keywords: adaptation, drought, feedback, soil microbiome, stainable agriculture, warming

A2 **[02]**

THE IMPACT OF CITIZEN VOICE AND ACTION (CVA) MODEL IN EMPOWERING YOUTH FOR SUSTAINABLE CLIMATE ACTIONS IN TANZANIA

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ABSTRACT

Climate change poses significant threats to vulnerable communities in Tanzania, especially those that depend on agriculture and natural resources (IMF, 2023). To address the impacts of climate changes in the rural communities in Handeni, and Korogwe districts in Tanga region of Tanzania World Vision implemented Sustainable Accountability Uniting Tanzanian and Irish Youth (SAUTI-Youth) project which used the Citizen Voice Action (CVA) model. This study investigates impacts of CVA model in empowering youths for sustainable climate actions looking on its effectiveness, sustainability, and application. A qualitative design approach used to conduct Focus Groups Discussions (FGDs) in 2023. Results indicate that the CVA model has proven to be a powerful tool for empowering communities. Found an increased community awareness and participation in implementation of various climate-friendly projects, including climate smart agriculture, planting of 10,000 trees, restoration of 5 hectares of land, and improved water access for 14,500 households. CVA initiatives improved livelihoods, resilience, and reduced vulnerability to climate change impacts in the project sites. Partnerships between government, civil societies, and NGOs was key. Capacity building and creating enabling environment policy found to be essential for scaling up CVA initiatives and ensuring their long-term sustainability. Unlike traditional top-down approaches, the model empowered communities to take ownership of climate actions led to impactful solutions. The model empowered communities in decision-making processes, scalling up capacity building, and implementation. It was found that the CVA model ensured that solutions are tailored to local needs and priorities, increasing relevance and sustainability. Limited resources, capacity constraints, and institutional barriers hindered the full potential of CVA. The study recommends CVA as a valuable tool for tackling climate change in both rural and urban contexts.

Keywords: climate change, citizen voice and action, community empowerment, youth engagement, sustainable development

A3 **[03]**

THE ADAPTATION TRIANGLE: A MULTIVARIATE ANALYSIS OF VULNERABILITY, RESILIENCE, AND LIVELIHOOD STRATEGIES IN SEMI-ARID REGIONS OF INDIA

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ABSTRACT

India is the seventh-most vulnerable country with respect to climate extremes. These semi-arid zones make up a significant 37% of India's total geographical area and they are characterized ecosystems by irregular rainfall, high temperatures, and hanging in the balance. It is uncharted territory, where the effects of climate change hit especially hard. These regions are even more at risk because of their unique characteristics, adding urgency to the need for a closer look at how they're affected and how they're adapting. So this study delves deep into understanding the intricate interplay between vulnerability and resilience in the context of climate change. It goes a step further by examining how livelihood strategies impact this dynamic interaction. The methodology employed multistage sampling design, covering three states (Rajasthan, Telangana and Tamilnadu) under semi-arid regions from north-west to southern regions of India and the sample size of approximately 300 households undergone primary data collection through an extensive survey focusing on 69 variables from each household. Household vulnerability and resilience indexes developed by adopting the methodology which was used for calculation of Human Development Index (HDI), Socioeconomic vulnerability index of IPCC, RIMA-II. Multivariate Analysis employed to investigate the joint impact of the vulnerability-resilience interplay in relation to diverse livelihood strategies of the households. By scrutinizing the efficacy of policy interventions, the impact of community-based support systems and the adoption of sustainable agricultural practices, this study endeavours to provide actionable recommendations for bolstering resilience and safeguarding livelihoods in the wake of climate change impacts. The significance of this research is not confined to the boundaries of India alone; it resonates across the globe.

Keywords: climate change, vulnerability, resilience, adaptation, livelihood strategies, semi-arid agriculture

A4 **[04]**

ENABLING DIGITAL PUBLIC GOODS FOR CLIMATE-RESILIENT AGRICULTURAL SYSTEM

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ABSTRACT

Farmers in tropical regions face increasing challenges due to climate change, including erratic weather patterns and soil degradation, threatening food and nutrient security. While digital platforms like DBT Fertilizers, DFS Bihar, and AgriStack have modernized agricultural support in India, they lack integrated climate resilience measures. We propose the Climate-Resilient Agricultural System (CRAS), a centralized, real-time reporting mechanism that enhances these platforms by incorporating climate analytics and AI-driven advisories to guide sustainable agricultural practices. The CRAS framework leverages Digital Public Infrastructure (DPI) to create Digital Public Goods (DPGs) with real-time climate data and AI-driven analytics to improve climate risk modeling, decision support, and policy implementation. It aggregates multi-source data (AgriStack, DBT Fertilizers, DFS Bihar, satellite imagery, and IoT sensors), standardizes it using AI models, and generates climate-smart advisories and early warning systems to help farmers and policymakers mitigate climate risks. MicroSave Consulting's work on AgriStack, DBT Fertilizers, and DFS Bihar has already enhanced subsidy transparency, improved financial access for farmers, and streamlined data interoperability, laying the groundwork for a climate-responsive agricultural ecosystem. CRAS further builds on these advancements by strengthening data-driven climate adaptation, sustainable input management, and real-time risk mitigation, ensuring greater food security and environmental resilience. With its scalable and replicable framework, CRAS can be adapted for other tropical regions, particularly South Asia, Sub-Saharan Africa, and Southeast Asia, where similar climate and agricultural challenges persist. By leveraging technology, data integration, and AI-driven insights, CRAS offers a sustainable model for climate-smart agriculture, empowering farmers and policymakers to build a more resilient agricultural future.

Keywords: climate resilience, sustainable agriculture, digital platforms, food security, tropical farming, environmental assessment

A5 **[05]**

SEDIMENTARY CARBON SEQUESTRATION POTENTIAL IN MANGROVES OF ORIENTAL MINDORO, PHILIPPINES: QUANTIFYING SOIL CARBON STOCKS

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ABSTRACT

Mangrove ecosystems play a vital role in climate mitigation, particularly through their soils, which serve as significant carbon sinks. However, extensive land use conversion and anthropogenic activities have led to a substantial decline in mangrove populations, especially in the Coral Triangle, a globally recognized marine biodiversity hotspot. This study assesses the sedimentary carbon sequestration potential of four mangrove zonations in Oriental Mindoro, a province within the Verde Island Passage and part of the Coral Triangle, by quantifying soil carbon stock (SCS) and analyzing associated soil properties, including organic matter content, depth, pH, bulk density, color, and texture. Mangrove areas and current land use were determined using LANDSAT-8 imagery and field-based techniques. Results indicate that SCS values range from 0.579 to 45.770 tons ha^{-1}, with soils predominantly dark in color, clayey in texture, and exhibiting acidic to neutral pH, conditions that align with mangrove environments characterized by anoxi, waterlogging, and slow decomposition rates. These findings underscore the critical role of mangrove soils in carbon storage and highlight the need for conservation strategies to mitigate carbon emissions and enhance climate resilience. The study provides valuable insights for policymakers and environmental planners in developing targeted interventions to protect mangrove ecosystems and optimize their carbon sequestration potential.

Keywords: mangrove soils, carbon sequestration potential, oriental mindoro, soil carbon stock

A6 **[06]**

SMALLHOLDER FARMERS RESILIENCE AND ADAPTATION TO CLIMATE CHANGE: IMPLICATION FOR CHANGE AGENTS IN BUFFELSPRUIT, SOUTH AFRICA

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ABSTRACT

The study investigated the demographic characteristics of smallholder farmers' and resilience approaches for adaptation to climate change in Buffelspruit, South Africa. The aims of the study were to determine local resilience approaches used by smallholder farmers and examine adoption behaviour in the use of local resilience approaches for mitigating climate change. The study was conducted in Buffelspruit, South Africa. A total number of 306 respondents were selected randomly for this study. Structured and semi-structured questionnaires were used for data collection. The adoption behaviour of smallholder farmers in the use of local resilience approaches was analyzed using the logit model. Findings reveal that crop rotation, crop diversification and the variations of planting dates were the resilience approaches used by smallholder farmers. Further, the result from the logit analysis reveals that gender (P<0.047), level of education (P<0.16), employment (P< 0.043), farm skills (P<0.058), extension services (P< 0.011) and farm size (P<0.022) influenced the adoption of climate resilient strategies in the study area. Extension education must move beyond technical training to enhance farmers' abilities for planning, problem solving, critical thinking and leadership skills to working with relevant stakeholders. Extension must be proactive with capacity development in climate change education.

Keywords: climate change, agriculture, mitigation, adoption, resilience approaches

A7 **[07]**

CLIMATE CHANGE, FOOD AND NUTRITION SECURITY: STRATEGIES FOR ADAPTATION

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ABSTRACT

Bangladesh is one of the most vulnerable countries to the impacts of climate change, due to its geographical location, high population growth, and depletion of natural resources. While climate change is not a new phenomenon, it is still a relatively new concept for many people in Bangladesh, particularly in rural areas. As agriculture forms the backbone of the rural economy, climate change places additional pressure on an already poor and socially vulnerable population. Climate change affects agriculture and food production through higher carbon dioxide levels, rising temperatures, altered precipitation patterns, increased frequency of extreme weather events, and the spread of pests, and pathogens. The impacts of climate change on food security are well-documented, with consequences varying spatially and temporally. In Bangladesh, the increased frequency and severity of floods and droughts, alongside decreasing agricultural productivity, have led to worsened food and nutrition insecurity. This study aims to explore strategies for adapting to climate change and enhancing food and nutrition security. Understanding the current status of climate adaptation is crucial for planning future actions. The authors conducted a comprehensive assessment of climate adaptation strategies in the study areas, focusing on food and nutrition security. Findings reveal that farmers and poor communities are already experiencing significant changes in climate patterns, including shifts in seasonal rainfall, changes in flood inundation, higher summer temperatures, prolonged droughts, increased salinity in agricultural land due to saltwater intrusion, and more frequent storms and cyclones. Despite these challenges, numerous barriers hinder effective adaptation. The authors tried to identify and address these barriers to improve resilience and securing food and nutrition in the face of climate change.

Keywords: climate change, food and nutrition security, adaptation

A8 **[08]**

APPLICATION OF AI-BASED SOLUTIONS FOR CLIMATE-SMART AGRICULTURE TO ENHANCE THE CLIMATE CHANGE RESILIENCE CAPACITY OF PADDY FARMERS IN THE DRY ZONE

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ABSTRACT

Paddy farmers in the dry zone of Sri Lanka face immense challenges in achieving their production targets and income due to the impact of climate change. They require an efficient mechanism to receive the necessary information from relevant authorities at the proper time to adopt climate-resilient paddy farming adaptation and mitigation strategies. This research aims to establish the Artificial Intelligence (AI) enabled web application for increasing climate resilience of paddy farming in the dry zone with resources in both Sinhala and English languages. The data sources included data from weather reports, satellite imagery, soil data, and agricultural statistics were used as secondary data sources. For the task of predicting drought situations for water management, a Convolutional Neural Network model was used. The model was evaluated for accuracy, precision, recall and F1 Score statistical measurements. Inferential sampling was also exercised among the 30 farmers of Anuradhapura district of Sri Lanka which was one of the worst affected areas by the drought and unexpected rainfall. The sample was purposely selected for this study. The findings indicated that the adopted AI model has the capability of correctly classifying the occurrence of droughts with an accuracy of 80% in addition to having an F1 Score of 0.79. A traits and satisfaction survey conducted among the farmers revealed that 87% of users' acceptance regarding the system's advice as easy to understand and use. The findings of this research are highly useful for developing a web dashboard for efficient access to required information to strengthen the efficient decision-making of farmers to adopt climate-smart agriculture practices. This system can be integrated into extension services in the agriculture sector.

Keywords: climate change, agriculture, artificial intelligence, dry zone, Sri Lanka

B1 **[09]**

PLANTDRAW: A WEB TOOL FOR FAST IMAGE-BASED PHENOMICS RECOGNITION AND ANALYSIS OF DISEASE IN PLANT SCIENCE

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ABSTRACT

Plant diseases pose an enormous challenge globally, with the potential to cause 100 % yield loss and threaten global food security. Early detection and prediction of diseases can significantly reduce food losses due to diseases. For this reason, researchers have endeavored to develop high-throughput phenotyping methods for disease detection. However, the lack of integration of these existing methods for plant disease detection has led to poor rapid recognition detection of diseases. To improve the efficiency of disease detection, we have introduced PlantDRAW, a web-based plant disease recognition and analysis platform. PlantDRAW has valuable features such as rapid intelligent diagnostics, disease data, and efficient disease detection and control. PlantDRAW categorizes 60 crops and 384 diseases and performs disease detection and apple leaf disease segmentation tasks. Our web platform efficiently reduces photo analysis time to under 30 seconds, providing users with rapid calculation of disease-affected areas and comprehensive insights across 120 diverse metrics, achieving an impressive 94.78% accuracy in disease recognition. With its user-friendly interface and functional design, PlantDRAW has great potential to enhance plant disease control research. PlantDRAW is freely available at http://plantdraw.samlab.cn.

Keywords: plant phenomics, plant disease recognition, image processes, web tool

B2 **[10]**

DEVELOPING FUTURE CROPS USING THE "FASTSTACK' PLATFORM AND SPEED BREEDING"

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ABSTRACT

Parents selection and stacking of desirable alleles play a crucial role in developing superior crop varieties that meet the demands of modern agriculture**.** Net form net blotch (NFNB), spot form net blotch (SFNB), and Leaf scald (LS), are some of the most destructive foliar diseases of barley crops worldwide. A haplotype mapping strategy was applied to 724 diverse barley accessions from the Australian Grains Gene bank for NFNB, SFNB, and LS, to support the discovery and utilization of exotic resistance alleles. A total of 14 phenotypic disease datasets for NFNB, SFNB, and LS and 9,050 polymorphic SNPs with known chromosomal positions were used for the analysis. Pairwise linkage disequilibrium (LD) (i.e., r^2 as LD measure) was calculated across each of the seven barley chromosomes, and the local genomic estimated breeding value (localGEBV) method was used to identify important chromosomal blocks for resistance. Of the 4,548 LD-blocks, 51 were unique or common across the 14 experiments, with variance estimates ranging from 0.01 – 1.30%. A total of nine blocks were deemed to contain novel resistance loci. From these, only a single block (b000104) on chromosome 1H (287.83 Mb) was associated with resistance to all three diseases. AI-guided crossing strategy was applied to 30 selected parents to stack the resistance alleles and develop three populations. By establishing a comprehensive haplotype catalogue for multiple disease resistance and development of new populations with stacks of desirable haploblocks provide new tools for the research community and breeders that could be used for crop genetic improvement.

