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FSSIDS 2022

Towards Resilient Food Systems

2nd Conference on Food Systems in Small Islands and Developing States

The Everly Putrajaya, Malaysia

(Conference room: IRAMA 5, Mezanine Floor)

7th – 9th September 2022

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FOREWORD

First of all, a very warm welcome to everyone to the conference on Food Security for Small Islands and Developing States (FSSIDS 2022): Towards Resilient Food Systems.

As you may already know, the first FSSIDS conference was held in September 2020, where participants from more than 10 countries in Southeast Asia and the Pacific, discussed and identified research gaps in issues relating to food security in the region using a systems-based approach. This 2020 workshop was originally planned to be held in-person, however the subsequent COVID-19 pandemic outbreak necessitated it to be conducted online.

Two years and one Covid pandemic later, we are pleased to finally have the opportunity to meet and work together with everyone in-person. The FSSIDS 2022 gathers the growing multidisciplinary community of academics, policymakers, professionals and industrialists to build on the lessons learnt and advance the discussion on achieving food systems resilience in the face of environmental, socio-economic and political turbulence. For these maritime nations, the relatively small size of their land and their economies gives them unique set of vulnerabilities that makes their food systems particularly sensitive to shocks and natural disasters.

In these contexts, the FSSIDS 2022 will focus on the following themes for resilient food systems in small island developing states: island, maritime or marine food systems and their shocks and crises, science-policy interface, innovations for sustainable food system and food cultural diversity. It is hoped that the FSSIDS 2022 Conference will mark the start of a network of academics and professionals with the common goal of improving the resilience and adaptability of food systems in small islands and developing states in the Asia Pacific region. We hope the FSSIDS network will go on to facilitate funding applications to support collaborative research in this region.

Wishing you an enjoyable and productive time in the conference.

FSSIDS 2022 Local Organising Committee

Chiew Foan Chin (Co-Chair)

Ee Von Goh (Co-Chair)

Christina Supramaniam

Pau Loke Show

THEMES

Island/ maritime/ marine food systems and their shocks and crises

Science-policy interface

Innovations for sustainable food systems

Food cultural diversity

PROGRAMME SCHEDULE

DAY 1 7th September 2022 – Wednesday

0800	Registration	
0900	Welcoming Address by Provost and CEO of the University of Nottingham Malaysia	Prof. Sarah Metcalfe
0915	Introduction to UNM Food, Energy and Environment Clusters Research by Vice Provost of Research and Knowledge Exchange, University of Nottingham Malaysia	Prof. Andy Chan
0925	Opening Speech by Assoc. Prof and Co-director of Future Food Malaysia, University of Nottingham Malaysia	Dr. Chin Chiew Foan
0930	Opening Ceremony Performance	
1000	MORNING TEA BREAK, GROUP PHOTO SESSION	
SESSION 1 (Chaired by Prof. Andy Salter)		
1030	**Keynote Speech:** Food Systems, Food Security and the Growing Complexity	Datin Paduka Dr. Fatimah Mohamed Arshad
1130	Improving Food Environments for Healthy and Sustainable Diets – A Case for Diversified Food Production and Consumption	Prof. Festo Massawe
1200	The Vietnam's Food System - Characteristics, Challenges and Opportunities	Dr. Nguyen Nam Giang
1230	Samoa's Food Systems	Mrs. Kuinimeri Asora-Finau
1300	LUNCH	
SESSION 2 (Chaired by Prof. Festo Massawe		
1400	**Keynote Speech:** Optimising Resource Use in Food Systems of Small Island States	Prof. Paul Teng Piang Siong
1500	Innovative Agroecological Processes for Agri-food Systems Transformation	Dr. Pedcris M. Orencio
1530	AFTERNOON TEA BREAK	
1600	Improving Green and Red Pakchoi Quality Using LED Illumination in Controlled Environment Vertical Farming	Mrs. Rosniza Kassim
1630	Innovations for Sustainable Food Systems	Mr. Errol Perera

PROGRAMME SCHEDULE

DAY 2 8th September 2022 – Thursday

SESSION 3 (Chaired by Prof. Asgar Ali)		
0900	**Keynote Speech:** How Do We Ensure a Healthy and Sustainable Supply of Protein for Future Generations?	Prof. Andy Salter
1000	Sustainable Livestock Development in the Pacific Island Countries	Dr. Royford Magiri
1030	Morning Tea Break	
1100	The Effects of Climate Change on Animal Productions in Fiji	Mr. Mohammed Rasheed Igbal
1130	Exertion of Enriched BSF Larvae Towards Sustainability and Carbon Neutral in Giant Freshwater Prawn Farming	Mr. Giva Kuppusamy
1200	Resilience in Small Islands Pacific States – Rethinking University Roles in Community Sustainability and Engagement	Prof. Unaisi Nabobo-Baba
1230	Lunch	
SESSION 4 (Chaired by Dr. Christina Supramaniam)		
1330	**Keynote Speech:** Functional Foods from Tropical Seaweeds: A Blue Economy Opportunity for Island Communities	Emeritus Prof. Phang Siew Moi
1430	A Cost-Effective Inclined Outdoor Photobioreactor for Cultivating Arthrospira (Spirulina) Platensis: Biomass Productivity and Nutritive Contents	Dr. Awalina Satya
1500	Afternoon Tea Break	
1530	Development of Functional Foods from Malaysian Marine Seaweeds	Dr. Patricia Clementina Matanjun
1600	Pushing for Resilience in Climate Disaster and Challenges to Food Security and Sustainability - Two Cases of Fijian Village Rural and Island Communities	Dr. Sereima Baleisomi
1630	Preparation for Transfer to Gala Dinner	
1700	Assemble at the Entrance Foyer of The Everly	
1930	Gala Dinner at Atmosphere 360 @ KL Tower	

PROGRAMME SCHEDULE

DAY 3 9th September 2022 – Friday

SESSION 5 (Chaired by Dr. Chin Chiew Foan)		
0900	**Keynote Speech:** Genomics and Breeding Innovations for Global Food and Nutrition Security	Prof. Rajeev Varshney
1000	Horticultural Food Loss in the South Pacific and its Capacity to Shape the Fresh Food System	Prof. Steven Underhill
1030	Morning Tea Break	
1100	Can Modern Postharvest Technologies Transform The Future Food Systems In Developing Countries?	Prof. Asgar Ali
1130	Traditional Foodways of Two Cham Communities: Contrasting Food Systems of Balamon and Bani Cham in Ninh Thuan Province, Vietnam	Dr. Eric Olmedo
1200	Rethinking of Sustainable Development Goals in the Upland Areas of Overlapping Territorial Claims: The Case of Karen Indigenous Community In Thailand	Dr. Yingluck Kanchanaroek
1230	Small Islands and Indigenous Agriculture Knowledge (IAK): Revisiting Philosophy, Values & Epistemology and Relationship to Kumala Production and Development in Ra, FIJI	Dr. Ilisoni Leweniqila
1300	Lunch	
SESSION 6: Discussion on Future Collaboration		
1430	Grants Briefing by Prof. Asgar Ali and Dr. Ee Von Goh	
1330	Breakout Group Discussion	
1530	Afternoon Tea Break	
1600	Breakout Group Discussion	
1700	Summary and Closing Ceremony	

DAY 4 10th September 2022 – Saturday

OPTIONAL		
Half day	Post-conference Tour	

KEYNOTE SPEAKERS

Fatimah Mohamed Arshad (Datin Paduka, Ph.D.)

