Taiwan-Africa

Smart Sustainable Agriculture and Marine & Aquaculture Forum

Website Link

2023 | 24~25 March

NCKU 893S1

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Day1-March 24

Taiwan	Africa	Subject	Speaker
14:30- 15:00-	8:30- 9:00-	**Arrival**	
		Chair: Prof. Woei-Jiun Guo (郭瑋君)	
15:00-	9:00-	**Welcome Remarks**	**Prof. Charles Lin (林建宏)** Vice President for International Affairs, NCKU, Taiwan **Dist. Prof. Ju-Ming Wang (王育民)** Dean, College Biosci. & Biotechnol., NCKU, Taiwan
-15:15	-9:15	**Photo Time**	
		Chair: Asst. Prof. Shih-Ming Lin (林士鳴)	
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15:45- 16:15-	9:45- 10:15-	**Microbial Based Solutions to Sustainable Agriculture-Multifunctional *Bacillus*-Based Probiotics**	**Prof. Tzu-Pi Huang (黃姿碧)** Chair, Plant Health Care Prog., Acad. Circ. Econ., NCHU, Taiwan
16:15- 16:45-	10:15- 10:45-	**Soil Biodiversity: An Understudied Driver of Sustainable Agriculture Production Systems**	**Dr. Khosi Ramachela** Lecturer, Crop Sci. Dept., NWU, South Africa
16:45- 17:15-	10:45- 11:15-	**An Evolutionarily Conserved Long-Distance Migrating Peptide Regulates Lignin Biosynthesis and Plant Immunity**	**Asst. Prof. Ying-Lan Chen (陳盈嵐)** Dept. Biotechnol. & Bioind. Sci., NCKU, Taiwan
17:10- 18:30-	11:15- 12:30-	**Dinner/Break**	
		Chair: Asst. Prof. Ying-Lan Chen (陳盈嵐)	
18:30- 19:00-	12:30- 13:00-	**Hydroponics: A Sustainable Tool for Regenerating Preferred Sex and Producing a Typical Dioecious Plant, *Telfairia occidentalis (Linn)***	**Prof. Isijokelu Moses Ojeifo** Dept. Agron., DSU, Nigeria
19:00- 19:30-	13:00- 14:30-	**Smart Agriculture: The Application of Unmanned Vehicle in Agriculture and Animal Husbandry Industry**	**Asst. Prof. Chen-Wei Liang (梁辰瑋)** Biomechatronic Engr. Dept. NIU, Taiwan
19:30- 20:00-	14:30- 15:00-	**Development of Sustainable Agriculture at National Pingtung University of Science and Technology**	**Asst. Prof. Yuh Tzean(曾昱)** Vice International Director, NPUST, Taiwan
20:00- 20:30-	15:00- 15:30-	**Sustainable Magic: Turn Agriculture Trash to Cash**	**Prof. Yung-Kai Lin (林詠凱)** Institute Food Safety & Risk Management, NTOU, Taiwan
20:30- end-	15:30- end-	**Conclusion, Chair: Prof. Woei-Jiun Guo (郭瑋君)**	