Keywords: genetic resistance, barley diseases, LD, GEBV, allele stacking

B3 **[11]**

MORPHOLOGICAL AND SYMPTOMATIC IDENTIFICATION OF TWO EMERGING PESTS IN RICE: *Hydrellia griseola* (RICE LEAF MINER) AND *Hysteroneura setariae* (RUSTY PLUM APHID) IN SRI LANKA

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ABSTRACT

Rice is the staple food and a widely cultivated crop in Sri Lanka. Due to unexpected climate changes, minor pests may escalate to major pests, potentially causing outbreaks that exceed the economic injury level. This study documents the first identification of two newly emerging pest species affecting rice. During 2023/24 *Maha* season, unidentified damage symptoms: linear whitish streaks in the central part of the leaf blade and a blotch-like appearance as they develop, were reported in Kandy, Kurunegala, and Polonnaruwa, reoccurring in Kalutara during 2024/25 *Maha* season in Sri Lanka. Plant samples were collected from affected fields and reared under laboratory conditions, and emerged adults were observed under a dissection microscope. To further confirmation, emerged adults were introduced to the rearing cages which contain healthy rice plant/cage and observed. The consistency between damage symptoms in affected fields and healthy rice plants, confirms the pest's identification. In August 2024, an unknown aphid colony was observed infesting rice plants at Rice Research and Development Institute, Bathalagoda. Aphids were primarily found on the peduncles of panicles, with few on spikelet and leaves. Morphological identification of pests was done using taxonomic keys and the book, Insect Pests of Rice published by the International Rice Research Institute. Two pests were identified as *Hydrellia griseola* (Rice Leaf Miner) and *Hysteroneura setariae* (Rusty Plum Aphid) respectively. The presence of *H. setariae* on rice in Sri Lanka is significant, as this species has previously been recorded on other Poaceae crops, but not rice. This finding highlights the emergence of a new threat to rice and underscores the need for continuous monitoring and proactive pest management approaches to safeguard rice cultivation in Sri Lanka.

Keywords: climate change, rice leaf miner, rusty plum aphid, taxonomic keys, whitish streaks

B4 **[12]**

EFFECT OF DIFFERENT CROP ESTABLISHMENT METHODS ON PEST ABUNDANCE AND CROP DAMAGE IN RICE

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ABSTRACT

Rice is the staple food and a major cultivated crop in Sri Lanka. Insect pest infestations are a key constraint in rice production, highlighting the need for cost-effective, environmentally friendly pest management strategies. This study examined the effect of different crop establishment methods on pest abundance during the 2021/2022 *Maha* season in Polonnaruwa, Kurunegala, and Kegalle districts, representing the dry, intermediate, and wet zones of Sri Lanka respectively. The experiment was laid out as Completely Randomized Block Design with three replicates. Six establishment methods: Broadcasting (T1), Row seeding (T2), Manual transplanting (T3), Machine transplanting (T4), Parachute method (T5), and Farmer practice (T6) were used as treatments. The abundance of thrips, leaf folder, and brown planthopper was considered separately and data were analysed using SAS software. Results showed lower pest populations in parachute (4±0.9, 21±3.8, 9±1.4), machine (9±1.2, 33±2.9, 12±2), and manual transplanting (8±1.5, 34±2, 10±1.7) methods, while higher infestations were recorded in row seeding (24±1.2, 50±3.1, 19±2.8), broadcasting (26±3.8, 48±4.5, 21±1.7), and farmer practice (28±2.8, 55±4.1, 25±1.8) methods. This trend was consistent across all three districts. Higher yields (Kegalle: 3.8-4.1 Mt/ha, Kurunegala: 5.0-4.9 Mt/ha, Polonnaruwa: 6.2-5.9 Mt/ha) were recorded in fields using parachute, manual, and machine transplanting, while the lowest yields (Kegalle: 2.2-2.9 Mt/ha, Kurunegala: 3.3-3.8 Mt/ha, Polonnaruwa: 4.5-4.2 Mt/ha) were observed in broadcasting, row seeding, and farmer-practiced fields. Thus, parachute, machine, and manual transplanting are effective methods for reducing pest infestations and enhancing productivity. Further research is needed to explore the relationship between microclimate and pest abundance, and this study highlights primary information on ecological based pest management but provides better insights for future research.

Keywords: rice, pest management, crop establishment methods, yield, sustainable agriculture

B5 **[13]**

APHIDS (APHIDIDAE) IN THE GARDEN OF UNIVERSITY OF PERADENIYA: DIVERSITY, DISTRIBUTION AND HOST SPECIFICTY

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ABSTRACT

Aphids (Hemiptera: Aphididae) are tiny soft-bodied sap-feeding insects with parthenogenetic reproduction, making them major agricultural pests; particularly in tropical climates. This study aimed to identify the diversity, distribution and host specificity of aphid species in the garden of University of Peradeniya. Flora (cultivated, ornamental, and wild plant species) from ground to approximately 1.5 m high canopy was scouted in an area around 250 ha. Morphological identification was performed using live photographs and permanent slide preparations. From collected 75 specimens, ten species were identified, with eight were taxonomically identified to species level across six genera and two subfamilies (Aphidinae,Greenidenae). An annotated identified species list along with the host plant and a distribution map were developed. *Aphis gossypii* Glover exhibited the widest host range and was the most polyphagous species, found on 15 plant species from nine families, including cultivated, ornamental, and wild plants with four different color morphs on multiple plant parts, including leaf buds, flower buds, tender leaves, and stems. *Hysteroneura setariae* showed the widest distribution, only associated with weeds of Poaceae, particularly in panicles and stems. *Myzus persicae* primarily infested cultivated plants, particularly *Brassica oleracea* (Kale) and *Capsicum annuum* (Chilli) with distribution limited to cultivated areas. *Brevicoryne brassicae* and *Greenidea psidii* van der Foot were recorded for the first time in Sri Lanka, associated with *Brassica oleracea* (Kale) and *Psidium guajava* (Guava), respectively. Remaining three species exhibited monophagy and had a limited distribution. These findings highlight the diversity and host specificity of aphids in the university garden, emphasizing the role of weeds as alternative hosts that may facilitate aphid dispersal into crops, as well underscore the importance of aphid monitoring for effective pest management.

Keywords: aphids, distribution, host specificty, polyphagous species

C1 **[14]**

AN INNOVATIVE APPROACH TO AMELIORATE ACID SULPHATE SOILS OF NILWALA BASIN

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ABSTRACT

Paddy tracts of Nilwala basin has been affected by acid sulphate soils through the implementation of Nilwala Flood Protection and Drainage Project in 1979. Nnearly 7000 acres of lowland paddy tracts abandoned. In these lands water table goes down to the level of 50 cm below soil surface during rainless periods and soil pH falls to 3-4 causing acid sulphate condition. Hitherto several efforts have been made to ameliorate the paddy lands but none were able to provide economical and farmer acceptable solution. An innovative approach where prevention instead of curing was suggested and the project was funded bt National Science Foundation (NSF).Thus the feasibility of using natural hydraulic forces to increase water table to keep the acid sulphate forming minerals at bay was tested. Water table fluctuation in relation to water level in the drainage channel was studied over one year and a very high correlation (r^2=0.985) indicating a possibility of increasing water table by heading up water in the drainage channel. Simulated greenhouse pot experiment showed that increasing water table to 15 cm below soil surface allowed rice plants to grow effectively, and the plant survival was 112 (53% survival) compared to 28 (15% survival) plants in control. Recorded plant height of Bg. 357 variety was 35 cm compared to 22 cm in different treatments and control, respectively. Soil pH also increased to a value closer to 6.0 in the treatment which is conducive for rice cultivation. However, the low values of plant survival and plant heights were due to unusual extreme low rainfall in 2020/21 maha season compared to 10 years' average.

Keywords: jarosite, natural hydraulic forces, pyrite oxidation, rice cultivation, water table

C2 **[15]**

AGROECOLOGICAL APPROACHES FOR ENHANCING RESILIENCE AND SUSTAINABILITY IN RURAL AGRI-FOOD SYSTEMS: LESSONS FROM KILIMO TIJA KIGOMA – TANZANIA

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ABSTRACT

Climate change is a threat to most of vulnerable communities across the globe with climate adaptation technologies/innovations stand as a crucial way to enhance livelihoods resilience, food security and improved nutrition (WHO, 2023). The Kilimo Tija Kigoma (KITIKI) project, implemented in Tanzania's Kigoma Region through a partnership with World Vision Tanzania, the World Food Programme, and Good Neighbors Tanzania, demonstrates the transformative potential of agroecology in creating resilient and sustainable agri-food systems. This study assesses the contribution of KITIKI in harnessing agroecological practices to improve rural livelihoods, enhance food security, and promote environmental sustainability. The study used a qualitative approach to collect data from Savings for Transformation (S4T) groups and Agricultural Marketing Cooperative Society (AMCOS) in the Kibondo, Kasulu, and Kakonko districts through focus group discussions, observations of demonstration farms, and quality-declared seed demonstration farms. Findings reveal significant adoption of sustainable improved farming practices including use of climate-resilient seeds. Capacity-building initiatives enhanced community adaptation strategies, while S4T groups improved financial access for agricultural inputs. Strengthened AMCOS improved market access and increased household incomes. Soil health assessments through districts agriculture officers, quality-declared seed demonstration farms, and irrigation systems, contributed to enhanced food systems and increased farmers livelihoods. The study underscores the importance of improving post-harvest storage and fostering multi-sector collaboration among governments, private sectors, and civil society organizations. Policymakers, researchers, and development actors should integrate agroecological practices into planning and budgeting, while encouraging hands-on learning for rural farmers. Technology should also be prioritized in government agendas.

Keywords: agroecology, climate resilience, livelihoods, market access

C3 **[16]**

FACTORS INFLUENCING THE SOIL PHYSICOCHEMICAL PROPERTIES UNDER DIFFERENT LAND USE OF JHILMIL JHEEL WETLAND CONSERVATION RESERVE, HARIDWAR – UTTARAKHAND, INDIA

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ABSTRACT

Assessing soil health relies significantly on its physicochemical attributes, which lay the foundation for biological activity in the soil. This investigation took place in the Jhilmil Jheel Wetland, a Conservation Reserve for swamp deer (*Rucervus duvaucelii*), categorized as "Vulnerable" according to the IUCN Red Data Book. Approximately 518.9 hectares of this area are covered by natural forest, divided into three main subsites: Mixed Moist Deciduous Forest (483.9 hectares), Riverine Forest (10 hectares), and Secondary Scrub Land Forest (25 hectares). This natural forest section plays a vital role in providing shelter to swamp deer during hot summers and serves as a breeding ground for them. Recognizing the wetland's significance, this study delved into the physicochemical properties of the forested portion, examining the factors influencing these properties across different land uses. Key analyses encompassed pH levels, soil texture, bulk density, coarse fragments, organic carbon, total nitrogen, available phosphorus, and exchangeable potassium. The examination uncovered that the soil within the Mixed Moist Deciduous Forest played a crucial role in preserving soil nutrients. In comparison to the other two subsites, the soil in the Mixed Moist Deciduous Forest displayed exceptional physical and chemical properties. Statistical analysis underscored substantial mean disparities between the Mixed Moist Deciduous Forest and the other areas, highlighting reduced nutrient levels in the Riverine Forest and Secondary Scrub Land Forest, making these soils more prone to degradation and desertification. These findings underscore the impact of land-use variations on soil physicochemical properties, which, in turn, influence soil biological activity. These insights provide valuable guidance for future studies related to soil quality, management, and long-term sustainability.

Keywords: wetland, physicochemical properties, conservation reserve, swamp deer, land use, sustainability and biodiversity

C4 **[17]**

SYMBIOSIS FOR SURVIVING ENVIRONMENTAL STRESSES

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ABSTRACT

Soil microorganisms take an active part in biogeochemical processes in the soil, and play key roles in maintaining the integrity and functionality of terrestrial ecosystem. Among the numerous soil microorganisms, arbuscular mycorrhizal (AM) fungi are typical plant symbiont that can form symbiotic associations with the majority of terrestrial plants. The fungi obtain carbohydrates from their host plants, and in return help plant with the uptake of mineral nutrients and water from soil. Many studies indicated that AM symbiosis can significantly improve plant adaptation to various environmental stresses, such as nutrient deficiency, drought stress and soil pollution. As AM fungi generally do not have host specificity, hyphal links can connect different plant roots through which neighboring plants can exchange materials, and resouces can be redistributed among different plants in a plant community through the common mycorrhizal network. Mycorrhizal symbioses are broadly involved in material cycling in the ecosystem, and largely affect plant biodiversity and productivity, and also the resilience of the ecosystem to environmental changes. Due to the multifunction of AM fungi in the ecosystem, stress physiology and ecology of AM fungi have long been hot topics in the research area of soil biology and ecology. Meanwhile, more and more attentions have been paid to developing mycorrhizal technologies for sustainable agriculture and ecological conservation. Based on our previous work, we will systematically introduce the ecological functions and underlying mechanisms of AM symbiosis and also the application of mycorrhizal technology for supporting sustainable agriculture. We aim to attract broad interests to mycorrhizal research and promote the development and application of mycorrhizal technologies.