Fatimah Mohamed Arshad is a research fellow at the Laboratory of Agricultural and Food Policy Studies, Universiti Putra Malaysia specialising in agricultural marketing and policy analyses. She obtained her doctorate degree in Agricultural Marketing from the University of Newcastle upon-Tyne in 1980. She has served as an academician at the Faculty of Economics and Management, Universiti Putra Malaysia (UPM) since 1980 until 2014. She was the Director of the Institute of Agricultural and Food Policy Studies, UPM (2006-2014) and later as a research fellow at the institute until to date.

She is currently a member of the country's National Agriculture Advisory Council, Ministry of Agriculture and Food Industry, Malaysia (2018 -). She is actively involved in providing input to the formulation of the country's agricultural food policy since 1980s starting with the National Agricultural Policy (NAP I) (1984), NAP II (1992-2010), NAP III (1998-2010), Agro-Food Policy (2011-2020), Agro-Commodity Policy (2011-2020), Food Security Policy (2008), Agro-food Policy 2.0 (2021-2030) and various five-year Malaysia plans. She is also a permanent member of Executive Committee on Food Security, Ministry of Agriculture and Food Industry (2020 -). She is the Head, Agriculture and Food Security Cluster, Academy of Professors, Malaysia (2020-) and senior fellow, Institute for Democracy and Economic Affairs (IDEAS), (2020-).

Her research areas include; agricultural marketing and economics issues, policy analyses, and agricultural market structure, conduct and performance. She has done various policy research studies particularly on the role of agricultural subsidies and incentives in the paddy and rice industry, food security, agricultural cooperatives, food supply chain and marketing, price analyses and forecasting and commodity and agricultural sector modelling. She has developed a vintage model for estimating oil palm production, system dynamics modelling on pertinent issues in agriculture such as food security, industrial commodity development and paddy and rice sector in Malaysia. She has carried out policy research for local and international agencies. Local agencies include: Economic Planning Unit (Department of the Prime Minister), Ministry of Agriculture and Food Industry, Fisheries Development Authority, Federal Agricultural marketing Authority (FAMA), Ministry of Plantation Industry and Commodity (MPIC), National Paddy and Rice Authority (NPRA), Bank Rakyat, Ministry of Science, Technology and Information (MOSTI), BERNAS, Malaysian Palm Oil Board (MPOB) among others. The international agencies include: World Bank, FAO, ACIAR, ALARN/ICONE, IAEA, ICLARM, SEARCA, AFMA, TFNet and IDRC.

KEYNOTE SPEAKERS

Professor Paul Teng (Ph.D., Hon. D.Sc., FAAET)

Professor Teng is Adjunct Senior Fellow, Centre for Non-Traditional Security Studies, and concurrently Managing Director and Dean, NIE International Pte. Ltd., both entities of Nanyang Technological University Singapore. He is also Senior Adviser (AgriFood) to A*STAR Singapore, and additionally advises several agtech startups. Paul previously held leadership positions in the Worldfish Centre, the International Rice Research Institute, Monsanto Company and U.S. universities. Professor Paul Teng is internationally recognised for his expertise in tropical agrifood systems, sustainable rural transformation and food security, with a focus on smallholder security, with a focus on smallholder cropping systems like rice-based ecosystems. He is also expert in AGTECH (Agricultural technology), Biotechnology applications in agriculture, Digitalisation in agrifood systems, Smart/Precision farming and Integrated Pest Management. Additionally, Paul has started, divested, and is still involved in several agri-bio tech companies. He has researched and taught in North America, Africa, and Asia, and has published over fifteen books and over two hundred technical papers. Paul obtained his B.Agric. Sc (Hons) and Ph.D. from Lincoln College, University of Canterbury, NZ. Paul has been recognised for his work through the Eriksson Prize in Plant Pathology, election as Fellow of The World Academy of Sciences and other professional societies and conferred an Honorary D.Sc. from Murdoch University, Australia.

Professor Andy Salter (Ph.D.)

Prof. Andy Salter has worked at the University of Nottingham since 1984 and is based in the Division of Food, Nutrition and Dietetics in the School of Biosciences. He has worked extensively on the molecular mechanisms whereby diet impacts on lipid metabolism and metabolic disease, particularly cardiovascular disease. In parallel, he has developed a research portfolio looking at the sustainable production of healthy foods to meet the demands of the expanding and ageing global population. He is currently the Director of the University's Future Food Beacon, which is an open research platform working across global food systems to help deliver sustainable food and nutritional security. This has provided funding for the Future Protein Platform which aims to evaluate novel systems for production of novel protein sources (plant, single cell organisms and insects), to assess their nutritional value and to develop their use as human foods and animal feeds. He is a Registered Nutritionist, has served as Elected Honorary Scientific Officer and Trustee of the Nutrition Society (2012-2018) and is currently a Trustee of the UK Academy of Nutrition Sciences.

KEYNOTE SPEAKERS

Emeritus Professor Phang Siew Moi (FASc, FMBA (UK))

Emeritus Prof. Dr. Siew-Moi Phang pioneered Applied Phycological Research in Malaysia. She co-founded the Asia-Pacific Society of Applied Phycology (APSAP) and served as its President, as well as President of the Asian-Pacific Phycological Association, Member of the International Phycological Society Board of Directors, and Overseas Vice-President of the British Phycological Society. She is a Fellow of the Academy of Sciences Malaysia (ASM); Fellow of the Marine Biological Association, UK; and Executive Committee Member, International Association for Biological Oceanography. She is the Founding Director, Institute of Ocean and Earth Sciences (IOES), University of Malaya, and led the IOES from 2003 – 2018. She joined the UCSI University in 2019 as Deputy Vice-Chancellor (Research & Postgraduate).

Prof. Phang leads the Algal Research Group, which focusses on the applications of algae in food, biofuel, biomaterials and their role in environmental and climate management, which has active collaborations with international partners. She has received several awards, including the International Foundation for Science/King Baudouin Award; the University of Malaya Vice-Chancellor's Lifetime Achievement Award for Publications, 2008; Outstanding Researcher Award (Distinguished Researcher), University of Malaya, 2017; Newton Prize 2017, British High Commission; and the ASM "Top Research Scientist Malaysia, 2012" Award. She has produced 276 papers in indexed journals, 17 books and 57 book chapters; awarded 9 patents with 8 filed; produced 32 PhDs and 70 Masters graduates. She is Associate Editor of the Journal of Applied Phycology; Maritime Technology & Research Journal; Geoscience Letters; Resource Person, Malaysia Biodiversity Information System (MyBIS) and Chair, ASM Committee on Blue Economy.

KEYNOTE SPEAKERS

Professor Rajeev Varshney (Ph.D.)

Prof. Rajeev Varshney is an agricultural research scientist specialising in genomics and molecular breeding with 20+ years of service in international agriculture while working in India, Germany, Australia, Mexico and several countries in Africa. He is serving Murdoch University as a Director, Centre for Crop and Food Innovation; Director, State Agricultural Biotechnology Centre: and International Chair in Agriculture & Food Security with the Food Futures Institute.

Prof. Varshney is a globally recognised leader for his work on genome sequencing, cataloguing and utilising genetic diversity, genomics-assisted breeding, seed system and capacity building in developing countries. He has made centrally important contributions towards improving food and nutrition security in India and several countries in Africa and Asia by assembling genomes, developing genomic resources and integrating genomic technologies in crop improvement programs in many tropical crops, and delivering several superior crop varieties to some of the world's poorest farmers.