Day2-March 25

Taiwan	Africa	Subject	Speaker
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		Chair: Assoc. Prof. Hong-Yi Gong (龔紘毅)	
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-15:15	-9:15	**Photo time**	
		Chair: Asst. Prof. Pinwen Peter Chiou (邱品文)	
15:15- 15:45-	9:15- 9:45-	**Present Status of Marine Fisheries in Berbera, Somaliland**	**Mr. Eid Saleban Ahmed** Lecturer, Dept. Fisheries & Marine Sci., PhD. fellow, BMFA, Rep. Somaliland
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16:15- 16:45-	10:15- 10:45-	**Decades of Growth and Development ofFisheries and Aquaculture In Nigeria: Prospects, Practices and the New Era For Sustainability**	**Dr. Bolaji Dunsin Abimbola** Chief Research Officer., NIOMR, Nigeria
16:45- 17:15-	10:45- 11:15-	**Development of Disruptive Technologies towards the Productivity and Sustainable Aquaculture**	**Assoc. Prof. Jenn-Kan Lu (陸振岡)** Dept. Aquac., NTOU, Taiwan
17:10- 18:30-	11:15- 12:30-	**Dinner/Break**	
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18:30- 19:00-	12:30- 13:00-	**Current Status and Potentials of Aquaculture in Delta State, Nigeria**	**Dr. Esther Uzoma Kadiene** Deputy Director, Centr. for Res. and Int. Prog., DSU, Nigeria
19:00- 19:30-	13:00- 14:30-	**Application of Agricultural Byproduct/Waste as Functional Feed Additives in Aquafeed**	**Dist. Prof. Yu-Hung Lin (林鈺鴻)** Dept. Aquac., NPUST, Taiwan
19:30- 20:00-	14:30- 15:00-	**From Scientific Breeding of Quality-Based Aquatic Seedlings to Sustainable Aquaculture**	**Assoc. Prof. Chang-Wen Huang (黃章文)** Deputy Director and Division Chief, Op. Centr. for Enter. Academia Networking, NTOU, Taiwan
20:00- 20:30-	15:00- 15:30-	**Challenges, Potential, Hopes and the Future of Shrimp Aquaculture**	**Dist. Prof. Han-Ching Wang (王涵青)** Director, Inter. Centr . for Sci. Dev. of Shrimp Aquac., NCKU, Taiwan
20:30- end-	15:30- end-	**Conclusion, Chair: Assoc. Prof. Hong-Yi Gong (龔紘毅)**	

The Contribution of Underutilized Vegetable Species to Household Food and Nutritional Security and Agrobiodiversity in Cereal-Based Cropping Systems

Dr. Sydney Mavengahama

Associate Professor

Sydney.maVengahama@nwu.ac.Za

- **Crop Science Department, School of Agricultural Sciences, Faculty of Natural and Agricultural Sciences, North-West University, Mafikeng, South Africa**
- **Food Security and Safety Niche Area, Faculty of Natural and Agricultural Sciences, North-West University, Mafikeng, South Africa**

【Abstract】

Underutilized vegetable species are an important source of food in the cereal-based subsistence farming sector of rural southern Africa. Their main role is as relish as they are used as an accompaniment for staple cereal based diets. They are generally touted to be rich in micronutrients. Although they may be consumed in small quantities, they influence the intake of cereal staples, manage hunger and play a central role in household food security for the poorer rural groups. Mixing several of the vegetable species in one meal contributes to dietary diversity in terms of more vegetable types as well as in terms of choice of relish. For some very poor families, underutilized vegetables are substitutes for some food crops. The seasonal occurrence of these vegetables leavesmany families without a food source during the off-season. Wild vegetables increase agro-biodiversity at the household level. This agrobiodiversity helps in buffering against the accumulation and multiplication of pests and diseases and provides important cover for the soil. Because of their weedy habit these species are also known to be hardy and tolerant to sub-optimal growing conditions that are otherwise unsuitable for conventional crops, thus they ensure availability and food stability under unfavorable climatic conditions.

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Microbial Based Solutions to Sustainable Agriculture - Multifunctional Bacillus-Based Probiotics

Dr. Tzu Pi Huang
Chair/ Professor
tphuang@nchu.edu.tw

- Chair of Master and Doctoral Degree Program in "Plant Health Care", Academy of Circular Economy, National Chung Hsing University, Taiwan
- Department of Plant Pathology, National Chung Hsing University, Taiwan