Keywords: environmental stress, sustainable agriculture, mycorrhizal fungi, mycorrhizal technology, biofertilizer

C6 **[18]**

PRODUCTION OF UREA INTERCALATED BIOCHAR FROM AGRICULTURAL WASTE AND EVALUATION OF ITS POTENTIAL BENEFITS

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ABSTRACT

Urea-intercalated biochar (UIBC) enhances nitrogen retention, however, its low nitrogen content leads to high application rates. This study optimized urea adsorption in biochar using different feedstocks (coir dust and groundnut shell), concentrations (50 % and 100 %), and soaking methods (capillary action and direct soaking. Statistical analysis (two-way ANOVA, $P < 0.0001$) confirmed that coir dust with capillary action and 100% urea exhibited the highest nitrogen content (38.31 ± 0.76 %). This formulation was further optimized by testing three particle sizes (0.25 mm, 0.5 mm, 1mm) and three urea concentrations (50 %, 75 %, 100 %), where coir dust, capillary action, 0.25mm, 100% UIBC recorded the highest nitrogen content 40.13 ± 0.51 %. Nitrogen leaching and release patterns of UIBC were assessed with seven treatments; T1 (control), T2–T4 (100 %, 75 %, 50 % urea), and T5–T7 (100 %, 75 %, 50 % UIBC), in a completely randomized design ($P<0.0001$) with four replicates. In the incubation study, T5 (100% UIBC) demonstrated significantly higher available nitrogen (66.5 ± 3.5 gkg^{-1}), cation exchange capacity (37.575 ± 0.70 $cmol^{+}kg^{-1}$), microbial respiration (9.685±0.98 mg $100g^{-1}$) and total organic carbon T5 (45.97±1.51 %) compared to T2 (100% urea) (54.25 ± 3.03 gkg^{-1}, 34.625 ± 1.07 $cmol^{+}\ kg^{-1}$, 7.047±1.4 mg $100g^{-1}$and 22.56±2.22 %, respectively). In the leaching study, cumulative nitrate loss was lower in T5 (4.19±0.04 mg) compared to T2 (5.38±0.05 mg), indicating reduced nitrogen leaching in UIBC treatments. Overall, this study demonstrated the potential of urea-intercalated biochar treatments to enhance nitrogen retention, soil quality and reduce leaching losses.

Keywords: urea-intercalated-biochar, slow-release nitrogen

D1 **[19]**

SEMI-TRANSPARENT SOLAR CANOPY FOR GREENHOUSES

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ABSTRACT

This study investigates the techno-economic feasibility of integrating agrivoltaic systems, specifically semi-transparent solar canopies, into greenhouse environments to optimize both energy production and crop yield. The primary objectives are to analyze the impact of 32% transparent solar panels on bell pepper growth and energy output, model and evaluate radiation received by crops under partial shading, propose an efficient agrivoltaic system design, and assess the economic benefits of this approach. Leveraging the DSSAT crop simulation tool, this research focuses on bell pepper cultivation under controlled greenhouse conditions. The selected location's climate, characterized by an average temperature of 25°C and solar insolation of 18.17 MJ/m² per day, serves as the basis for simulations. Optimal growing conditions for bell peppers, including a temperature range of 25 to 30°C and a light level of 25,000 lux, are maintained using coco peat baskets, Albert Solution fertilizer, and insect-protective side nets. The traditional 80% polythene film greenhouse roof is replaced with 32% transparent 90 semi-transparent solar panel units (305 W each), in raw wise with a gap of 1ft which lead to around 67% total transparency. The panels are oriented East-West to maximize power generation. Irradiance analysis, conducted using Rhinoceros 3D 8 with Grasshopper and Ladybug extensions utilizing Python scripting, models the radiation distribution under the solar canopy. Plant modeling revealed that the baseline bell pepper yield was 12,514 kg/ha without the solar panels. After implementation of the solar canopy, the yield decreased to 10,676 kg/ha due to shading effects. The addition of grow lights restored the yield to 12,501 kg/ha, demonstrating their effectiveness in compensating for reduced natural light. The total energy output of the system is 53215.97 kWh per year. Considering the plant's life cycle of 8 months, the total energy generation for this period is 36,671.51 kWh. This research demonstrates the potential of agrivoltaics to achieve sustainable agricultural practices by balancing energy production and crop yield, offering practical insights for real-world applications.

Keywords: agrivoltaic, solar canopy, greenhouse, grow lights, energy generation, radiation modeling, yield optimization

D2 **[20]**

REMOTE SENSING AND COMPUTER VISION FOR TEA AGROVOLTAIC OPTIMIZATION

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ABSTRACT

Agrovoltaics presents a promising avenue for sustainable agriculture, particularly for shade-loving crops like tea. However, the light reduction caused by semi-transparent solar panels can negatively impact plant growth. Initial field assessments, including manual measurements and visual inspections, revealed certain impacts of the solar canopy, such as increased susceptibility to blister blight during heavy rain. As tea is a perennial crop, these measurements and inspections have to be conducted continuously for a long time. However, performing this manually is bound to consume time and labor and will also produce inconsistent results. The project addresses this challenge by developing a remote monitoring system to monitor the effects on the tea plants due to the grow lights and solar canopy. Hence, three experimental plots were established: a control plot without a solar canopy, a plot with a solar canopy and no grow lights, and a plot with a solar canopy and grow lights. The monitoring system consists of IP surveillance cameras, irradiance sensors, DHT21 for atmospheric temperature and humidity, JXBS-3001-EC-RS for soil temperature, moisture and electric conductivity, driven by ESP32 microcontrollers. The implemented monitoring system has been acquiring RGB and IR images at a rate of one image per hour and sensor data at a rate of one sample per minute from December 2024 onwards. Computer vision, utilizing YOLOv8 object detection, is adopted to analyze images and infer about the plant conditions, namely the spread of blister blight and the density of tea shoots. Utilizing this information about the plants and their association with the environmental measurements, we aim to optimize grow light control to maximize tea yield while minimizing plant stress.

Keywords: agrovoltaic, remote monitoring, computer vision, grow lights

D3 **[21]**

C4 CROP MILLETS HOLD WITH GREAT PROMISE FOR FOOD SECURITY AND NUTRITION UNDER ELEVATED CO_2 CONCENTRATION

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ABSTRACT

Global challenges such as climate change, food security, nutrition require the adoption of climate-resilient, nutrient-rich crops to support a growing population under changing environmental conditions. Millets, C4 crops, are energy and water-efficient crops that produce high yields with low water input in stressful environments. In this study, gas exchange parameters, yield, nutritional quality, and metabolites of millets were investigated under ambient [CO_2] (aCO_2, approximately 400 μmol mol^{-1}) or elevated [CO_2] (eCO_2, approximately 600 μmol mol^{-1}) by using open-top chambers. 15 plants were analyzed at each treatment for statistical reliability. eCO_2 increased net photosynthesis rate by 7%-36% in millets compared with aCO_2. eCO_2 significantly increased the yield of millet by 9.8%-29.9% compared with aCO_2 (P <0.05). eCO_2 significantly increased the contents of Mg (27.3%), Mn (14.6%) and B (21.2%) over three years in broomcorn millet and increased P content by an average of 12.4% in foxtail millet (P <0.05), whereas it did not affect the contents of K, Ca, Cu and Zn in millets. eCO_2 significantly decreased protein content by an average of 7.3% across the three years in millets. This decrease was attributed to the decreased L-glutamine and L-lysine metabolites in broomcorn millet under eCO_2. However, flavonoids including kaempferol, apigenin, eriodictyol, luteolin, and chrysoeriol were increased in broomcorn millet under eCO_2. This may potentially be useful for breeding more nutritious plants under climate change scenarios.

Keywords: elevated CO_2 concentration, millets, yield, nutrition, photosynthesis

D4 **[22]**

IMPACTS OF CLIMATE VARIATION ON YIELDS AND PRICES OF SELECTED FOOD CROPS IN SMALL ISLANDS: THE CASE OF MAURITIUS

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ABSTRACT

This study examines the effects of climate variation on vegetable yields and prices in Mauritius. It investigates how rising temperatures, altered rainfall patterns, and extreme weather events impact agricultural yields and market dynamics. Monthly data from January 2003 to December 2021 on temperature, rainfall, humidity, retail prices of grade-one vegetables were analyzed. Results show increasing yields for vegetables like chillies, tomatoes, beans, and calabash, while cabbage, cauliflower, brinjal, groundnut, and green peas yields have declined. Statistical analysis revealed significant correlations between climate variables and vegetable prices. Adverse weather events—such as high temperatures, cyclones, flash floods, and drought cause yield reductions and price spikes. Additional factors, including labour shortages, pest outbreaks, consumer preferences, input costs, soil health, and the ageing farmer population, further influence supply dynamics.The findings underscore the vulnerability of agriculture in small island states to climate change, highlighting its effects on vegetable yields, supply, and demand, and thus on prices. Proposed adaptation strategies include implementing climate-smart agricultural practices, diversifying crops, improving irrigation systems, establishing early warning systems, and developing climate-resilient crop varieties. These measures aim to mitigate climate impacts and ensure food security. The study emphasizes the importance of collaboration among policymakers, farmers, and researchers to address these challenges and promote sustainable agricultural practices in the face of climate change. By understanding the intricate relationships between climate change, crop production, and market dynamics, stakeholders can better navigate the challenges of ensuring food security in small islands.

Keywords: climate change, crop yields, small islands, crop prices, climate adaptation and mitigation

D5 **[23]**

STRATEGIES FOR CLIMATE CHANGE ADAPTATION AMONG TEA GROWERS IN THE UVA REGION OF SRI LANKA: AN ASSESSMENT OF KNOWLEDGE, PERCEPTIONS, AND RESILIENCE

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ABSTRACT

Sri Lanka is among the countries most affected by climate change, which poses serious threats to agricultural productivity particularly tea cultivation, due to its sensitivity to temperature and rainfall variations. Given the importance of tea to the country's economy and job market, it is critical to comprehend how vulnerable this industry is to climate change. The present study aims to assess the knowledge and perceptions of tea growers on climate change and its impacts, as well as the adaptation and mitigation strategies employed by tea plantations in the Uva region. A stratified random sampling technique was applied to select the sample tea smallholders and Regional Plantation Companies (RPCs) estates. A sample of Regional Plantation Company (RPC) estates and tea smallholders was randomly selected from regions considered as vulnerable and extremely vulnerable to climate change. This sample included 100 tea smallholders from five Grama Niladhari (GN) Divisions and 30 estate managers and field staff from eleven RPC estates located in these two change-affected regions. Descriptive statistics and multiple linear regression analyses were employed to analyse data. Findings of the study revealed varied levels of knowledge and perceptions about climate change among tea growers, and significant challenges in adopting effective adaptation strategies. The findings indicate that RPC estate workers have a significantly higher level of knowledge about climate change, with 70% reporting high or very high knowledge levels. Additionally, 80% have a positive perception of climate change, ranging from moderate to very high. In contrast, tea smallholders show a concerning trend: 45% have low knowledge levels, and 47% exhibit moderate perceptions of climate change. The study also reveals a notable gap in the adoption of climate change adaptation strategies between the two groups. Among RPC respondents, 80% demonstrate high levels of adoption, with 57% rated as high and 23% as very high. Conversely, 53% of smallholders exhibit very low levels of adoption, and an additional 40% show low levels of adoption. The results of the multiple linear regression indicate that there is a moderate positive correlation ($R = 0.573$) between the level of adoption of climate change mitigation practices and the independent variables related to tea smallholders, explaining 32.9% of the variance ($R^2 = 0.329$). In contrast, a strong positive correlation ($R = 0.772$) was found in the case of Regional Plantation Companies (RPC) estates, where 59.6% of the variability in the adoption level is explained by the independent variables ($R^2 = 0.596$). Key factors influencing the adoption of practices among tea smallholders include education, experience in tea cultivation, and technical skills. In contrast, age, gender, and financial stability do not significantly affect adoption rates. For Regional Plantation Companies (RPC) estates, perceptions of climate change, along with yield, production, and profitability, serve as the main drivers for embracing climate-resilient practices. This study highlights the importance of improving education and technical support for tea smallholders, as well as implementing targeted interventions to raise awareness about climate change and address technical challenges in RPC estates.

Keywords: adaptation; climate change; knowledge; mitigation; perception; vulnerability

D6 **[24]**

QUANTIFICATION OF POST-HARVEST LOSSES AND DIETARY FIBER CONTENTS OF FRUIT AND VEGETABLE WASTES GENERATED IN DAMBULLA AND THAMBUTHTHEGAMA ECONOMIC CENTERS IN SRI LANKA

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ABSTRACT

In Sri Lanka, improper harvesting, handling, packing, and transportation cause significant post-harvest losses of fruits and vegetables, leading to environmental and economic challenges. Utilizing these wastes or by-products as dietary fiber (DF) sources in food applications offers a promising solution due to their rich nutritional and functional properties. This study aimed to assess the post-harvest losses of fruits and vegetables at the Dambulla and Thambuththegama economic centers in Sr Lanka and evaluate the dietary fiber contents of their major wastes/by-products. Primary data were collected through structured questionnaires in Sinhala, Tamil, and English, targeting wholesalers and retailers across the thre main agricultural sesons of Sri Lanka, “Yala” (May), “Maha” (February), and off-season (September). The survey captured waste types, quantities, and their seasonal variations. DF content of selected by-products/wastes was analyzed using the water extraction method. Results revealed that post-harvest losses were highest during the “Yala” season, with banana (18%), pumpkin (17%), watermelon (15%), and cucumber (10%) as major contributors. In the off-season, watermelon accounted for the highest waste (31%), followed by pumpkin (17%) and cucumber (10%). During the “Maha” season, significant losses were recorded from banana (15%), papaya (14.2%), mango (14%), watermelon (12.5%), and brinjal (9%). DF analysis showed that mango flesh had the highest soluble DF content (34.08±1.99%) while cucumber peel had the highest insoluble DF content (57.09±0.87%). These findings highlight the potential of fruit and vegetable by-products as valuable DF sources in functional foods, contributing to both nutritional enhancement and sustainable waste management. Further product development studies are recommended to explore their practical applications.