Prof. Varshney, a highly prolific author and Highly Cited Researcher for 8 consecutive years (2014-2021) in a row has published >500 papers in high impact factor journals including 20 papers in Nature journals. Based on his publications, he has h-Index of 111 with >50,000 citations. He is the only agricultural/plant scientist in India, and the second plant biologist in Australia to achieve an h-index of >100 as per Google Scholar. He is an elected fellow to about 10 science and agriculture academies/ societies in India, Germany, USA, etc. and recipient of several noted awards including the most coveted science award, Shanti Swarup Bhatnagar Prize, and the most prestigious agricultural science award, Rafi Ahmed Kidwai Award from Government of India. Recently ICRISAT won the 2021- Africa Food Prize for the outputs and impact of Tropical Legume projects, led by Prof Varshney as Principal Investigator for 7 years.

LIST OF ABSTRACTS

Food Systems, Food Security and the Growing Complexity

Fatimah Mohamed Arshad[1,2]*

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Abstract

The recent food crisis reveals the vulnerability of the food security situation of developing nations including Malaysia. It's a crisis of a generation in scale and depth. It is a 3Cs-shock: Covid-19, Conflict of Russia-Ukraine and Climate Change with each producing its own impact to the world. The pandemic has caused serious supply chain disruption, the war resulted in an upsurge of fuel and commodity prices while climate change has affected the production of essential food commodity particularly wheat, corn and soybean. These impacts are not merely converging but interacting with each other in a feedback loop manner. The interaction of the three factors reinforces the inflationary effect which is challenging the three pillars of food security to the core: availability and affordability of food and hence nutrition security. In view of the growing complexity, the Food Systems summit 2021 proposed the embodiment of food systems in food security policy formulation for sustainability and resiliency. The underlying principle of food systems is 'systems thinking' which views the circular interconnectedness of elements that works towards achieving the system's objective. FAO defines[1] food systems are the sum of actors and interactions along the food value chain—from input supply and production of crops, livestock, fish, and other agricultural commodities to transportation, processing, retailing, wholesaling, and preparation of foods to consumption and disposal. The systems outcomes include: healthy and nutritious food, inclusive, environmentally sustainable and resilient[2]. Resilience is defined as the system's ability to survive and persist within a variable environment[3]. The future of food is no longer about production but the interaction of the sub-systems in the food systems that need to be steered towards sustainability, resiliency and equity. It's an arduous task but inevitable in view of growing food demand in the face of serious supply constraints. Developing countries like Malaysia, despite its richness in natural resources (land, water, sun shine, bio-diversity) is a net food importer. Like Malaysia the small island states need to revisit our food systems for food security policy and resteer it towards smart-agriculture for agro-ecological farming, resiliency and inclusivity.

[1]FAO (2021), FAO (2021). Sustainable food systems: Concept and framework. https://www.fao.org/publications/card/en/c/CA2079EN/ (Accessed on 12 December 2021)

[2]Ruerd Ruben, Romina Cavatassi , Leslie Lipper , Eric Smaling , Paul Winters, (2017). Towards food systems transformation-five paradigm shifts for healthy, inclusive and sustainable food systems.https://pubmed.ncbi.nlm.nih.gov/34667484

[3]Meadows, D. H. (2008). Thinking in Systems: A Primer. White River Junction, VT: Chelsea Green Publishing

Optimising Resources Use in Food Systems of Small Island States

Paul Teng*

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Abstract

Small island states (SIS) are characterised by limited natural food production resources such as land, water and labour, and commonly also inputs such as seeds and agrochemicals (synthetic fertilisers and pesticides). Because of this, in their natural state, SIS have a maximum production capacity and implicitly an upper "carrying capacity" of human populations. Food systems in SIS have evolved or been adapted to suit the resource limitations and demands of the prevailing human population, often leading to SIS having some level of self-production of food balanced against imports. Generally, with increasing populations, food systems have had to intensify in crop and animal culture, commonly with the use of modern inputs such as improved seed varieties, fertilisers, pesticides and with farming systems using mechanisation and irrigation. In the 20th century, all these technologies were responsible for the gains in yield. In this century, "disruptive technologies" such as digital technologies, biotechnology and New Breeding Innovations are proving themselves as essential productivity-enhancing technologies. SIS like Singapore have opted for high tech farming which use indoor vertical space, and other under-utilised space. Urban indoor agriculture and aquaculture have enabled optimisation of land, water and labour to significantly increase the production of vegetables and fish per unit area of land. However, high tech indoor farming requires high investments in capital expenditure (CAPEX) and consume much energy with the resultant produce costing higher than similar produce from open fields. The tradeoffs between using limited production resources, high CAPEX and higher costs of produce have to be optimised for the type of crop and the price affordability of consumers. There is no one formula that applies equally to all SIS. Lastly, as a result of supply chain disruptions, some SIS have chosen to venture into producing novel food like cultured meat.

How Do We Ensure A Healthy and Sustainable Supply of Protein for Future Generations?

Andy Salter*

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Abstract

There is increasing recognition that current global food systems are unsustainable and contribute to global warming and pollution of our planet. While many of the world's population, particularly those in high income countries, obtain the majority of their dietary protein from animal products, there is increasing concern over the impact of livestock production on the environment. This includes greenhouse gas emissions, nitrogen pollution and land and water use (largely for the production of crops used as animal feed). While many in high-income countries could reduce their consumption of meat without any significant impact on health, more vulnerable groups, including those in the lowest socioeconomic groups and the elderly, are already struggling to meet protein requirements and require careful consideration as we try to transition to more sustainable protein sources.

Protein quality is a function of both its indispensable amino acid (IAA) content and digestibility. While the protein associated with animal products is generally of high quality, many plant sources can be deficient in specific IAAs and of poor digestibility, often due to the presence of anti-nutritional factors. This is illustrated in some of our recent research which indicates that those in the lowest socioeconomic households in Malawi are of severe risk of lysine deficiency, due to their dependence on maize as their principle protein source. Diversifying the range of protein sources available, and developing effective processing strategies to improve digestibility would help in ensuring 'protein security' without further increasing our dependency on animal sources.

At the University of Nottingham we are investigating a range of novel protein sources, including underutilised crops, single cell organisms and insects. Many of these have the potential to replace animal protein in the human diet and represent more sustainable sources for animal feed. For example Winged Bean and Bambara Ground Nut are both rich in protein and can grow in relatively hostile environments. However, both suffer from poor digestibility due to the presence of anti-nutritional factors such as phytate, tannins and trypsin inhibitors. We are working on trying to improve digestibility through creation of different varieties and novel methods. Single cell organisms such as fungi, micro-algae and even bacteria all represent potential protein sources with relatively high

... (continued from page 14)

content of IAAs. Our research is aimed at assessing their value as potential components of both human diets and in replacing unsustainable ingredients of animal (and fish) feeds, such as soya and fishmeal. Insect larvae also represent a potentially more sustainable source of protein for livestock diets. Our recent work has indicated that dried mealworms can replace at least some of the soya protein in the diets of chickens. However, such substitutions result in significant changes in the gut microbiome, the impact of which we are currently trying to assess.

We believe that the dual strategy of reducing and replacing animal protein in the diets of those consuming excessive amounts, together with improving the sustainability of protein used in animal feed, represents the best way of reducing the impact of protein production on the environment, while protecting the most vulnerable from potential deficiencies.