【Abstract】

World leaders committed to the Sustainable Development Goals (SDGs). The "One Health" approach is also critical for achieving the SDGs. We proposed a Microbial Based Solution for sustainable agriculture, and for plant, animal, and environment health. Our transdisciplinary team discovered two Bacillus-based probiotics (Bacillus licheniformis EC34-01, and Bacillus subtilis 151B1), and demonstrated their applications in crop health care, bioremediation of agricultural pollutants, livestock farming, and aquaculture. Both strains were isolated from the plant rhizosphere in Taiwan. The two microbial agents in liquid, powder formulations, and spray-coating granules were assessed for their efficacy. Our results indicated that both strains could promote growth of various plants and suppress plant diseases. They also possessed plant growth promoting traits including production of extracellular enzymes, IAA, and phosphorus-solubilizing activity. B. subtilis 151B1 was found to produce surfactins and iturin A to trigger apoptotic-like cell death of the pathogen. B. subtilis 15 1B1 and B. licheniformis EC34-01 induced the expression of plant defense genes on cucumber seedlings. Both strains formed biofilms on plant roots and enhanced the tolerance of plants to drought and flooding. Additionally, they exerted numerous beneficial effects on animals including hogs, chickens, milkfishes, and whiteleg shrimp. These two probiotics are good alternatives for improving feed utilization, leading to enhanced growth performance, disease resistance, and meat quality. Our findings also suggested their potential use in improvement of livestock farm environment and water quality. Moreover, both probiotics exhibited activities in degradation of pesticides malathion and deltamethrin, and tricyclazole. The influence of introducing these Bacillus-based probiotics on the microbiome of the plant rhizosphere and fish guts will also be discussed in this presentation.

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Soil Biodiversity: An Understudied Driver of Sustainable Agriculture Production Systems

Dr. Khosi Ramachela

Senior Lecturer

Khosi.ramachela@nwu.ac.za

- **Food Security and Safety Research Entity, Crop Science Department, Northwest University, Mmabatho, South Africa**
- **2018 Vice Chancellor Technology Innovation Award**

【Abstract】

Sustainable agriculture is use of natural resources for continuous provision of agricultural products and services. Very often this understanding is generally discussed with minimum analysis on drivers of the processes. Soil health is the major driver of these processes. Soil health is highly influenced by the soil biodiversity. This is relationship is however not given recognition and attention it deserves. This paper discusses various roles played by biotic factors such as invertebrates and soil micro-organisms in maintenance and promotion of soil health. Soil invertebrates that include earthworms, termites, play an important role in soil aeration and incorporation of organic matter. This process drives the soil microbial activities which in turn drive nutrient recycling. Of particular interest is mycorrhizal fungi that plays a critical role in mobilization of nutrients and making them available to plants. This fungal species and various other microbes also play an important role in protecting plants against soilborne pathogens. This is important for the establishment of a sustainable agro ecosystems. Furthermore, the paper analyses use of these factors for re-habilitation of degraded soils. In conclusion the paper brings out importance of maintenance of soil biodiversity in climate change mitigation and adaptation by enhancing soil carbon sequestration.

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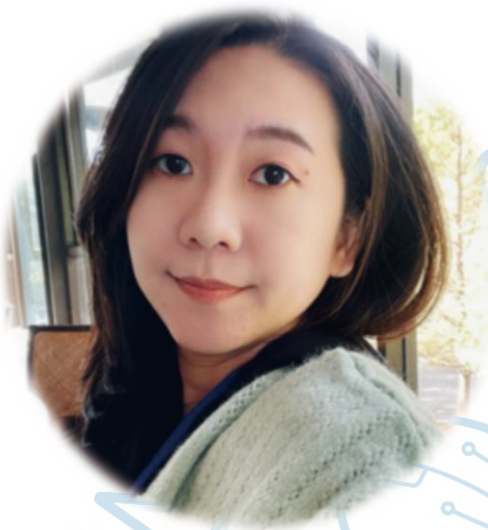
An Evolutionarily Conserved Long-Distance Migrating Peptide Regulates Lignin Biosynthesis and Plant Immunity



Dr. Ying-Lan Chen

Assistant Professor

cyl0828@gs.ncku.edu.tw

- **Department of Biotechnology and Bioindustry Sciences, College of Bioscience and Biotechnology, National Cheng Kung University, Taiwan**