Keywords: yala and maha seasons, sustainable waste management, post-harvest practices, fruit and vegetable by-products

D7 **[25]**

ASSESSING THE IMPACT OF THE INDIAN OCEAN DIPOLE(IOD) ON SRI LANKA'S RAINFALL PATTERNS AND AGRICULTURE: A GIS AND RS BASED APPROACH

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ABSTRACT

Climate change is increasingly impacting agricultural productivity of the world by causing irregularities in rainfall patterns worldwide, with the Indian Ocean Dipole playing a crucial role in influencing rainfall patterns across the Indian Ocean. This study mainly focuses on assessing the impact of the Indian Ocean Dipole on Sri lanka's rainfall patterns and the way it affects the agricultural productivity over time. This study collects data from the historical Indian Ocean dipole indices from reputable sources such as NOAA Physical Sciences Laboratory, NOAA Ocean Observing and Monitoring Division (OOPC), Indian National Centre for Ocean Information Services (ESSO-INCOIS), long-term rainfall data from meteorological stations across Sri Lanka, agricultural production data from relevant government agencies and satellite imagery for rainfall estimation and crop monitoring. GIS and remote sensing techniques are employed to assess the spatial and temporal variations in rainfall and agricultural productivity. Last year (2023) which was an El Nino year with an IOD positive phase brought heavy rains to Sri Lanka in the months of October to December. This severely affected the agricultural sector especially in the central Highlands. Therefore, this study aims to provide the deeper understanding about the effects of the Indian Ocean dipole on Sri Lankan agriculture to identify vulnerable regions and to design A GIS based solution for planning the agriculture and mitigating the risk .This GIS solution will offer spatially explicit vulnerability maps and decision support for optimized agricultural planning and risk mitigation against IOD impacts in Sri Lanka .This research will vastly contribute towards the identification of the impacts of IOD towards Sri Lanka and for the development of effective adaptive strategies.

Keywords: climate change, crop productivity, Indian Ocean Dipole (IOD), central highlands

E1 **[26]**

MICROPLASTICS POLLUTION IN THE BAY OF BENGAL - A CALL FOR REGIONAL POLICY FRAMEWORKS AND TRANSBOUNDARY COLLABORATION

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ABSTRACT

Microplastics pollution has emerged as a critical environmental challenge, with significant implications for aquatic ecosystems, biodiversity and human health. It also contribute to climate change by releasing greenhouse gases and disrupting marine ecosystems that sequester carbon. This paper synthesizes findings from a series of our field sampling and laboratory investigations conducted in the Bay of Bengal (BOB), its coastal mangrove ecosystem and connected rivers, along with policy recommendation workshops with relevant stakeholders and partners. Our research reveals widespread contamination of microplastics in water, sediment, fish and crude salt, and ingestion by fish and invertebrates, highlighting the pervasive nature of this pollution in aquatic ecosystems and transfer through the aquatic food chain, posing potential risks to food safety and human health. A key focus of this paper is the transboundary dynamics of microplastics pollution, as evidenced by our research along the Brahmaputra-Jamuna River. This work underscores the complex nature of microplastics transport across borders and the urgent need for regional cooperation to address this issue. Despite ample evidence of microplastics pollution in the BOB region, comprehensive policy frameworks to mitigate its impacts remain lacking. Our findings emphasize the necessity of developing regional policy frameworks that integrate scientific research, long-term monitoring and targeted management strategies. We propose to employ regular environmental monitoring programs, establishment of transboundary collaboration mechanisms and implementation of region-specific mitigation measures to reduce microplastics pollution. By fostering regional cooperation and evidence-based policymaking, the BOB region can serve as a model for addressing microplastics pollution in coastal-marine environments globally. This paper highlights the urgency of unified regional action to safeguard the ecological integrity and sustainability of the BOB and its interconnected ecosystems.

Keywords: microplastics, bayof Bengal, aquatic food chain, transboundary collaboration, regional policy

E2 **[27]**

REVITALIZING THE MILPA SYSTEM IN NORTHERN VERACRUZ, MEXICO: A STRATEGY TO COMBAT CLIMATE CHANGE AND ENSURE FOOD SECURITY

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ABSTRACT

The milpa system, a traditional polyculture practice in rural Mexico, primarily integrates corn, beans, and pumpkins, significantly contributing to food security and nutritional diversity. However, a concerning shift towards monoculture threatens these benefits, leading to environmental degradation and reduced agricultural resilience to climate change (Novetny et al. 2021). This study presents findings from a longitudinal case study – from 1985 to 2024 - conducted in Totonac communities in northern Veracruz, highlighting the adverse effects of transitioning from agroforestry to maize monoculture. This shift has resulted in the abandonment of diverse crops, exacerbating issues such as deforestation, biodiversity loss, and water scarcity, while increasing disease prevalence among the population. Furthermore, this research explores the perceptions of local Totonac community regarding these challenges and their proposed solutions. The study uses ethnographic methodology. Emphasizing the importance of agroforestry and polyculture, the study illustrates how traditional knowledge can bolster food sovereignty and conserve biodiversity. The findings advocate for the revitalization of the milpa system, alongside the adaptation of innovative agricultural technologies and reforestation efforts, as essential strategies to combat climate change and enhance community resilience. This research underscores the critical need to support sustainable agricultural practices that align with local ecological and cultural contexts to ensure long-term food security and environmental health.

Keywords: milpa system, agroforestry, traditional ecological knowledge, food security, biodiversity conservation, climate change resilience

E3 **[28]**

FUNDING TREE PLANTING IN LAGOS TO IMPROVE GREENERY AND PROVIDE NATURE-BASED SOLUTIONS TO NATURAL DISASTERS THROUGH THE LAND USE CHARGE SYSTEM

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ABSTRACT

Rapid urbanization in Lagos State has led to significant environmental challenges, including increased flooding, heat, and air pollution, necessitating sustainable solutions to enhance the city's resilience against natural disasters.This initiative aims to leverage the Land Use Charge system to fund tree planting projects, thereby improving urban greenery and providing nature-based solutions to mitigate the impacts of climate change and enhance the quality of life for residents.A mixed-methods approach will be employed, beginning with a comprehensive analysis of the Land Use Charge revenue potential. Collaborating with local stakeholders, including community groups and environmental organizations, we will identify priority areas for tree planting. These areas will be selected based on vulnerability assessments, ecological needs, and community input. The plan will incorporate ongoing monitoring and evaluation metrics to assess the effectiveness of the tree planting initiative.Preliminary assessments indicate that allocating a portion of Land Use Charge revenues could generate substantial funds for afforestation efforts. Expected outcomes include increased tree cover, reduced urban heat islands, improved air quality, and enhanced community engagement in environmental stewardship.Funding tree planting through the Land Use Charge system represents a promising approach to combat the adverse effects of urbanization in Lagos State. By integrating nature-based solutions into urban resilience strategies, this initiative not only contributes to ecological restoration but also fosters a healthier urban environment, ultimately benefiting both the community and the local ecosystem.

Keywords: tree planting, Lagos State, greenery, nature-based solutions, land use charge, funding

E4 **[29]**

ASSESSMENT OF SOIL REHABILITATION PERFORMANCE AND SOIL CARBON STOCK ESTIMATION IN TREE INTEGRATED SYSTEM IN COMPARISON TO TEA CULTIVATION, UPCOUNTRY, SRI LANKA

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ABSTRACT

Developing climate-resilient agricultural systems is challenging but essential to combat future climate risks. In the early days, there were numerous farming systems that included climate-smart features. However, most of the prevailing popular monoculture farming systems lack climate-resilient features. Therefore, this is the time to revisit and incorporate the climate-resilient features with the current agricultural land use systems to ensure food security. Intergovernmental Panel on Climate Change has identified an integrated tree farming system as the promising climate adaptation approach that provides multiple benefits to crops while storing significant amounts of carbon in the systems. The present study aims to compare soil chemical properties, including carbon stock, pH and Electrical conductivity, between restored tea land with native trees and adjacent conventional tea plantations. This study was conducted in the Belipola, Badulla District, Sri Lanka. The two land use systems share common climate and biophysical factors. A total of 168 soil samples were selected from the two systems at 10 cm and 30 cm depths. The results revealed that soil acidity between tea cultivation and marginal land restored with trees significantly differed (3.38 vs 4.09, respectively; $\boldsymbol{P < 0.05}$), indicating higher acidity levels in tea-cultivated areas. Soil electrical conductivity in tea cultivation was 41% higher than in the rehabilitated area with trees. Further, soil organic carbon stock was significantly greater in land restored with trees than in tea cultivation (33.95 $Mgha^{-1}$ vs 29.93 $Mgha^{-1}$, respectively). This concluded that the land rehabilitated with trees currently is in the state of the soil restoration process when compared with the adjacent tea cultivation. This study highlighted the restoration performance of tree-integrated systems compared to pure tea plantations.

Keywords: climate resilient farming, soil organic carbon stock, climate change mitigation

E5 **[30]**

INTEGRATING REMOTE SENSING AND MACHINE LEARNING FOR URBAN CARBON FOOTPRINT ESTIMATION IN COLOMBO DISTRICT

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ABSTRACT

Cities are increasingly central to the Intergovernmental Panel on Climate Change's efforts in climate mitigation and adaptation. Likewise, UN-Habitat and the New Urban Agenda (NUA) highlight actions to address systemic urban challenges. As major contributors to greenhouse gas emissions, cities play a key role in global warming and require effective carbon reduction strategies. Understanding the link between urbanization and carbon emissions is vital for promoting green development and enabling a low-carbon transition. Urban areas in resource-constrained developing countries, especially those experiencing rapid and unregulated growth, have become critical emission hotspots. Sri Lanka, as a developing island nation, faces similar issues. Limited resources and infrastructure hinder consistent ground-based carbon monitoring. To address this, the study applied remote sensing and machine learning techniques to estimate carbon emissions in Colombo District, the country's commercial and residential hub. Data sources included Night-Time Light, Land Use and Land Cover, Land Surface Temperature, and pollutants such as Carbon Monoxide, Sulfur Dioxide, Aerosol Optical Depth, and Nitrogen Oxide. A Deep Neural Network Ensemble (DNNE) model was used for training and analysis. The study examined spatiotemporal changes in city-level carbon emissions from 2020 to 2024, identifying an increase in carbon hotspots from 0.45 to 0.70. Results were validated with the Urban Development Authority (UDA) to assess related LULC changes. This analysis supports informed decision-making and helps guide effective strategies for sustainable urban development.

Keywords: carbon emissions, remote sensing, machine learning, sustainable urban development

E6 **[31]**

CARBON SEQUATRATION IN SAND DUNE HABITATS OF *Spinifex littoreus* AND *Ipomoea pes-caprae* IN THE EASTERN COAST OF SRI LANKA

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ABSTRACT

Coastal sand dunes are vital blue carbon ecosystems that provide essential ecosystem services and possess significant carbon sequestration potential. *Spinifex littoreus* and *Ipomoea pes-caprae* are key plant species aid in dune stabilization. However, their carbon storage capacity in Sri Lankan coastal ecosystems remains poorly understood, hindering effective conservation strategies. This study aims to fill this knowledge gap by providing baseline data on aboveground and belowground carbon stocks of these species and total soil organic carbon stocks in their habitats in Kalkudah Bay, Sri Lanka. Plant samples were systematically collected from three habitat types: *Spinifex littoreus*-only, *Ipomoea pes-caprae*-only, and mixed habitats (~50% abundance of each species) using 50 cm x 50 cm quadrats. Biomass of shoot and root samples was estimated using the oven-dry method, and carbon content was determined by conversion. Soil samples were collected using a hand auger at 5 cm depth intervals up to 50 cm. Organic matter content was analyzed using the loss on ignition method to determine organic carbon content. According to the results *Ipomoea pes-caprae* habitats had the highest aboveground carbon stock (7.97 ± 1.82 Mg C/ha), followed by mixed habitats (4.71 ± 1.12 Mg C/ha) and *Spinifex littoreus* habitats (0.45 ± 0.07 Mg C/ha). Mixed habitats exhibited the highest belowground carbon stocks (6.07 ± 0.92 Mg C/ha) and total plant carbon stocks (162.1 ± 29.9 Mg C/ha). Soil organic carbon was highest in mixed habitats (151.6 ± 40.3 Mg C/ha), while bare soil had minimalcarbon storage (0.02 ± 0.00 Mg C/ha). Total carbon stock in mixed habitats highlighted the significant climate change mitigation potential (594.91 ± 109.53 Mg CO_2/ha). These findings emphasize the need for targeted conservation and integration into national climate strategies.

Keywords: coastal sand dune plant species, blue carbon ecosystems, *Spinifex littoreus*, *Ipomoea pes-caprae*, carbon sequestration

F1 **[32]**

DROUGHT RESISTANCE IN "NIYAN WEE" – A LOCAL RICE LANDRACE

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ABSTRACT

Rice is the staple food for over half the global population, and its resistance to climate change is critical in ensuring food security. The agricultural output losses due to drought surpass losses resulting from all other sources. This project screened the phenotypic and genotypic responses of Sri Lankan landrace "Niyan wee" which grows and yield under dry conditions for its potential as a genetic resource for drought resistance. Niyan wee accession IRGC 67646, along with popular local variety Bg 352 (susceptible), and tolerant varieties Bg 377, Bg 314, Dhagad Deshi and Vandana, were screened under controlled drought conditions (30% field capacity) and compared to well-watered controls (100% field capacity). Phenotypic traits such as chlorophyll content, plant height, biomass, and root growth were assessed, along with stress indicators such as leaf rolling, tissue death, and tip drying. Root length was the only trait significantly affected by drought, with Vandana and Bg 314 exhibiting higher root growth under stress. Genotypic screening using PCR amplification of the qDTY1.1 QTL revealed that IRGC 67646 carries the Dhagad Deshi allele associated with high yield under drought. However, compared to other varieties, IRGC 67646 did not recover from transplanting shock. This may be due to the higher rate of root growth and the higher number of lateral roots during the initial growth stages, forming a complex root system in early seedlings. Due to these reasons, roots may be sensitive and not adapted to transplanting. Although IRGC 67646 has potential drought-tolerant traits and associated QTLs, the traits were expressed in drought and in normal conditions. Therefore, the traits that contribute to drought tolerance will add a yield penalty under normal conditions.