Take Home Message

It is clear that our food systems should move towards more sustainable sources of protein and, in many high income countries, this should include a decrease in animal product consumption. As well as decreasing excess consumption, animal protein can be replaced by a combination of plant proteins and some of the novel sources described above. While livestock production is likely to be reduced, some production will almost certainly continue in the coming decades and, as such it is important we consider more sustainable protein sources for animal feed as well.

Acknowledgements

I would like to thank all of my colleagues who have been involved in the work described in my presentation and, in particular, our two Postdoctoral Fellows; Dr Molly Muleya and Dr Carlos Lopez-Viso.

This work was primarily funded by the University of Nottingham through the Future Food Beacon and the BBSRC through their Doctoral Training Programme. Some aspects were also funded by industrial partners including; ABAgri, Quorn and Herbalife.

Functional Foods from Tropical Seaweeds: A Blue Economy Opportunity for Island Communities

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Abstract

Seaweeds or marine macroalgae, have been traditional used by many maritime and island communities, as source of food, feed, medicine, food additives, fertiliser, industrial materials as well as renewable energy in recent years. The use of seaweeds for its medicinal value has been documented in various medical treatises; eg. The Pen Ts'ao by Emperor Shen Nung circa 2800 BC which lists 366 herbs and 1000 herbal formulations. *Porphyra* or nori has been used by the Japanese for more than 1500 years. In China, in the year 600 AD, Sze Teu wrote "algae are a delicious delicacy for the most representative guests, even for the king himself". The "Economic Products of the Malay Peninsula" was first published by I H Burkill in 1935, and reprinted in 1966. Several species of seaweeds and their uses are included in this invaluable document of Malaya's indigenous natural resources. The global seaweed market reached a value of US$ 6.73 Billion in 2021, and is expected to reach US$ 12.85 Billion by 2027. Biomass produced from aquaculture has overtaken that from wild harvest. Seaweeds produce phycocolloids, namely agar, carrageenan and alginate, and together with high contents of minerals and bioactive compounds, find diversified applications in the food, feed, industrial materials, nutraceutical, cosmeceutical and agroindustries. Studies show that seaweeds possess functional and health benefits, which can lead to development of new functional foods, including providing a nutritious diet to vegans and vegetarians. Seaweed colloids can also be used to produce edible films for food packaging, as well as biodegradable plastic. Technologies for seaweed cultivation are well established, as are technologies for extraction of the colloids. The development of a Blue Economy industry based on functional foods from seaweeds, has potential for maritime nations including small island states, especially those within the Coral Triangle and the Asia-Pacific region. Malaysia has implemented the 10-10 MySTIE Framework that serves as an integrative tool for government, researchers, innovators, industries and communities to work together to transform Malaysia into a harmonious, progressive, prosperous and sustainable nation. This together with the 8i Ecosystem Model (Nair 2011), can provide a framework for development of this Blue Economy industry.

Genomics and Breeding Innovations for Global Food and Nutrition Security

Rajeev K. Varshney*

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Abstract

Crop improvement offers sustainable solutions for food production and food security in the form of high-yielding, nutritious crops that can withstand various biotic and abiotic stresses. Innovative genomics and crop breeding techniques (e.g., marker-assisted selection, genomic selection, gene editing and speed breeding) have shown promise in enhancing crop performance. In this direction, we have decoded genomes and integrated advanced genome discoveries in crop improvement programs in several crops. Several high-yielding varieties with enhanced tolerance to biotic/abiotic stresses and higher nutrition have been developed in chickpea, pigeonpea and groundnut in India, Ethiopia, Kenya, Nigeria, etc. Translating crop productivity gains from genomics-assisted breeding in farmers' fields, however, require improved access to innovative technologies and their adoption by farming community. A robust seed system—delivering improved cultivars steadily to replace old cultivars— is plausible for adapting agriculture to climate change. This presentation will discuss the advances in genomics science, and opportunities and challenges of genomics-assisted breeding in improving agriculture to ensure food and nutrition security in developing countries.

Improving Food Environments for Healthy and Sustainable Diets – A Case for Diversified Food Production and Consumption

Festo Massawe*

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Abstract

Globalisation of the food system coupled with economic development have transformed our food environments and ultimately eroded local and regional food systems. Intensive practices, and specialisation into a few food staples dominate the current food system with only a few major actors in the whole of the food value chain, creating not only unfair competition but also making most developing countries excessively dependent on uncertain food imports. Consequently, exports restrictions (as seen during the pandemic and Russia-Ukraine war) and food price hikes can make importing countries food insecure overnight. It is also evident that, diets have become more uniform globally, usually dominated by low quality and highly processed food imports. Increased income and accessibility of poor-quality foods in low- and middle-income countries are linked with a decrease in traditional food production and consumption, and an increase in the consumption of meat, sugar and high caloric fatty and refined starch-based foodstuffs. As a result, the 'triple burden' of malnutrition (undernutrition, micronutrient deficiencies and overnutrition), and poor health outcomes are now widespread in many countries irrespective of wealth. It is therefore crucial for us to look at how food environments, especially in the global south, have evolved over time and the impact of these changes on local food production and diets, and the environmental, socio-economic, and public health outcomes. Several actions and essential ingredients necessary to improve food environments are then identified and proposed to deliver healthy and sustainable diets and tackle socio-economic and environmental challenges.

Acknowledgments

I would like to thank my colleagues who have been involved in the work described in my presentation: Ee Von Goh, Susan Azam-Ali, Gaik Cheng Khoo, Vengadeshvaran Sarma, Mohan Avvari, Maysoun Mustafa, Alex Lechner.

The Vietnam's Food System Characteristics, Challenges And Opportunities

Nguyen Nam Giang, Dao The Anh, Bui Quang Dang

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Abstract

Vietnam's Food system includes food value chains, food environment, consumer behaviour, and diets which are driven by bio-physical and environment, demographic, technology, and infrastructure, political and economic as well as socio-culture. It is characterised by five keys: Rapidly transforming; vitally important; multi-sectoral; interconnected and complex, vulnerable and requires urgent collaborative action. Vietnam's food system has significantly contributed to nutrient and health status, food security, social economic, and welfare as well as the environmental outcome. Food value chains in Vietnam grow rapidly with a diversity of production, provide more than domestic consumption and making 25.4 billion USD for export. Wet market (with 94% of food), low mechanisation, and unprocessed food remain the key issues. In the food environment, food safety, and environmental pollution became major concerns and food policies lack the capacity for monitoring and enforcement to comply with food safety standards. In terms of consumer behaviour, demand and consumption of meat and aquatic animal as well as certificated food increase. There is a significant difference in traditional and fast-food consumption between ages. Diets, it is affected by urbanisation, income increase, and consumer preferences. The high nutrient food is increasingly preferred.

The food system is massively influenced by climate change, around 16.5% of spring rice yield estimated to decrease in 2050, and 89,400ha in the Mekong delta will be at risk of flooding in 2100. The increase of population and urbanisation raise processed food consumption and eating far from home. It is also noted that food waste increases significantly in near future. The culture and the rapid growth of the economy are the main drives of the food system in both domestic and export. The resilient food system can be achieved by the acceleration of agro-ecology production, nutrients-sensitive agriculture, increase accessibility and availability for poor people; improving the propagation of education and policies to understand and control unhealthy food; towards SDGs and promoting the international cooperation in food system.