- **The 5-Year Young Scholar Grant Award for the Ministry of Science and Technology (MOST) Einstein Program**

【Abstract】

Peptides act as hormones to deliver intercellular signals to govern intracellular transcriptional networks during complex developmental processes. Lignin in vascular tissues plays a critical role in plant terrestrialization for water-conducting and structural-supporting functions. Lignin also forms physical barriers against pathogen invasion. Comprehensive knowledge has been established on the transcriptional networks for the regulation of lignin biosynthesis. However, the long-distance migrating peptides transported by vascular sap for regulating monolignol biosynthesis remain unknown. Here, we used high throughput peptidomic analyses to reveal a group of evolutionarily conserved long-distance migrating peptides in vascular sap of five angiosperms, Cinnamomum kanehirae, Populus trichocarpa, Eucalyptus grandis, Glycine max and Zea mays. We found one of the conserved peptides, named Angiosperm Sap Peptide (ASAP), can strengthen the plant cell wall through the enhancement of the S-lignin pathway and trigger the salicylic acid-mediated immune responses to resist root-knot nematodes. The phosphoproteomic analyses exhibited that the ASAP rapidly induced protein phosphorylation involved in lignin biosynthesis and xylem development. Sequence identity analysis showed that ASAP emerged in land plants, suggesting its evolutionarily conserved role on regulation of lignin biosynthesis to facilitate plant terrestrialization and resistance to pathogens.

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Hydroponics: A Sustainable Tool for Regenerating Preferred Sex and Producing a Typical Dioecious Plant, *Telfairia occidentalis (Linn)*

Dr. Isijokelu Moses Ojeifo

Professor

imojeifo@delsu.edu.ng

- **Department of Agronomy, Faculty Agriculture, Del University, Abraka, Nigeria**
- **National Horticultural Research Institute (NIHORT), Ibadan, Nigeria**
- **University of Ibadan, Nigeria**

- **2019 Bioresource Conserv. Network Dev. Grant**

【Abstract】

Telfairia occidentalis **is a highly cherished leaf and seed vegetable. It is propagated mainly by seed. The seed is recalcitrant and dioecious with often equal proportion of female to male ratios of seed in the fruit. The female component produces better economic yield while the edible yield of the male is short-lived and overtaken by profuse flowering. There is therefore the need to access a sustainable technology for the regeneration of clonal propagules from the stem, to regulate the proportion of sex in favour of the female for plant in the field for higher economic return than the current. Attempt to achieve this through tissue culture has met with promising success, but is not sustainable. Also, efforts to produce the stem clones under conventional system was also successful but at a very low rate, less than 50 percent. Hydroponic culture promises to provide a wide range of alternative systems that can enhance the rooting of Telfairia stems where water, rooting hormone and nutrient applications are regulated with a lot of flexibilities, as well as the provision of humidity under sterile condition. Some sustainable hydroponic systems, such as Drip and Sandponics for rooting cuttings, have been identified.**

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Smart Agriculture: The Application of Unmanned Vehicle in Agriculture and Animal Husbandry Industry

Dr. Chen-Wei Liang
Assistant Professor
cwliang@niu.edu.tw

- **Department of Biomechatronic Engineering, National Ilan University, Taiwan**

【Abstract】

Agriculture and Animal Husbandry is one of the most important industry to feed the population. In order to reduce the effect of rural exodus and aging problem, smart and automated agriculture technique has been carry out during the last two decades. Biomechatronic Engineering Department of National Ilan University has placed an important role in this challenge. New kind of unmanned vehicle has been carrying out for both fruit growing and poultry farming. Unlike the unmanned vehicle in producing industry, agriculture and farming has more unexpected challenge and more surface factor. How to develop a mechanical structure and control/navigation strategy is the key for the smart agriculture. The technique of designing multipurpose wheel-based mechanical structure, and the strategy of multi-sensor and computer vision navigation system will be carry out.