Keywords: drought, drought-resistance, landraces, rice

F2 **[33]**

PHYSIOLOGICAL AND METABOLOMIC RESPONSES OF FOXTAIL MILLET (*Setaria Italica*) TO ELEVATED CO_2 CONCENTRATIONS

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ABSTRACT

Rising atmospheric carbon dioxide concentration ([CO_2]) significantly influences plant growth, development, and biomass. Most studies have focused on the response of C_3 crops to elevated [CO_2] (eCO_2), yet the response of C_4 crops to eCO_2 remain incompletely understood. This study aimed to investigate the responses of carbon and nitrogen metabolism, as well as structural substances in leaves and stems of foxtail millet to ambient [CO_2] and eCO_2 (ambient [CO_2] plus 200 μmolmol^{-1}). eCO_2 enhanced the chlorophyll content and photosynthesis, thereby increasing contents of soluble sugar, reducing sugar and starch in leaves. It also increased leaf wax content, thus reducing water evaporation and improving water use efficiency. eCO_2 boosted starch, hemicellulose monosaccharide (xylose, glucose, galactose) and lignin monomer (H, G, S) concents in stems, thus enhancing conduit hardness and nutrient transport. However, while eCO_2 increased free amino acid content in stems, it decreased free amino acid and soluble protein contents in leaves. Meanwhile, metabolomic analysis revealed that the majority of amino acid metabolism pathway related metabolites exhibited a significant downregulation trend in both leaves and stems. Additionally, the content of abscisic acid was also downregulated in both leaves and stems. Notably, all metabolites involved in flavonoid metabolism were upregulated in leaves, while the sucrose content specifically was upregulated in stems. In summary, eCO_2 promoted growth and biomass in foxtail millet by facilitating carbohydrate transport and metabolism, reducing abscisic acid content, but inhibiting the transport and metabolism of nitrogenous substances and affecting nitrogen assimilation. This study provides a theoretical basis for understanding the response of foxtail millet to future climate change scenario.

Keywords: elevated CO_2, foxtail millet, nutrient transport and metabolism, metabolomic

F3 **[34]**

MITIGATION OF GHGS AND AMMONIA EMISSIONS IN RICE PADDY IN FLOODPLAIN SOILS

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ABSTRACT

Wetland rice cultivation contributes significantly to global warming potential (GWP) and to air pollution. Conservation agriculture (CA) may mitigate greenhouse gas (GHG) and ammonia (NH_3) emissions but the effects are not well defined. Investigations were carried out in an irrigated rice field in the fifth and eighth crops after conversion of conventional tillage (CT) to strip tillage (ST) with two crop residue levels (low vs high, LR vs HR) and three nitrogen (N) rates (N1 = 108, N2 = 144 and N3 = 180 kg N ha^{-1}) with split-plot design and replicated thrice. Data were analysed using SPSS with tillage, residue level and N rate as main factors. Data were checked for normality and ensured normal distribution through log-transformation when necessary. Mean N_2O emission factors ranged from 0.43% to 0.75% in ST and 0.45% to 0.59% in CT, irrespective of residue level and N rate. This led to a 29% higher N_2O emission in CA (ST with HR) than in the conventional practices (CT plus LR). By contrast, CH_4 emissions were significantly lower in CA than in the conventional practices, may be due to higher water percolation coupled with enhanced aeration in the top soil. The ST with LR in N2 reduced the GWP by 16% over the conventional practices. NH_3 fluxes in rice field were associated with the N fertilization events corresponding to higher pH and reduced soil conditions. The lower NH_3 EF was in CT coupled with LR (ca. 15%) than all other treatment combinations, where ST with HR showed the highest EF (ca. 20%). The overall decrease in GWP of the CA practices with optimal N fertilizer, were coupled with higher NH_3 EF, while the relatively higher N_2O emission factors suggest that mitigation of this GHG in wetland rice systems needs greater attention. However, higher N_2O emissions were associated mainly with the changes in soil moisture regimes, from standing water in CT to fluctuating water contents in ST with higher total N and organic carbon contents.

Keywords: rice, GHG emissions, ammonia emissions, conservation agriculture, nitrogen rate

F4 **[35]**

EFFECT OF DIFFERENT PLANTING METHODS ON GROWTH AND YIELD PERFORMANCE OF RICE VARIETY BG 366

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ABSTRACT

Rice is the staple food for Sri Lankan people. Annual production of rice in Sri Lanka needs to be increased to feed the growing population and to maintain the self-sufficiency. Expanding the area under rice cultivation will not be possible in near future. Therefore, additional rice production has to come from increasing the productivity of grains. Choosing the best rice establishment method for higher yield and higher economic return is one of the ways to increase the productivity of land. A study was conducted at farmers' field in 1.7 ha of land during *Yala* season 2024, to evaluate the effect of different planting methods (Dry seeding, Wet seeding, Seedlings broadcasting and Machine transplanting) on growth and yield performance of rice variety Bg 366. The experiment was laid out in RCBD with three replicates, and data were analyzed by using ANCOVA to enhance the accuracy of results due to large size experimental units. Data on plant growth and yield parameters were collected as plant height, flag leaf area, chlorophyll content of flag leaf, days taken to maturity, number of productive tillers m^{-2}, weight of panicle, number of filled grains $panicle^{-1}$, 1000 grain weight and grain yield. Cost of production and net income also were calculated for each planting method. Considering the growth parameters, higher plant height, higher chlorophyll content, higher flag leaf area were observed in both machine transplanting and seedlings broadcasting compared to direct seeding methods. Results showed that grain yield and net income were significantly higher in seedlings broadcasting method (6.84 t ha^{-1}, Rs.241 700 ha^{-1} respectively) followed by Machine transplanting (5.81 t ha^{-1}, Rs.194 400 ha^{-1}respectively).This may be due to the quick establishment of seedlings with soil ball and production of the highest number of effective tillers in seedlings broadcasting method. Findings suggest that both seedlings broadcasting and machine transplanting were found to be most productive and economically viable methods of rice establishment than direct seeding.

Keywords: rice, direct sowing, transplanting, seedling broadcast, net income, productivity

F7 **[36]**

UTILIZATION OF BANANA (*Musa acuminata* × *balbisiana*) PEELS FOR FERMENTED NATIVE SWINE FEED: A CASE STUDY ON MATERIAL RECYCLING EFFICIENCY AND ECONOMIC BENEFITS IN MARKADUKE R AND D CENTER, MARINDUQUE, PHILIPPINES

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ABSTRACT

Recycling agro-industrial by-products into animal feed represents a sustainable strategy that reduces waste and lowers production costs. This study examines the integration of banana peels—previously discarded by a local banana chips factory—into a fermented feed formulation for native pigs at the Marinduque State University-Markaduke Research and Development Center. The present native swine stock inventory of the center was utilized in this analysis. Weekly, 600 to 700 kilograms of banana peels are collected, combined with salt and molasses, and allowed to ferment under anaerobic condition for 7 to 14 days. The resulting feed was used to meet the daily consumption of the 36 native swine breeders with 108 kilograms per day, with a production cost of approximately P10.76 per kilogram compared to P44 per kilogram for commercial alternatives. Material recycling ratio analysis reveals a 100% recycling rate of available banana peels, highlighting the significant potential for cost reduction and environmental sustainability.

Keywords: banana peels, fermented feed, material recycling ratio, sustainable agriculture, cost-effectiveness

F8 **[37]**

EXPLORING THE CIS REGULATORY ELEMENT DIVERSITY IN ABIOTIC STRESS RESPONSE-RELATED GENES OF RICE

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ABSTRACT

Cis-regulatory elements (CRE) control gene expression, by determining the time, place, and transcription level. This regulation is essential for plants response to abiotic stresses. Abiotic stresses significantly impact rice cultivation worldwide, especially under global climate change. Understanding CRE distribution and diversity is essential when finding solutions for rice cultivation under climate change. Currently, research on CRE distribution and diversity of master abiotic stress regulators of the rice genome is limited. The main objective of this study was to assess the distribution and diversity of CRE of master abiotic stress regulators of the rice genome. This study focused on 103 genes responsible for stress responses and their five major stress categories that impact the growth and development of rice. A region covering 1,200 bases of each gene's transcription start site (TSS) was analyzed, including 1,000 base pairs upstream and 200 downstream of the TSS. Identified areas were scanned for CREs and their enrichment using CiiiDER. The analysis revealed that 15 overrepresented ($p \leq 0.05$) CREs were common for Drought and Cold. Moreover, for the (Heat, Drought) and (Heat, Salinity), and (Heat, Heat/Cold, Drought, Salinity), 3 overrepresented ($p \leq 0.05$) CREs common for each stress-responsive gene group. The findings provide insight into the common and unique CREs in major stress regulators of the rice genome which can potentially be used to develop new stress-tolerant rice varieties through *cis*-engineering strategies. Furthermore, this study provides a foundation for breeding programs that aim to develop rice varieties that contribute to global food security. This can address the United Nations Sustainable Development Goal of Zero Hunger by 2030, offering potential solutions to enhance rice production and resilience under climate change.

Keywords: gene expression regulation; cis regulatory elements; plant stress response; abiotic stress

POSTER PRESENTATIONS

P1 **[38]**

ANALYSIS OF SUSTAINABILITY IMPACT ASSESSMENT CRITERIA FOR ORGANIC FOOD SUPPLY CHAINS IN SRI LANKA

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ABSTRACT

The inspiration of this study pertains to the problem of identifying and ranking sustainability impact assessment criteria of local organic food supply chains. Scoring models are often regarded as the most promising method of handling this increasingly important sector, but the literature on sustainability assessment concepts is only emerging. Multi-Criteria Decision Analysis based techniques such as Fuzzy Delphi Method (FDM) and Fuzzy Analytic Hierarchy Process (FAHP) appear practically appealing, as a way to develop commercially viable arrangements to develop sustainability assessment decision models. The first phase of our study identifies sustainability assessment criteria for organic food supply chains through literature review and expert panel interviews. Literature identifies environmental sustainability, economic sustainability and societal sustainability as the main criteria and a set of sub-criteria under each main criterion. The second phase develops FDM questionnaire survey for criteria reduction and later FAHP survey questionnaire is used for criteria analysis and weighting. Both surveys expert opinions of 12 industry experts. Sub-criteria such as long-term profitability, food quality and preservation of ecological habitats and biodiversity receive highest weights under economic, social and environmental criteria. Our research provides a structured decision-making framework which can be a valuable tool for strategic planning, enabling targeted interventions to improve farmers' resilience and support the growth of the organic sector in Sri Lanka.

Keywords: sustainability impact assessment, organic food supply Chains, multi-criteria decision analysis, fuzzy delphi method (FDM), fuzzy analytic hierarchy process (FAHP)

P2 **[39]**

OPTIMIZING SPECTRAL BANDS AND VEGETATIVE INDICES FOR EARLY DETECTION OF BANANA FUSARIUM WILT: A SYSTEMATIC REVIEW

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ABSTRACT

Global banana cultivation faces a severe threat from Banana Fusarium Wilt (BFW), caused by *Fusarium oxysporum* f. sp. cubense (Foc 4), which leads to severe yield losses and currently no effective curing method due to its early-stage asymptomatic spread. Inefficient traditional crop disease detection relies on in-field investigation and diagnostic tools that may not detect infections early enough. The transition from Agriculture 4.0 to Agriculture 5.0 has introduced advanced digitization, precision agriculture and technological innovations including integrated predictive models, real time disease diagnostics and sustainable solutions. This review aims to assess and identify the most effective spectral bands and vegetative indicis for distinguishing early-stage symptoms of BFW. Thus, based on PRISMA methodology, 30 relevant articles were selected from a pool of 500 articles available in the English through ResearchGate and Google Scholar, using Boolean operators ("And/Or") for filtering. Crop growth and vegetation health were considered as strong predictive parameters, while, unmanned aerial vehicles provide a cost-effective solution for capturing high resolution spatial and spectral data. A focus on visible and near-infrared (NIR) spectral bands showed BFW symptoms can be effectively identified using the VIs such as green chlorophyll index (CI_G), red-edge chlorophyll index (CI_{RE}), normalized difference vegetation index (NDVI), and normalized difference red-edge index (NDRE). The integration of remote sensing, image processing and machine learning have immense potential to enhance the effectiveness of disease detection models. Additionally, integrating disease predictions with climate data is crucial for understanding disease development patterns. The development of user-friendly decision support tools will empower farmers and stakeholders with actionable insights, promoting a multidisciplinary approach to comprehensive disease management.