Samoa's Food Systems

Kuinimeri Asora-Finau*

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Abstract

Samoa like all Pacific island states face numerous problems stemming from its limited size and resources, isolation and fragile environment. Its food system is highly vulnerable to natural disasters and climate change, pests and diseases and external shocks like the pandemic and volatile economic environment. In the past 30 years The country was devastated by cyclones, had its main staple and export commodity wiped out by the taro leaf blight (TLB), affected by the economic crisis, hit by a tsunami, had a measles outbreak, and now the pandemic and war in Ukraine. All these events combined with increased demand for cash, changing lifestyles and the high production and processing costs continue to shape and influence not only people's willingness to engage in the food sector but also national policies and strategies.

The country's current food systems are characterised by many small scale farmers with food imports accounting for a quarter of the overall food supply, and animal and processed food making up 80% of imports. The local diet is nutritionally unbalanced with 61% of food being purchased and 37% locally produced. There is also a high incidence of malnutrition and non-communicable diseases in the country.

A transformation towards a more resilient food systems requires changes in dietary attitude to be supported by changes in food policy, food environments, civil society action and private sector offerings. There is a need to increase trade and consumption of competitively priced locally produced food and encourage nature- positive production. Building the resilience of communities to shocks affecting food supply and consumption is crucial, so farming for home consumption will continue to be supported.

Innovative Agroecological Processes for Agri-food Systems Transformation

Pedcros M. Orencio*

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Abstract

Many concerns about local food security stem from unsustainable agri-food systems. Advancing the arrangements for the transformation of this system require a wider orientation of agroecological processes that look at pre-production and post-consumption stages. This will complete a circular management approach wherein the roles of existing and alternative institutions that provide innovative mechanisms are developed and strengthened, respectively. To showcase how smallholder farming communities can benefit from non-technologically innovative approaches for developing agroecological systems, a case study in the Philippines that advocates efficient production, minimising losses, and managing waste will be presented.

There are basically three approaches. First, building the readiness for sustainable transformation, wherein a set of common institutional, organisational, and political components are developed. This is followed by a programmatic implementation of key activities, which address the prevailing concerns affecting the community's agricultural commodities of interest. And finally, the recognition of the elements and processes, which allows the successful on-the-ground delivery of the identified agricultural interventions. In this new normal, a virtuous cycle of upskilling and reinvestment in agriculture is worth sparking on as they can revolutionise agroecological processes and further contribute to transforming the agri-food systems into sustainable and resilient systems.

Improving Green and Red Pakchoi Quality Using LED Illumination in Controlled-environment Vertical Farming

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Abstract

Malaysia population is predicted to reach 41.2 million by 2040, thus an efficient and sustainable vegetable production technology, is required to minimise the country's reliance on imports and assure national food security. Controlled-environment vertical farming with artificial lighting is one of the latest method for producing high-quality food crops efficiently. LED light is the ideal illuminance choice for vertical farming since it is efficient, long-lasting, and emits less heat. Understanding the effects of different LED light wavelengths on the plant development and accumulation of essential nutrients such as antioxidants is crucial for achieving ideal LED illuminance for the production of high-quality vegetables in controlled-environment vertical farming. The purpose of this study is to examine the influence of various LED wavelengths on green and red pakchoi in the hydroponic vertical farm by measuring morphological, physiological and secondary metabolite responses. The research was carried out at the LED Light Research Lab MARDI, Serdang. Green and red pakchoi seedlings were exposed to six distinct wavelengths for 40 days with photoperiod 12-h day/12-h night. The LED wavelengths were; White (W) as a control, monochromatic red (100R), combination red and blue (82R12B), combination red and blue (50R50B), monochromatic blue (100B), and the combination red, blue and green (R69B24G7). According to the results, the optimal light spectrums for green and red pakchoi in terms of growth quality and phytochemical accumulation are 82R18B and 69R24B7G. The G wavelength is excellent for improving plant quality. Incorporating a tiny amount of G wavelength into growth light sources may enhance the indoor vertical farming environment without reducing yield, quality, or phytochemical content of green and red pakchoi. G wavelengths have been revealed to be just as important to plants as R and B wavelengths. However, further study is needed to determine the appropriate G proportions to add on R and B wavelengths, as well as to evaluate other possible crops that may be cultivated in controlled-environment vertical farming with LED lights.

Innovation for Sustainable Food Systems

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Abstract

Environmental, social and economic costs of the 'linear' nature of the modern food production system are significant. Food related CO2 emissions could double by 2050 without changes to the current unsustainable food systems as well as consumptions patterns. Circular agriculture is a way to farm sustainably, while making use of scientific advances, innovations and new technologies.

The ASEAN Sustainable Agriculture Guidelines are being developed currently to help lead the way for the development of Sustainable Agriculture and food production within ASEAN for the near future and beyond. One key aspect of these guidelines is the recognition of the need to incorporate circularity into the agricultural and food systems in ASEAN in order to drive sustainability. A cornerstone of the ASEAN Sustainable Guidelines is the recognition of the need for sustainable inputs (Fertilisers, Feeds and Biological Control Agents) to drive the creation of the ASEAN Sustainable Agriculture and Food Production. Without sustainable, renewable inputs, sustainable agriculture would not be able to develop.

Two technologies are presented which support and showcase the positive effects of sustainable and circular agriculture as well as aquaculture. The first is the development of the Organoponix systems and the second was the development of the EOT Restorative aquaculture system. Both demonstrate the significance of combining the science with system design and technology to achieve sustainable and circular goals. The Organoponix system is a unique organic recirculating system based on the use of only valorised agriculture waste to produce leafy vegetables crops, fruit crops as well as root crops in a soil-based system. The EOT system is a system which was developed for aquaculture of herbivore and omnivore finfish which uses principles of Restorative aquaculture in a similarly cost-effective sustainable approach to reduce the environmental impacts of fish culture, while lowering the feed requirements (FCR) resulting in both lower costs of production while limiting the discharge of fish wastes into the surrounding water bodies.

Sustainable Livestock Development in the Pacific Island Countries

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Abstract

Agriculture contributes for around 10.4% of Fiji's GDP, supports the livelihoods of 27% of the people, and is the primary source of employment for more than 83 percent of the country's rural population. However, the estimated contribution of livestock is low and not well known. Livestock production has decreased in the recent decade, yet it remains a vital industry for Pacific Islanders' livelihoods, income, and food security. To meet future demand and lessen reliance on imports of livestock products, livestock sector must develop at a faster rate than the present less than 4% per year. For long-term growth, government assistance and private investment are critical. Small livestock, such as chickens, sheep, and goats, can be incorporated into the farming system to provide additional revenue and food security in the face of climate change.

The Effects of Climate Change on Animal Production in Fiji

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Abstract

One of the world's most significant concerns in the twenty-first century is climate change, which has increased the frequency of severe weather occurrences. The changing environment has also impacted the livestock industry, which has led to a rise in animal asset losses and various other indirect losses. Thermal and cold stress, an increase in disease incidence, and a reduction in the availability of feed, fodder, and water are some of the effects of climate change on livestock, resulting in a decrease in animal productivity and production. With variations in solar energy, temperature, and precipitation, climate change is a process brought on by emissions of greenhouse gases from fuel burning, deforestation, urbanisation, and industry. Water supplies, agriculture, livestock, coastal areas, freshwater habitats, vegetation, forests, melting of snow-covered mountains, and increased climatic catastrophes such as landslides, desertification, and flood pose a significant threat to human life worldwide. It continues to significantly impact Fiji's economy and the animal (livestock and marine) and food output from earlier decades. These significant changes harm Fiji's economy and livestock production. Additionally, humans involved in the production of animals are impacted by climatic factors such as loss of income and livestock species that die out during cyclones and other aspects. These climatic phenomena include floods, temperature increases, sea level rise, droughts, tropical cyclones, and all other occurrences that significantly alter the ecosystem. Global warming, changing precipitation patterns, and an increase in the frequency of extreme weather events are the three main aspects of climate change that are already noticeable and becoming more significant. As a result, the Fijian government and other Pacific organisations have introduced techniques, including adaptation plans to execute in the animal production sectors that will aid farmers in boosting their farming systems and adapting to climatic changes. Thus, this will result in more productivity and a more robust economy. This study aims to identify and elaborate on the consequences of climate change on Fiji's livestock and marine production and practical remedies adapted by Fiji and other Pacific Island nations to prevent unfavourable climate circumstances.