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DeVelopment of Sustainable Agriculture at National Pingtung University of Science and Technology

Dr. Yuh Tzean

Vice Director/ Assistant Professor

tzean@mail.npust.edu.tw

- Office of International Affairs, UniVersity of Science and Technology, Taiwan
- Department of Plant Medicine, National Pingtung University of Science and Technology, Pingtung, Taiwan
- 2021 First Place, Lightening Talk Competition, International Society of Biocatalysis and Agricultural Biotechnology (ISBAB)

【Abstract】

The National Pingtung UniVersity of Science and Technology (NPUST) has been at the forefront for fostering comprehensive education and researches in the development of sustainable agriculture and aquaculture. As NPUST is currently home to six colleges, the development of educational resources in diverse disciplines of study and the integration of strength in each of these colleges has enabled NPUST cultivate holistic and technically-skilled professionals in agricultural arena. In the department of Plant Medicine, College of Agriculture, NPUST, a major agricultural challenge addressed is in the sustainable mitigation of microbial phytopathogens, which are a major limiting factor affecting plant growth and crop production. In pursuit of this goal, fundamental knowledge in phytopathology is translated for practical applications to develop strategies in the detection and/or control of important phytopathogens including nematodes, fungi, bacteria, and viruses. Here, we present on the researches exemplifying the rapid detection of fungal pathogens, strategies for enhancing plant immunity against viruses, as well as biological control against bacterial and plant-parasitic nematodes. All in all, NPUST strives to build high-quality education and research environments for innovating development and sustainable management of agricultural and aquacultural resources.

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Sustainable Magic: Turn Agriculture Trash to Cash

Dr. Yung-Kai Lin
Professor
YKlin@Ntou.edu.tw

- **Institute of Food Safety and Risk Management, National Taiwan Ocean University, Taiwan**
- **Department of Food Science, National Taiwan Ocean University, Taiwan**
- **Graduate Institute of Biomedical Engineering, National Chung Hsing University, Taichung, Taiwan.**
- **2022 Academic achievement Award of Food Science and Technology**

【Abstract】

Seed, peel, leaf and pomace from vegetable; blood, feather, skin and viscera from animal; all trash can be transform to cash upon the different types of kisses. We proposed five important concepts on sustainable magic: 1) know properties of your material; 2) design by function; 3) obtain by feasible method; 4) optimization and 5) design by application. Our investigation of wasabi leaves extract, for antioxidant, anti-glycation and whitening effects. Furthermore, application of banana flower extract (HappyAngel?) to stimulate hair growth and inhibit the activation of hair loss genes also present. Various unexplored natural source of bioactive ingredients and applied for the development of related value-added products in near future.

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Present Status of Marine Fisheries in Berbera, Somaliland

Mr. Eid Saleban Ahmed

Lecturer

Waayel934@gmail.com

- **Project coordinator, Strengthening Fisheries value chain project at UNFAO, Somaliland**
- **Department of Fisheries and Marine Science, Berbera Maritime and Fisheries Academy (BMFA), Berbera, Somaliland**
- **Department of Fisheries, Rajshahi University, Bangladesh**
- **2022 Award on innovative new dried fishery products in Berbera**

【Abstract】

The study was carried out to evaluate the marine fisheries' status in Berbera, Somaliland in terms of fish production, fishing crafts, fishing gear, constraints and future prediction. The study was conducted using questionnaires and interviews followed by a focus group discussion (FGD), and then the data was analyzed SPSS software and excel. In the present study, the fish production of the last 5 years (2017-2021) was 1689.34 tons, 1802 tons, 2058 tons, 1724.644 tons, and 1892.04 tons respectively. Different types of fishing crafts were found such as Hantar, Volvo, Layla, Gamuur, Hadra-mout, 2000, Af-dheer, jriif (trawler) and xaawis (seiner). During the study, fishing gear was collected such as trawl nets, pursuing ne,t gillnets, cast nets, traps, lines, long lines and squid nets. The main constraints that faced the fishery sector were a lack of financial and human resources, lack of information, poor traditional fishing practices, high post-harvest losses, very limited fishing gear suppliers and boat factories, Poor supporting infrastructure and cold chain facilities. The study may help Somalilander's policymakers to create future fisheries policies and development as well as the organizations who work in the fishery sector.