Keywords: banana fusarium wilt; early disease detection; machine learning, precision agriculture, spectral band; vegetation indices

P3 **[40]**

SILICON ALLEVIATES SALT STRESS IN RICE (*ORYZA SATIVA*) THROUGH THE MODIFICATIONS OF PHYSIOLOGICAL AND BIOCHEMICAL ATTRIBUTES

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ABSTRACT

Rice is sensitive to salt stress. This study investigated the protective role of silicon against salinity. Rice varieties (Bg 94-1, Bg 360, Bg 359, Bw 367, At 362 and MR 297) were grown in nutrient solution with salinity tolerant Pokkali. The experiment was arranged in a split split plot design with three replications. The main factor was salinity (0, 4, 8, 12 dS/m). The subplot factor was silicon levels (0 and Si 2mM). The sub sub-plot factor was rice varieties. Ten days after salt stress, seedlings were rated using standard evaluation score (SES) for salt stress. Electrolyte leakage (EL) relative water content (RWC), proline, catalase activity, SPAD value and Na^+/K^+ ratio were measured. Data were analyzed using SAS version 9.4. The means were compared using Least Square Means Test at p=0.05. Silicon significantly reduced EL, with Bg 94-1 showing the highest reduction (53%) at 12 dS/m. SPAD values of silicon treated Bw 367, Bg 94-1, At 362 and Bg 359 at 8 dS/m were comparable to Pokkali (28.7) and SPAD values of Pokkali (27.96), and silicon treated Bw 367 and Bg 94-1 were comparable at 12 dS/m. Silicon lowered Na+/K+ ratio in varieties over Pokkali at each salinity level. Silicon increased proline and CAT activity in Bw 367 and Bg 94-1 at 12 dS/m. In tested parameters, Bg 359, At 362 and MR 297 performed better at 8 dS/m than 12 dS/m. SES rated Si treated Bw 367 and Bg 94-1 as tolerant and Bg 359 and At 362 tolerant at 8 dS/m. In conclusion, silicon improved salinity tolerance but there is a varietal difference. With silicon, identified tolerant varieties can be grown in salinity prone areas.

Keywords: varieties, seedlings, nutrient solution, catalase, proline

P4 **[41]**

MORPHOLOGICAL AND SYMPTOMATIC IDENTIFICATION OF TWO EMERGING PESTS IN RICE: *Hydrellia griseola* (RICE LEAF MINER) AND *Hysteroneura setariae* (RUSTY PLUM APHID) IN SRI LANKA

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ABSTRACT

Rice is the staple food and a widely cultivated crop in Sri Lanka. Due to unexpected climate changes, minor pests may escalate to major pests, potentially causing outbreaks that exceed the economic injury level. This study documents the first identification of two newly emerging pest species affecting rice. During 2023/24 *Maha* season, unidentified damage symptoms: linear whitish streaks in the central part of the leaf blade and a blotch-like appearance as they develop, were reported in Kandy, Kurunegala, and Polonnaruwa, reoccurring in Kalutara during 2024/25 *Maha* season in Sri Lanka. Plant samples were collected from affected fields and reared under laboratory conditions, and emerged adults were observed under a dissection microscope. To further confirmation, emerged adults were introduced to the rearing cages which contain healthy rice plant/cage and observed. The consistency between damage symptoms in affected fields and healthy rice plants, confirms the pest's identification. In August 2024, an unknown aphid colony was observed infesting rice plants at Rice Research and Development Institute, Bathalagoda. Aphids were primarily found on the peduncles of panicles, with few on spikelet and leaves. Morphological identification of pests was done using taxonomic keys and the book, Insect Pests of Rice published by the International Rice Research Institute. Two pests were identified as *Hydrellia griseola* (Rice Leaf Miner) and *Hysteroneura setariae* (Rusty Plum Aphid) respectively. The presence of *H. setariae* on rice in Sri Lanka is significant, as this species has previously been recorded on other Poaceae crops, but not rice. This finding highlights the emergence of a new threat to rice and underscores the need for continuous monitoring and proactive pest management approaches to safeguard rice cultivation in Sri Lanka.

Keywords: climate change, rice leaf miner, rusty plum aphid, taxonomic keys, whitish streaks

P5 **[42]**

EFFECT OF DIFFERENT CROP ESTABLISHMENT METHODS ON PEST ABUNDANCE AND CROP DAMAGE IN RICE

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ABSTRACT

Rice is the staple food and a major cultivated crop in Sri Lanka. Insect pest infestations are a key constraint in rice production, highlighting the need for cost-effective, environmentally friendly pest management strategies. This study examined the effect of different crop establishment methods on pest abundance during the 2021/2022 *Maha* season in Polonnaruwa, Kurunegala, and Kegalle districts, representing the dry, intermediate, and wet zones of Sri Lanka respectively. The experiment was laid out as Completely Randomized Block Design with three replicates. Six establishment methods: Broadcasting (T1), Row seeding (T2), Manual transplanting (T3), Machine transplanting (T4), Parachute method (T5), and Farmer practice (T6) were used as treatments. The abundance of thrips, leaf folder, and brown planthopper was considered separately and data were analysed using SAS software. Results showed lower pest populations in parachute (4±0.9, 21±3.8, 9±1.4), machine (9±1.2, 33±2.9, 12±2), and manual transplanting (8±1.5, 34±2, 10±1.7) methods, while higher infestations were recorded in row seeding (24±1.2, 50±3.1, 19±2.8), broadcasting (26±3.8, 48±4.5, 21±1.7), and farmer practice (28±2.8, 55±4.1, 25±1.8) methods. This trend was consistent across all three districts. Higher yields (Kegalle: 3.8-4.1 Mt/ha, Kurunegala: 5.0-4.9 Mt/ha, Polonnaruwa: 6.2-5.9 Mt/ha) were recorded in fields using parachute, manual, and machine transplanting, while the lowest yields (Kegalle: 2.2-2.9 Mt/ha, Kurunegala: 3.3-3.8 Mt/ha, Polonnaruwa: 4.5-4.2 Mt/ha) were observed in broadcasting, row seeding, and farmer-practiced fields. Thus, parachute, machine, and manual transplanting are effective methods for reducing pest infestations and enhancing productivity. Further research is needed to explore the relationship between microclimate and pest abundance, and this study highlights primary information on ecological based pest management but provides better insights for future research.

Keywords: rice, pest management, crop establishment methods, yield, sustainable agriculture

P6 **[43]**

EVALUATING THE POTENTIAL OF UNDERUTILIZED PARTS PRODUCED IN THE PROCESSING OF *Cinnamomum Zeylanicum* BLUME CULTIVATED IN SRI LANKA

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ABSTRACT

Cinnamomum zeylanicum, valued for its warm aroma and rich flavour has occupied a premium place in the global market. This study aims to identify and quantify the essential oil content, bioactive composition, moisture content, oleoresin percentages, and Total Polyphenolic Content (TPC) in underutilized parts of *Cinnamomum zeylanicum*. This work is significant as it highlights the potential of these parts to enhance resource efficiency and unlock new value in the cinnamon industry. Four underutilized parts—scrapings, quillings, heavy bark, and chips—were analyzed. The experimental design involved three replicates per sample type, ensuring reliable results. Data analysis was performed using Minitab 19 to assess the statistical significance and variability across the different sample types. Essential oils were extracted through hydrodistillation using a Clevenger system, with qualitative and quantitative analysis performed using GC-MS. Moisture content was measured using the Dean and Stark method, and oleoresins were extracted via refluxing (solvent-to-sample ratio: 8:1, acetone). The TPC was quantified using the Folin-Ciocalteu assay. According to the results obtained fot the moisture content, they are ranging from 1.2±0.10% in scrapings to 12.7±0.06% in quillings. The highest essential oil content was observed in quillings(1.5±0.10%), while scrapings had negligible amounts. GC-MS detected cinnamaldehyde, D-limonene, linalool, β-caryophyllene, and eugenol as major components in essential oils, with quillings showing the highest cinnamaldehyde content(82.10%). The highest eugenol content(9.00%), was detected in essential oil extracted from chips while there is a lower cinnamaldehyde content(66.78%), when comparing with others. The highest oleoresin percentage(9.0034±0.0076%), and TPC(247.66±8.37 mg GAE g^{-1}), were also recorded from quillings while scrapings showed the lowest TPC(19.49±0.12 mg GAE g^{-1}). This study demonstrates the potential of underutilized cinnamon parts, particularly quillings, heavy bark, and chips, as valuable sources of essential oils, bioactive compounds, oleoresins, and polyphenols, offering opportunities for improved resource utilization.

Keywords: cinnamon, underutilized parts, oleoresins, essential oil

P7 **[44]**

ELEVATED ATMOSPHERIC CO_2 CONCENTRATION ENHANCES DROUGHT RESISTANCE OF MAIZE (*Zea Mays* L.) BY REGULATING CELL MEMBRANE STRUCTURE AND PHENYLPROPANOID METABOLISM

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ABSTRACT

Elevated atmospheric carbon dioxide (eCO_2) and increased drought frequency pose significant challenges to maize production. However, the comprehensive mechanisms underlying maize responses to eCO_2 and drought stress remain poorly understood. This study investigated maize cultivar XianYu 335 grown under two soil moisture regimes (70-80% and 40-50% field water holding capacity) in an environmentally controlled chamber with either ambient CO_2 or elevated CO_2 (+200 $\mu molmol^{-1}$ above ambient condition). We analyzed physiological parameters, leaf metabolomics and the transcriptome of ear-position leaves of maize at the trumpet stage. Results demonstrated that eCO_2 significantly enhanced aboveground dry weight by 32.1% and mitigated the adverse effects of drought stress on biomass accumulation in maize. Under drought stress, leaf peroxidase (POD) activity and proline (Pro) content increased significantly by 66.4% and 74.4%, respectively; however, eCO_2 substantially moderated these drought-induced alterations. Drought stress reduced photosynthetic rate (*Pn*), stomatal conductance (*Gs*), and transpiration rate (*Tr*) in maize leaves by 64.5%-92.7%. While eCO_2 ameliorated drought-induced suppression of *Pn*, it further reduced *Gs* and *Tr*. Differentially expressed metabolites under eCO_2 and drought conditions were primarily associated with cell membrane stability, antioxidant capacity, nucleic acid synthesis, energy metabolism and amino acid catabolism. Transcriptomic analysis revealed that differentially expressed genes were predominantly enriched in the mitogen-activated protein kinase signaling pathway and plant hormone signal transduction. eCO_2 maintained cellular osmotic balance and membrane integrity through modulating alanine, aspartate, glutamate, α-linolenic acid, and linoleic acid metabolism, while simultaneously enhancing drought tolerance through phenylpropanoid-mediated synthesis of lignin and flavonoids. These findings advance our understanding of maize production to future climate scenarios characterized by elevated CO_2 levels and increased drought frequency.

Keywords: elevated CO_2 concentration, drought, maize, transcriptome, metabolome

P8 **[45]**

UNPACKING THE DETERMINANTS OF FOOD INSECURITY AMONG HOUSEHOLDS IN KABOKWENI, SOUTH AFRICA

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ABSTRACT

One in five people in Africa goes to bed hungry and an estimated 140 million people in Africa face acute food insecurity. The study aims to analyse the socio-economic determinants of food insecurity among households in Kabokweni, South Africa. The sub-objective is to examine whether there is a relationship between socio-economic characteristics of households and food insecurity in the study area. The study was conducted in Kabokweni Ehlanzeni District, South Africa. A simple random sampling process was used to choose 377 participants from a group of 6612 households. Data was gathered using a structured questionnaire which was administered to the respondents by the lead researcher with the assistance of trained enumerators. Descriptive statistics was employed to analyze the data using SPSS version 28 software. The socio-economic characteristics of households were measured by typically gathering data on the participant's income, house quality, education level, occupation and access to amenities. According to the findings of the study, unemployment (M=4.60) and low household income (M=4.26) were cited by participants as the two main obstacles to the determinants of food insecurity. Insufficient resources and access to better job opportunities (M=4.29) and family planning (M=4.37) were the minor mentioned challenges. The empirical results show that education (p<0.001), employment (p<0.181), and level of awareness about the determinants of food insecurity (p<0.001) were significant and positively associated with the determinants of food insecurity of households. In conclusion, the study took cognizance of the death of resources, raised the call for a collaborative approach and inherent farming indigenous crops for food and nutritional security. The study recommends that household food security should be prioritized to effectively enhance the livelihoods of individuals in Kabokweni.

Keywords: food insecurity, households, socio-economic determinants, global demand, indigenous crops, nutritional security

P9 **[46]**

THE IMPACT OF ECONOMIC CRISIS ON FOOD SECURITY AMONG URBAN POOR HOUSEHOLDS IN COLOMBO DISTRICT: A MULTI-INDICATOR ASSESMENT

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ABSTRACT

The Sri Lankan economy experienced its most severe crisis since independence in 2022, with GDP contracting by -7.8%. The COVID-19 pandemic, coupled with global and domestic challenges, severely affected food security by limiting access to affordable food and driving up prices. As a result, malnutrition worsened, with 54% of households facing acute food insecurity—46% moderately and 8% severely. Despite the urban poor being one of the most vulnerable groups, their dietary diversity and food security remain underexplored in the literature. This study investigates the impact of economic downturns on dietary diversity and food security, as well as alternative coping strategies adopted by households. A survey of 80 households in Colombo and Maharagama divisional secretariat divisions was conducted in July 2024, using simple random sampling and a semi-structured questionnaire. Food security was assessed using five dietary diversity indices: the Household Dietary Diversity Score (HDDS), Entropy Index (EI), Shannon Equitability Index (SEI), Herfindahl-Hirschman Index (HI), and Simpson's Index (SI). A multiple regression model was employed to analyze socio-demographic determinants. Findings indicate low dietary diversity among urban poor households based on EI and SEI, and moderate diversity according to HDDS, HI, and SI. Dietary diversity was found to vary significantly with socio-demographic factors. The economic crisis exacerbated food insecurity among urban poor households, leading to a shift in diets towards cereals and vegetables while reducing protein intake. This study underscores the urgent need for integrated policy measures to improve dietary diversity and food security. Furthermore, it recommends a critical analysis of post-crisis food consumption trends among the urban poor and at the national level.

Keywords: economic crisis, food security, urban poor, dietary diversity, coping strategies

P10 **[47]**

NEW INSIGHTS INTO THE DECLINE OF GRAIN PROTEIN OF RICE AND WHEAT UNDER ELEVATED CO_2 LEVELS USING META-ANALYSIS.