Exertion of Enriched BSF Larvae Towards Sustainability and Carbon Neutral in Giant Freshwater Prawn Farming

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Abstract

Finite marine resources (such as fishmeal or fish oil) and sustainability and anti-nutritional concern in alternate feed ingredients (such as terrestrial plant proteins) have driven the research interest to explore various alternate resources including insects. Various insects have been the subject of research for the past decades, and among all, black soldier fly (BSF) is promising candidate as potential alternate to marine-based ingredients in aquaculture. Other than reducing the environmental pressure on solid waste management as an efficient bio-converter, BSF also can be contribute its novelty to improve feed and food security. BSF larvae is unique in the way that it can alter the nutrient content based on feeding substrate. Higher content of protein, lipid, essential amino acids and micronutrients present in BSF meal added the value as excellent replacer for other expensive and unsustainable resources in aquaculture. However, significant deposition of lipid, particularly saturated fatty acid (SFA) and heavy metals from the waste substrate arises questions on food safety and security issues. Thus, modification of the feeding substrate from underutilised plant such as *Sesbania grandiflora* (hummingbird leaf) could solve the issues on food hygiene and security, promotes green technology and provides sustainable sources.

Sesbania grandiflora, a leguminous plant from family Fabaceae is well studied for its extraordinary nutraceutical properties, capability to eliminate heavy metals and boost the soil fertility. Preliminary research done on Sesbania as feeding substrate to BSF larvae have shown higher protein (>70%), lesser lipid (<6%), fair content of PUFA and substantial reduction of heavy metal content. The incorporation of nutraceutical properties of sesbania into BSF larvae will certainly improve the immune response, survival endurance and growth of giant freshwater prawn, and parallelly the implementation of the plant substrate potentially minimise the exploitation of marine or other finite resources and promote the practice towards carbon neutral and green circular aquaculture.

Resilience in Small Islands Pacific States – Rethinking University Roles in Community Sustainability and Engagement

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Abstract

Small Island States present a particular array of challenges in light of the 2030 SDGs and especially in food security given climate challenges. Universities in small island states can contribute to the Public good in many ways. This paper discusses the public good given two projects. First it looks at the twin concepts of Pacific Small Islands Developing Sates and (Climate) Vulnerabilities then discusses how a University Climate project works to impact resilience of local communities. The paper further discusses how a University Campus is supporting resilience on one of its Campuses.

A Cost-effective Inclined Outdoor Photobioreactor for Cultivating *Arthrospira (Spirulina) Platensis*: Biomass Productivity and Nutritive Contents

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Abstract

Background

The biomass of the microalgae *Arthrospira (Spirulina) platensis* has known as a source of highly valuable nutritive compounds. To support the goal of improving the resilience and adaptability of food systems in small islands and developing states, a low-cost microalgae cultivation system for obtaining high biomass productivity needs to be developed. Hence, the prospect of utilising a low-cost material for the culture of this microalga in an outdoor inclined photobioreactor construction was evaluated.

Materials and methods

The plastic pillows (polyethylene material, 0.8 mm thickness) filled with modified Zarrouk medium in two varied diameters of 20 cm (InPBRD-20) and 50 cm (InPBRD-50) were used as an outdoor airlift photobioreactors system which gave a working volume of 45 L and 150 L, respectively. A duplicated shading treatment for 42 days using the ordinary shading net gave light reduction varied of 50%, 70%, 90%, and without shading (as a control treatment), which was then denoted as I=50%, I=30%, I=10%, and I=100%. Inclination had adjusted to 158.22° using a supporting wooden rack as a base. Harvesting was conducted weekly. The relative performance of this shading effect on both in the PBRs type was investigated concerning their biomass productivity and nutritive content profiles.

... (continued from page 28)

Results and Discussions

The highest Specific Growth Rate (45.56±0.28%/day), carbohydrate (27.52±4.53 % dry weight), total ash (20.86±4.14% dry weight), and biomass productivity (266.48±24.24 mg/L. d) were found on PBRD-20 that received 50% of light reduction (~6kLux to 16.1kLux). Meanwhile, the highest protein content (77.98±6.69 % dry weight) and lipid content (10.41±1.53 % dry weight) were found on PBR D-50 under light reduction of 10% (~16kLux to 29kLux). Those values were significantly higher than of values observed on control treatments (that irradiated of~18kLux to 32.1kLux).

Conclusions

This cost-effective inclined outdoor photobioreactor provides an excellent amount of *Arthrospira (Spirulina) platensis* biomass productivity and adequate

Development of Functional Foods from Malaysian Marine Seaweeds

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Abstract

Marine origin materials from seaweeds are potential sources of functional food components. In Malaysia, the seaweed flora is fairly rich but most of the seaweeds are under-utilised, and their health benefits are unknown. These studies were conducted to investigate the nutrient composition, antioxidative, cholesterol-lowering properties, antiobesity, anticancer and blood pressure lowering of Malaysian seaweeds, *Kappaphycus alvarezii, Caulerpa lentillifera* and *Sargassum polycystum*. These seaweeds were high in dietary fibre, minerals and trace elements, low in lipid, and a significant amount of omega-3 fatty acids, vitamins, total carotenoids and flavonoids. These seaweeds demonstrate good antioxidant properties and exert a cardioprotective effect in rats fed high-cholesterol/high-fat diets. The findings found that *S. polycystum* supplementation had a positive effect in inhibiting weight gain and has promising value in preventing obesity. The results also showed that *K. alvarezii* ethyl acetate extracts were antiproliferative against HepG2 and water extracts were antiproliferative against HeLa. Seaweed noodles, tea, crackers and bread were newly developed food products with unique flavour, natural colour and enhanced with health-promoting ingredients from Malaysian seaweeds. Diet intervention in human subjects showed that consuming seaweed bread resulted in lower (P<0.05) systolic blood pressure, diastolic blood pressure, pulse and total cholesterol. Consumer studies have shown that these food products are well accepted. These seaweeds are nutritionally valuable thus making them a potential source of healthy ingredients for the development of functional foods.