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The Water Quality and Pond Management of Aquaculture in Taiwan

Dr. Hong-Thih Lai

Dean/ Professor

htlai@mail.ncyu.edu.tw

- **Dean, College of Life Sciences, National Chiayi University, Taiwan**
- **Department of Aquatic Biosciences, National Chiayi University, Chiayi City, Taiwan**
- **Councilor, The Asian Fisheries Society, Taiwan**
- **2011-2018 MOST University Research Awards**

【Abstract】

Over the past few decades, global aquaculture production has been increasing rapidly and is predicted to surpass capture fishery production before 2030. In Taiwan, aquaculture industries are experiencing the same trends. However, due to its geographic location, Taiwan is facing various challenges that may negatively affect aquaculture practices. The limited plain land and bay around seashores have led to the intensive culture in Taiwan. In addition, the high temperature during the hot season caused decreased survival of cultured organisms. Furthermore, the heavy rain during the summer monsoon season and typhoons also resulted in the tremendous loss of farmers. Maintaining the water quality in these ponds is crucial for the health and growth of the aquatic animals, as well as the overall productivity of the industry. Therefore, continuous water quality monitoring must be done manually or with the help of remote sensors and AI management. In these years, the combination of solar panels with aquaculture is encouraged in Taiwan for reducing operational costs and improve sustainability. However, to effectively combine aquaculture and solar panels, it is important to consider factors such as the type of culture species, water quality, location, and the energy needs of the aquaculture system

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Decades of Growth and Development of Fisheries and Aquaculture in Nigeria: Prospect, Practice and The New Era for Sustainability

Dr. Bolaji Dunsin Abimbola
Chief Research Officer
bolajida@niomr.gov.ng

- **Department of Fishing Technology and Safety, Nigerian Institute for Oceanography and Marine Research (NIOMR), Nigeria**

- **2021 Save The Manatee Club Collaborative Grant**

【Abstract】

Nigeria's coastal zone is endowed with numerous living and non-living resources. The most important living resources are the fin and shellfish. The Industrial fisheries sector dated back to 1950 and 1953 when 2 commercial trawlers operated by the Colonial Development Corporation (CDC) Lagos terminals. The trawlers are well over 135 now operating in the continental shelf up to 50m depths. The industry has witnessed growth in the production of 21,600 metric tonnes (mt) to 616,981 mt in 2010 although currently produces around 15,464 mt. Small pelagic fishes including Tuna and Tuna-like species have been identified to be available in commercial quantity but have yet to be exploited. Lantern fish as also been identified in commercial quantity and yet underexploited. The advent of various technologies to enhance the sustainability of the resources saw the introduction of bycatch reduction devices (BRD) and turtle excluder devices (TED) along with a monitoring policy that ensures all edible catches are landed. The aquaculture sector has witnessed a tremendous increase over the decades from 16,119 mt to well over 2.5 million mt. The aquaculture boast has focused on the production of catfish *Clarias gariepinus* and Tilapia.

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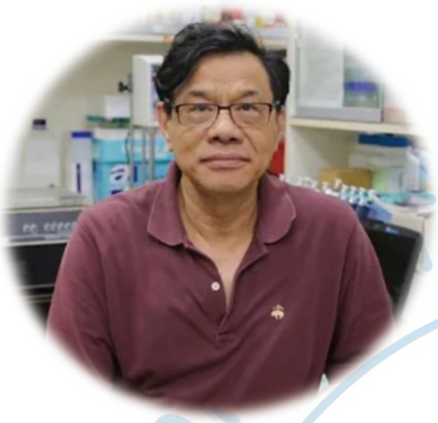

Development of Disruptive Technologies towards the Productivity and Sustainable Aquaculture