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ABSTRACT

Rice and wheat are the major staple crops globally, contributing 7.3% and 10.6% of dietary protein, respectively. The global CO_2 levels are projected to rise from the current 424 µmol mol-1 to 500-1000 µmol mol-1 by the year 2100. Studies generally indicate that grain yield in these crops increases under elevated CO_2 due to an increase in photosynthesis. However, the effect of elevated CO_2 on grain N (protein) remains poorly understood. In this study, a mixed effect model meta-analysis on response-ratio to elevated CO_2 levels was carried out to compare 126 observations on both crop species, involving 46 studies over the last 30 years, under two nitrogen fertilizer levels (>150 $kgNha^{-1}$ and ≤150 $kgNha^{-1}$). Effect-sizes based on natural log response ratio were calculated for grain yield and shoot biomass ($gplant^{-1}$), grain and shoot N% and grain and shoot N uptake. Regardless of N application rates, wheat showed a significant reduction in grain protein (-6.48%) under elevated CO_2, whereas rice showed a comparatively least reduction (-3.58%). Nitrogen allocations to shoots-to-grains decreased in both crops under elevated CO_2. However, wheat showed a more prominent reduction in nitrogen allocation to the grain (-0.27%) than rice (-0.023%). At lower N application rates, wheat exhibited a significant reduction of shoot N compared to grain N. Our findings suggest that rice and wheat operate contrasting mechanisms for nitrogen loading into the grain. Such species dependent variation could have an impact more on wheat eaten population than rice suggesting that addressing these challenges through advanced crop improvement and breeding programs is a timely concern at the phase of climate change.

Keywords: elevated CO_2, grain protein, nutrient security, meta-analysis, wheat, rice

P11 **[48]**

EVALUATE THE EFFECT OF GAMMA IRRADIATION INDUCED MUTATION IN M2 GENERATION OF *VIGNA MUNGO* (VAR. MI- 1)

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ABSTRACT

Agriculture plays an important role in poverty eradication and food security throughout the world. In this regard, this study evaluated the effects of gamma irradiation induced mutation in M2 generation *of Vigna mungo* (var. MI-1). The M2 generation is raised from seeds harvested from M1 generation plants. The traits observed in the M1 generation plants should be carried forward to the M2 generation plants as the M2 generation is raised from seeds harvested from M1 generation. Thus, it is crucial to continue the research to whether all traits are successfully carried forward to the M2 generation. The seeds were collected from the previous M1 plants of the previous study of Hansani & Sutharsan (2023) where the seeds were subjected to gamma irradiation doses of 20Gy, 40Gy, 60Gy, 80Gy, 100Gy with a control (0Gy). This experiment was conducted at the University farm, Eastern University of Sri Lanka as a field experiment by using Randomized Complete Block Design with four replications during May to September 2024. The study revealed that the treatments showed significant differences in treatment T3 (40Gy) in comparison to treatment- control (0Gy) with increased plant height (55.85%), chlorophyl content (21.3%), shoot fresh weight (165%), and yield characteristics as number of pods per plant (81.55%), and total yield (46.6%). Therefore, the present study concluded that there were significant ($P<0.05$) differences among the treatments on the above-mentioned characteristics and the treatment T3 (40Gy) is more suitable to increase yield in *Vigna mungo* especially in var. MI-01.

Key words: *Vigna mungo*, M2 generation, gamma irradiation, mutation

P12 **[49]**

ISOLATION AND IDENTIFICATION OF NOVEL FUNGAL STRAINS WITH POTENTIAL APPLICATION IN FOOD INDUSTRY FROM SINHARAJA FOREST RESERVE OF SRI LANKA

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ABSTRACT

Filamentous fungi play a significant role in food production, particularly in the manufacturing of fermented food and as a source of protein. Therefore, isolation of filamentous fungi is a promising solution for ensuring sustainable food production. The objective of the study to isolate novel filamentous fungal strains from primary forest soil of selected forest reserve of Sri Lanka. Prior to samples collection research permit was get approved by the Forest Department Sri Lanka. Soil samples were collected from pre identified locations (N=6) of Sinharaja Forest Reserve in replicate. Measures were taken in soil sample collection to avoid cross contamination, sample were selected 30 cm of soil horizon and soil temperature was measured. To isolate fungal species associated with soil samples, standard microbiological technique followed in Potato Dextrose Agar and incubated at 25 ± 1 ° C for 5 days. Pure cultures of isolated fungal colonies were phenotypically characterized. Molecular identification was done by extraction of genomic DNA followed by ribosomal DNA amplification and sequencing using fungal primer ITS 4 and ITS 5 at Macrogen, South Korea. The resulted sequences were aligned using BioEdit 7.2 and partial sequences of novel fungsl strain with potential application in food industry was submitted to NCBI GenBank and accession numbers were received. The phylogenetic relationship was newly isolated fungal strains was investigated by MEGA 10 using neighbor-joining method. Twenty-one different fungal strains were identified during the study. Out of which 4 strains *Trichoderma harzianum* (SI – 10; PQ665276.1), *Aspergillus japonicas* (SI – 2; PQ665268.1), *Trichoderma crassum* (SI – 14; PQ669207.1), *Trichoderma koningii* (SI – 18; PQ764474.1) were identified as most potential fungal strains in food industry application. *T. harzianum* is a potential bio preservative due to the production of endochitinase and exochitinase. A. Japonicas has vast application in food industry due to the ability of producing citric acid. Further, its' ability to synthesize itaconic acid highlighting *A. joponicus* as a biodegradable food packaging producer. Both *T. crassam* and *T. koningii* are biocontrol agent as well as disease resistance against wilt. Therefore, the result of the study emphasize the potentiality of soil borne filamentous fungi potential applicants in diversified application in food industry. newly isolated fungal strains.

Keywords: filamentous fungi, food industry, Sinharaja forest reserve

P13 **[50]**

INVESTIGATING THE ROLE OF NEERAMULLIYA *(Hygrophila auriculata)* IN PHYTOEXTRACTION: A STUDY ON COPPER REMEDIATION IN CONTAMINATED SOIL

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ABSTRACT

Food security and agricultural productivity are increasingly threatened by heavy metal contamination, exacerbated by soil degradation due to climate change. Copper (Cu), a crucial micronutrient, becomes toxic at high concentrations, often as a result of excessive agrochemical use, and is classified as a heavy metal. This study investigates the phytoremediation potential and Cu accumulation capacity of *Hygrophila auriculata*, a tropical perennial plant, to address Cu contamination in soils. Over 12 weeks, the effects of varying Cu concentrations (0, 50, 100, 200, and 300 mg kg^{-1}) on plant development, Cu uptake, and accumulation were examined. Atomic Absorption Spectroscopy (AAS) was used to assess Cu levels in plant tissues. The results indicated strong tolerance to Cu at moderate concentrations (50–100 mg kg^{-1}). Significant differences in root length ($P = 0.003$), root fresh weight ($P = 0.059$), and root dry weight ($P = 0.022$) were observed across treatments, with root length and dry weight showing the strongest significance ($P < 0.05$). At 200 mg kg^{-1} Cu, the root bioconcentration factor (BCF = 3.85 ± 0.20) and translocation factor (TF = 0.18 ± 0.01) confirmed the plant's effectiveness in phytostabilization rather than phytoextraction. A strong negative correlation ($r = -0.840$) between BCF and TF suggests that *H. auriculata* retains Cu in its roots, reducing its mobility and environmental risks. These findings indicate that *H. auriculata* is well-suited for phytostabilization, contributing to soil health and promoting safer agricultural practices in moderately contaminated soils. Future research should explore long-term Cu retention and the impact of organic soil amendments on the plant's phytoremediation efficiency.

Keywords: copper, *Hygrophila auriculata*, phytoremediation, phytostabilization, soil contamination

P14 **[51]**

SYNTHESIS OF ORGANIC HYDROGELS AND THEIR EFFECTS ON SOIL PROPERTIES AND SEED GERMINATION

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ABSTRACT

Hydrogels are potential tools to address issues namely water scarcity and nutrient leaching. This study evaluated biodegradable hydrogels synthesized from peanut shells, Palmyra leaves, or coconut leaves, combined with seaweed (*Kappaphycus alvarezii*), to improve water retention, minimize nutrient leaching, and enhance seed germination. The experimental design was a two-factor (hydrogel types; derived from either peanut shells, Palmyra leaves, and hydrogel concentrations; 0% (T1), 0.5% (T2), 1% (T3), 2% (T4), and 3% (T5) factorial with three replicates**.** To assess the impact of three types of hydrogels on seed germination at 2% hydrogel concentration three distinct moisture levels (50% (T1), 75% (T2), and 100% (T3) were tested with each type of hydrogel. Results showed that hydrogel concentration significantly influenced the outcomes, whereas no significant difference was found among the hydrogel types. The 3% hydrogel treatment (T5) significantly improved water retention, reducing moisture loss in the soil to 23.5 ± 0.14 % (vs. 40.2 ± 0.02% in T1). Nutrient leaching also decreased: nitrate leaching dropped to 0.06 ±0.01 mg in T5 (3% peanut shell hydrogel) compared to 0.84±0.05 mg in T1, while ammonium leaching fell to 0.07 ± 0.007 mg in T5 (3% Palmyra hydrogel) from 1.10 ± 0.03 mg in T1. Potassium and phosphorus losses were also minimized, enhancing nutrient availability near the root zone. Seed germination rates improved, with 90% germination observed in peanut shell and palmyrah hydrogels (T3, 100% moisture level) versus 56% in T1. Beyond improving water and nutrient retention and germination, hydrogels utilize agricultural waste and support environmental sustainability.

Keywords: biodegradable-hydrogel, water-retention, nutrient-leaching, seed-germination

P15 **[52]**

THE EFFECT OF LOW DOSAGE GAMMA IRRADIATION ON THE GROWTH AND YIELD OF *Vigna Mungo* (VAR. MI-01)

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ABSTRACT

Agriculture is crucial for poverty alleviation and global food security. This study evaluated the impact of low-dosage gamma irradiation on the growth and yield of black gram (*Vigna mungo*) conducted at the University Farm, Eastern University of Sri Lanka, from June to September 2024, the experiment involved exposing *Vigna mungo* seeds (var. MI-01) to difference doses gamma radiation (0Gy, 20Gy, 25Gy, 30Gy, 35Gy, 40Gy, 45Gy, 50Gy, 55Gy, 60Gy) using a "Gamma Chamber 1200 Cobalt-60" irradiator. After irradiation, the seeds were planted in poly bags before being transplanted into open fields, following a Randomized Complete Block Design with four replications. Results showed that moderate gamma irradiation (35Gy) significantly enhanced key growth parameters compared to the control (0Gy) treatment plant height increased (44.86%), number of leaves (46.38%), chlorophyll content (22.4%). Yield characteristics also improved, with increasing 100 seed weight (4.2%), and total yield (53.8%). Additionally, mutational traits like trailer-type plant habits and 5-6 pods per node were predominantly observed in the 35Gy treatment. In conclusion, a 35Gy gamma irradiation dose was optimal for enhancing growth and yield traits in *Vigna mungo* (var.MI-01), highlighting its potential for mutation breeding in crop improvement.

Keywords: low-dosage gamma irradiation, mutation breeding, black gram (*Vigna mungo*)

P16 **[53]**

IDENTIFICATION OF WHITE LEAF DISEASE ON SUGARCANE (*Saccharum officinarum L.*) USING DRONE-BASED MULTISPECTRAL IMAGES

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ABSTRACT

Sugarcane (Saccharum officinarum L.) is the economically important tropical grass in the world. Sugarcane white leaf disease is caused by a phytoplasma transmitted by leafhopper vectors, posing a significant threat to sugarcane industries, especially in some Asian countries like Sri Lanka. Accurately monitoring white leaf disease (WLD) infection, especially for early detection, is crucial to preventing the disease spreading. This study was conducted to find the suitability of drone-based multispectral imaging to identify sugarcane WLD. The most suitable multispectral bands and vegetative indices for early disease detection were evaluated. The WLD detection methods discussed in this study were tested and validated in a sugarcane field at Lanka Sugar Company Privet Limited, Pelwatte, Sri Lanka. The study classified WLD severity in six different levels (Healthy plant, Minimal signs of disease, Low severity, Moderate severity, High severity, Maximum severity) and, evaluated by using four spectral bands and four indices (VIs). Normalized Difference Vegetation Index (NDVI), Green Normalized Vegetation Index (GNDVI), Normalized Difference Red Edge (NDRE), and Chlorophyll Vegetation Index (CVI) were used to determine the correlation between the index and WLD severity. Utilizing the green, red, red edge, and NIR bands, the research achieved a significant correlation with WLD severity, particularly in the red, red edge, and green bands. The top performing vegetation indexes for distinguishing healthy and infected sugarcane crops were NDVI and GNDVI with Root Mean Square Error values of 0.89 and 0.96 respectively. The green spectral band evolving as the most effective spectral band according to correlation analysis. These results underscore modern technology's directness, cost-effectiveness, and efficiency in detecting WLD.

Keywords: precision agriculture, remote sensing, spectral bands, vegetation indices, white leaf disease monitoring

P17 **[54]**

FARMER PERCEPTION OF CLIMATE CHANGE IN RELATION TO ADAPTATION IN ANURADHAPURA DISTRICT

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ABSTRACT

Smallholder farmers in Sri Lanka are confronted by an escalating number of climate-induced disasters, including heat waves, prolonged drought seasons, changed seasons, and increased pest attacks, threatening their livelihoods and causing food insecurity. In building resilience in local agricultural processes, understanding farmers' perception of climate change is significant. Farmers' ability and willingness to implement climate-smart agricultural adaptations depends on their perception on climate variability and adaptation efficacy. By using cross-sectional data from 331 farmers collected from the Anuradhapura district of Sri Lanka, this study explores the climate perception of farmers and whether they are agree with observed local climate trends. Additionally, the study assesses the correlation between the different elements of climate perception and their key socio-demographic drivers using a Multivariate Probit Model. The results imply that farmers moderately perceive increasing average temperature and longer dry seasons. Though this matches the local climate data, the climate awareness of smallholder farmers can be further improved by the availability of accurate climate information and extension services. Education, annual income, ownership of arable land, access to climate information, and experience are found to vary positively with perception components of climate change, vulnerability, and adoption of adaptation activities. Increased organizational involvement with farm-related cooperatives and associations is shown to improve their perception of climate change. However, results showcase that farmers are less reliant on available climate information and extension services, which can be improved to support climate awareness of farmers. This study contributes to the climate policy-making efforts of Sri Lanka by providing an understanding of the climate perception of agricultural communities, and so that they can be taken into consideration during the development stage of climate adaptation policies.