Pushing for Resilience in Climate Disaster and Challenges to Food Security and Sustainability – Two Cases of Fijian Village Rural and Island Communities

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Abstract

Climate Change presents the greatest threat to the global community and current advances in development. The range of the climate disaster effects, determined through scientific research, and increasing understanding of impacts on livelihood practices of indigenous communities, will endure for many centuries to come. In tropical areas of Africa, Asia, and the South Pacific, and especially with low lying island countries, these effects will combine with the El Nino/El Nina events and other natural disasters such as hurricanes, cyclones, flooding, and tsunamis, to present disaster risk with challenges to national development. As Ocean states, with high dependence on the environment and natural resources, Pacific Island countries face looming existential threats to health and well-being. Pacific Islands suffer from long standing issues of island states as predicted by Bacchus and Brock (1987); Nunn (1994) and Turvey, 2007. Turvey notes for instance, …since the 1990s, there has been a renewed interest in the old problems faced by SIDS with the emergence of new concerns about vulnerability and sustainable development. The conventional analysis of small-island characteristics (for example, remoteness and insularity) as 'constraint criteria' has been supplanted by the emergence of vulnerability criteria in contemporary research on SIDS (page 1). These encompass challenges to food security as already limited agricultural land becomes salinated, reefs are bleached and the key economic sectors of tourism, agriculture and fisheries are severely affected. This paper focuses on the critical issue of Food security of rural communities as they struggle to meet the challenges of climate disaster and build community level resilience. The paper, based on primary data drawn from current research with an outer island village community in Fiji, and a river affected community on Viti Levu identifies the key drivers of Food security including high temperature, rising sea level, droughts, precipitations as well as secondary effects of increasing production and transportation cost. The paper further explores practical efforts, by the communities, at attaining Food security as a climate resilience strategy. Critically the paper demonstrates the relevance in aligning science with indigenous knowledge and practices to achieve better climate resilience outcomes to sustain the community.

Horticultural Food Loss in The South Pacific and Its Capacity to Shape The Fresh Food System

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Abstract

In the last ten years, there has been an increased global recognition of the importance of food loss. In small island developing states, often with limited natural resources and underlying socio-economic challenges, food loss can create an elevated burden on the food system. Between 2015 and 2021, we sought to quantify the level of horticultural postharvest loss in the South Pacific region and its implications on the fresh food system. Horticultural loss was assessed in Samoa, Tonga, Fiji, the Solomon Islands, and Vanuatu, using municipal and road-side vendor surveys and commodity-specific value chain studies. Supplementary farmer and vendor surveys were then undertaken to document the fresh food distribution system, handling practice, and explore food loss mitigation or avoidance strategies. Horticultural loss in the South Pacific was 5 to 10%, with sporadic incidences of high loss (>20%). Loss was more prevalent in the large commercial farms, or value chains sourcing product from the outer islands and semi-subsistence production systems. The primary strategy to mitigate against loss involved rapid and regular market supply, underpinned by fast market throughput. In the Pacific, "*fast fresh food*" is commonly relied on to compensate for a lack of effective postharvest infrastructure. We found that market vendors in Tonga actively up-regulate market supply to reduce loss, potentially limiting farmer participation in the food system. In Samoa, loss was higher in the traditional municipal markets, possibly reflecting changes in consumer purchasing behaviour. In Solomon Islands, farms tend to selectively source product from farm locations based on perceived vulnerability to elevated loss. While food loss in the Pacific is comparatively low, the underlying mitigation strategies can have a profound impact on the food system. Minimising food loss can influence the type and quantity of crops farmers grow, the markets they supply, and the relative criticality of reliable transport logistics.

Can Modern Postharvest Technologies Transform the Future Food Systems in Developing Countries?

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Abstract

According to the United Nations, the current world population is expected to reach 9 billion by the year 2050. To meet the food and nutrition needs of this rising population, food production (under the current trends) will have to increase by 70%. Increasing production requires additional resources (land, water, energy, and other agro-inputs) that are scarce. Producing more and more, in a non-sustainable manner will have a very high cost for the environment, a much better solution would be to concentrate more on what we are currently producing and make the best out of it.

One strategy for increasing the food available to feed the ever-increasing population is to ensure proper and better utilisation of the food that is already produced. It is estimated that one-third (30%) of the food produced for human consumption is lost or wasted along the supply chains globally. This translates into 1.3 billion metric tons of the total volume of food produced The Food and Agricultural Organisation says that annual food waste and losses worldwide are worth about US 2.6 trillion (including energy, water and workforce required), which is approximately 5% of the world GDP. Food is lost or wasted throughout the supply chain from the production to the consumption stage.

The reduction of FLW is an important strategy to ensure food and nutritional security in efficient and sustainable food systems. Therefore, an urgent need exists for a concerted effort at national, regional, and global levels to reduce FLW.

New technologies are being developed to prevent food waste - one of the most straightforward 'wins' to achieving a global food supply. In developing countries, as much as half of the harvested crops are lost between the field and the consumer. Pilot scale studies are being carried out here in collaboration with the industry to develop an edible coating technology.

In this session, Professor Asgar will discuss the potential of advanced technologies in delaying ripening and extending postharvest life and reducing postharvest losses of fruit and vegetables.

Traditional Foodways Of Two Cham Communities: Contrasting Food Systems Of Balamon And Bani Cham In Ninh Thuan Province, Vietnam

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Abstract

This research focuses on the foodways of the Cham social group, descendants of the Champa Kingdom, who are presently accounted for as an ethnic minority by the Vietnamese government. Within the broader Cham community coexist two subgroups delineated by religious beliefs: the Balamon Cham and the Bani Cham, who practice localised forms of Hinduism and Islam, respectively. This paper presents an ethnographic account of both communities' food systems, based on a fieldwork that took place in Bau Truc village and its surroundings in Ninh Thuan province, Vietnam, in the month of May 2022. This research works aims at reconstructing Cham's food systems, contrasting difference and highlighting similarities between Balamon and Bani communities. The collected data cover the following components of the food system: sacred foods, food supply chain, food security, traditional foods, and food rituals. Findings show the central role of wild edible plants and domesticated vegetables in both food systems, while more insight is gained on the influence of religion upon eating habits and socialisation patterns, within and inter-groups.

Rethinking of Sustainable Development Goals in the Upland Areas of Overlapping Territorial Claims: The Case of Karen Indigenous Community in Thailand

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Abstract

The Karen indigenous community was suspected to having a role in the deforestation and forest degradation in Thailand, thus hindering the achievement of Sustainable Development Goals (SDGs). This paper aims to investigate whether agroecological resource management by the Karen community is in line with SDGs. The research employed semi-structured interviews, community focus groups and a close-ended survey instrument. The results show that the Karen community has created community-based resource management systems for more sustainability of the ecosystem. They applied local wisdom, ecosystem services and a common property approach to their management. As a result, community members have equal rights to access and receive the benefits of natural services (SDG15). This management also provided food security at the community level (SDG 2) and ensured sustainable consumption and production (SDG 12). However, poverty (SDG1), vulnerability, and land rights are still significant challenges for this community.

Small Islands and Indigenous Agriculture Knowledge (IAK): Revisiting Philosophy, Values & Epistemology and Relationship to Kumala Production and Development in Ra, Fiji

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Abstract

Subsistence agriculture is a primary food source for most I-Taukei or indigenous Fijian farmers. The purpose of this research and paper is to build an understanding of how indigenous agricultural (or traditional) knowledge (IK) can contribute to achieving Climate-Smart Agriculture (CSA) in Fijian farming systems, with a particular focus on its relevance to kumala (sweet potato. Ipomoea batatas) farming in Ra province in Fiji. The implementation of the Fijian Vanua Research Framework FVRF with Scientific methods in this research has paid specific attention to indigenous Fijian society in an agricultural context aligned to future food security issues. This research sought a solidarity approach for the rural areas in Fiji using their systems of knowledge and understandings as the basis for inquiry and investigation and opens the possibilities of extending the knowledge base of indigenous people and transforming their understanding of the social-cultural world like solesolevaki, which is our current cultural currency. The findings of this research discussed the cultural role in kumala production in the traditional Fijian context under four components: values and beliefs, practices, skills, and knowledge. Indigenous Knowledge (IK) exists across all facets of the Fijian way of life, including health, spiritual beliefs, and environmental survival.