Dr. Jenn-Kan Lu
Associate Professor
F0008@mail.ntou.edu.tw

♦ Department of Aquaculture, National Taiwan Ocean University, Taiwan

【Abstract】

Aquaculture is the fastest growing food production sector, with aquaculture production has surpassed capture fisheries since 2013(FAO, 2022). However, with the scale of farming overstocking, the deterioration of the water environment is accelerating, and infectious fish diseases occur frequently, resulting in a decline in the quality of aquatic products. Furthermore, since aquaculture in many regions face the dilemma of high age of farming workers and labor shortage, therefore innovative aquaculture technology need to be adopted to increase productivity and achieve sustainable development. In recent years, modern ICT and AIOT technologies are applied to various fields of aquaculture. Smart farms try to introduce AIoT technology to carry out precision breeding (GS & GE), biofloc technology, intelligent water oxygenation and auto-feeding management, recirculating water system (RAS), precision nutrition, exploiting alternative protein sources and functional additives, and biosecurity management to reduce incidence rate. Using intelligent precision cultivating technology to carry out scientific farming, farmers no longer rely on the climate to survive. Application of renewable energy, artificial intelligence-assisted decision analysis and automatic control technology can greatly reduce labor costs and achieve green and sustainable aquaculture. This presentation will summarize the development of aquaculture smart equipment, Internet of Things, edge computing, and drones, as well as the application of AI algorithms in smart aquaculture operations, analyze existing problems and future development prospects.

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Current Status and Potentials of Aquaculture in Delta State, Nigeria

Dr. Esther Uzoma Kadiene
Deputy Director / Lecturer
ekadiene@delsu.edu.ng;
estherkadiene@gmail.com

- **Deputy Director, Centre for Research and International Programmes, Delta State University, Nigeria**
- **Department of Animal and Environmental Biology, Delta State University, Abraka, Nigeria.**

【Abstract】

Delta State is endowed with different water bodies enriched with high specie diversities. About 87% of the fish farmers in Delta State culture Catfish, and about 12% culture tilapia mostly gotten from the wild and trained. There are over 30 species of fish in our water bodies and are yet to be exploited. Aquaculture is a sustainable means for food production and security, and we are yet to fully explore the production of most fish species in aquaculture. Feed accounts for more than 70 % cost of aquaculture production in Delta State, because of the high cost and low supply of fish meal. From the survey we conducted, we observed that some of the fishes sampled from the river were very small in size with high abundance caught in all seasons but have very low market value to the fishermen. However, they can be potential source of fishmeal when produced. Mormyridae, Clariidae, Cichlidae, Mochokidae, Gymnarchidae are some of the families of fish we found to be in abundance in our water bodies with high aquaculture potential. We have begun to identify these fish species at the molecular level using DNA bar cording for aquaculture production.

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Application of Agricultural Byproduct/Waste as Functional Feed Additives in Aquafeed

Dr. Yu-Hung Lin
Distinguished Professor
yuhunglin@mail.npust.edu.tw

- **Department of AQuaculture, National Pingtung UniVersity of Science and Technology, Pingtung, Taiwan**
- **Secretary, Taiwan Branch, Asian Fisheries Society**

【Abstract】

The issue of agriculture circular economy has received attention around the world in recent years. The main purpose of the agriculture circular economy is to promote economic efficiency and environmental protection through waste recycling. Aquafeed is a key issue in sustainable aquaculture. Recently, the active components from plants or their extracts, such as polysaccharides, alkaloids, flavonoids, pigments, phenolics, terpenoids, steroids, and essential oils, have been paid attention in their effects on h ealth control and as a strategy instead of antibiotics and chemotherapies in aquafeed. Our team has evaluated some agricultural byproduct/waste as the functional feed additives in aquaculture industry. The water hyacinth, banana peel, cacao pod husks, and lemon peels, the four commonly agricultural byproduct/waste in Taiwan, have been documented their potentiality in enhancing immune responses, stress resistance, and disease resistance for fish and shrimp. Our studies also reported that simple processing, such as heating, extraction or fermentation, could improve the efficacy of these products.