Keywords: climate adaptation, climate change, smallholder farms, climate perception, Anuradhapura

P18 **[55]**

INSECTICIDAL ACTIVITIES OF SELECTED BOTANICAL EXTRACTS AGAINST LARVAE OF RICE LEAF FOLDER *Cnaphalocrocis Medinalis*

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ABSTRACT

The rice leaf folder (*Cnaphalocrocis medinalis*) is a Key pest in Asian rice fields that pose a significant yield loss. In order to address this issue, the study introduced 10 botanical plant extracts offering a sustainable approach. Methanol extracts from *Azadirachta indica*, *Calotropis* sp., *Ricinus communis*, *Justicia adhatoda, Aristolochia bracteolate, Cassia auriculata*, *Acorus calamus, Nicotiana tabacum, Pongamia pinnata, Lawsonia inermis* were assessed. The resultant extracts were evaluated at five concentrations 1%,3%,5%,10%15%. The larvae were subjected to each dose under laboratory conditions, with mortality recorded at 24, 48, and 72 hours. Phytochemical screening was performed to ascertain bioactive chemicals. The filter paper disc method was used to evaluate the repellence of plant extracts. Histopathological changes were examined on thoracic muscles, gastrointestinal tracts, Malpighian tubules. The overall findings demonstrate, *A. indica* and *J. adhatoda* consistently made the greatest larval mortality across all concentrations and time intervals, with one-way ANOVA indicating highly significant effects at 24,48,72 hours ($p < 0.001$). According to the Phytochemical study indicated that *A. indica and J. adhatoda* had elevated concentrations of bioactive chemicals, including phenols, flavonoids, and alkaloids.Probit analysis established lethal concentration values, revealing *A. indica*'s LC50 at 430.82 mg x ml^{-1}, LC90 at 547.18 mg x ml^{-1} , therefore affirming its efficacy. *A. indica and P. pinnata* showed 100 % repellence activity while *C. auriculata and L. inermis* conquered least repellence effect (<30%). Intense histopathological effects were recorded by *A. indica* extracts which resulted in significant tissue alteration with H-score ranging from 255-285 while much lower H-score (<40) recorded with *C. auriculata*. These findings indicate that plant extracts may function as efficient, environmentally sustainable substitutes for synthetic pesticides.

Keywords: Botanical extracts, *Cnaphalocrocis medinalis*, Larval Mortality, Sustainable pest management

P19 **[56]**

GARVICIN Q-PRODUCING *Lactococcus Garvieae* LG3092: ITS ROLE IN MITIGATING DYSBIOSIS AND HP-ASSOCIATED GASTRITIS

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ABSTRACT

Helicobacter pylori (Hp) is a major risk factor for gastric cancer, primarily due to the infection-induced gastritis caused by Hp toxins, which can promote gastric mucosal carcinogenesis. Early infection screening and inflammation treatment are crucial for preventing Hp-related complications. The standard treatment for Hp infection typically involves bismuth-based quadruple antibiotic therapy. However, this often leads to gastrointestinal dysbiosis, with side effects such as nausea, vomiting, diarrhea, and antibiotic resistance, which are common reasons for premature treatment discontinuation, thereby hindering effective eradication of Hp and the management of related gastritis. Biotherapeutic agents show great potential for adjunctive therapy, but their underlying mechanisms require further investigation. In this study, *Lactococcus garvieae* LG3092 was found to antagonize pro-inflammatory bacteria and restore gastric microbiota balance, thereby improving Hp-associated gastritis. *16S rRNA* amplicon sequencing revealed that gastric dysbiosis, characterized by an increase in pro-inflammatory bacteria such as *Staphylococcales*, *Enterobacterales*, *Bacillales* and *Clostridiales*, along with a reduction in anti-inflammatory *Lactobacillales*, is a key factor in Hp-related gastritis. *Lactococcus garvieae* LG3092 produces Garvicin Q (GarQ), which precisely targets Hp-related pro-inflammatory bacteria without affecting the abundance of beneficial anti-inflammatory bacteria, thereby regulating gastric microbiota composition and preventing microbial imbalance. By reshaping the gastric microbiota, LG3092 reduces the expression levels of IL-1β, IL-6, IL-8, and TNF-α in the gastric mucosa, helping to control Hp-induced gastric inflammation. The adjunctive use of probiotics like LG3092 provides a promising supplementary approach to modern medicine and may enhance the treatment of Hp infection and related gastritis when combined with other therapeutic strategies.

Keywords: *Lactococcus garvieae*, *Helicobacter pylori*, microbial community, gastric inflammation, function

P20 **[57]**

PROBIOTIC *Levilactobacillus brevis* SR52-2 AS A NOVEL THERAPEUTIC AGENT AGAINST HPV INFECTION: MECHANISTIC INSIGHTS AND THERAPEUTIC EFFICACY

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ABSTRACT

Human papillomavirus (HPV) infection, a critical global health challenge strongly associated with cervical carcinogenesis, urgently requires innovative therapeutics due to the limitations of current prevention and treatment strategies. This study pioneers the screening of probiotics with anti-HPV potential and elucidates their mechanisms. From 258 probiotic strains isolated from diverse sources (fermented foods, fecal matter, soil) across China and Sri Lanka, 222 strains were identified as safe candidates through whole-genome sequencing, excluding those carrying virulence or resistance genes. Using HPV-infected SiHa/HeLa cells and non-infected Vero cells for functional screening, Levilactobacillus brevis SR52-2 demonstrated selective anti-HPV activity: its fermented supernatant significantly inhibited proliferation in HPV-positive cells (48.7% reduction in SiHa, 52.3% in HeLa, $P<0.05$) while sparing normal epithelial cells. Mechanistic analysis revealed potent suppression of HPV16 E6/E7 oncogene expression (72-85% downregulation), critical for viral carcinogenicity. Comprehensive safety profiling confirmed SR52-2's γ-hemolytic activity, antibiotic susceptibility, and gastrointestinal resilience (78.4% survival in simulated gastric juice, 82.1% in intestinal fluid), supporting oral administration potential. In HPV16-positive SiHa xenograft models, SR52-2 intervention promoted weight recovery (18.3% increase vs control) and reduced tumor volume by 64.5% ($P < 0.01$). qPCR analysis demonstrated significant E6/E7 suppression in excised tumors (67.9-73.2% reduction), corroborating in vivo antiviral efficacy. In summary, this multilevel investigation establishes L. brevis SR52-2 as a dual-action therapeutic candidate through selective inhibition of HPV oncogene expression and restoration of host physiological parameters. The strain's safety profile and cross-kingdom efficacy highlight its potential as a groundbreaking microbiome-based intervention against HPV-associated pathologies.

Keywords: *Levilactobacillus brevis*, probiotics screening, inhibition, Human papillomavirus

P21 **[58]**

ASSESSING THE RELATIONSHIP BETWEEN PARTICIPATORY LEARNING AND ACTION (PLA) APPROACH ON CLIMATE SMART AGRICULTURE (CSA) ADOPTION IN DRY ZONE OF SRI LANKA

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ABSTRACT

The agriculture sector is identified as one of the most vulnerable sectors to climate change impacts due to heavy dependency on climatic factors. Introducing climate-smart agricultural practices (CSA) through the participatory learning and action (PLA) approach among developing nations is a long-term strategy as an adoption measure. This study focused on the level of participation in selected PLA practices in adopting CSA among rural-level smallholder farming communities and exploring strategies for scaling up the best PLA practices. A mixed-method approach with a semi-structured questionnaire survey was employed among 100 randomly selected sample units in purposefully selected Divisional Secretariat Divisions in the dry zone of Sri Lanka, Palugaswewa (Anuradhapura) and Gomarankadawala (Trincomalee). Both descriptive and inferential statistics are drawn to analyze the primary data. The chi-square test revealed that PLA participation in CSA adoption has a strong relationship to solving climate change-related risks and uncertainties (χ^2 (1, N = 100) = 16.67, $p < 0.001$). Farmers with higher participation in PLA were likelier to adopt CSA practices than those with lower participation. 50% of the community would actively participate in PLA practices while they have an 80% adaptation rate. The most preferred PLA method is transecting walks (89%) to address the real issues while actively adopting CSA practices. Seasonal climate calendars (76%), focused group discussions (67%), and farmer field schools (56%) are also prominent accepted PLA practices. The participation level in mixed PLA practices, which include participatory rural appraisals (46%), resource mapping (33%), and participatory technology developments (28.5%), is very low. Key barriers include negative sentiments toward switching to advanced learning methods instead of traditional methods and a lack of trust in extension services. This study suggested that proper awareness and knowledge dissemination programs with enough motivation must be provided for effective PLA programs.

Keywords: adaptation, agriculture, climate smart agriculture, participatory learning and action

P22 **[59]**

ASSESS THE SUITABILITY IN APPLICATION OF EASILY ACCESSIBLE ORGANIC AMENDMENTS AS A NURSERY SOIL PRE-TREATMENT UNDER ANAEROBIC SOIL DISINFESTATION ACCORDING TO THEIR CARBON RELEASING EFFICIENCY IN UPCOUNTRY WET ZONE TEA ECOSYSTEM SRI LANKA

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ABSTRACT

Assess and identify the suitability of easily accessible organic amendments like *Tithonia*, *Gliricidia*, vegetable residue, and animal compounds for Anaerobic Soil Disinfestation (ASD) in Sri Lanka's upcountry wet zone tea ecosystem is a prevailing requirement. This study evaluates the carbon-releasing efficiency of ASD-treated soil, a natural resource-based method that enhances soil health and structure, as an alternative to chemical fumigation. The ASD used air-impermeable black polythene to produce bags. After preparing the bags, the soil was filled with each bag. Selected organic amendments for the study were *Tithonia diversifolia*, *Gliricidia sepium*, cabbage residues, cattle manure, and poultry litter, *Tithonia* + poultry litter, *Tithonia* + cattle manure, *Gliricidia* + poultry litter, *Gliricidia* + cattle manure, cabbage residues + poultry litter, cabbage residues + cattle manure. Organic amendments were incorporated at a 5 tons/ ha rate. After preparing the bags, all bags were sealed to ensure air-impermeability and kept for 35 days. After 35 days, the samples were analyzed for organic carbon. According to the results, the organic matter content of different ASD-treated soil has increased considerably. There was a positive significant increases in organic carbon ($p < 0.05$) was observed the combination of *Tithonia* + poultry litter (10.95% ±1.51), *Tithonia* (8.35% ±*1.46)*, cabbage residues (7.56% ±1.15), cabbage residues + cattle manure (7.29% ±0.25) and poultry litter (7.02% ±0.37) Therefore, crop residues such as cabbage residues, which have many unmarketable residues, give a good opportunity for nutrient cycling within the agroecosystem. Results after 35 days among the selected organic amendments, under anaerobic conditions, incorporated organic amendments combinations like *Tithonia* + poultry litter, *Gliricidia* + poultry litter, cabbage residues + cattle manure, and single applications including *Gliricidia*, *Tithonia*, poultry litter, cabbage residues have given positive results to implement the ASD by adding higher levels of organic carbon to the soil.

Keywords: easily accessible, anaerobic soil disinfestation, organic amendments, soil organic carbon, incorporating

P23 **[60]**

COMPARATIVE ANALYSIS OF THE ANTIOXIDANT MECHANISMS IN LYCOPENE ISOMERS: DFT STUDY

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ABSTRACT

Lycopene, a naturally occurring carotenoid predominantly present in all-trans in various fruits and vegetables, is known for its potential antioxidant properties. This DFT study employed the B3LYP/6-31G (d) level of theory to investigate the radical scavenging mechanism of lycopene isomers using three mechanisms, which are Hydrogen Atom Transfer (HAT), Sequential Electron Transfer Proton Transfer (SETPT), and Sequential Proton Loss Electron Transfer (SPLET). According to the HAT mechanism, the lowest bond dissociation energy (BDE) corresponds to the higher reactivity of the lycopene, which is related to the hydrogen abstraction of the lycopene from the radical species. Based on the calculated results, the lowest BDE values are 5-cis (66.68 kcal.mol^{-1}) < all-trans (67.04 kcal.mol^{-1}) < 9-cis (67.62 kcal.mol^{-1}) < 13-cis (67.73 kcal.mol^{-1}) in the non-polar environment. The SETPT mechanism is a combination of Ionization Energy and Proton Dissociation Enthalpy value and the SPLET mechanism is a combination of Proton Affinity and Electron Transfer Enthalpy. Both mechanisms' enthalpies are followed as 5-cis (134.15 kcal.mol^{-1}) < all-trans (134.51 kcal.mol^{-1}) < 9-cis (135.09 kcal.mol^{-1}) < 13-cis (135.20 kcal.mol^{-1}) in the polar environment. HAT mechanism can be identified as the primary mechanism for CH3OO• radical scavenging of lycopene. Both SETPT and SPLET mechanisms suggested 5-cis as the highest potential antioxidant. The activation energy of the radical scavenging mechanism, 5-cis, and 13-cis isomers are identified as the most kinetically favorable antioxidant under the HAT mechanism (9-cis (14.06 kcal.mol^{-1}) > all-trans (14.04 kcal.mol^{-1}) > 5-cis (12.66 kcal.mol^{-1}) > 13-cis (12.42 kcal.mol^{-1}). 5-cis isomer shows the most kinetically and thermodynamically favorable antioxidant properties compared to the other isomers.

Keywords: antioxidant, density functional theory, lycopene, HAT mechanism, SPLET mechanism, SPLET mechanisms

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