Synthesis and Characterisation of Fish Waste Chemically Cross-linked Gelatin Gel for Biomedical Application: From Problem to Valuable Resources

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Abstract

The growing demand for environmental-friendly and sustainable materials has obliged the exploration of materials from natural resources for potential application in various fields. With the better understanding of the important role of gelatin, the search for gelatin from alternative sources has risen globally over the year. Fish gelatin has been considered a very promising alternative source because it has similar functional properties to gelatin from mammals. Indonesia as a maritime country has the second largest marine catch production in the world after China, which is around 7 million tons in 2015. However, not all parts of the fish are used in industrial processing. According to various estimates, waste from fish processing can account for up to 85% of the total catch. A large portion of waste (about 30%) is skin, bone, and scales with high collagen content. Therefore, the production and usage of gelatin from fish skins seem very promising and can solve the problem of waste disposal and utilisation in the fish processing industry. This article discusses the synthesis and characterisation of skin fish gelatin-based hydrogel crosslinked with glutaraldehyde (GA) as a candidate for drug delivery systems and an antidiabetic agent. Fish skin of salmon crosslinked with GA (SG) and fish skin of Tilapia (TG) have various types of amino acids with the highest content of glycine and L-proline followed by slightly lower alanine and glutamic acid. It was found that the introduction of GA as a crosslinker agent is capable of rendering the gelatin network of both SG and TG to be more stable again mechanical stress. The morphology of SG-GA and TG-GA gels was found to be smooth and homogenous. The stress and elongation of gelatin-based hydrogel cross-linked with GA under wet conditions showed excellent when the mixture ratio of GA was 0.05%. The hydrogel showed good swelling, mechanical, and thermal properties. The α-glucosidase inhibitory activity of SG and TG had IC50 values of 483.97 ± 8.10 g/mL and 344.98 ± 3.56 g/mL, respectively, compared to quercetin positive control with IC50 values of 2.27 ± 0.05 g/mL. The active peptides of SG and TG showed an interaction with α-glucosidase involving hydrogen bonding, hydrophobicity, electrostatic, van der Waals, and unfavorable VW (SG) and WF (TG) peptides had the highest binding affinity with α-glucosidase, the value was higher than acarbose with a difference of 2.3 and 2.7 kcal/mol, respectively. The binding site of the active peptides SG and TG on α-glucosidase is the same as that of acarbose. Based on the results of the study, it can be concluded that SG and TG cross-linked GA 0.05% can be the best alternative to mammalian gelatin as a source of the hydrogel. This contribution presents that gelatin holds the promise of an effective product used in biomedical applications, especially in the management of metabolic disorders such as diabetes.

Tackling Food Security Issues through Sustainable Smallholder Rice Farming in Trobriand Islands, Milne Bay Province, Papua New Guinea

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Abstract

The El-Nino and La-Nino have imposed serious constraints on traditional gardening in Trobriand Islands and are faced with a relative shortage of food supply and water. Climate change on a global scale has negative impacts on traditional gardening and therefore affects the island's food supply. Food security systems in rural areas are mainly traditional gardening based while semi-urban areas are more dependent on imported food. Smallholder rice farming is, therefore, paramount in addressing the challenges of food security and reducing malnutrition and food insecurity. The ethnographic and survey methodologies were used in data collection from November 2017 to March 2018. The survey was a key research tool used to find out socio-economic activities, local gardening patterns, local climate, and environment. Individual household consultation, one on one dialogue, group discussions, and public awareness were the key activities in community mobilisation. The small-holder rice farming in North Kiriwina, Trobriand Islands involves eleven (11) council wards with two model farmers from each ward. Currently, the importance of rice has dominated other staple food crops in Trobriand society. There is a significant period indicated in the local gardening calendar that is covered by rice productivity. Not only to fill in the food insecurity period but also to supplement the food diet, increase food production, and provide income opportunities for the local people. Climate change has been continuously affecting the Trobriand Islands' food security. The primary food sources and water have been impacted by climate change and, in most cases, these impacts are negative. In terms of action against climate change and coping with its impacts, the introduction of smallholder rice farming will fit into the food scarcity period as a sustainable project with a focus on eradicating food insecurity and hunger.

Role of Agricultural Institutions and Tertiary Colleges in Providing Support Towards Sustainable Rural Development in South Pacific Island Countries

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Abstract

This paper examines the agricultural training in higher education institutions and tertiary colleges, their pre-eminent role and how best they can contribute to alleviate poverty in rural communities in Fiji and other South Pacific island countries. These institutions provide support through training farmers (vocational and adult education) and/or extension officers and providing researchers. Unfortunately, agricultural training institutions are not adapting to the rapid changing times early enough and have more or less maintained the traditional way of training. There is a need for agricultural institutions to amend their programs to facilitate the new emerging areas, together with new learning and teaching frameworks, establish new partnerships with the private sector in addition to expanding their representation in governance in addition to holding continuous dialogue with policymakers. Further, these institutions can potentially showcase local customs and knowledge, mirroring the regional culture, and ethical customs of the Pacific island community, as well as global movements and development forces. In reinforcing their title role as contributors to a culture of education and rural agricultural development, we suggest that agricultural institutions engage more directly and more effectively in partnerships and dialogue with other local agricultural stakeholders and their surrounding rural communities in Fiji and other Pacific island countries.

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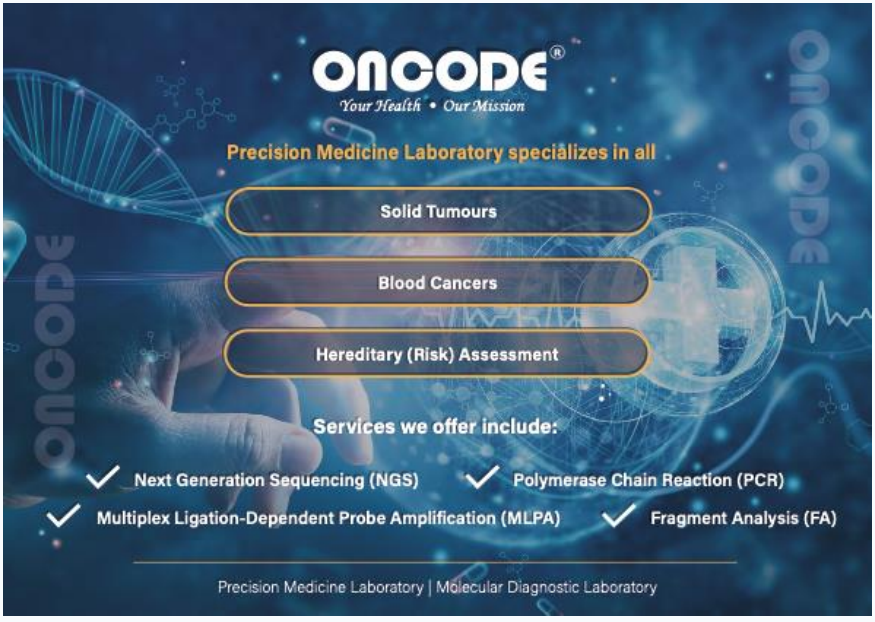

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