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From Scientific Breeding of Quality-Based Aquatic Seedlings to Sustainable Aquaculture

Dr. Chang-Wen Huang

Associate Chair / Associate Professor

cwhuang@mail.ntou.edu.tw

- **Department of AQuaculture, National Taiwan Ocean University, Keelung, Taiwan**
- **Center of Excellence for the Oceans, National Taiwan Ocean University, Keelung, Taiwan**
- **Operation Center for Enterprise Academia Networking, National Taiwan Ocean University, Keelung, Taiwan**
- **19th National Innovation Award in the Agricultural and Food Biotechnology Category of the Academic Research Category**

【Abstract】

Emerging sciences, forward-thinking technologies, and intelligent innovations are key to achieving sustainable development goals. Precision breeding technology can enhance the resilience of farmed species to natural disasters and diseases, increase production, and provide consumers with high-quality aquatic products. Additionally, it can improve breeding efficiency, reduce labor and space requirements, and shorten breeding cycles. This aligns the aquaculture industry with international trends and contributes to the United Nations' sustainable development goals and human food safety. The aquatic breeding team at National Taiwan Ocean University has been researching ways to improve fine varieties of Taiwan tilapia. Collaborating with industry and other fields, we have developed multiple assisted breeding technologies, selected and breeding quality-based breeds, and trained innovative teams. We also have a solid foundation of academic achievements and have filed for domestic and international patents. In the future, our research and development efforts will be applied to the aquaculture seedling industry through international cooperation to enhance competitiveness and sustainability in the global market. This research has significant value for producing high-quality human protein, which not only addresses global hunger but also impacts the economy, academia, and education.

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Challenges, Potential, Hopes and The Future of Shrimp Aquaculture

Dr. Han-Ching Wang

Distinguished Professor/ Director

wanghc@mail.ncku.edu.tw

- Department of Biotechnology and Bioindustry Sciences, National Cheng Kung University, Tainan, Taiwan
- International Center for the Scientific DeVelopment of Shrimp Aquaculture (ICSDSA), National ChengKung University, Tainan, Taiwan
- Leading Expert, Reference labs of AHPND and WSD, OIE (World Organization for Animal Health)
- 2022 International Outstanding Young Scholars(National Science and Technology Council)

【Abstract】

Asia is undoubtedly a major contributor for global aquaculture. However, this industry is burdened by the growing food demand and climate change that has eventually led to emergence of diseases, depletion of marine resources and a lack of reliable SPF stock/fry. An immediate attention and an action plan are needed to transform the existing practices in shrimp industry to ensure the cultured shrimps are harvested sustainably. In this talk, I will share our adventurous research journey till date, current developments in our shrimp breeding program and our future goals. We have integrated our pioneering scientific researches with over 40 latest aqua-technologies into our program. Our extended shrimp farming facility in East Taiwan is a prototype for business model ecosystem. ICSDSA, at present maintains ~30 shrimp families with commercially desirable traits, these valuable SPF tiger shrimps along with our exclusive facility is gaining momentum towards sustainable tiger shrimp aquaculture. Therefore, the future of sustainable shrimp aquaculture depends on a concerted effort from global shrimp research community and the stakeholders of aquaculture industry.

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國立臺灣海洋大學
National Taiwan Ocean University

Taiwan can help project proposal

Asia, including Taiwan, is the region with the fastest growing tilapia aquaculture production in the world. We propose to use Taiwan's well developed tilapia genetic breeding and farming technology and BSF insect circular bioeconomy model to respond to strengthen international aquaculture fishery technical cooperation to assist African friends. The development of modern cultivating fishery will contribute to the sustainable development of African friendly countries.

Proposal for joint R&D projects to develop ready-to-market solutions for products, technology-based services or methods in intelligent aquaculture and application areas, which have strong market potential.

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National Taiwan Ocean University


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